http://www.isess2017.com

ISESS 2017

1ST ANNUAL MEETING OF INTERNATIONAL SOCIETY OF ENDOSCOPIC SPINE SURGERY (ISESS)

28th Nov-1st Dec, 2017

GUANGZHOU, CHINA

Program & Abstracts

ISESS 2017 Program & Abstracts 28th Nov-1st Dec, 2017

Welcome to ISESS

The First Annual Conference of the International Society of Endoscopic Spine Surgery (ISESS) is being held in Guangzhou, China. It marks the formal prelude of ISESS academic research activities.

ISESS is a non-profit academic organization registered in the United States. The organization's mission is to promote the development of endoscopic spine surgery globally, facilitate the academic exchange in this highly specialized field, improve and expand surgeons' knowledge and professional expertise, lead a continuation of endoscopic spine surgery innovations, and to benefit the patients.

In July 2016, the first ISESS Executive Committee Meeting was held in Beijing. The meeting has approved a series of important resolutions about the future development of ISESS. The Executive Committee is the supreme authority of ISESS with full power to plan, organize, and execute all the activities and related affairs of ISESS. The Executive Committee is composed of representatives from different countries all over the world. Members from each country have equal rights in the Executive Committee. All decisions from the Executive Committee should be authorized by a majority vote from the participating members' agreement before execution. At present, world famous experts from 12 countries and one region have participated in the Executive Committee. These countries are: Brazil, Germany, India, Indonesia, Japan, the Philippines, Russia, South Korea, Thailand, Turkey, the United States, Taiwan (China), and China. We welcome more professionals from different countries to become ISESS Executive Committee members. We also welcome all the colleagues and professionals engaged in endoscopic spine surgery to join ISESS.

With the best efforts of all Executive Committee members, we will create a high efficiency, openness and responsible organization to serve our ISESS members. We will dedicate to continuing and expanding education of endoscopic and endoscopically-assisted spine surgery. We will provide an honest, energetic, highly accredited academic exchange platform for the training of outstanding endoscopic spine surgeons. Together, we will make significant contributions to the international development of endoscopic and endoscopically-assisted spine surgery.

Shuxun Hou, M.D.
President of the 1st Executive Committee
International Society of Endoscopic Spine Surgery (ISESS)

ISESS 2017

Welcome Message

Dear Colleagues,

We are pleased and honored to invite you to 1st Annual Meeting of International Society of Endoscopic Spine Surgery (ISESS) on Nov. 28th-Dec. 1st, 2017 in Guangzhou, China.

ISESS is a non-profit organization to promote the development of endoscopic spine surgery. It has been free of institutional, governmental, industry or individual biases since its establishment. ISESS is designed to improve diagnoses of spinal conditions, enhance surgeons' knowledge, competence, and performance, lead the advancement of spine technologies, and inform the public.

1st Annual Meeting of ISESS will cover all the major issues in different fields of endoscopic spine surgery, including Percutaneous Endoscopic Spine Surgery, Microendoscopic Spine Surgery, Microscopic Spine Surgery, Minimally Invasive Spinal Fusion, Digital Navigation and Artificial Intelligence in MISS and so on. Besides, particular attention will be given to young spine surgeons with dedicated sessions aimed at improving both their knowledge and skills in surgical procedures via cadaver workshop courses. All members of the scientific committee will be dedicated to putting together a very comprehensive and varied scientific programme which will make the meeting unforgettable and worth attending for all delegates.

Guangzhou, the forerunner of China's reform and opening up, is blessed with a profound history dating two thousand years and boasts the unique, splendid culture of South China. Hence, Guangzhou will not only make a perfect venue for the meeting, but will also offer a chance for participants to explore Chinese culture, traditions, as well as its development. We promise Guangzhou will leave you with unforgettable memories. You will be delighted by discovering the charms of the Ancient East.

On behalf of ISESS 2017 I wish you a very successful meeting and enjoyable days in Guangzhou.

Sincerely,

Shuxun Hou, M.D.
Honorary President

Anthony Yeung, M.D.
Honorary President

Yue Zhou, M.D.
Chair

Limin Rong, M.D.
Executive Chairman

Kaixuan Liu, M.D.
Executive Chairman

SPINENDOS
innovation for healthcare

We set the golden standards in full-endoscopic spinal surgery

Endoscopic Cervical Spine System · Endoscopic Lumbar Spine System · Endoscopic Thoracic Spine System · Endoscopic Spinal Stenosis System

Perfect training system

Germany Training Center

America Training Center

Thailand Training Center

Taiwan Training Center (CHINA)

West China Training Center (CHINA)

Beijing Training Center (CHINA)

Guangzhou Training Center (CHINA)

Chongqing Training Center (CHINA)

Shanghai Training Center (CHINA)

Xiamen Training Center (CHINA)

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ORGANIZING

Honorary President

侯树勋
Shuxun Hou

Anthony Yeung
(美国)

Chairman

周　跃
Yue Zhou

Executive Chairman

戎利民
Limin Rong

Kaixuan Liu
(美国)

Executive Presidium

Said Osman
(America)

Eduardo Barreto
(Brazil)

Stefan Heillinger
(Germany)

Dirk Gothel
(Germany)

Fujio Ito
(Japan)

Gun Choi
(Korea)

Jin-Sung Kim
(Korea)

Chi Heon Kim
(Korea)

Hyeun Sung Kim
(Korea)

Masatsune Yamagata
(Japan)

Sumito Shimizu
(Japan)

Jayaswal Arvind
(India)

S.M.Rohidas
(India)

Karaeminogullari Oguz
(Turkey)

Ismail Gokyar
(Turkey)

Kuansongtham Verapan
(Thailand)

Pornpavit Sriphirom
(Thailand)

Luthfi Gatam
(Indonesia)

Bambang Darwono
(Indonesia)

Petr Zelenkov
(Russia)

Elmer Jose Arevalo Meceda
(Philippines)

Shao-Keh Hsu
(Chinese Taipei)

Chien-Min Chen
(Chinese Taipei)

Zhongliang Deng
(China)

Zhenzhou Li
(China)

ACCESS & FLOOR PLAN

ACCESS TO LANGHAM PLACE AND CONFERENCE VENUE

LOCATION

Located in the new central business district on Pazhou Island and adjancent to the Canton Fair Complex.It takes just 5minutes walking from nearest subway station:Xingangdong Station.

Add: 638 Xingang East Road, Haizhu District, Guangzhou 510335 China

Tel: 86 (20) 8916 3388

Guangzhou Baiyun International Airport
44km, 45 mins
drive depending on road condition

Guangzhou Railway Station
15km, 30 mins
drive depending on road condition

Guangzhou East Railway Station
10km,25 mins
drive depending on road condition

Guangzhou South Railway Station
22km, 35 mins
drive depending on road condition

Timetable Shuttle bus		
Date	**Departure Time**	**Destination**
Nov. 29th, 2017	18:30	Hilton Guangzhou Tianhe
Nov. 30th, 2017	21:00	

HILTON GUANGZHOU TIANHE

LOCATION

Located in Guangzhou's central business district, with easy access to the city's most popular shopping and entertainment venues.It takes just 10minutes walking from nearest subway station: Linhexi Station.

Add: 215 Linhe Xi Heng Road, Tianhe District, Guangzhou 510500,China

Tel: 86(20)6683 9999

Guangzhou Baiyun International Airport
35km, 40 mins drive depending on road condition

Guangzhou East Railway Station
700m, walking about 10 mins

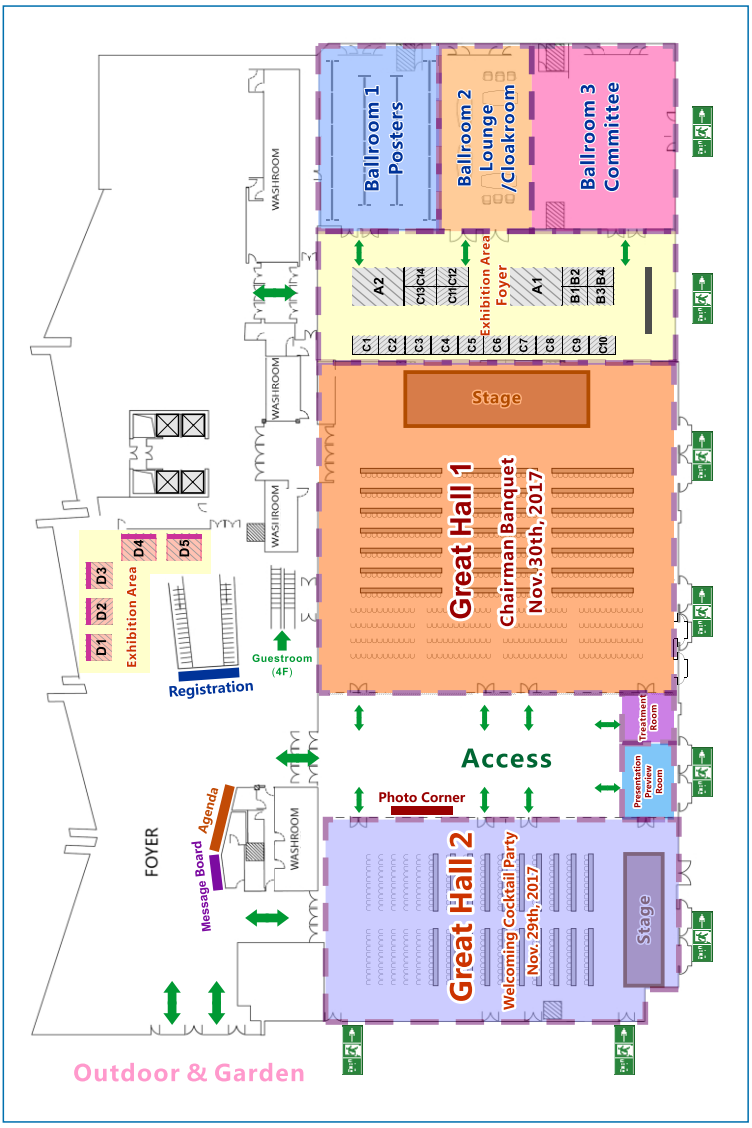
Guangzhou South Railway Station
25.5km, 35 mins drive depending on road condition

Guangzhou Railway Station
8km, 16mins drive depending on road condition

Timetable Shuttle bus

Date	Departure Time	Destination
Nov. 29th, 2017	08:15	Langham Place, Guangzhou
	08:30	
	09:15	
	09:30	
	11:00	
Nov. 30th, 2017	06:30	
	07:30	

ACCESS & FLOOR PLAN



3rd Floor , Langham Place, Guangzhou

4th Floor , Langham Place, Guangzhou

GENERAL INFORMATION

Dates

Tuesday,28 November – Friday,1 Decmber,2017

Venue

Langham Place, Guangzhou
http://www.langhamhotels.com/en/langham-place/guangzhou/

Official Language

English
Simultaneous interpretation is provided.

Dress Code

Smart casual or refreshing styles

Congress Topics

1. Percutaneous Endoscopic Spine Surgery
2. Microendoscopic Spine Surgery
3. Microscopic Spine Surgery
4. Minimally Invasive Spinal Fusion
5. Digital Navigation and Artificial Intelligence in MISS

Registration

The staff at the conference registration desk is happy to assist you in all matters of registration. The opening hours of the registration desk are as follows:

- Executive Committee Member and Golf Tournament Player Registration
  14:00-22:00, November 28th, 2017 (Tues.)
  Registration Site: 4th Floor of the Front Desk Registration, Langham Place, Guangzhou
- On-site Registration
  08:00-18:00, November 29th, 2017 (Wed.)
  Registration Site: 3rd Floor of the Front Desk Registration, Langham Place, Guangzhou

Registration fee

	By September 30th, 2017	By October 30th, 2017	After October 30th, 2017 and On-site Registration
Representatives	$600	$800	$1000
Training Students	$300	$400	$500
The costs below contain the expenses of Conference, Program and abstracts Book,City Transportation, Chairman Banquet and Two Days' Accommodation.			
Spouse/Accompanying	$150	$150	$150
The costs below contain the expenses of City Transportation & Chairman Banquet.			

Budges

All participants are required to wear their name badges in order to gain entry to the scientific sessions.
Access to meeting rooms and exhibition will be denied without a valid name badge.
Lost badges CANNOT be replaced at the registration desk.

Executive Committee Conference

Date: November 29th, 2017 (Wed.)
Time:16:30-18:00
Place: Ballroom 3 (Langham Place, Guangzhou 3F)

Social Activities

1. 1st ISESS Cup Golf Tournament
   Date: November 29th, 2017 (Wed.)
   Time: 08:00 - 12:30
   Place: Nansha Golf Club, Guangzhou
   Departure Time&Place: 07:00, Lobby(Langham Place, Guangzhou 1F)
   No On-site registration is available.
2. Excursion
   Date: November 29th, 2017 (Wed.)
   Time: 08:00-14:00
   Departure Time&Place: 08:00, Lobby(Langham Place, Guangzhou 1F)
   Destinations: Chen Clan Ancestral Hall → Sai Kwan Mansion → Liwan Museum → Panxi Restaurant(Lunch)
3. Welcoming Cocktail Party
   Date: November 29th, 2017 (Wed.)
   Time: 18:30-20:30
   Place: Great Hall 2(Langham Place, Guangzhou3F)
4. Chairman Banquet
   Date: November 30th, 2017 (Thur.)
   Time: 18:30-21:00
   Place: Great Hall 1(Langham Place, Guangzhou3F)

Contacts

Registration: Qiaojuan Lai +8613411974875
Congress Schedule & Program: Feng Feng +8618665665152
Transportation: Bin Liu +8613068807078 Lanying Li +8613763337826
Accommodation: Peixin Liang +8613380068346 Chunxiao Luo +8618922102798

PRESENTATION GUIDELINES

Oral Presentation Guidelines

Below are some guidelines to help your oral presentation.

Equipment and room setup:

- The conference rooms are set up in classroom style seating.
- Each conference room is equipped with a standard audio-visual package that supports electronic presentation.
- The package includes the following item: Screen*Microphone*Laser Pointer

Presentation Preview:

- Presentation Preview is imperative for every presenter.
- The Presentation Preview Room is set in 3rd floor of Langham Place, Guangzhou.
- Presenters should come to Presentation Room at least 1 hour prior to the scheduled presentation time for presentation preview. Technical supports concerning electronic presentation are available there.
- Presenters will need to bring USB for the their presentation. Presenters are NOT ALLOW to use their own laptop for presentation.

Hours of Presentation Preview Room:

Wed, 29 November 09:00-20:00
Thur, 30 November 06:30-17:00

Presentation Timing:

- Please note that you have limit time to present your paper with PowerPoint®2010.
- Please DO NOT run over your allotted time.
- Each session will have moderators who will keep the program on time.
- The session moderations will facilitate the discussion.

Considerations for Mac Users:

Keynote will NOT be accepted as it cannot be playedback on PC. Please export your presentation as PowerPoint.

Presentation:

- Please arrive at the conference room at least 15 minutes before your session begins. Presenters will have to operate their slides by themselves during the presentation, though presentation technical support is available in each conference room.
- When presentation, please speaks slowly and clearly so as to make your presentation better understood.
- Be sure to come early to your session. You, or one of your co-authors, MUST be present during the start of the session.

Poster Presentation Guidelines

Below are some guidelines to help you prepare your poster presentation.

- Display only NO oral presentation.
- Each poster author will be provided with H1100mm*W900mm poster board area, with a poster number indicated in them upper right or left corner of the board area, as shown in the drawing above.
- All illustrations, charts, etc., to be posted should be prepared by yourself in advance. Support concerning poster editing will not be available during the meeting. But pushpins are available close to the poster board.
- Poster texts must be edited in a large enough font to be viewer friendly.
- No commercial activities or advertisements are allowed to be included in you're the poster text or in the poster board. Violating this rule will result in removal of your poster.
- Poster Authors are responsible for putting up and removing their own posters in the following specific time.

Hours of Poster Operation		
Preparation	Wed, 29 November,2017	09:00-20:00
Exhibition	Thur, 30 November,2017	07:00-17:30
Remove	Thur, 30 November,2017	17:30-21:30

NOTE: Secretariat is not responsible for posters that have not been collected at the end of the Congress. And we will discard posters not collected.

PROGRAM AT A GLANCE

Nov. 29th, 2017

Time	Great Hall 1(3F)	Great Hall 2(3F)	Ballroom 1(3F)	Ballroom 3(3F)
07:00				
08:00				
09:00			**09:00-20:00** Poster Preparation	
10:00				
11:00				
12:00				
13:00	**13:00-18:10** 8th Meeting of Chinese Minimally Invasive Spinal Surgery, 4th Academic Meeting of Chinese Endoscopic Spine			
14:00		**14:20-17:30** 8th Meeting of Chinese Minimally Invasive Spinal Surgery, 4th Academic Meeting of Chinese Endoscopic Spine		
15:00				
16:00				
17:00				**16:30-18:00** The 2nd ISESS Executive Committee Conference
18:00				
19:00		**18:30-20:30** Welcoming Cocktail Party		
20:00				
21:00				

Simultaneous interpretation is provided

Nov.30th,2017

Time	Great Hall 1(3F)	Great Hall 2(3F)	Ballroom 1(3F)
07:00			06:30-17:30 Poster Viewing
	07:15-07:55 Master lecture		
08:00		08:00-08:20 ISESS 2017 Opening Ceremony	
09:00	08:20-10:10 Chapter 1 Keynote Speech		
10:00			
11:00	10:20-12:00 Chapter 2 Scientific Sessions	10:20-12:00 Chapter 1 Scientific Sessions	
12:00	12:00-12:50 Shui Mu Tian Peng	12:00-12:50 Satellite Symposium (DepuySynthes & Lilly)	
13:00	13:00-14:00 Chapter 3 Scientific Sessions	13:00-14:10 Chapter 2 Scientific Sessions	
14:00	14:00-15:00 Chapter 4 Scientific Sessions	14:10-15:00 Chapter 3 Scientific Sessions	
15:00	15:15-16:15 Chapter 5 Scientific Sessions	15:15-16:30 Chapter 4 Scientific Sessions	
16:00	16:15-17:15 Chapter 6 Scientific Sessions	16:30-17:40 Chapter 5 Keynote Speech	
17:00			17:40-18:00 ISESS 2017 Closing Ceremony
18:00		18:00-18:30 Satellite Symposium(HENGRUI)	
19:00	18:30-21:00 Chairman Banquet		17:30-21:30 Poster removal
20:00			
21:00			

PROGRAM

November 28th, 2017 (Tues)

14:00-22:00 1st ISESS Cup Golf Tournament Registration
Executive Committee Member and Golf Tournament Player Registration Conference Registration

November 29th, 2017 (Wed)

08:00-15:00 1st ISESS Cup Golf Tournament

08:00-18:00 Conference Registration(Register Address: 3rd Floor of the Front Desk Registration,Langham Place Hotels,Nanfeng,Guangdong)

16:30-18:00 The 2nd ISESS Executive Committee Conference

18:30-20:30 Welcoming Cocktail Party

November 30th, 2017 (Thur) GREAT HALL 1

07:15-07:55 **Master lecture**
Chairs: Karaeminogullari Oguz, Zhenzhou Li

Ms 1 07:15-07:45
The Role of Endoscopic Surgery in the Treatment of Painful Degenerative Conditions of the lumbar Spine
Speaker: Anthony Yeung

07:45-07:55 **Q & A**

08:00-08:20 **Opening Ceremony**

08:20-10:10 **Chapter 1 Keynote Speech**
Chairs: Gun Choi, Eduardo Barreto, Limin Rong

KS A1 08:20-08:35
Assessment of the various systems for Endoscopic Spine Surgery: The Philosophies and Evolving Techniques in Commercially Available Systems in the Market Place
Speaker: Anthony Yeung

KS A2 08:35-08:50
Full-endoscopic concepts in the treatment of pathologies of the thoracic spine
Speaker: Martin Komp

PROGRAM

KS A3	08:50-09:05 Navigation assisted spinal endoscopic techniques Speaker: Yue Zhou
KS A4	09:05-09:20 Percutaneous Endoscopic Surgery for Lumbar Spinal Stenosis: Transforaminal or Interlaminar? Speaker: Kaixuan Liu
KS A5	09:20-09:30 Ipsilateral, biportal Endoscopic approaches to the thoracic and lumbar spine – Historical, anatomic and technical perspectives Speaker: Said Osman
KS A6	09:30-09:40 Percutaneous transforaminal endoscopic discectomy versus microendoscopic discectomy for lumbar disc herniation: two-years' results of an ongoing randomized controlled trial Speaker: Limin Rong
KS A7	09:40-09:50 Bony Decompression in Endoscopic Spine Surgery Speaker: Stefan Hellinger
KS A8	09:50-10:00 A new sugical method for thoracolumbar burst fracture with percutaneous transforaminal endoscopic decompression and percutaneous pedicle screw reduction and fixation Speaker: Zhenzhou Li
10:00-10:10	**Q & A**
10:10-10:20	**Coffee Break**
10:20-12:00	**Chapter 2** Chairs: Ismail Gokyar, Yen-Mou Lu, Huilin Yang
FP A2-1	10:20-10:30 Percutaneous Endoscopic Translaminar keyhole approach in lumbar spine Speaker: Jin-Sung Kim
FP A2-2	10:30-10:40 Percutaneous Endoscopic Lumbar Discectomy for Treatment of Intervertebral Disc Herniation: The Outcomes and Learning Curve in the First Sixty Cases Speaker: Luthfi Gatam
FP A2-3	10:40-10:50 Percutaneous Endoscopic Surgery for Lumbar juxta-facet Cyst Speaker: Chien-Min Chen
FP A2-4	10:50-11:00 Transforaminal Percutaneous Endoscopic Discectomy Speaker: Karaeminogullari Oguz

PROGRAM

FP A2-5 11:00-11:10
Percutaneous Endoscopic Cervical Spine Surgery: Principles, Techniques and Complications
Speaker: Zhongliang Deng

FP A2-6 11:10-11:18
TOTAL ENDOSCOPIC SURGERY OF THE SPINE. THORACIC DISK HERNIA. EXPERIENCE IN 16 CASES OPERATED BY THE AUTHOR.
Speaker: Roth Vargas Antonio

FP A2-7 11:18-11:26
PEID (Percutaneous endoscopic interlaminar discectomy): Cautional Point based on the Evidences
Speaker: Jun ho Lee

FP A2-8 11:26-11:34
How steep is the learning curve?
Speaker: Loke Wooi Pin

FP A2-9 11:34-11:42
The Clinical Investigation of Zessys for Lumbar Foraminoplasty in Percutaneous Endoscopic Lumbar Discectomy (PELD)
Speaker: Changqing Li

FP A2-10 11:42-11:50
The preliminary clinical application of percutaneous endoscopic transforaminal lumbar interbody fusion in lumbar spinal stenosis
Speaker: Jincai Yang

11:50-12:00 **Q & A**

12:00-12:50 **Satellite Symposium 3** **Shui Mu Tian Peng**

13:00-14:00 **Chapter 3**
Chairs: Sumito Shimizu, Tolgay Satana, Akira Dezawa

FP A3-1 13:00-13:10
Endoscopic management in lumbar spondylolysis.
Speaker: Pornpavit Sriphirom

FP A3-2 13:10-13:20
Learning curve and early results of interlaminar and transforaminal full-endoscopic resection of lumbar disc herniations
Speaker: Petr Zelenkov

FP A3-3 13:20-13:28
Tips and Pearls of percutaneous endoscopic decompression technique using a new scope and a high speed drill
Speaker: Akira Dezawa

FP A3-4 13:28-13:36
Combined Interlaminar and transforaminal endoscopic discectomy for large disc herniation
Speaker: Withawin Kesornsak

FP A3-5 13:36-13:44
Endospine- Endoscopic Anterior Cervical Discectomy & Cord Decompression – Destandau's technique.
Speaker: S.M. Rohidas

PROGRAM

FP A3-6	13:44-13:52 Clinical outcomes of posterior percutaneous endoscopic cervical discectomy for cervical spondylotic radiculopathy Speaker: Xiaojian Ye
13:52-14:00	**Q & A**
14:00-15:00	**Chapter 4** Chairs: Petr Zelenkov, Yi-Hung Huang, Shangli Liu
FP A4-1	14:00-14:10 Indications and Technique of trans-Sacral Epiduroscopic Laser Decompression Surgery Speaker: Elmer Jose Arevalo Meceda
FP A4-2	14:10-14:20 Uniportal bilateral endoscopic decompression: Possible complications and how to avoid them Speaker: Kuansongtham Verapan
FP A4-3	14:20-14:30 Lateral Decubitus position affecting the transforaminal approach of L5-S1 Speaker: Bambang Darwono
FP A4-4	14:30-14:38 Complications of Percutaneous Endoscopic Lumbar Discectomy via Interlaminar Approach Speaker: Jiancheng Zeng
FP A4-5	14:38-14:46 Surgical treatment for lumbar lateral recess stenosis with the percutaneous endoscopic technique: interlaminar approach versus transforaminal approach Speaker: Bing Wang
FP A4-6	14:46-14:54 Anatomy of transforaminal approach Speaker: Pradyumna P Pai Raiturker
14:54-15:00	**Q & A**
15:00-15:10	**Coffee Break**
15:15-16:15	**Chapter 5** Chairs: Kuansongtham Verapan, Nizar Natout, Liming Cheng
FP A5-1	15:15-15:25 Transforaminal Endoscopic Lumbar Discectomy at L5-S1 with foraminoplasty Speaker: Ismail Gokyar
FP A5-2	15:25-15:35 New approach of PECD and PETD for Cervical, Thoracic Myelopathy Speaker: Sumito Shimizu
FP A5-3	15:35-15:43 Surgical outcome of percutaneous full endoscopic technique for highly migrated disc herniation via three different approaches Speaker: Yi Jiang

PROGRAM

FP A5-4 15:43-15:51
Percutaneous Endoscopic Transforaminal and Lateral Recess Decompression After Previous Spinal Surgery
Speaker: Kai-Uwe Lewandrowski

FP A5-5 15:51-15:59
The L4/5 lamina gap difference between flexion (kneeling) position and prone position and the advantage of percutaneous endoscopic interlaminar discectomy (PEID) under the flexion (kneeling) position
Speaker: Qun Yang

FP A5-6 15:59-16:07
Endoscopic decompression for L5S1 foraminal stenosis in patients with or without previous adjacent fusion surgery - A preliminary reports
Speaker: Changchen Yang

16:07-16:15 **Q & A**

16:15-17:15 **Chapter 6**
Chairs: Jin-Sung Kim, Xifeng Zhang, Lixin Zhu

FP A6-1 16:15-16:25
Changes in cervical motion after cervical spinal motion preservation surgery
Speaker: Chi Heon Kim

FP A6-2 16:25-16:33
Selective Endoscopic Fragmentectomy for the Lumbar Spine: The good, the bad and how to solve the problems.
Speaker: Prada Nicolas

FP A6-3 16:33-16:41
Experience of Percutaneous Endoscopic Spine Surgery in treating Lumbar Disorders with Intraspinal Occupying Ossification
Speaker: Qingquan Kong

FP A6-4 16:41-16:49
The Full-Endoscopic Interlaminar Operations of Lumbar disc herniations and Spinal Stenosis - State of the art, possibilities and limitations
Speaker: Markovic Marko

FP A6-5 16:49-16:57
Application of Full endoscopic spine surgery in the lumbar spine
Speaker: Gun Keorochana

FP A6-6 16:57-17:05
A look at works of art from the point of view of a neurosurgeon and orthopedist.
Speaker: Leonid Sak

17:05-17:15 **Q & A**

18:30-21:00 **Chairman Banquet**

PROGRAM

November 30th, 2017 (Thur) GREAT HALL 2

10:20-12:00 Chapter 1
Chairs: Stefan Hellinger , Huiyong Shen, Zhaomin Zheng

FP B1-1 10:20-10:30
Decompression effects of L-LIF surgery for degenerative lumbar diseases
Speaker: Masatsune Yamagata

FP B1-2 10:30-10:40
The combined anterior plate and contralateral transarticular screw foe atlantoaxial fixation; Biomechanics study and preliminary results
Speaker: Pornpavit Sriphirom

FP B1-3 10:40-10:48
Learning curve of minimally invasive surgery oblique lumbar interbody fusion for degenerative lumbar diseases
Speaker: Jian Wang

FP B1-4 10:48-10:56
Endoscopic assisted thoracolumbar fracture fixation - Kyphoplasty & pedicle instrumentation
Speaker: Ujjwal K Debnath

FP B1-5 10:56-11:04
The techniques and approach related complications of modified lateral lumbar interbody fusion
Speaker: Fangcai Li

FP B1-6 11:04-11:12
Instrumentation Related Complication of Lumbar Degenerative disc Diseases (LDD) treated by Minimally Invasive Transforaminal Lumbar Interbody Fusion (MIS-TLIF)
Speaker: Xinyu Liu

FP B1-7 11:12-11:20
FIBULA GRAFT USING VIDEO-ASSISTED THORACOSCOPIC SURGERY FOR SYNDROMIC SCOLIOSIS
Speaker: Hidetomi Terai

FP B1-8 11:20-11:28
Minimally Invasive Spinal Grading Of Osteotomy
Speaker: Xun Ma

FP B1-9 11:28-11:36
Clinical research of minimally invasive management for isthmic lumbar spondylolisthesis via Vista visualization channel
Speaker: Feng Xu

FP B1-10 11:36-11:44
Minimal access decompression surgery in lumbar degenerative disease
Speaker: Motonobu Natsuyama

FP B1-11 11:44-11:52
Accuracy of Percutaneous Pedicle Screw Placement for Thoracolumbar Fractures using Conventional Fluoroscopy Compared with Three-dimensional Navigation
Speaker: Jun Zou

11:52-12:00 Q & A

PROGRAM

12:00-12:50 **Satellite Symposium 4**
NEW MIS TECHNIQUE (DepuySynthes & Lilly)

13:00-14:10 **Chapter 2**
Chairs: Luthfi Gatam, Yu Liang, Dongsheng Huang

FP B2-1 13:00-13:08
Robot-Assisted Minimally Invasive Spine Surgery
Speaker: Yen-Mou Lu

FP B2-2 13:08-13:16
Accurate placement of cervical pedicle screws using 3D-printed navigational templates and continuous image registration
Speaker: Haibin Lin

FP B2-3 13:16-13:24
The impact of navigator-assisted device on radiation exposure in transforaminal percutaneous endoscopic lumbar discectomy
Speaker: Shisheng He

FP B2-4 13:24-13:32
Trajectory Quantification and Guided Punctures with Isocentric Navigation in Posterolateral Endoscopic Lumbar Discectomy.
Speaker: Guoxin Fan

FP B2-5 13:32-13:40
Ultrasound volume navigation technology in transforaminal puncture of minimally invasive lumbar surgery with full endoscopic techniques
Speaker: Qiang Fu

FP B2-6 13:40-13:48
Feasibility of ultrasound (US) volume navigation technology in posterior percutaneous full endoscopic cervical discectomy
Speaker: Zhengjian Yan

FP B2-7 13:48-13:56
Minimally Invasive Full-endoscopic Posterior Cervical Foraminotomy assisted by O-arm-based navigation
Speaker: Chao Zhang

FP B2-8 13:56-14:04
MIS-TLIF: The evolution from C-arm Guided to Cutting-Edge 3D Navigation- Assisted Surgery
Speaker: Arvind G Kulkarni

14:04-14:10 **Q & A**

14:10-15:00 **Chapter 3**
Chairs: Bassampour Alireza, Heping Yin, Hong Xia

FP B3-1 14:10-14:20
The Endoscopic Solution for degenerative thoracic spinal diseases
Speaker: Jin-Sung Kim

PROGRAM

FP B3-2 14:20-14:28
Clinical Efficacy of Microendoscopic Lumbar Discectomy Combined with Annulus Suture in the Treatment of Lumbar Disc Herniation
Speaker: Qingchu Li

FP B3-3 14:28-14:36
Stand-alone Lateral Recess Decompression Without Discectomy In Patients Presenting With Claudicant Radicular Pain And MRI Evidence Of Lumbar Disc Herniation: A Prospective Study
Speaker: Arvind G Kulkarni

FP B3-4 14:36-14:44
Contralateral Radiculopathy Following Microendoscopy-assisted Minimally Invasive Transforaminal Lumbar Interbody Fusion
Speaker: Zhongyu Liu

FP B3-5 14:44-14:52
Preliminary clinical results of adipose derived endoscopic stem cell injection for facet joint syndrome
Speaker: Ralf Rothoerl

14:52-15:00 **Q & A**

15:00-15:15 **Coffee Break**

15:15-16:30 **Chapter 4**
Chairs: Elmer Jose Arevalo Meceda, Zhongliang Deng, Erxing He

FP B4-1 15:15-15:25
Management of Sequestrated Lumbar Disc Herniation Using Percutaneous Endoscopic Lumbar Disc Herniation. A Case Series
Speaker: Luthfi Gatam

FP B4-2 15:25-15:33
Case series of early endoscopic experience from pain management perspective
Speaker: Bernard Lee

FP B4-3 15:33-15:41
Avoiding Postoperative Dysesthesia in Transforaminal Percutaneous Endoscopic Lumbar Discectomy by Preoperative Evaluation of 3D CT/MRI Fusion Imaging
Speaker: JIRO HIRAYAMA

FP B4-4 15:41-15:49
Comparison of Endoscopic Ultrasonic Bone Scalpel and High-speed Drill in Transforaminal Endoscopic Foraminoplasty
Speaker: Gang Rui

PROGRAM

FP B4-5	15:49-15:57 Experience with Percutaneous Endoscopic Decompression in Revision Lumbar Spinal Surgery for Lateral Recess or Adjacent Segment Stenosis Speaker: Keng-Chang Liu
FP B4-6	15:57-16:05 Awake Percutaneous Endoscopic Lumbar Decompression for Lumbar Stenotic Patients in Out Patient Settings-Case Series and Short Term Results Speaker: Ting-Chun Huang
FP B4-7	16:05-16:13 TRANSFORAMINAL DECOMPERSSION AND FORAMINOPLASTY ON SEVERE SPINAL STENOSIS OF ELDERS Speaker: Tolgay Satana
FP B4-8	16:13-16:21 Transforaminal endoscopic(TFE) foraminoplasty & lumbar stenotic decompression :Preliminary Study of 56 patients Speaker: Ajay Krishnan
16:21-16:30	**Q & A**
16:30-17:40	**Chapter 5 Keynote Speech** Chairs: Bambang Darwono, Guohua Lv, Anmin Jin
KS B1	16:30-16:45 Percutaneous Endoscopic Thoracic Discectomy for Herniated disc Speaker: Gun Choi
KS B2	16:45-17:00 Twenty five years of experience with different percutaneous decompression techniques. This is a retrospective analysis of different techniques in 2000 patients Speaker: Eduardo Barreto
KS B3	17:00-17:15 Percutaneous Endoscopic Decompression for Cervical disc herniation with hypertrophied osteospur – Anterior, Trans-corporeal and Posterior approach Speaker: Fujio Ito
KS B4	17:15-17:30 A New Day for Endoscopic Spine Surgery Speaker: Said Osman
17:30-17:40	**Q & A**
17:40-18:00	**Closing Ceremony** ISESS Closing Ceremony, Handover Ceremony of the Next Session
18:00-18:30	**Satellite Symposium 5** **HENGRUI**

ISESS 2017

Abstracts

ML A1

The Role Of Endoscopic Surgery In The Treatment Of Painful Degenerative Conditions Of The Lumbar Spine

Anthony Yeung

The International Endoscopic Therapy

KS A1

Assessment Of The Various Systems For Endoscopic Spine Surgery: The Philosophies And Evolving Techniques In Commercially Available Systems In The Market Place

Anthony Yeung

The International Endoscopic Therapy

Nov.30th, 2017 08:20-10:10
Great Hall 1 Keynote Speech

KS A2

Full-endoscopic Concepts In The Treatment Of Pathologies Of The Thoracic Spine

Martin Komp

St. Anna Hospital Herne

Full-endoscopic concepts in the treatment of pathologies of the thoracic spine

Nov 30th 2017 08:20-10:10
Great Hall 1 Keynote Speech

KS A3

Navigation Assisted Spinal Endoscopic Techniques

Yue Zhou

Department of Orthopedics, Xinqiao hospital, Third Military Medical University

Nov.30th, 2017 08:20-10:10
Great Hall 1 Keynote Speech

KS A4

Percutaneous Endoscopic Surgery For Lumbar Spinal Stenosis: Transforaminal Or Interlaminar?

Kaixuan Liu

Atlantic Spine Center

Background: Percutaneous endoscopic surgery for LSS has been reported by a series of researches. Moreover, it has been divided into two approaches: the lateral transforaminal approach and the posterior interlaminar approach. However, the optimal surgical approach for LSS remains controversial. According to our knowledge, the published literature rarely reports the selection of optimal surgical approach according to different conditions of LSS patients.

Objectives: Describe minimally invasive surgical technique utilizing endoscopy for LSS and the selection of optimal surgical approach.

Study design: Single-center retrospective observational study.

Methods: This is a single-center retrospective observational study of all patients managed with percutaneous endoscopic surgery for LSS between January 2016 and January 2017. Patients were assessed neurologically before surgery and followed up at regular outpatient visits. The clinical outcomes were evaluated with the visual analogue scale and the modified MacNab criteria. Radiographical follow-up such as magnetic resonance images was performed when necessary. Continuous sedation and local anesthesia were used, continuous feedback from patients were acquired to avoid nerve injury. The surgery was performed by transforaminal or interlaminar approach.

Results: In each group, the mean VAS after surgery improved dramatically. The overall excellent rate was over 80% according to the modified MacNab criteria. For the stenosis on the same level of intervertebral space, transforaminal approach shows significantly better results. On the other hand, for the stenosis lower than the level of intervertebral space, interlaminar approach shows better results.

Limitations: As a preliminary study of selection of optimal surgical approaches of percutaneous endoscopic surgery for LSS, this study is limited by its sample size.

Conclusions: Percutaneous endoscopic surgery is a minimally invasive, valid and safe therapeutic option for LSS. This surgery could minimize the iatrogenic damage, while accomplishing goals of decompressing a compressed nerve root. For LSS on the same level of intervertebral space, transforaminal approach is the optimal surgical approach of percutaneous endoscopic surgery; On the other hand, interlaminar approach is the optimal surgical approach for LSS under the level of intervertebral space.

Nov 30th 2017 08:20-10:10
Great Hall 1 Keynote Speech

KS A5

Ipsilateral, Biportal Endoscopic Approaches To The Thoracic And Lumbar Spine – Historical, Anatomic And Technical Perspectives

Said Osman

Advanced Spine Endoscopy and Pain Institute

Nov.30th, 2017 08:20-10:10
Great Hall 1 Keynote Speech

Introduction: In the early 1900s Hibbs and Albee popularized thoracic laminectomies for thoracic decompression and fusion in patients with tuberculous spondylitis. Today, it is rare to perform this procedure, alone, without risking paralysis as the tension band which stabilizes the thoracic kyphosis is removed. Trans-thoracic approach to the thoracic spine is a major procedure which risks intra-thoracic complication and mortality. Open Inter-lamina approach to the lumbar spine involves various degrees of structural disruption including devascularization of paraspinal muscles, removal of laminae and various degrees of facet violation not to mention intra-canal injury and scar formation. Uniportal endoscopic transforaminal approach is popular today because it preserves muscular and osseous integrity, and avoids of violation of the spinal canal. However, the uniportal approach limits the range and sizes of instruments which can be applied to address different pathologic conditions. Furthermore, using same tube with endoscope and instrument channels severely limits the freedom to maneuver the instruments. The bilateral/bilateral approach, as popularized by Kambin was designed to provide the freedom of maneuverability, but this much limited by virtue of being in the confines of disc. It is the recognition of these limitations which led the author to develop unilateral, bi-portal endoscopic approaches to thoracic and lumbar spine in mid-1990s.

Materials and Methods: The literature review and review of the author's innovations and publications.

Historical perspectives: Philip Bozzini launched the Lichtleiter (light conductor) in 1806: This was the first instrument inserted through a natural orifice to view the interior of the body – ear, nasal cavity, mouth, bladder, rectum, etc. Hijikata and Kambin, simultaneously published their experiences in percutaneous endoscopic lumbar discectomy in 1989. The author, after publication of a cadaver study in 1994, performed the first endoscopic transforaminal unilateral/biportal approach to thoracic spine in 1995. The first unilateral/biportal endoscopic lumbar foraminoplasty was performed by the author in 1996. More recently, the author developed unilateral endoscopic laminoforaminoplasty.

Anatomic considerations of unilateral/biportal transforaminal endoscopy: To perform endoscopic transforaminal procedures, it is imperative that the surgeon appreciates the 3D configuration of the

foraminal anatomy, to minimize the risk of injuries in the confined space. Therefore, the boundaries of the neuroforamen must be thoroughly understood. The dimensions of normal foramen need to be understood, and importantly, the dimensions of the diseased foramen need to be thoroughly understood for safe and proper performance of transforaminal decompression. It is important that the surgeon appreciates precise anatomic abnormalies of the motion-segment to make the right decision about the most appropriate surgical intervention.

Technical considerations for unilateral/biportal endoscopy: Accurate assessment of the spinal canal and neuroforaminal dimensions is imperative to choose the best approach to decompress the neural elements. In this regard imaging studies including MRI, and CT-Myelogram are the most appropriate studies to accurately classify the severity of anatomic abnormalities. Based on the appropriate grading the abnormalities and their impact on the dimensions of the spinal canal and neuroforamen, either the transforaminal or combined interlaminar/foraminal approach may be appropriate. For safe unilateral/biportal transforaminal endoscopy, the cannulae with appropriate dimensions, shape of the tips and armed with nozzles for irrigation and suction are necessary for safe procedure. Proper pre-operative planning, based on the imaging studies – MRI/CT scan, is needed to plan portals and angles of instrumentation. Intra-operation skin marking is based on the pre-operative data and use of fluoroscopy or intra-operative CT scan. These data will help triangulation of the cannulae in the Kambin triangle. It is important to appreciate that instrumentation of the disc may not be necessary or may not be possible due to hypertrophy of the facets. Biportal approach may make it difficult to endoscopically visualize the instrument in the operating cannula, this may be due to intraforaminal fat pad or other structures. This may require special tools to facilitate visualization of the instruments. For foraminoplasty and lamino-foraminoplasty, special, automated tools with proper shielding from neural structures are necessary to avoid disastrous complications.

Keywords: Percutaneous spinal endoscopic technique

KS A6

Percutaneous Transforaminal Endoscopic Discectomy Versus Microendoscopic Discectomy For Lumbar Disc Herniation: Two-years Results Of An Ongoing Randomized Controlled Trial

Limin Rong, Zihao Chen, Liangming Zhang, Jianwen Dong, Peigen Xie, Bin Liu, Qiyou Wang, Ruiqiang Chen, Tao Shu, Shangfu Li, Feng Feng, Bu Yang, Yang Yang, Lei He, Zhongyu Liu, Mao Pang, Chang Liu, Shuo Qi

The Third Affiliated Hospital of Sun Yat-sen University

Nov.30th, 2017 08:20-10:10
Great Hall 1 Keynote Speech

Object: A prospective randomized controlled study was conducted to clarify whether percutaneous transforaminal endoscopic discectomy (PTED) had better clinical outcomes and less surgical trauma than microendoscopic discectomy (MED).

Methods: In this single-center, open-label, randomized controlled trial, patients were included if they had persistent signs and symptoms of radiculopathy with corresponding imaging-confirmed lumbar disc herniation (LDH). Patients were randomly allocated to PTED or MED group by computer-generated randomization codes. The primary outcome was the score of Oswestry Disability Index (ODI) at 1 year after surgery and the secondary outcomes included the score of Medical Outcomes Study 36-Item Short-Form Health Survey bodily pain (SF36-BP) and physical function (SF36-PF) scales, European Quality of Life-5 Dimensions (EQ-5D), Visual Analogue Scales for back pain (VAS-back) and leg pain (VAS-leg). The data, including operation time, in-bed time, length of hospital stay, surgical cost and total hospital cost, complications and reoperations, were also recorded.

Results: A total of 153 participants were randomly assigned to two treatment groups (PTED vs. MED), and 89.5 percent (137 patients) completed 1 yearfollow-up. Both the primary and secondary outcomes did not differ significantly between the two treatment groups at each prespecified follow-up time (P>0.05). For PTED, the postoperative improvement of ODI score in the median herniation subgroup was less at 1 week (P=0.027), 3 months (P=0.013), 6 months (P=0.027) and 1 year (P=0.028) compared with paramedian subgroup. For MED, significantly less improvement of ODI score was found at 3 months (P=0.008), 6 months (P=0.028) and 1 year (P=0.028) in far-lateral herniation subgroup compared with paramedian subgroup. Total complication rate over the course of 1 year was 13.75% in PTED group and 16.44% in MED group (P=0.642). 5 cases (6.25%) in PTED group and 3 cases (4.11%) in MED group suffered from residue/recurrence of herniation, for which reoperation was required.

Conclusions: Over the one year follow-up period, PTED did not show superior clinical outcomes and did not appear to be safer procedure for LDH patients compared with MED. PTED had inferior results for median disc herniation, while MED did not appear to be the best option for far-lateral disc herniation.

KS A7

Bony Decompression In Endoscopic Spine Surgery

Stefan Hellinger

ISAR Klinikum Munich

Since the start of working channel based endoscopic spine surgery there had been a constant development. Meanwhile in the beginning the focus was on intradiscal removal of material and discal decompression the progress went more and more to different techniques of bone removal. This shift from an “inside out” over an “outside in” to an “outside” technique was related to new instruments for a work with the endoscope on the spine. Beside these new tools new surgical techniques have been created. This development has brought endoscopic spine surgery close to the opportunities of an open- or microsurgery for bone decompression.

To understand how to work on the bony structures of the lumbar spine the clarification of the bone related pathology is essential. The different problems of pinged nerves by foraminal stenosis, osteophytes or spondylosis of the vertebra as well as all kinds of spinal stenosis have to be considered. Meanwhile discogenic problems are mostly present in younger population, the aged spine is showing more changes of the bone anatomy causing symptoms. The decision and the planning of the right surgical steps with an endoscopic technique are the key to a successful outcome.

The selective work by the magnification with an endoscope allows a targeted bone removal with a diminished trauma. Techniques like decompression with endokerrisons or different kinds of high speed drills will be presented and should be understood.

Conclusion: The endoscopic surgery of the spine enables nowadays different ways and possibilities for bony decompression. This connects the advantages of a minimal invasive endoscopic surgery reducing surgical trauma with the common opportunities of open spinal decompression surgery.

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KS A8

A New Surgical Method For Thoracolumbar Burst Fracture With Percutaneous Transforaminal Endoscopic Decompression And Percutaneous Pedicle Screw Reduction And Fixation

Zhenzhou Li, Shuxun Hou, Weilin Shang, Zeng Cao, Hongliang Zhao

The first affiliated hospital of PLA's General Hospital

Objective: To explore the surgical route and early clinical outcome of percutaneous transforaminal endoscopic decompression combined with percutaneous reduction and fixation for thoracolumbar burst fracture

Material and methods: 5 cases of thoracolumbar burst fractures, aged 18-35 years (mean 28.5 years), T12 fracture in 1 case, L1 fracture in 2 cases, L2 fracture in 2 cases. Are accompanied by lower extremity neurological symptoms, but no corda equina syndrome. Surgery was performed under local anesthesia by percutaneous transforaminal endoscopic surgery to remove burst fractures fragments retropulsed into the spinal canal. After decompression, the percutaneous implantation of the pedicle screw system (Sextant II slippage reduction system) And pull the reduction operation, but to avoid distraction reduction. Fluoroscopic views confirmed that the reduction satisfaction, alignment line recovery is satisfied after the tightening nut fixed.

Result: The second day after operation, postoperative digital radiography showed restored thoracolumbar alignment and the normal position of the implants; postoperative CT showed a complete resection of retropulsed burst fracture fragment in the spinal canal. 3 months after operation, the reexamined MRI showed full decompression of the spinal canal, fracture healing, thoracolumbar alignment to maintain good; 3 months follow-up nerve function recovered to normal.

Conclusion: Percutaneous transforaminal endoscopic decompression can completely remove the retropulsed burst fracture fragments from the spinal canal, percutaneous pedicle screw system can used to restore the thoracolumbar alignment and complete the fracture reduction and stabilization.

Keywords: thoracolumbar spine, burst fracture, percutaneous endoscopic surgery, decompression, percutaneous pedicle screw, reduction, minimally invasive.

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Great Hall 1 Keynote Speech

KS B1

Percutaneous Endoscopic Thoracic Discectomy For Herniated Disc

Gun Choi

Pohang Wooridul Spine Hospital

Percutaneous Endoscopic Lumbar Discectomy (PELD) for treatment of lumbar disc herniations with radiculopathy has become a trend. Based on this procedure Percutaneous Endoscopic Thoracic Discectomy (PETD) procedure is developed. Until now PETD has only been performed for soft disc herniations. We have successfully done the procedure of PETD using special designed bone drill system (maxmore spine, Germany) in soft as well as calcified disc herniations. PETD is an evolving procedure, with a steep learning curve, but with a well-planned strategy and appropriate instruments and by widening foramen, it can be made safer. This procedure can be performed for soft as well as calcified thoracic disc herniations.

KS B2

Twenty Five Years Of Experience With Different Percutaneous Decompression Techniques. This Is A Retrospective Analysis Of Different Techniques In 2000 Patients

Eduardo Barreto

Barra Life Medical Center

Nov.30th, 2017 16:30-17:40
Great Hall 2 Keynote Speech

KS B3

Percutaneous Endoscopic Decompression For Cervical Disc Herniation With Hypertrophied Osteospur – Anterior, Trans-corporeal And Posterior Approach

Fujio Ito
Aichi Spine Hospital

Background: Cervical disc herniation (CDH) can be treated by Anterior approach for central-CDH requiring a 5.8 mm incision using percutaneous endoscopy (PE). When accompanied by osteophytes or migrated herniation, trans-vertebral decompression surgery was performed. Posterior-approach for intraforaminal-CDH/ foraminal stenosis requiring a 9.5 mm incision using percutaneous stenoscopy (PS). We will discuss indications, procedures and results of them.

Materials and Methods: We operated 180 cases of CDH for herniation located inside the lateral edge of the spinal cord using anterior approach. 15 cases were performed using trans- vertebral decompression method. 95 cases of intraforaminal-CDH located outside the lateral edge, sometimes extending into the foramen, 165cases of cervical foraminal stenosis, and 38 cases of cervical radiculo-myelopathy were performed using posterior approach.

Anterior-approach: Cannula inserted between esophagus and carotid artery, then into disc space. Prolapsed nucleus removed by forceps. When there is osteophyte or migrated herniation, we select percutaneous trans-vertebral decompression method using a small diamond-burr.

Posterior-approach: Medial half facet removed by drill. Posterior foraminal wall partially resected to enlarge foramen and decompress root.

Cervical radiculo-myelopathy also had to be performed using posterior foramino-laminotomy method.

Results: Evaluated by Macnab score, and neck and upper extremity VAS.

1. Anterior-approach: Initial operation results satisfactory (excellent, good) in 87% of patients, and unsatisfactory in 13%. The seven poor cases were insufficient osteophyte removal, recurrence, transient C7 palsy, aggravated myelopathy and residual numbness. Anterior-posterior dural shrinkage averaged 42.1% preoperatively, recovering to 75.8% post-operation, then increased to 86.5% after one year using anterior approach. Disc height decreased on average by 12.6% one year later, without significant new symptoms.

2. Trans-vertebral approach: The learning curve was steep. However, anterior decompressions were almost completely performed without troublesome such as anterior hematoma, palsy and cervical vertebral crush.

3. Posterior-approach: 86% of surgeries satisfactory. The four poor cases were transient C6 root palsy, insufficient decompression, and incomplete sensory paresis due to venous plexus bleeding related spinal cord ischemia.

Conclusion: We emphasize that careful technical training is key to successful cervical procedures. PE is relatively safe and minimally invasive for cervical herniation without fusion surgery requiring a large incision and long hospital stay.

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KS B4

A New Day For Endoscopic Spine Surgery

Said Osman
Advanced Spine Endoscopy and Pain Institute

Nov.30th, 2017 16:30-17:40
Great Hall 2 Keynote Speech

FP A2-1

Percutaneous Endoscopic Translaminar Keyhole Approach In Lumbar Spine

Jin-Sung Kim
Seoul St Mary's Hospital, The Catholic University of Korea

Up to date, many articles have been reported to treat migrated disc herniations in the lumbar spine. When the ruptured disc fragments migrate cranially from the index disc level, most spine surgeons prefer open laminotomy with additional removal of upper laminar to remove ruptured fragments. Compared with open surgery, percutaneous endoscopic lumbar discectomy (PELD) provides excellent visualization and exposure of neural tissue, ruptured disc and other normal surrounding tissues also, with reduced incidence of operative morbidity, less pain, cosmetic benefit, and rapid recovery. However, there have been still many debates of endoscopic techniques in the treatment of highly migrated and sequestrated disc herniation in the lumbar spine, others are also skeptical about its application for many issues. Some researchers have reported modified techniques of transforaminal PELD technique under the foraminoplasty or foraminotomy, which partially removes the facet or the pedicle to expand the intervertebral foramen to expose the HNP. In this paper, we introduce the direct access to the ruptured disc under the translaminar keyhole endoscopic approach. This approach addresses the following advantages. 1) Because surgeons could access the ruptured disc directly after making a small keyhole on the laminar by precise and targeted translaminar drilling of the hole, 2) this avoids the likelihood of the occurrence of subsequent instability caused by the medial facetectomy, 3) surgeons could reduce the epidural scarring and subsequent adhesion, which are associated with post-laminectomy lumbar syndrome.

Nov.30th, 2017 10:20-12:00
Great Hall 1 Chapter2

FP A2-2

Percutaneous Endoscopic Lumbar Discectomy For Treatment Of Intervertebral Disc Herniation: The Outcomes And Learning Curve In The First Sixty Cases

Luthfi Gatam
Fatmawati Hospital

Introduction: Symptomatic lumbar disc herniation often needs surgical decompression. The management itself has been developed through generation with microdiscectomy as the "gold standard" for surgical decompression. Percutaneous endoscopic lumbar discectomy (PELD) offers the less invasive surgery with many advantages. However the steep learning curve discourages many surgeons and this technique remains uncommon. The aim of this study is to share the outcome, complication, surgical technique and obstacle of transforaminal PELD.

Method: This is a non randomized prospective studies. The inclusion criteria were patients with true herniated nucleus pulposus without any degenerative process who failed for conservative treatment. Visual analog scale for sciatica was compared pre and post operatively, and the patients satisfactory result was measured using modified MacNab's criteria. All patients underwent transforaminal PELD in local sedation anesthesia.

Result: The mean age was 31.9 years (range 14-51) which consist of 27 male (45%) and 33 female (55%). The herniation occurred at L2-3 in three patients (5%), L3-4 in two patients (3%), L4-L5 in 32 patients (53%) and L5-S1 in 23 patients (38%). The mean Sciatica VAS was decrease from 5.7 (range 4-7) to 2.5 after surgery. The First three patients had persistent symptoms after endoscopic discectomy and converted to open microdiscectomy. One patient had dyesthesia and one other had motoric deficiency that completely recovered in one month follow up. The overall satisfactory result was excellent and good in 56 (94%) patient and fair or poor in four (6%) patient.

Discussion: High satisfaction rate of our series are consistent with many studies published. These 60 cases give us a brief representation of good PELD outcome. PELD offer better advantages compared to microdiscectomy due to operation under local sedation anesthesia and direct evaluation of sciatica. Although the learning curve is very steep, some studies simplify the skin entry point measurements that shorten the learning curve for percutaneous approach. The limitation of this study was the short follow up that unable to represent the long-term complication or recurrence.

Conclusion: PELD is one of the reliable method in treating lumbar disc herniation. It offers many advantages such as day care procedure, local anesthesia, minimal soft tissue damage, less possibility for nerve injury. In Indonesia this is the future in managing lumbar disc herniation.

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Great Hall 1 Chapter2

FP A2-3

Percutaneous Endoscopic Surgery For Lumbar Juxta-facet Cyst

Chien-Min Chen
Changhua Christian Hospital

The term “juxtafacet cyst” was first created by Kao et al. in 1968 to include both synovial cysts and ganglion cysts adjacent to a spinal facet joint, or arising from the ligamentum flavum of the spinal facet joints. When it develops in lumbar spine, despite being relatively rare, this condition is an increasingly recognized cause of symptomatic nerve root compression, leading to radiculopathy, neurogenic claudication, and cauda equina syndrome.

Many different types of treatments have been proposed, including oral medications, physical therapy, facet joint or cyst steroid injection or aspiration, cyst rupture, and decompression surgery with or without fusion. The high-quality studies for guideline of treatment do not exist, but generally surgical management seems to be more effective than nonsurgical ones.

Percutaneous endoscopic lumbar surgery could be a new option to manage the lumbar synovial cyst, especially when the general anesthesia is not appropriate for the patient. We present interlaminar, transforaminal and transfacet approach. Perhaps new technique of transfacet approach could relate to a lower recurrent rate comparing to non-surgical managements because it also destroy the structure of facet joint like open approach. But, studies with higher quality are needed to be performed to better evaluate this method.

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Great Hall 1 Chapter2

FP A2-4

Transforaminal Percutaneous Endoscopic Discectomy

Karaeminogullari Oguz
Bayindir Hospital

Transforaminal percutaneous endoscopic lumbar discectomy (PELD) is accepted as an alternative to microscopic discectomy in the treatment of lumbar disc herniations. Less soft tissue and bone trauma, reduced blood loss, decreased occurrence of epidural fibrosis and scarring, reduced hospital stay, early functional recovery and improvement in the quality of life are the main advantages of this minimal invasive technique.

Transforaminal (PELD) technique was initially used for intradiscal decompression which with advanced surgical technique changed to epidural decompression of even low-grade migrated disc herniations.

From 2012 to 2017 total of 346 lumbar disc herniations were treated by transforaminal endoscopic technique under general anesthesia. The mean VAS for leg pain improved from 8.2 ± 1.3 preoperatively to 2.2± 1.51 at 3 weeks postoperatively and 1.8 ± 1.1 at 6 months postoperatively ($P < 0.01$). Excellent or good global outcomes were obtained in 85%, and the rate of symptomatic improvement was 91%.

The transforaminal endoscopic approach is effective for patients with leg pain in lumbar disc herniation. Good to excellent clinical results can be obtained due to decreased surgical trauma, early functional recovery and decreased epidural scrarring.

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FP A2-5

Percutaneous Endoscopic Cervical Spine Surgery: Principles, Techniques and Complications

Zhongliang Deng
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Background: With advancements in surgical instrumentations as well as general applications in lumbar spine, percutaneous endoscopic surgery is gradually common in cervical spine. Percutaneous endoscopic surgery, mainly divided into anterior and posterior approach, is generally performed to deal with cervical disorders.
Purpose: To share our 7 years' experience of percutaneous endoscopic surgery, present surgical principles , techniques, and intraoperative and postoperative complications.
Methods: In the past 7 years, we performed percutaneous endoscopic cervical surgeries to treat cervical pathologies ranging from intervertebral disc herniation, degenerative cervical myelopathy (DCM), focal ossification of posterior longitudinal ligament (OPLL), ossification of the ligamentum flavum (OLF), cervical intervertebral disc infection, cervical metastatic tumor and basilar invagination. The endoscopic surgery approaches were anterior transdiscal approach, vertebral hole approach, anteriolateral transforaminal approach, posterior K-hole approach, and laminal hole approach. During the surgery, we did the decompression through the discectomy, foraminotomy, foraminoplasty, and osteophyte remove. General aneasthesia and local aneasthesia were applied. Main complications intraoperative and postoperative were recorded
Results: According to the pathologic repairing process after trauma or iatrogenic injury, percutaneous endoscopic cervical spine surgery should
abide by the three following principles. Firstly, to keep the systematic homeostasis and interior environment stable. Secondly, to avoid damaging the spinal cord, nerve root, and the cartilage as well as disc, to alleviate the damage of the ligament, muscle and bone. The repairing ability of different sort of tissue determines the surgery strategy; Thirdly, to provide a comfortable operative circumstance for both patient and surgeon. Based on our practice, the techniques of percutaneous endoscopic cervical surgery are mainly divided into basic and advanced techniques. The former includes handling endoscope and instruments as a whole, but also possessing good skills in endoscopic high speed electric burr usage and instrument manipulation. Advanced techniques mainly consist of six different approaches (anterior transdiscal, transcorporeal and retropharyngeal approaches; posterior interlaminar, laminar hole, and Key-hole approaches) and four kinds of surgical methods (discectomy, foraminotomy, laminectomy, and bony tissue remove), which are respectively suitable for the specific situations. We still encountered some complications. 4 cases were aborted due to intraoperative complications (one for total spinal anesthesia, one for cerevical epidural aneasthesis, one for bleeding and one for tachycardia). The surgery-related postoperative complications include: temporary postoperative headache, Brown Sequare Syndrome, postoperative hematoma, dyspnea due to swelling of soft tissue, dysphagia, anterior jugular vein injury, mediastinal effusion, etc.
Conclusions: percutaneous endoscopic cervical surgery can serve as a safe and efficacious treatment for more and more cervical pathologies. The clinical indications can be extended gradually.

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Great Hall 1 Chapter2

FP A2-6

Total Endoscopic Scopic Surgery Of The Spine. Thoracic Disk Hernia. Experience In 16 Cases Operated By The Author

Roth Vargas Antonio

Hospital Centro Medico Campinas / Neurosurgery

The author reports on her experience in thoracic hernia surgery using the total endoscopic technique. Thoracic hernia is known to pose a challenge to spine surgeons. The endoscopic technique presents as an excellent minimally invasive option and can be performed outpatient. Indications and difficulties are discussed in the presence of calcifications. Endoscopic surgery of the thoracic hernia and forame stenosis wil be demonstrated in video. Also the presence of calcification will be discussed. Indication and difficulties

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FP A2-7

PEID (Percutaneous Endoscopic Interlaminar Discectomy): Cautional Point Based On The Evidences

Junho Lee

Kyung Hee University Medical Centre, Seoul, Rep of Korea

Background: Percutaneous endoscopic lumbar discectomy (PELD) is one of the most sophisticated operative procedures for the treatment of lumbar disc herniation (LDH). Endoscopic techniques are now becoming the standard in many areas due to the expanded technical possibilities of full-endoscopic transforaminal or interlaminar resection of herniated lumbar discs as well as stenosis. However, even with these good results, conventional percutaneous endoscopic interlaminar discectomy (PEID) disc operations may sometimes result in subsequent untoward complications due to unnoticed iatrogenic trauma to neural structures, which is mostly related to an anatomical limitation during endoscope insertion.

Methods: An appropriate operative indication of the PEID without bone removal or laminectomy can be used to treat LDH cases with an enough interlaminar space (at least ≥ 20 mm by bi-facetal distance) from the reported evidences. Otherwise, there might be several indications for the requirement of bone removal; a narrow interlaminar space, disappearance of the concave shape of the upper vertebral laminae, high-grade migration of LDH, recurrent LDH, obesity, or an immobile nerve root.

Conclusion: The significance of PEID lies not only in the small skin incision but also in its minimal damage to surrounding structures such as muscle, bone, and ligaments. Reckless performance of this procedure would certainly compromise both the patient as well performing surgeon with unprecedented neurological consequences. Therefore, a discrete radiographic evaluation from the patient preoperatively is mandatory before choosing a proper endoscopic surgical modality for the sake of optimal clinical outcome after PEID.

Nov.30th, 2017 10:20-12:00
Great Hall 1 Chapter2

FP A2-8

How Steep Is The Learning Curve?

Loke Wooi Pin
Hospital Lam Wah Ee Penang， malaysia.

Endoscopic spine surgery has a very high learning curve but is within the grasp of every endoscopic surgeon with proper training. As with any new procedure, the complication rate is higher during the learning curve, and it may vary according to the skill and experience of each surgeon. The endoscopic technique, because of its approach, may pose additional risk for iatrogenic injury, but it is possibly safer than traditional surgery because the patient is awake and able to provide immediate input to the surgeon when pain is generated. The future of endoscopic spine surgery is extremely bright. Refined techniques and image-guided systems (navigation) may help diminish the learning curve. There will be a paradigm shift in the way clinicians view and approach patients with back pain, especially when endoscopic spine surgery is further validated with outcome studies and becomes routinely available.

Nov.30th, 2017 10:20-12:00
Great Hall 1 Chapter2

FP A2-9

The Clinical Investigation Of Zessys For Lumbar Foraminoplasty In Percutaneous Endoscopic Lumbar Discectomy (PELD)

Changqing Li, Haiyin Li, Chao Zhang, Wenjie Zheng, Yue Zhou
Xinqiao Hospital of Third Military Medical University

Purpose: To investigate the efficacy and safety of Zessys for lumbar foraminoplasty in PELD.

Method: A total of 426 patients who diagnosed of lumbar disc herniation or lumbar stenosis from Oct 2016 to Jun 2017 in our department were enrolled in our study. All the patients are suffered from lumbago and sciatica and their diagnosis were established by lumbar computed tomography (CT) or/and magnetic resonance image (MRI). Among them, 271 cases were male and 155 cases were female. Their average age is 63.4±15. 7 year-old. The enrolled cases were randomized into two groups. There are 211 cases in group A and 215 cases in group B. All the patients were performed percutaneous endoscopic lumbar discectomy. Self-designed Zessys surgical system was performed in group A and eccentric reaming technique was applied for group B. All the patients were ambulated with the protection of hard waist 3 hours after surgery. Intraoperative radiation, time consumed for foraminoplasty, complication, Visual Analog Scoring (VAS), Oswestry Disability Index (ODI) and MacNac scoring system were used for investigation.

Result: The intraoperative radiation time is 8.5±1.8 in group A and 12.4±2.6 in group B ($P<0.01$); the time for foraminoplasty is 13.7±3.9min and 25.1±6.3min in group A and group B, respectively ($P<0.01$). VAS, ODI and MacNac were all improved in both group before and after surgery and no significant difference was found between the two groups. 4 (1.89%) and 6 (2.80%) cases were suffered from recurrent lumbar disc herniation and revision surgery were performed on them. No other complication was observed.

Conclusion: Zessys surgical system can make foramiplasty in PELD faster and more accurate. Also it is a safe method for this minimally invasive spine surgery method.

Nov.30th, 2017 10:20-12:00
Great Hall 1 Chapter2

FP A2-10

The Preliminary Clinical Application Of Percutaneous Endoscopic Transforaminal Lumbar Interbody Fusion In Lumbar Spinal Stenosis

Jincai Yang

Beijing Chao-Yang Hospital， Capital Medical University

Objective: To summarize the preliminary clinical application of percutaneous endoscopic transforaminal lumbar interbody fusion (PE-TLIF) in treating lumbar spinal stenosis.

Methods: From Sep 2016 to June 2017, four patients (3 female and 1 male) who diagnosed with lumbar spinal stenosis were involved in this study. All of the patients were presented with low back pain and unilateral lower extremity pain with neurogenic intermittent claudication. Demographic data, operation time, intraoperative blood loss, preoperative and postoperative visual analogue scale (visual analogue scale, VAS) and Oswestry disability index (Oswestry disability index, ODI) were evaluated. The changes of intervertebral space height and lumbar lordosis were measured on the radiograh. The perioperative complications were also recorded.

Results: The mean age of the 4 patients was 56.25±15.00 years old (43~77). The mean height, weight and BMI was respectively 162.75±2.50cm, 69.00±0.82kg and 26.06±0.95. The mean operation time was 301.50±65.82 min and the mean intraoperative blood loss was 82.50±53.77ml. There was a significant improvement in low back pain VAS (4.00±1.83, preoperative; 1.00±0.00, postoperative), lower extremity pain (5.00±2.58, preoperative; 1.25±1.50, postoperative) and ODI (42.25±20.27, preoperative; 13.50±4.44, postoperative). The mean postoperative L4/5 intervertebral space height was higher than the height before operation (12.41±0.37 mm vs. 9.47±0.36 mm), while postoperative lumbar lordosis showed no change compared with preoperation. And there was no postoperative nerve injury and instrument-related complications.

Conclusion: Percutaneous endoscopic transforaminal lumbar interbody fusion is a safe and efficient procedure in treating lumbar spinal stenosis, but it requires more clinical applications and longer follow-up to evaluate its long-term clinical efficacy.

Nov.30th, 2017 10:20-12:00
Great Hall 1 Chapter2

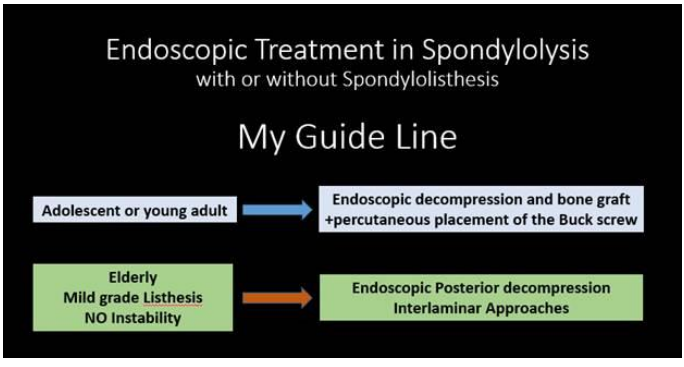
FP A3-1

Endoscopic Management In Lumbar Spondylolysis

Pornpavit Sriphirom
Rajavithi Hospital

Definition of spondylolysis is a defect of Pars interarticularis. Because of loss of hook mechanism, slow progression of spondylolisthesis may occurred. Most of spondylolysis are asymptomatic. According to Beutler WJ1, Fredrickson BE[i] [i], Prospective study of spondylolysis and spondylolisthesis in 1955, with a radiographic and clinical study of 500 first-grade children (45-year follow-up evaluation), there was no association of slip progression and low back pain and there was no statistically significant difference between the study population SF-36 scores and those of the general population at the same age. In 1995, Schneiderman et al[ii][ii] obtained 6 soft tissue from the pars defect to conduct histologic study, neural elements were found in all specimens. They concluded that pars defect may be a source of back pain in some patient. Systematic review of 15 studies By Nicholas S[iii][iii] in 2015 demonstrated that There is no strong or consistent association between Spondylolysis & Isthmic spondylolisthesis and LBP.

One of the misunderstanding about spondylolysis & spondylolisthesis is the existing nerve root was decompression by forward slip of the vertebra. In fact, it is not. According to J.G. Edelson[iv] [iv] , Pathoanatomic study showed that the fibrocartilaginous tissues in the lysis area, together with the bony hypertrophy commonly found on both the proximal and distal ends of the pars defect is the main etiology. Bony hook slips forward and gradually compromised foraminal area thus compress exiting root. Resulting, pressure from the hook posteriorly and pressure from the annulus or caudal vertebra anteriorly.



Identify the exact pain generator, and understanding pathoanatomy is very crucial. Helping us choose appropriated treatment. As an algorithm is my guideline.

Adolescent or young adult with maintained disc height, no disc derangement or herniation, I prefer endoscopic decompression and bone graft + percutaneous placement of the Buck's screws. In elderly with or without spondylolisthesis and dynamic films show no instability present with mainly leg pain, I prefer endoscopic decompression alone without fusion. Interlaminar technique is easier and can effectively remove fibrocartilaginous mass and bony hypertrophy from lateral recess to foraminal zones. Limitation of my opinion is due to few cases and short follow

up (3-5 Yrs.) but until now no case was failed.

FP A3-2

Learning Curve And Early Results Of Interlaminar And Transforaminal Full-endoscopic Resection Of Lumbar Disc Herniations

Petr Zelenkov

Burdenko Institute of neurosurgery

Background: Full-endoscopic spinal surgery is an evolving technique. Laborious learning phase is inevitable due to complexity of orientation and instrumentation. The goal of the present study is to evaluate the single surgeon's learning curve and early outcomes in full-endoscopic resection of lumbar disc herniations.

Methods: Study design: prospective non-controlled single-surgeon cohort study. In 54 patients with 57 herniations, 41 interlaminar and 16 transforaminal resections were performed. Surgery time, severity of adhesive process in spinal canal, complication rates and clinical outcomes (VAS, ODI, custom questionnaire, relapses and reoperations) were assessed.

Results: In interlaminar group, surgery time decreased from 60±20 min in the first 20 operations to 45±14 min in the following 17 (p=0.023). In transforaminal group, surgery time decreased from 60±16 min in the first 7 operations to 41±12 min in following 9 (p=0.023). Severe adhesive process in spinal canal was associated with duration of symptoms over 2 years, longer surgery and higher risk of surgical complications. Four relapses were reoperated using full-endoscopic technique. VAS, ODI and pain medications dramatically decreased in both groups and in reoperated patients.

Conclusion: The plateau of the learning curve and good short-term clinical results of full-endoscopic interlaminar and transforaminal surgery may be achieved after twenty operations, given extensive previous experience in microsurgery. Risk of complications at the learning phase may be decreased by excluding the patients with symptoms lasting over two years.

Nov.30th, 2017 13:00-14:00
Great Hall 1 Chapter3

Nov.30th, 2017 13:00-14:00
Great Hall 1 Chapter3

FP A3-3

The L4/5 Lamina Gap Difference Between Flexion (Kneeling) Position And Prone Position And The Advantage Of Percutaneous Endoscopic Interlaminar Discectomy (PEID) Under The Flexion (Kneeling) Position

Qun Yang
The First Affiliated Hospital of Dalian Medical University

Objective: To measure the height and width of the L4/5 lamina gap under flexion (kneeling) position and analyze its difference between flexion (kneeling) position and prone position and the surgical effect analysis of percutaneous endoscopic interlaminar discectomy (PEID) under flexion (kneeling) position.

Methods: We analyzed 207 patients with lumbar disc herniation (L4/5) who underwent PEID on flexion (kneeling) position from April 2014 to June 2016. We measured the height and width of the L4/5 lamina gap on flexion (kneeling) position and prone position during surgery and then compared its difference. We compared the difference of operation time, visual analogue scale (VAS) score of low back pain and leg pain, ODI index and the Macnab efficacy before and 1 day, 3 months and 6 months after operation.

Results: The average height of L4/5 lamina gap was 14.55±2.34 mm (9.3-18.3mm) on prone position and 16.75 ± 2.23 mm (12.5-20.5mm) on flexion (kneeling) position, its increased significantly compared with forward, and there was a significant drfference ($P<0.05$). The average width of lamina gap was 23.94 ±0.61 mm (21.5-25 mm) on prone position and 23.97±0.55 mm (21.6-25mm) on flexion (kneeling) position, and there was no significant difference ($P>0.05$). The were no statistically different between the two groups of patients of leg pain and low back pain VAS score before operation time and 1 day, 3 months, 6 months after the operation time, ODI score 6 months after the operation and modified Macnab evaluation standard outcomes ($P> 0.05$).

Conclusion: The lumbar curvature can be reduced and the height of L4/5 lamina gap can be increased significantly when patients took flexion (kneeling) position, the mobility and operating space in spinal canal of percutaneous endoscopic system working channel can also be increased. Its a safe and effective minimally invasive surgical approach.

FP A3-4

Combined Interlaminar And Transforaminal Endoscopic Discectomy For Large Disc Herniation

Withawin Kesornsak

Bumrungrad International Hospital

Interlaminar and Transforaminal approaches have different advantages and limitations in performing full-endoscopic discectomy. Each approach requires different skill sets thus does not share the learning curve. In this study the author propose an idea to minimize nerve retraction in large lumbar disc herniation. Removing large free disc fragment transforaminally as an initial step will reduce nerve compression without retraction. The following interlaminar approach will help removing remaining disc fragment intradically or in case of migrated disc fragment.

Nov 30th, 2017 13:00-14:00
Great Hall 1 Chapter3

FP A3-5

Endospine - Endoscopic Anterior Cervical Discectomy & Cord Decompression - Destandau's Technique.

Nov.30th, 2017 13:00-14:00
Great Hall 1 Chapter3

S.M. Rohidas
DR. Rohidas's centre for Minimally Invasive Spine & Neurosurgery.

Objective: We are using endospine in degenerative lumbar pathologies like disc herniation, radiculopathy due to disc hernia & bony canal & foraminal stenosis since 2002. After going through the initial steep learning curve we started using endospine for posterior foraminotomies & disc removal with canal decompression for cord compression since 2004. Since 2006 we started using Endospine for anterior cervical endoscopic microforaminotomy and cord decompression. I report use of Endospine for excision of intradural extramedullary SOL since 2004. Small intradural extramedullary tumours mostly posterior or laterally placed can be excised. Anteriorly placed tumours in thoracic region are more difficult. Exact localization of the SOL level is done with C arm and localizing pin. Paramedian or midline incision is usually used. Subperiosteal dissection of lamina & sos spinous process done and the outer tube of Endospine is placed with two small retractors to retract muscles laterally. Under endoscopic vision laminectomy is performed with Kerrison punch and when ever it is necessary endoscopic drill or ultrasonic bone cutter is also used. Over the lateral edge of dural sac two small gelfoams kept to control epidural oozing, rather than cauterizing the epidural veins. Dural is opened with 15 mm blade with long handle, and extended with scissors. Two stay sutures are taken over dural edge through outer tube. Again the outer tube is placed with stay sutures retracting the dural edges. If the localization is correct and the SOL has noy shifted its position during position, most of the times the SOL is seen compressing the cord. Dissection of SOL is done with small curretes, endoscopic bipolar cautery. Concerned nerve root is resected with scissor. SOL is taken out carefully by holding it biopsy forceps along with the inner tube of Endospine. For meningioma tumour cusa is used to decompress the tumour from within. Closure of dura is achieved with 2 mm Titanium anaestoclips.
Results: Since 2004 till 2016 I have treated 18 SOL from D4/5 level to lumbar level, with Endospine. Nine males and nine females with minimum age of 22 yrs and maximum age of 73 yrs. 14 were neurofibromas at thoracic and lumbar level and 4 were meningioms. At L5/S1 level on Rt. Sided approach after exposure author found intraneural swelling. The histopathological findings was neurofibrama. Post operative 17 patients had excellent recovery. One had partial recovery of preoperative spastic paraplegia as she had lond standing spastic paraplegia. No CSF leak or wound infection noted in postoperative period.
Conclusion: Small intradural extramedullary SOL can be safely and effectively treated with Endospine- Destandau's technique a minimally invasive mobile technique. Small incision, relatively less bold loss and less hospitalization suggest that in hands of an experienced endoscopic surgeon Endospine may present an alternative to traditional open technique.

Keywords: Endospine, Intradural extramedullary SOL, CSF leak, meningioma, neurofibroma.

FP A3-6

Clinical Outcomes Of Posterior Percutaneous Endoscopic Cervical Discectomy For Cervical Spondylotic Radiculopathy

Nov.30th, 2017 13:00-14:00
Great Hall 1 Chapter3

Xiaojian Ye, Jun Ma

Changzheng Hospital Affiliated Navy Military Medical University

Purpose: To investigate the clinical outcomes using posterior percutaneous endoscopic cervical discectomy (P-PECD) for single level cervical spondylotic radiculopathy (CSR). Methods From October 2015 to June 2016, 33 patients (23 men, 10 women, mean age 54.0 years, range 30-85 years) who had single level CSR were treated by P-PECD, and the medical records were reviewed. Allpatientswerefollowed for average13.5 months (range, 12 to 22months). The operation related parameters(operation time, estimated blood loss, length of hospitalization, complications), clinical parameters, including neck visual analog scale (Neck-VAS), arm visual analog scale (Arm-VAS) and neck disability index (NDI), the modified Macnab criteria, as well as radiological parameters (disc height, shell angle, C2-C7 Cobb's angle, range of motion) were recorded preoperatively and at 3 months, 6 months, 12 months and last follow-up postoperatively.

Results: The mean operation time was 76.4 minutes (range, 40 to 120 minutes), the mean estimated blood loss was 30.2 ml (range, 20 to 80 ml), and the mean length of hospitalization was 3.5 days (range, 2 to 8 days).There was significant decrease at different time point postoperatively in Neck-VAS, Arm-VAS, and NDI when compared with preoperatively ($P<0.05$).According to the modified Macnab criteria, there was excellent concordance in 20 patients (60.6%), good in 7 patients (21.2%) and fair in 6 patients (18.2%) atthelastfollow-up。The disc height and the range of motion of index level were significantly decreased at postoperative 1 year compared with at preoperative ($P<0.05$). The C2-C7 Cobb's angle and range of motion at upper adjacent level increased significantly at postoperative 1 year compared with at preoperative ($P<0.05$). The range of motion in lower adjacent level, spine functional unit of index level, as well as C2-C7 had no significant difference between preoperative and postoperative 1 year ($P>0.05$). One patient turned into traditional ACDF procedure because of hemorrhage limiting the vision during P-PECD operation. Upper extremity numbness and pain deteriorated in one case after a P-PECD procedure and was revised with ACDF at last. No other complications, like spinal cord injury, cervical root injury, cerebral spinal fluid leakage, infection as well as recurrence were found. Conclusion P-PECD, which can maintain normal cervical range of motion and intervertebral disc height, is a minimally invasive and essential procedure for CSR treatment with minor trauma, excellent outcome (overall satisfactory rate was 81.8%) and quick recovery. Surgeon's experience, however, is needed in case of turning into open surgery for good outcome.

FP A4-1

Indications And Technique Of Trans-Sacral Epiduroscopic Laser Decompression Surgery

Elmer Jose Arevalo Meceda

1.UERMMCDepartment of Neurosciences

2. Section of Neurosurgery-Spine

3. MISS

Nov.30th, 2017 14:00-15:00
Great Hall 1 Chapter4

The trans Sacral Epiduroscopic Laser Decompression Surgery (tSELD) aims to decompress lumbar spinal nerve roots, perform fragmentectomy and or ablate the sensitized sinuvertebral nerves growing into to the annular tear in the lumbar-sacral ventral epidural space (VES) through the sacral hiatus as the entry point. In our institution, we have used this procedure to treat the following: 1) Symptomatic lumbar disc herniation, either extruded or sequestrated; 2) Chronic discogenic back or leg pain from annular tear syndrome; 3) Post-operative Adhesions or Failed back surgery syndrome. We have also utilized tSELD as additional diagnostic modality in chronic leg and back pain that the cause cannot be ascertained with available diagnostic imaging. It uses a 30 cm long 3.0mm or 3.3mm diameter steerable catheter (Surgibio Co. Ltd, Korea); a 0.9 mm ultra-high definition fiber endoscope (Myriad Imaging Tech Inc, Dudley, MA); a 1mm fiber straight firing Ho: YAG laser (550nm) (VersaPulse, Lumenis Ltd. Yokneam, Israel); and a 1.2mm flexible micro-forceps (Hangil, Korea). To understand the rationale, significance and to enlighten utility of tSELD procedure, we described the basic technique of tSELD.

FP A4-2

Uniportal Bilateral Endoscopic Decompression: Possible Complications And How To Avoid Them

Kuansongtham Verapan
Bumrungrad International Hospital

Bilateral endoscopic decompression is a good alternative surgical approach for spinal stenosis. The operation can be done as a day-case. This study is based on a surgeon who has 10 years experience of this technique. We started from drilling for endoscopic interlaminar discectomy at the spinal level above L5-S1 before we started with stenosis cases. Outcomes, complications and techniques to avoid common problems in central stenosis cases are shared here. Bilateral endoscopic decompression is a good alternative surgical approach for spinal stenosis. The operation can be done as a day-case. This study is based on a surgeon who has 10 years experience of this technique. We started from drilling for endoscopic interlaminar discectomy at the spinal level above L5-S1 before we started with stenosis cases. Outcomes, complications and techniques to avoid common problems in central stenosis cases are shared here.

Nov 30th 2017 14:00-15:00
Great Hall 1 Chapter4

FP A4-3

Lateral Decubitus Position Affecting The Transforaminal Approach Of L5-S1

Bambang Darwono

Gading-Pluit HospitaL and Medical Faculty Tarumanagara University

Nov.30th, 2017 14:00-15:00
Great Hall 1 Chapter4

Lateral Decubitus position affecting the transforaminal approach of L5-S1

Background: Many patients suffer from radiculopathy and low back pain due to lumbar disc hernia of L5-S1. Transforaminal percutaneous endoscopic lumbar discectomy (TPELD) is a minimally invasive method that accesses the pathology through the intervertebral foramen. This method meets a difficulty in approaching the L5-S1 disc in some patients with high iliac crest.

Purpose: Does lateral decubitus position affecting the Transforaminal approach of L5-S1

Methods: AP and lateral radiography were done in patients with standing and lateral decubitus position. For lateral decubitus position a pillow was placed under the waist. Radiological parameters such as the relative distance position of the iliac crest to the landmark of L5 pedicle, foraminal size between transverse process of L5 to iliac crest and disc space were considered.

Result: A decrease of the relative distance position of the iliac crest to the landmark of L5 pedicle and a significant larger of the foraminal size were found on AP radiography in lateral decubitus position, while a larger disc space were found on lateral radiography in lateral decubitus position

Conclusion: At L5-S1 level in patient with high iliac crest the existing nerve root is at risk of injury. Hence it is advised to enlarge the foramen for save passage of endoscopic instruments and to minimize the possibility of nerve injury by positioning the patient in a lateral decubitus position.

FP A4-4

Complications Of Percutaneous Endoscopic Lumbar Discectomy Via Interlaminar Approach

Jiancheng Zeng

West China hospital of Sichuan university

Objective : To analyze the complications and reasons of percutaneous endoscopic lumbar discectomy(PELD) via interlaminar approach, and to investigate their interventions.

Methods: From January 2010 to December 2012, a total number of 479 patients with lumber disc herniation(LDH) underwent PELD via interlaminar approach after general anesthesia in our hospital, including 252 males and 227 females, with a mean age of 43 years(range 13～70 years). All patients suffer from typical low back pain and leg pain with the latter severer, and were confirmed no evidence of lumbar instability. The levels of herniation were L4/5 in 196 cases, L5/S1 in 286 cases. There were 476 cases of mono-segment LDH, 3 cases of double-level LDH, 46 cases of LDH combined with calcification, and 15 cases of LDH combined with lumbar stenosis. Those cases with complications in intraoperative and postoperative period were studied restropectively.

Results: The mean follow-up period was 36 months(range 25～59 months). The complications were found in 29 cases, with the incidence rate of 6.05%. Nucleus pulposus omissions were found in 3 cases, who suffered from central protrusion type of LDH, and underwent the procedure in the initial stage of a surgeon performing PELD. The symptom released after 3-6 weeks of conservative treatment. 2 cases suffered nerve root injury, both were L4/5 LDH combined with lumbar stenosis and had decreased muscle strength of lower limbs but recovered from Neurotrophic drugs and 1-3 months of functional training. 24 cases had postoperative dysesthesia, and the symptom was improved by Mecobalamin, Gabapentin and 3-6 weeks of rehabilitation exercise. Recurrent disc herniation occurred in 9 cases. 6 cases released their symptom after conservative treatment, 3 cases underwent fenestration discectomy and completely recovered in 3-6 months after operation.

Conclusion : Percutaneous endoscopic lumbar discectomy via interlaminar approach is effective for LDH. The complications during intraoperative and postoperative period include nucleus pulposus omissions, nerve root injury, dysesthesia and recurrent disc herniation. Strict selection of the indication, sophisticated arrangements of surgical plan and skillful manipulation are effective ways to decrease and prevent operative related complications.

Nov.30th, 2017 14:00-15:00
Great Hall 1 Chapter4

FP A4-5

Surgical Treatment For Lumbar Lateral Recess Stenosis With The Percutaneous Endoscopic Technique: Interlaminar Approach Versus Transforaminal Approach

Bing Wang, Yawei Li, Guohua Lv, Yuliang Dai, Zhiming Tu
The Second Xiangya Hospital, Central South University

Nov.30th, 2017 14:00-15:00
Great Hall 1 Chapter4

Purpose: To compare the surgical results for the percutaneous endoscopic technique via the interlaminar approach with those of the conventional microsurgical technique in patients with degenerative lateral recess stenosis.

Methods: From July 2013 to June 2015, a total of 193 patients with the percutaneous endoscopic decompression underwent follow-up for 2 years. Clinical outcomes were evaluated using visual analog scale (VAS) for low back and leg pain, Oswestry Disability Index (ODI) for the functional assessment and modified Macnab criteria for the patient satisfaction.

Results: No significant differences were found between both groups in terms of the mean operative time, the mean length of hospital stay, complications and recurrences ($P > 0.05$). At the final follow-up, the VAS of leg and back pain decreased from 7.5 ± 1.7 and 3.2 ± 2.4 points preoperatively to 1.5 ± 1.3 and 1.6 ± 0.9, respectively ($P < 0.05$). The ODI score was $67.5\% \pm 10.6\%$ preoperatively, and declined to $22.8\% \pm 7.3\%$ ($P < 0.05$). VAS, ODI, and modified MacNab criteria of the FEID group were improved compared to the control group though there were no statistically significant differences between the 2 groups.

Conclusions: Functional improvements were maintained at 2 years in both groups with similar complications and recurrences rate. However, proper surgical indications and great deal of experience are important for successful percutaneous endoscopic technique via the interlaminar or transforinminal approach.

FP A4-6

Anatomy Of Transforaminal Approach

Pradyumna P Pai Raiturker

Deenanath Mangeshkar Hospital， Saishree hospital for special surgery， Pune， India

Safety and efficacy of percutaneous Transforaminal back surgery depends on complete comprehensive understanding of the 3dimensional correlative anatomy especially the neural structures in relation to bony landmarks. For the traditionally trained spine surgeon the transforaminal approach needs reorientation from the popular posterior approach. In the lecture we identify the origin of the approach and also describe the anatomy of the neural foramen with its structures. The Kambin's triangle is the most important anatomical landmark in transforaminal approach. We describe all the studies relating to its boundaries as well as its dimensions. Cadaveric dissections help us better understand the relation of the transforaminal route and the structures which are encountered in the intended trajectory. Finally the structures at risk in the transforaminal route are also discussed.

Nov.30th 2017 14:00-15:00
Great Hall 1 Chapter4

FP A5-1

Transforaminal Endoscopic Lumbar Discectomy at L5-S1 With Foraminoplasty

Ismail Gokyar
Bayindir Hospital

Percutaneous endoscopic lumbar discectomy (PELD) is a minimally invasive spinal technique which has advantages over microscopic discectomy. Though in the former years it was used for intradiscal decompression, with the progress of surgical techniques more cases were treated by this technique.

One of the most challenging issue is herniated disc on L5-S1 level. This level is known for the anatomical obstacles for transforaminal route. High iliac crest may, narrow intervertebral foramen and big faset joint may all limit the access by transforaminal route. Most of the surgeons uses interlaminar route for overcoming these barriers though foraminoplaty by using drills can also be used and transforaminal route may be an option for treating disc herniation at L5-S1 level with high iliac crest.

From 2012 to 2017 346 lumbar disc herniation were treated at our instutition by transforaminal endoscopic discectomy. A total 110 herniation were at L5-S1 level and foraminoplasty by drilling was used in 54 of these cases. We obtained good to excellent result in 83 % of these foraminoplasty cases.

Transforaminal endoscopic lumbar discectomy with foraminoplasty is an succesfull option for L5-S1 disc herniations with high iliac crest.

Nov.30th, 2017 15:15-16:15
Great Hall 1 Chapter5

FP A5-2

New Approach Of PECD And PETD For Cervical, Thoracic Myelopathy

Sumito Shimizu
Omigawa General Hospital

Nov.30th, 2017 15:15-16:15
Great Hall 1 Chapter5

FP A5-3

Surgical Outcome Of Percutaneous Full Endoscopic Technique For Highly Migrated Disc Herniation Via Three Different Approaches

Yi Jiang

Minimally Invasive Spinal Department, Hai Dian Section Of Peking University Third Hospital

Objective: A retrospective analysis of 68 patients operated for excision of highly migrated intracanal lumbar disc herniation by percutaneous full endoscopy via three different approaches.

Methods: sixty-eight consecutive patients (Male: Female=43:25, mean age 42.3±15.9 years old) with highly migrated herniation who underwent percutaneous full endoscopic lumbar discectomy(PFELD) via transforaminal, interlaminar or transpedicular approach under local anaesthesia were enrolled in present study from June 2011 to June 2013 retrospectively. Of 45 cases (L2-3:1, L3-4:8, L4-5:32, L5S1:2) via transforaminal approach, fifteen cases (L5S1) via interlaminar approach, and 8 cases (L3-4:4, L4-5:4) via transpedicular approach. The disc material was migrated superiorly in 23 patients, inferiorly in 45 patients. Magnetic resonance imaging (MRI) were available confirmed migrated disc matter pre- and post-operatively. Patients were evaluated by postoperative Visual Analogue Scale (VAS) score for leg pain and Japanese Orthopedics Association (JOA) score and modified MacNab criteria for functional recovery.

Results: Mean follow-up was 18±15.9 months. Mean VAS score for radicular pain improved from 7.5±1.1 to 0.3±0.8 and mean JOA score improved from 9.3±2.4 to 26.3±1.7. According to modified MacNab criteria, satisfactory results were 91.5%.One patient had dura tear without symptoms. 7 cases underwent temporary hyperalgesia after surgery relieved by conservative treatment.

Conclusion: PFELD is safe and effective procedure for surgical treatment of highly migrated herniation. The decision should be made by characters of anatomy. Foraminoplasty contributed good working area when the transforaminal approach was applied. Tanspedicular approach could find lesion directly. However, it depends on good skill and equipment.

Nov.30th, 2017 15:15-16:15
Great Hall 1 Chapter5

FP A5-4

Percutaneous Endoscopic Transforaminal And Lateral Recess Decompression After Previous Spinal Surgery

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Background: Leg and back pain after previous lumbar laminectomy and spinal decompression fusion surgery is common and is often related to persistent lumbar foraminal or lateral recess stenosis. While persistent symptoms often stem from incomplete decompression during the primary index surgery, recurrent symptoms may also be the result of intervertebral cage subsidence due to loss of intervertebral and neuroforaminal height.

Objective: The author investigated the feasibility of utilizing the outpatient percutaneous transforaminal decompression procedure as an alternative to an inpatient open revision decompression surgery with the intent of minimizing the incidence of peri- and postoperative surgical complications, while reducing both direct, and indirect cost of surgical treatment, shortening time to patient postoperative narcotic independence, and return to work.

Mthhods: Forty-eight patients with conclusive diagnostic imaging and interventional work up underwent endoscopic transforaminal and lateral recess decompression for either persistent or recurrent leg and low back pain following previous lumbar laminectomy (22 patients), or decompression fusion surgery (26 patients). In addition to radiographic studies, patients were followed for a minimum of 2 years postoperatively and clinical outcomes were evaluated with VAS, ODI, and modified MacNab criteria.

Results: At final follow, patients with single- and two level prior surgeries reported an average ODI reduction following their secondary surgery of 44.6% with an average final score of 14.8%. Less favorable ODI score reductions following secondary surgery (23.8%) were reported by patients, who had more than one or complex prior multilevel surgery. According to the modified Macnab criteria, excellent and good results were obtained with the secondary surgery in 79.1% (38/48) of patients with no more than a single one- or two-level prior lumbar surgery. The mean VAS score decreased from 7.7 ± 1.8 preoperatively to 2.3 ± 1.1 at final follow-up ($P < 0.01$). Fair and poor results with the secondary surgery were seen in 20.9% (10/48) of patients with several prior surgeries or complex multilevel previous lumbar surgeries. The level distribution for secondary surgery was as follows: L4-5

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segment (26 levels, 54.1 %), L5-S1 (14 levels, 29.2 %), L3-4 (7 levels, 14.6 %), and the L2/3 level (1 levels, 2.1 %). Postoperative complications were limited to irritation of the dorsal root ganglion, which occurred in 25% (12/48) patients. There were no wound infections, nerve root injuries, foot drop, or admissions to a hospital for further postoperative care. All of the patients with Excellent and Good outcomes measured by modified Macnab criteria, who were working before and after the primary and_secondary surgery (27/38), reported earlier return to work after the endoscopic outpatient surgery (2.6 ± 0.8 weeks) than with the prior inpatient open spinal surgery (8.1 ± 4.5). On the basis of 2012 Medicare fee schedule for professional fees, direct cost were 40.6% and indirect cost were 37.1% lower with the secondary endoscopic surgery when compared to primary open surgery.

Conclusions: Percutaneous transforaminal decompression is an effective alternative to open revision lumbar spinal surgery to treat symptomatic spinal stenosis after previous lumbar surgery in patients with persistent or recurrent leg and low back pain. It can be safely done in an outpatient setting, while realizing reduction in direct and indirect cost.

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Tips and Pearls of Percutaneous Endoscopic Decompression Technique Using A New Scope And A High Speed Drill

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Introduction: The object of this study was to assess the feasibility and efficacy of a novel, minimally invasive spinal surgery technique to correct degenerative lumbar spinal stenosis involving a modified unilateral-approach percutaneous endoscopic decompression. Tissue -sparing procedures are becoming more common. Endoscopic techniques have become the standard in many areas because of the advantages they offer in surgical technique and in rehabilitation. The goal of this prospective randomized controlled study was to compare the surgical results for the technique via the interlaminar approach with those of the conventional microendoscopic technique (MED) in patients with degenerative spinal canal stenosis.

Materials and Methods: In this prospective study,60 patients with lumbar stenosis were randomly assigned to undergo either a novel percutaneous endoscopic laminectomy, (30 patients) or microendoscopic laminectomy (30 patients). Spinal anteroposterior diameter, cross-sectional area, lateral recess distance, spinal stability, postoperative back pain, functional outcomes, and muscle trauma were evaluated. Follow-up ranged from 20 to 24 months, with a mean of 19.5 months for the novel procedure group and 19.1 months for the MED group.

Results: The results show that 76.8% pats reported no longer having leg pain, and 20.5% had only occasional pain. The clinical results were the same in both groups. The rate of complications and revisions was significantly reduced in the group. This novel techniques brought advantages in the following areas: operation, complications, traumatization, and rehabilitation. Satisfactory neurological decompression and symptom relief were achieved in 90% of these patients. There was no significant clinical difference compared with the MED group's results. There was no evidence of spinal instability in any patient, and no patient required a follow-up MED laminectomy.

Conclusions: Although this method requires more operating time than a MED method, it requires only minimal muscle trauma and spinal stability maintenance, and allows for early mobilization. This shortens the hospital stay, reduces postoperative back pain, and leads to satisfactory neurological and functional outcomes. Moreover, with the midline approach, decompression was accomplished without compromising the facet joints, even with a narrow width of lamina. The clinical results of the interlaminar technique are equal to those of MED technique. At the same time, there are advantages in the operation technique, such as reduced traumatization. The interlaminar spinal decompression procedure is a sufficient and safe supplement and alternative to MED procedures.

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Endoscopic Decompression For L5S1 Foraminal Stenosis In Patients With Or Without Previous Adjacent Fusion Surgery - A Preliminary Reports

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Introduction: As the result of several specific anatomies at the lumbosacral junction area, L5S1 is the most common site of foraminal stenosis. In the same time, L5S1 foraminal stenosis can also be an adjacent disease to spinal fusion above L45 level. Several methods were reported to treat the foraminal stenosis including TLIF or MED and Percutaneous endoscopic foraminoplasty. We reported our experiences and clinical results of using percutaneous endoscopic foraminoplasty for pure L5S1 stenosis in both patients with or without previous fusion surgery above L45 level.

Methods: Between October 2014 and September 2016, patients with foraminal stenosis over L5S1 were treated as percutaneous endoscopic foraminoplasty. All of these cases presented as solitary, unilateral L5 radicular pain. They all had a suspected L5S1 foraminal stenosis on MRI and diagnosis were confirmed by positive L5S1 foraminal block test. They were separated into two groups. Group 1 included patients without history of spinal surgery while group 2 included patients with history of spinal fusion above L45 levels. All of these cases were followed at least 12 months (12 ms~20 ms). The clinical results including preoperative and post-operative VAS for leg pain, back pain and ODI were presented and compared.

Results: Totally 23 patients received percutaneous endoscopic foraminoplasty for L5 root decompression. There were 11 patients in group 1 and 12 patients in group 2. In Group 1, the mean operation time 99.5±23 minutes. VAS for back pain was 5.9± 1.1(3~7) preoperatively and 0.5±0.5 (0~1) postoperatively. VAS for leg pain was 7.2±0.7 (8.5~6.0) preoperatively and 0.63±0.6(0~2) at postoperative 2 weeks and 0.09±0.3 at post operation one year. In group 2, the mean operation time was 99.0±19.4 minutes. VAS for back pain was 6.3±1.7 preoperatively and 2.0±0.9 postoperatively. VAS for leg pain was 7.1±1.2(8.5~4.5) preoperatively and 0.9±0.8 at 2 weeks postoperation and increase to 2.4±2.7 (0-7.5) at one year. Two patients in the group 2 had advanced leg pain with VAS more than 5.0 at one year.

Conclusions: The L5S1 foraminal stenosis is frequent overlooked by MRI leading to L5 radiculopathy. It could be resulted from a degenerative disease, with or without far-lateral disc herniation of L5S1. It could also be an adjacent disease inferior to a floating fusion and even a neglected lesion on MRI. L5S1 foraminal stenosis can be successfully treated with percutaneous endoscopic decompression and has a good short-term result. However, in those cases with a history of fusion surgery above L5 level, the long-term result could be more unpredictable.

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Changes In Cervical Motion After Cervical Spinal Motion Preservation Surgery

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Background: For patients with single-level cervical radiculopathy, various types of motion preservation surgeries are available, such as total disc replacement (TDR), posterior cervical foraminotomy (PCF) and posterior percutaneous endoscopic foraminotomy and discectomy (PECF). In addition to motion preservation, the quality of motion is also an important issue. Considering the minimally invasive surgical technique of PECF, we hypothesized that its influence on cervical motion may be minimized.

Objectives: The purpose of the present study was to evaluate the influences of surgeries on cervical motion by comparing the instantaneous axis of rotation (IAR) and range of motion (ROM) among PECF, TDR and PCF at the index and adjacent segments. Study designThis was a retrospective case study. SettingThis study included patients from the University Medical Center in Seoul, Korea.

Methods: A retrospective review was performed of patients who underwent index surgery at C5-6 for cervical single-level foraminal disc herniation or foraminal stenosis. Patients with minimal degeneration at the index and other cervical spinal levels and flexion/extension cervical lateral radiographs both preoperatively and 6 months postoperatively were included (PECF: 11 patients; TDR: 11 patients; and PCF: 12 patients). The IARs and ROMs were calculated at the index segment and segments above and below the index segment from the flexion and extension cervical lateral radiographs, which were obtained preoperatively and 6 months postoperatively.

Results: Postoperatively, neck pain was significantly decreased, with no difference observed among the surgical methods. The IARs were not significantly changed after the PECF in the index and adjacent segments. However, significant inferior shifts of the IARs were observed after PCF at C5-6 ($p = 0.02$) and C6-7 ($p = 0.02$) and after TDR at C6-7 ($p = 0.02$). The ROMs were not significantly changed after the surgery, and there was

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FP A6-2

Selective Endoscopic Fragmentectomy For The Lumbar Spine: The good, The bad And How To Solve The Problems

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Introduction: Herniated discs are a common cause of low back pain and sciatica. Advanced technology and techniques have been able to replace conventional procedures to less invasive methods, such as selective endoscopic fragmentectomy for the treatment of lumbar or radicular pain due to herniated nucleous pulposus (HNP). Although it is a safe and effective procedure, the complications are present and we must be prepared to solve them always having as alternative minimally invasive spine procedures.

Aim: Determine the results of selective endoscopic fragmentectomy for the treatment of lumbar or radicular pain. Analize the good and bad results and how the complications were solved.

Materials and Methods: Medical records and patients were clinically reviewed. ODI, Modified MacNab criteria and VAS were evaluated Pre-Op and Post-Op. Age, gender, surgical level, surgical approach, intraoperative time, intraoperative complications, postoperative complications, patient satisfaction, and reoperation were documented. Descriptive statistics were used to analyze variables reporting them as simple frequencies and percentages.

Results: 111 patients were analyzed; Follow-up was 12 months. ODI improved from 46% to 13%. VAS results: Pre-op 8/10 – Post-op 1/10. 85% of the patients reported excellent to good results regarding modified MacNab criteria. Mean operative time was 52.5 minutes (range 30-80min). Intraoperative bleeding was minimal. 3 intraoperative and 10 postoperative complications. Seven patients (7.77%) required reoperation.

Conclusion: SEF is a MISS procedure with good surgical results and less morbidity compared with conventional methods. Patient selection and rigurous clinical and radiological analysis is required to prevent intra-op and post-op complications and reoperation cases. Long term follow – up is needed to evaluate results.

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FP A6-3

Experience Of Percutaneous Endoscopic Spine Surgery In Treating Lumbar Disorders With Intraspinal Occupying Ossification

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Objective: To investigate the feasibility, effectiveness and security of percutaneous endoscopic spine surgery in treating lumbar disorders with osseous occupy lesion and discuss the related surgical strategies.

Methods: 96 patients suffering lumbar disorders(LDH/LSS) with osseous occupy lesion were treated with percutaneous endoscopic spine surgery in our department during July 2008 to June 2016. There were 59 males and 37 females, ranging in age from 13 to 57 years (mean±SD, 29.54±7.14 years). Compressive factors, such as nucleus pulposus and/or hypertrophy of the yellow ligaments, joint capsules and articular osteophyte, were removed with the help of endoscopic systems. Comprehensive analysis of compressive factors based on imaging characteristics, such as location and size of osseous occupy lesion, and clinical symptoms of patients were needed preoperatively. The compressive factors must be removed if we determined it as "bony material". Otherwise, remove it as much as possible. Local anesthesia or continuous epidural anesthesia was given when performing via transforaminal approach, by contrast, continuous epidural anesthesia or general anesthesia were needed in the process of operation via interlaminar approach. Effectiveness and safety of the treatment were assessed with the help of follow-up data including low back pain and leg pain VAS score obtained preoperatively and postoperatively, Macnab score in the last follow-up. The causes of poor postoperative outcomes were further discussed. Among 96 patients, 51 had a clear trauma history and 92 menifested as single segmental unilateral symptom. Classified based on different occupying regions involved, 32 were lateral bone fragments, 13 were central cortical and cancellous fragments, 51 were mixed type.

Results: 42 cases whose involved segment were all L5-S1 were performed through interlaminar approach. 52 cases were performed via transforaminal approach, L5/S1 in 8 cases, L4/5 in 40 cases, L3/4 and L2/3 in 4 and 2 cases respectively. All patients were followed up for 6-18 months (mean, 11 months). VAS scores of lower extremity were 4-8 (5.8±1.1) preoperatively, and 0-5 (0.7±1.1) postoperatively. With the exception of dural tear in 1 case, no other complications, such as nerve root injury, hematoma, incision infection, occurred. Macnab score, excellent rate of 95.8%, were obtained in 6 months after operation.87 patients were given "excellent", 5 and 4 were given "good" and "fair" respectively.

Conclusion: As for lumbar spine disorders with intraspinal occupying ossification, which have surgical indications, the percutaneous endoscopic technique is a safe and effective alternative. Accounting for the treatment of ossification, comprehensive analysis should be made by combining clinical symptoms, imaging characteristics (position and size of osseous occupy lesion), operation difficulty and risk assessment. Ossification located at the upper part of bony lateral recess must be removed. When the lesion is a big one and in the intervertebral disc-ligamentum flavum space or the central area of the spinal canal (more than 50%), it should be resected as well. If it is just a small one (less than 50%), remove it as much as possible.

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FP A6-4

The Full-Endoscopic Interlaminar Operations Of Lumbar Disc Herniations And Spinal Stenosis - State Of The Art, Possibilities And Limitations

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Introduction: Full-endoscopic operations of lumbar spine are truly minimally invasive surgical procedures. Endoscopic techniques have become the standard in many areas because of the advantages they offer intraoperatively and after surgery. With the interlaminar and transforaminal approach, two full-endoscopic procedures are available for lumbar compresive lesion operations.

Aim: To present and explain all aspects of the full-endoscopic operative technique, and presentation of results of lumbar discectomies and monosegmental decompression in spinal canal stenosis with full-endoscopic interlaminar technique.

Material and Methods: A series of 535 patients underwent full-endoscopic interlaminar lumbar discectomy, and 103 patients with full-endoscopic spinal canal decompression for spinal canal stenosis performed during a 3-year period, is analyzed. In addition to general and specific parameters, VAS and ODI scale are used as a measuring instruments.

Results: In group of patients with full-endoscopic lumbar discectomy 88% no longer had leg pain, 7% had only occasional pain, and remaining 5% did not have significant improvement postoperatively. In seven (1.3%) patients minor nerve damage resulted in transient mild parestesias, and none of patients had neurological deficit. The recurrence rate was 6.5%. In group of patients with full-endoscopic monosegmental decompression, dural tear occurred in 6 (5.8%) patients (all of them with absolute central spinal canal stenosis), and only one had reoperation for direct dural repair. Resection of the herniated disc and sufficient decompression was technically possible in all cases.

Conclusion: The clinical results of the full-endoscopic interlaminar technique in lumbar disc herniations and spinal canal stenosis shows advantages such as reduced traumatization, improved patient mobility, and low complication and recurrence rate. With the possibility of selecting the most adequate approach, all forms of lumbar disc herniations and monosegmental spinal canal stenosis, can be sufficiently resolved using the full-endoscopic technique, when taking the appropriate indication criteria into account.

Keywords: full-endoscopic discectomy, interlaminar decompression, monosegmental stenosis

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Application Of Full Endoscopic Spine Surgery In The Lumbar Spine

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Full endoscopic surgery has increasingly been used for the surgical treatment of spine diseases and has gained more popularity due to advances and improvements in endoscopic instruments and tools. Nowadays, many thoracolumbar and lumbar spinal disorders could be operated by full endoscope in the proper selected cases, especially degenerative spine problem. Other conditions such as bacterial or tuberculosis infection has frequently been operated by endoscopic spine surgery. Rarely, lumbar apophyseal fracture or reported osteoporotic fracture or cauda equina syndrome which successfully treated by endoscope have been reported. We discussed the common indications and usefulness of endoscopic surgery in degenerative diseases including lumbar intervertebral disc herniation including contained and uncontained disc, lumbar spinal stenosis, facet joint arthritis, degenerative disease (annular tear). The application of endoscopic surgery in spinal infection has been also proposed such as transforaminal endoscopic biopsy, drainage and debridement. The future and feasibility of endoscopic lumbar fusion is debated. Furthermore the limitations or contraindications of endoscopic spine have been discussed.

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A Look At Works Of Art From The Point Of View Of A Neurosurgeon And Orthopedist.

Leonid Sak
Public hospital

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FP B1-1

Decompression Effects Of L-LIF Surgery For Degenerative Lumbar Diseases

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Introduction: The L-LIF surgery for degenerative lumbar diseases are performed in many institutes in Japan recent years. However, the decompression effects of interbody fusion from anterior or lateral are not clear. The short term surgical results of L-LIF were evaluated especially decompression effects.

Methods: Ninety-three cases were followed after L-LIF surgeries, and also the surgical result of TLIF which were performed at the same time in our institution were evaluated as a comparison. The blood loss during surgery and surgical time, complications are compared between two groups. The pre and post-operative VAS score of low back pain and leg pain were evaluated. The lumbar lordosis, disc angle, disc height and % slip were also investigated.

Results: The average blood loss of L-LIF group was less than the TLIF groups, there were no significant differences of the surgical time and the post-operative VAS scores between two groups. The post-operative disc height was significantly higher in the L-LIF groups.

Discussions: Fundamentally, this is an approach from the front, it is necessary to pay attention to the abdominal organs. But it is possible to make more secure interbody fusion using L-LIF techniques. From our results, it is possible to decompress the neural tissues without any posterior direct decompression as a laminectomy. It seems to be one of the most useful surgical techniques for the degenerative lumbar diseases.

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The Combined Anterior Plate And Contralateral Transarticular Screw Foe Atlantoaxial Fixation; Biomechanics Study And Preliminary Results

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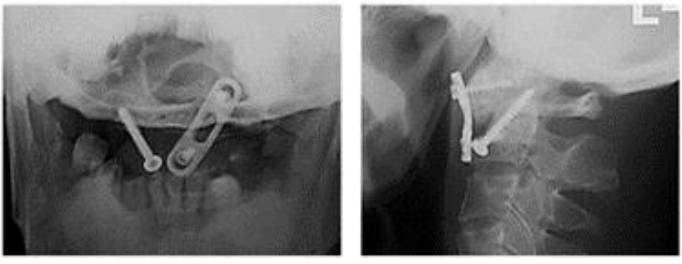
The combined anterior plate and contralateral transarticular screw foe atlantoaxial fixation; Biomechanics study and preliminary results. The instability of the atlantoaxial joint may have many causes. Atlantoaxial reduction and fusion is the preferred choice of treatment. Many techniques have been proposed giving a choice of fusion, but it comes down to posterior or anterior approaches. Posterior, such as Gallie's technique, Brooks and Jenkins, Magrel's screws (a good technique with good clinical outcome) definitely has its drawbacks. The transarticular C1-C2-fixation has a relevant risk of vertebral artery (VA) injury in the case of a high-riding VA within the axis. Both C1 lateral mass, C2 pedicular screw system and anterior approach were originally considered to be the preferred option. However, an anterior approach is not popular because of surgeons not being familiar with this approach.

Normally reduction of Atlantoaxial dislocation is effected by extension and gradual traction. This has met with some success. After reduction was achieved fixation was done posteriorly. For irreducible Atlantoaxial dislocation an initial anterior release is effected followed by posterior fixation in a number of cases. Wu YS, reported 10 successes cases were treated by anterior release with microscopic assistance and subsequent reduction, anterior transarticular screw fixation and morselized autologous bone grafts. However, it has been found that 2 anterior transarticular screws may not prove strong enough to hold the reduction and in some cases applied transarticular fixation is difficult.

Combined Anterior Plate and Contralateral Transarticular Screw for Atlantoaxial fixation



The Combined Anterior Plate and Contralateral Transarticular Screw for the Atlantoaxial Fixation was created by the author as illustrated. Biomechanical in cadaveric operations was studied by comparing 3 posterior fixation methods and the results show that stiffness of The Combined Anterior Plate and Contralateral Transarticular Screw constructs was comparable with that found in posterior constructs. Clinical trials were stated to show limited indications, such as

1. Irreducible Atlantoaxial dislocation
2. High-riding VA within the axis
3. Sub axial level that needed an anterior approach

Preliminary studies show that this technique is simple and effective and results in fewer complications. It might be possible to use as an alternative in C1-C2 reduction and fixation.

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Learning Curve Of Minimally Invasive Surgery Oblique Lumbar Interbody Fusion For Degenerative Lumbar Diseases

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Purpose: The purpose of this study is to characterize the learning curve for a single surgeon during his initial phases of performing a minimally invasive surgery oblique lumbar interbody fusion (MIS-OLIF) on the basis of intra- and perioperative parameters.

Methods: A prospective analysis of 49 consecutive patients that underwent a MIS-OLIF by a single surgeon was performed. Only those patients that were single level, index surgeries were included. Every patient had a diagnosis of degenerative lumbar diseases including lumbar spondylolisthesis, discogenic low back pain or segmental instability. Patients underwent an indirect decompression and fusion using an expandable tubular retractor and single intervertebral cage with bilateral percutaneous pedicle screw fixation. 49 patients were divided into the A group (the first 24 patients) and the B group (25 patients after the initial 24 patients). The following data were compared between the two groups: surgical time for (Skin-Skin, minutes), estimated blood loss (ml), radiograph exposure time (seconds), the clinical and radiographic results, and intra-/postoperative complications. All intraoperative parameters only included the measurement and findings related with the MIS-OLIF procedure. The learning curve was assessed using a logarithmic curve-fit regression analysis.

Results: Average operative time was significantly longer in the A group (47.07±10.61min) compared with the B group (37.24±10.01min) (P=0.002). In comparison with the B group, the A group had significantly more X-ray exposure time (25.33±6.13 sec versus 17.12±6.91 sec, P<0.000). The operative and X-ray exposure time gradually decreased as the series progressed, and an asymptote was reached after about 20 cases. There was no statistically significant difference in intraoperative blood loss between the A group (28.13±18.17 ml) and the B group (24.40±10.93 ml) (P=0.642). The most observed complications was donor site pain (11 cases, 44%), followed by thigh numbness/pain (5 cases, 20.8%) and psoas/quadriceps weakness (2cases, 8.3%), paralytic ileus (one case, 4.2%) and sympathetic nerve injury (one case, 4.2%) in the A group. Donor site pain occurred in four patients (16.7%), thigh numbness/pain in three patients (12.0%), psoas/quadriceps weakness in one patient (4.0%) and sympathetic nerve injury in one patient (4.0%) in the B group. All complications were transient and resolved within 3 months. The incidence of complications excluding donor site pain in the early period (A group) and the later period (B group) was 37.5% and 20.0%, respectively, showing temporal improvement after the introduction, although there were no significant differences in perioperative complications between both groups (P=0.175). Forty-nine patients were followed up for more than 1 year, and the average follow-up period was 18.5±3.9 months. The clinical outcomes were basically identical in the two group based on the back pain VAS and ODI scores. Radiographic evaluation showed similar bony fusion in the A group (22 of 25 cases) with the B group (22 of 24 cases) in last follow-up.

Conclusions: The MIS-OLIF procedure presents a learning curve to the practicing spine surgeon with regards to operative time, X-ray exposure time and intra-/postoperative complications. Intraoperative parameters improved with understanding the minimally invasive technique. Close attention to detail can minimize complications that may be associated with the learning curve.

FP B1-4

Endoscopic Assisted Thoracolumbar Fracture Fixation - Kyphoplasty & Pedicle Instrumentation

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Objective: Evaluate the outcome of endoscopic minimally invasive (MIS) percutaneous spinal fixation in single level lumbar fractures combined with percutaneous kyphoplasty

Methods: 7M:3F ranging between 25-65years who had suffered either compression fractures of single segment at the lumbar region. One patient had D12 fracture, four patients had L1 fracture, three patients had L2 fracture and two patients had L3 fracture. All but one had either vertebroplasty or kyphoplasty as an adjunct to the fixation. Percutaneous pedicle screw and rod fixation device was used as a rigid construct to stabilize the lumbar spine. Pre-and post-operative VAS was recorded. Radiographs were taken at 6weeks and 6 months. Radiographic analysis included measurements of kyphotic angulation, central and anterior vertebral body height, and evidence of bone fusion.

Results: The visual analog scale score was found to be significantly decreased; from 7.0 ± 1.0 before surgery to 1.5 ± 0.9 immediately after surgery and to 0.9 ± 0.6 ($p < 0.001$) at the end of follow-up. The Kyphotic angle was 35° ± 5° before surgery and 7° ± 5° at follow up. The central VB height that was 45% ± 10% before surgery increased to 75% ± 10% of the estimated intact central height immediately after surgery ($p < 0.001$). The anterior VB height increased from 45% ± 8% before surgery to 80% ± 5% of the estimated intact anterior height immediately after surgery ($p < 0.001$). All had signs of bony union.

Conclusion: Endoscopic assisted MIS pedicle screw fixation combined with PK is a safe and effective technique for treating selected lumbar fractures and that it yields satisfactory results.

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FP B1-5

The Techniques And Approach Related Complications Of Modified Lateral Lumbar Interbody Fusion

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Objective: To present the techniques of modified lateral lumbar interbody fusion and investigate the approach related complications.

Methods: Fifty-two patients underwent with modified lateral lumbar interbody fusion(LLIF) in our center were studied retrospectively. There were 20 males and 32 females, aged from 45 to 82 years old (averaged at 66.0 ± 11.2). The diagnosis was as following: degenerative spinal scoliosis in 21 cases, lumbar spinal stenosis in 15, lumbar spinal spondylolisthesis in 12, spinal infection and spinal trauma in 2 respectively. The main techniques of modified LLIF included direct vision method, improved transpsoas approach and novel retractor. The mean follow-up time was 9.2 ± 2.1 months (ranged from 6 to 12months). The approach related complications of anterior thigh pain/numbness, psoas major weakness and quadriceps weakness were recorded.

Results: A total of 118 levels were performed with modified LLIF, one level in 17 cases, 2 levels in 10. 3 levels in 19 and 4 levels in 6 cases. The mean surgical time was 56.5 ± 13.1minutes for 1 level, 94.5 ± 31.3 for 2 levels, 130.1 ± 41.5 fro 3 levels and 208.3 ± 22.7 for 4 levels. The estimated blood loss during surgery was less than 10ml every level. The incidence rate of approach related complications was 11.5%(6/52), and anterior thigh pain pain 9.6%(5/52), numbness 7.7%(4/52) and psoas major weakness 5.8%(3/52), and without quadriceps weakness. Five cases of anterior thigh pain occurred in patients underwent L23 or L34 fusion. Three case of psoas major weakness occurred in patients underwent 3 or more levels fusion.

Conclusion: The modified lateral lumbar interbody fusion reduces the approach related complications of traditional lateral lumbar interbody fusion through the operation under the direct vision, the improved transpsoas approach and the novel retractor.

FP B1-6

Instrumentation Related Complication Of Lumbar Degenerative Disc Diseases (LDD) Treated By Minimally Invasive Transforaminal Lumbar Interbody Fusion (MIS-TLIF)

Nov.30th, 2017 10:20-12:00
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Xinyu Liu

qilu hospital of shanodng university

Objective: To analyze the instrumentation-related complications of 87 lumbar degenerative disc disease (LDD) patients who underwent MIS-TLIF procedure and discussion the potential strategy to control these complications.

Methods: Eighty-seven patients (male: 29, female: 58; mean age: 54.2±19.6 years) with LDD were included in this study. All patients underwent MIS-TLIF procedure, among which 68 cases received single-level and 19 patients received two-level surgery. The affected levels were L3-4 in 21cases, L4-5 in 57 cases, and L5-S1 in 28 cases. The preoperative diagnosis was lumbar spondylolisthesis (40 with Meyerding grade I and 2 with grade II spondylolisthesis) in 42 cases, lumbar spinal stenosis (LSS) in 26 cases, LSS with instability in 12 cases, and lumbar surgery revision in 7 cases. A total of 386 percutaneous pedicel screws (PPS) were included in this series. The complications including malposition or breakage of guide pin, PPS or cages, neurological deficit, and superior level facet joint violations were determined during and after the surgery. Computed tomography (CT) was used to evaluate the accuracy of PPS and superior level facet joint violations 3 months after surgery. The following screw misplacement grading systems were used to assess the accuracy of the screw placement：Grade 0, no pedicle perforation; Grade 1, 0–2 mm; Grade 2, 2–4 mm; Grade4, greater than 4 mm. Facet Joint Violation (FJV) was classified as following: Grade 0, screw not in facet; Grade 1, screw in lateral facet but not in facet articulation, Grade 2, penetration of facet articulation by screw; Grade 3, screw travels within facet articulation.

Results: During surgery, guide pin and PPS perforated anterior wall of vertebral body (VB) in 3 cases (0.7%) and 1 (0.3%) case, respectively. One PPS (0.3%) was pulled out during the reduction of slip because of severe osteoporosis. Malposition of cages occurred in 6 cases (1.5%). All these were adjusted accordingly during surgery. All cases received more than 2 years follow-up. No loosening or breakage of PPS and cages was observed. CT showed 27 misplaced PPS (7%), including 20 （5.2%）grade 1 screws, 4 (1%) grade 2 screws, 2 (0.5%) grade 3 screws, and 1 (0.3%) grade 4 screw. Misplaced PPSs were located at L4 (13 screws), L5 (9 screws) and S1 (5 screws). One grade 4 screw (0.3%) resulted in unilateral low back pain. No neurological deficit related to misplaced PPSs was observed in this series. The total FJV rate was 36.6%, with Grade 2 and 3 violation occurred in 21 (12.1%) and 3 cases (3.4%), respectively. The highest occurrence of FJV occurred in L5 in this series.

Conclusion: MIS-TLIF has similar instrumentation-related complications with open TLIF. Accurate pre-operative evaluation and improvement in surgical technique can effectively reduce instrumentation-related complications.

FP B1-7

Fibula Graft Using Video-Assisted Thoracoscopic Surgery For Syngromic Scoliosis

Nov.30th, 2017 10:20-12:00
Great Hall 2 Chapter1

Hidetomi Terai
Osaka City University

Introduction: Video-assisted thoracoscopic surgery (VATS) is commonly used in the field of general thoracic surgery. There are many advantages of VATS: smaller incisions, less muscle damage, minimal open/closing time, cosmetically appealing, and good visualization during operation. Some authors have reported usefulness of VATS regarding anterior release or anterior instrumented spinal fusion in scoliosis surgery 1, however, there have been no reports regarding anterior fibula graft for scoliosis using VATS. In this paper, we will report two cases of anterior fibula graft for syndromic scoliosis using VATS.

Methods: Case 1: 9 yrs. old female with neurofibromatosis type 1. Because of a huge vascular rich tumor in her back, posterior instrumented fixation using subcutaneous rod insertion technique was performed to avoid excess bleeding. Then, paravertebral tumor resection and anterior fibula graft was performed using VATS. Case 2: 15 yrs. old male with Arnold-Chiari malformation type 1. Preoperative functional x-ray revealed 95º main thoracic curve was very rigid and in-situ fusion was appropriate. So, posterior fixation using subcutaneous rod insertion and partial bone grafting was performed first, then, followed by the anterior fibula bone graft using VATS.

Results: Case 1: Operation time was 11 hrs 19 min and blood loss was 2100g. Pre-operative cobb angle of main thoracic curve changed from 72º to 30º postoperatively. Solid bony fusion between vertebrae and fibula was acquired within 6months. Case 2: Operation time was 12hrs 6 min and blood loss was 1645g. Pre-operative cobb angle of main thoracic curve changed from 95º to 71º postoperatively. Though the thoracic curvature remained in coronal plane, coronal/ sagittal balance has improved and low back pain disappeared post operatively. There was no instrumentation failure or surgery related complication in both cases.

Discussion & Conclusions: The indication of anterior surgery for scoliosis is limited to the anterior release of rigid curvature or the correction of lumbar curvature. Recently, the chance of anterior approach for adolescent idiopathic scoliosis is decreasing due to the developed superior techniques of posterior instrumentation, though the anterior fixation using fibula graft is still inevitable and beneficial technique for syndromic scoliosis. The problem of anterior approach is its invasiveness related to the exposure of thorax, which may be reduced by VATS. Disadvantages of this technique are longer operative time, requirement of special techniques of endoscope and many endoscope related apparatus though there are many advantages mentioned above. Fibula graft using VATS was useful for the treatment of syndromic scoliosis

FP B1-8

Minimally Invasive Spinal Grading Osteotomy

Xun Ma 1, Zejun Xing 2, Zhuo Ma 3

ShanXi DaYi Hospital, Department of Orthopedics

Objective: To explore the procedures of minimally invasive spinal tubular grading osteotomy(MIS-TGO) in the patient with degenerative spinal scoliosis.

Methods: We performed 9 MIS-TGOs including 7 cases with Grade-1 to Grade-2 osteotomy, 1 case with Grade-3 osteotomy and 1 case with Grade-4 osteotomy. Then we report a typical Grade-3 minimally invasive spinal three column pedicle subtraction osteotomy(PSO) in the patient with progressive back pain and limitation of motion in thoracolumbar spine for 3 years. Preoperative radiographs of total spine showed stiffness degenerative kyphoscoliosis in thoracolumbar spine and existed sagittal and coronal imbalance. The main spinopelvic parameters were measured pre- and postoperatively including the sagittal vertical axis(SVA), C7 plumb line to certer sacral vertical line(C7PL-CSVL), pelvic tilt(PT), pelvic incidence(PI), sacral slope(SS), lumbar lordosis(LL) and thoracic kyphosis(TK). The patient underwent curve correction using navigation-asisted tubular minimally invasive spinal pedicle subtraction osteotomy(MIS-PSO) in the level of L2 with piezosurgery combined with percutaneous bilateral pedicle screws fixation from T9 to L5 segments. The neuroelectrophysiological monitoring was used during the operation.

Results: The patient relieved the back pain one week postoperatively. The radiographs showed sagittal and coronal imbalance were corrected. The main spinopelvic parameters were at normal ranges.

Conclusion: The MIS-TGO is a reliable technique for the correction of stiffness degenerative spinal scoliosis with exquisite manipulations that must have abundant open and tubular operations experiences.

Keywords: Minimally invasive, spinal, tubular, navigational, percutaneous, three column, grading, pedicle subtraction osteotomy, piezosurgery, scoliosis.

Nov.30th, 2017 10:20-12:00
Great Hall 2 Chapter1

FP B1-9

Clinical Research Of Minimally Invasive Management For Isthmic Lumbar Spondylolisthesis Via Vista Visualization Channel

Feng Xu, Bin Xu
Wuhan General Hospital of PLA

To analyze the feasibility and effectiveness of minimally invasive management for isthmic lumbar spondylolisthesis via Vista visualization channel.

Methods： Analysis of 18 patients with isthmic spondylolisthesis cases which Meyerding grade were Ⅰ - Ⅱ degree from June 2015 to July 2016.The surgeries were performed via Vista visualization channel by bilateral muscle gap for posterior decompression, restoration, fusion, and fixation. VASand ODI system wad used to evaluate the pre-and post operative (6 months) score. The pre-and post operative radiographic data was evaluated, including slipping degree and intervertebral disc height rate.

Result: All operations were successfully completed and no significant postoperative complications. All patients were followed up for 6-12 months (mean, 10 months). The mean operation time was 115min (range 85-145min); intraoperative blood loss was 75-135ml (mean 105ml). The Lumbocrural pain were significantly alleviated. Mean postoperative VAS score was 2.53±0.75 compared with 7.83±1.42 ofpreoperation. ODI was decreased from （29.47±2.75）% of preoperation to （ 9.58±1.36 ） % of the last follow-up (P<0.01). The spondylolisthesis had different degree of correction；The slipping degree significantly decreased from preoperative （ 23.58±3.55 ） % to （5.47±2.34）% at 6 months postoperatively. Intervertebral disc height from preoperative （ 4.54±1.23 ） mm to （ 9.74±1.85 ） mm at 6 months postoperatively .

Conclusion: Minimally invasive management for isthmic lumbar spondylolisthesis via Vista visualization channel is safty and feasible. Vista as a new type of visualization channel system, should be widely promoted.

FP B1-10

Minimal Access Decompression Surgery In Lumbar Degenerative Disease

Motonobu Natsuyama
Shima Neurosurgical Orthopedic Hospital Title and Abstract

Nov.30th, 2017 10:20-12:00
Great Hall 2 Chapter1

Introduction: The purposes of this presentation are to compare minimum access surgery to open surgery, to evaluate the effectiveness of minimum access surgery in lumbar
degenerative disease, and to compare results by unilateral approach to those by Microendoscopic muscle-preserving interspinous inter-laminar decompression technique (ME-MILD).

Methods: We did comparative study of Microendoscopic versus Microscopic discectomy of the lumbar spine, and investigated our Microendoscopic laminotomy for Lumbar spinal canal stenosis (LCS). We also reviewed other authors` comparative study between MED decompression and open decompression in LCS.

Results: The advantages of minimum access surgeries were the morbidity decrease in minimum access surgery, (Blood loss, postoperative CRP, postoperative pain, return to
work), and better cosmesis. The disdvantages were the slightly higher incidence of complication, and relatively longer operative time. For LCS 221 cases, Average op. time was 104 minutes per level, estimated blood loss was 19.1 ml. It took 22.3 days to return to work. JOA recovery rate was 85.6% 3M. postop, 85.4% 6M postop., and 85.3% 12M. postop. Complications: There were 12 dural tears.5 cases needed revision surgeries. By unilateral approach, the reduction rate of facet joint post operation was 24.9% at approached side. By ME-MILD, the reduction rate of facet joint post operation was only 7.4%.

Conclusions: Minimum access surgery is a useful minimally invasive procedure for treating lumbar degenerative disease. ME-MILD is a useful approach to preserve facet joints in lumbar spinal canal stenosis.

FP B1-11

Accuracy Of Percutaneous Pedicle Screw Placement For Thoracolumbar Fractures Using Conventional Fluoroscopy Compared With Three-Dimensional Navigation

Nov.30th, 2017 10:20-12:00
Great Hall 2 Chapter1

Jun Zou, Yufeng Chen, Jun Ge, Junjie Niu, Huilin Yang
The First Affiliated Hospital of Soochow University

Objective: Minimally invasive spinal surgical techniques have been growing in popularity recently. Percutaneous pedicle screw (PPS) provides great benefits to patients, especially in the thoracolumbar fracture cases. Many studies have demonstrated highly accurate PPS placement with various novel imaging systems, such as computer-assisted navigation. However, such navigation systems are exceedingly expensive, and only well-funded institutions can afford such specialized equipment. Actually, the rotating single C-arm could also simply and easily show the entry point and screw trajectory to the surgeon. We hypothesized that a modified pedicle screw insertion method with conventional fluoroscopy could achieve good results without specialized equipment in trauma patients. The goal of this study was to evaluate the accuracy of PPS placement using conventional fluoroscopy compared with three-dimensional navigation.

Methods: The patients who underwent lumbar fusion surgery were divided into two groups, A (conventional fluoroscopy) and B (three-dimensional navigation). The pedicle screws were inserted according to anatomical landmarks using “one line sign” techniques—a modified standard procedure in group A. The position should be fine-tuned in the craniocaudal direction to align the anterior end plate of the vertebra with the posterior end plate, and it must be turned around to allow visibility of the pedicle symmetrically toward the vertebral rotation angle on the AP view. On the lateral view, the shaded images of the two pedicles must correspond. If the vertebral body was compressed into a V-shape, puncture was performed from the "10 o'clock" and “2 o'clock” positions. If the vertebral body was compressed horizontally, puncture was performed from the "9 o'clock " and "3 o'clock " positions. When the needle was located at the pedicle of 1/2 on the AP view, it could not beyond the midline of the pedicle on the lateral view. The accuracy of pedicle screw placement was based on evaluation CT scans. Morbidity and mortality data were collected prospectively.

Results: Of 150 PPSs, only 7 screws were misplaced. The breach rates of groups A and B were 4% and 2.7% ($p<0.05$). There were no screw caused neurovascular injuries in both groups.

Conclusions: Without using an expensive imaging system, the modified technique of PPS insertion with conventional fluoroscopy is fairly accurate and provides good clinical outcomes. An experience-dependent learning curve has the possibility of decreasing the absorbed doses of radiation. This fluoroscopy-based technique could be used in any institution.

FP B2-1

Robot-Assisted Minimally Invasive Spine Surgery

Yen-Mou Lv
Department of Orthopaedics

INTRODUCTION: Robotic technology has been increasingly used in spine surgery, minimally invasive spine surgery is still hot today. The application of robot in spine may provide a way for minimally invasive surgery by reducing the surgical, radiation exposures and improve accuracy and outcomes. METHODS: Using the Mazor Robotics Renaissance™ system, 711 patients between May 2013 and Oct. 2017 were operated by the orthopedic and neurosurgeon from Kaohsiung Medical University Hospital. There were 494 female and 217 male, aged from 11-89 (average 61.2) years. 516 cases were MIS, included degenerative disease, deformities, tumor infection and fractures. We examined the accuracy and safety of the robot using in pedicle screw placement.

RESULTS: From the 2142 screws reviewed, the average operating time using robot was 7.4 minutes per screw. The need of fluoroscopic x-ray exposure was 8 shots per patient, there were 51 screws repositioned. The accurate rate was 98.6 %. There was no neurologic, vascular or pulmonary injury related to the robotic procedure. One cage backed out was found in the follow up at 12 weeks. For assessing the intraoperative accuracy, K-wire placements deviating <3 mm from the planned trajectory was determined to be 98.7%, the robot-guided pedicle screw implantation attained an accuracy of 94.0% before repositioning. Most K-wire entry points deviated caudally and laterally. CONCLUSIONS: The use of the Renaissance™ robot system can enable minimally invasive approaches, enable procedures that are hard or impossible without the robot and the accuracy is high in spine pedicle screw placement.

Nov 30th 2017 13:00-14:10
Great Hall 2 Chapter2

FP B2-2

Accurate Placement Of Cervical Pedicle Sscrews Using 3D-printed Navigational Templates And Continuous Image Registration

Haibin Lin

Affiliated Hospital of Putian University

Objective: The accurate placement of cervical pedicle screws remains to be a surgical challenge. This study aimed to test the feasibility of using a novel 3D-printed navigational template to overcome the challenge.

Methods: Cervical spines were scanned using computed tomography (CT). A three-dimensional model of the cervical spines was created. The screw trajectory was designed to pass through the central axis of the pedicle. Then, a navigational template was designed by removing the soft tissue from the bony surface in the 3D model. A 3D printer was used to print the navigational template. The screws were then placed in the cadavers following CT scanning. The 3D model of the designed trajectory and the placed screws were registered. The coordinates of the entry points and the exit points of the designed trajectory and the actual trajectory were recorded. The numbers of qualified points that met the different accuracy degrees were compared using a chi-square test.

Results: A total of 158 screws were placed. Five screws breached the pedicle cortex with a distance <2 mm. There was no significant difference between the preoperative and postoperative entry points with an accuracy degree ≥1.7 mm (P= 0.131). Meanwhile, there was no significant difference between the preoperative and postoperative exit points with an accuracy degree ≥2.7 mm (P= 0.071).

Conclusion: A navigational template can be designed by removing the soft tissue from the bony surface in a CT-generated 3D model. This guiding tool may effectively provent intraoperative drifting and accurately places cervical pedicle screws.

Nov.30th, 2017 13:00-14:10
Great Hall 2 Chapter2

FP B2-3

The Impact Of Navigator-Assisted Device On Radiation Exposure In Transforaminal Percutaneous Endoscopic Lumbar Discectomy

Shisheng He, Guoxin Fan

Shanghai Tenth People's Hospital

Objective: An optimal transforaminal approach is required in transforaminal percutaneous endoscopic lumbar discectomy (tPELD), of which the working channel depends on the accurate percutaneous puncture. The conventional blinded punctures heavily rely on repeated fluoroscopy, which resulted in massive radiation exposure and longer operation time. The study aimed to investigate the impact of navigator-assisted device on radiation exposure and radiation-related disease in tPELD.

Method: The study prospectively assessed the medical records of 127 patients receiving tPELD from October 2015 to August 2016. Patients receiving the navigator-assisted device were regarded as group A, and those undergoing conventional methods of puncture were considered as group B. The main comparative indicators included puncture times, fluoroscopic times, exposure time, estimated radiation dose, risk of relative disease and operation time.

Result: The average puncture times was 1.59±0.66 in Group A and 4.83±1.76 in Group B (P<0.001). The total fluoroscopic times were 27.38±5.11 in Group A and 36.97±7.52 in Group B (P<0.001). The total exposure time was 26.27±4.75s in Group A and 33.51±7.08s in Group B (P<0.001). The estimated radiation dose was 0.49±0.09mSv in Group A and 0.63±0.14mSv in Group B (P<0.001). The estimated risk of cancer was (26.75±4.89) * 10^{-9} in Group A and (34.39±7.50) *10^{-9} in Group B (P<0.001). The estimated risk of genetic diseases was (0.97±0.18) *10^{-9} in Group A and (1.25±0.27) *10^{-9} in Group B (P<0.001). The operation time was 62.91±10.03 min in Group A and 69.84±10.49 min in Group B (P<0.001).There were no significant difference in satisfaction and complication between two groups (P>0.05).

Conclusion: Navigator-assisted device could significantly improve the puncture accuracy of tPELD and decrease the operation time as well as minimize radiation exposure, which might reduce the risks of cancer and genetic disease. The study indicated navigator-assisted device had a great potential in the future clinical applications.

Nov.30th 2017 13:00-14:10
Great Hall 2 Chapter2

FP B2-4

Trajectory Quantification And Guided Punctures With Isocentric Navigation In Posterolateral Endoscopic Lumbar Discectomy.

Guoxin Fan, Shisheng He

Shanghai Tenth People Hospital, Tongji University School of Medicine

Nov.30th, 2017 13:00-14:10
Great Hall 2 Chapter2

Background: Posterolateral endoscopic trasforaminal discectomy (PELD) requires an ideal percutaneous puncture to place the working channel for endoscopic discectomy. The conventional blinded puncture relies on the surgeon's experience and repeated fluoroscopy, which may not contribute to the populizaiton of PELD. This study aimed to introduce a novel isocentric navigation system to plan trajectory and guide punctures in PELD.

Methods: From May 2015 to June 2015, 14 patients with symptomatic LDH undergoing PELD were enrolled in the study. The diagnosis of LDH was based on a comprehensive clinical evaluation, including typical symptoms and signs, as well as radiographic assessment on magnetic resonance imaging (MRI) or computed tomography. All surgeries were conducted by one single surgeon with extensive surgical experience in all types of minimally invasive spine surgery. Posterior projection of the planned trajectory was over the tip of the superior facet joint to the puncture target, which created an angle α with the longitude line. Lateral projection of planning trajectory was over the tip of the superior facet joint to the puncture target, which created an angle β with the longitude line. This way, we quantified the trajectory by calculating the 2 angles into the parameters for the navigation system. Thereafter, we identified the posterior and lateral projections of puncture target on the back and the lateral radiopaque frames. Then, we slightly adjusted the navigator to ensure that the beams were right on the identified markers of the puncture target. At this moment, the puncture target became the center of the arch, and the guided puncture could be achieved following the planned trajectory.

Results: Four patients (5 female, 9 male) were included in this study. Age ranged from 21 to 67 years, and the body mass index ranged from 18.71 to 23.15 kg/m2. The included 12 patients received just one puncture and the other two patients receive just two punctures to obtain an appropriate position. The radiation exposure time could be minimized to 15 seconds and the operation time could be limited to 58 minutes. No significant complications were observed during the over-one-year follow-up, and all patients reported significant pain relief and improved surgical outcomes, as assessed by the Oswestry Disability Index and Macnab criteria.

Conclusions: Isocentric navigation is feasible in planning the trajectory and guiding the punctures in PELD and could be considered as a potential practical tool to facilitate surgery.

FP B2-5

Ultrasound Volume Navigation Technology In Transforaminal Puncture Of Minimally Invasive Lumbar Surgery With Full Endoscopic Techniques

Qiang Fu, Zognde Yang, Xiao Zhai, Xiaochuan Gu, Xianzhao Wei, Xiaochuan Gu

Spine Surgery Department, Changhai Hospital

Objective: To evaluate the effectiveness of ultrasound (US) volume navigation technology in guiding the lumbar transforaminal puncture with fullendoscopic technique through posterolateral approach.

Methods: From June 2011 to June 2013, 60 patients (37 males and 23 females; mean age: 32.9 years) with single level lumbar disc herniation who had undergonelumbar transforaminal puncture with fullendoscopic technique through posterolateral approach were enrolled in this retrospectivestudy, and they were randomly divided into 2 groups according to whether the assistance of ultrasound volume navigation technology was used. They received the minimally invasive surgery on L4, 5 (47 cases) and L5S1 (13 cases). In the USguidance group (29 cases), ultrasound volume navigation was used to guide puncture process, and in the Carm guided group (31 cases), Carm was applied to guide the puncture process The total puncture time and Carm fluoroscopy times were recorded. Parameters including Oswestry disability index (ODI) and visual analogue scale (VAS) were selected to evaluate the clinical efficacy.

Results: Patientsnhad no obvious discomfort during the puncture procedure and no postoperative complications. In US guidance group, the preoperative time was 13.7±2.1 min (range, 11-16 min), and the whole process took 20.6±3.1 min (range, 16-28 min), while the average time of Carm exposure were 4.9±0.8 times (range, 4-7 times). In Carm guided group, the average time for puncture procedure was 27.9±1.7 min (range, 25-32 min), and the average times of Carm exposure were 14.3±1.2 times (range, 13-17 times). There were significant differences between two groups. Compared with Carm guided group, USguidance group had the same accuracy rate of puncture (the puncture needles all reached the target area), but the fluoroscopy times and puncture timewere decreased significantly. There's no significant difference among the pre and postoperative ODI and VAS indexes. Patients were followed up at 3 months and 1year postoperation. The mean follow up period was 16.4 months (range, 12-26 months). The ODI score of the US guidance group were 72.9%±5.9%, 17.1%±3.6% and 15.9%±3.3% before operation, 3 months postoperation and 1 year postoperation respectively. The ODI score of the Carm guided group were 73.2%±4.9%, 17.3%±3.3% and 16.1%±2.9% respectively. The VAS were 7.4±0.9, 2.2±0.7 and 1.9±0.8 in USguidance group, and were 7.2±0.9, 2.1±0.7, 1.8±0.8 in Carm guided group.

Conclusion: The ultrasound volume navigation can guide the lumbar transforaminal puncture with full endoscopic technique through posterolateral approach accurately, reducing the puncture time and the amount of Xray radiation significantly. Its puncture accuracy and efficacy have no significant differences, which could be broadly used in clinical application.

Nov.30th 2017 13:00-14:10
Great Hall 2 Chapter2

FP B2-6

Feasibility Of Ultrasound (US) Volume Navigation Technology In Posterior Percutaneous Full Endoscopic Cervical Discectomy

Zhengjian Yan

The second affiliated hospital of ChongQing medical university

Objective: To evaluate the possibility of ultrasound (US) volume navigation technology in posterior percutaneous full endoscopic cervical discectomy.

Methods: Five healthy people were enrolled in this study. The cervical vertebra CT scan data were collected, and the 1 to 1 model was output by 3D printer. Imbed the model into coloed gel. Insert short stick under ultrasound volume guidance. The “V points” of bilateral C4 / 5, C5 / 6 and C6 / 7 were our target puncture point. These model were get CT scan after insert all the 6 sticks. Record the distance between the needle tip and the”V point” on the CT image（both horizontal and vertical ）,and make the tip position distribution map.

Results: In this study, five puncture models (30” V points”) were positioned and punctured successfully, the positions of the needle tips are in the circle with “V point”as the center and 3mm as the radius.

Conclusion: (US) volume navigation technology is feasible to guide posterior percutaneous full endoscopic cervical discectomy

Nov.30th, 2017 13:00-14:10
Great Hall 2 Chapter2

FP B2-7

Minimally Invasive Full-endoscopic Posterior Cervical Foraminotomy Assisted By O-arm-based Navigation

Chao Zhang, Junlong Wu, Changqing Li, Yue Zhou

Xinqiao Hospital of the Third Military Medical University

Background: Navigated percutaneous endoscopic cervical discectomy(PECD) is a promising minimally invasive surgery for treating cervical spondylotic radiculopathy. PECD has been described as a safe, effective and minimally invasive method for patients with radiculopathy but with steep learning curve. Due to the limited field of vision, anatomic localization is difficult for surgeons until using the O-arm based navigation. In this study, patients with radiculopathy due to foraminal disc herniation or foraminal stenosis in the lower cervical spine underwent the single level full endoscopic posterior cervical foraminotomy procedure assisted by O-arm-based navigation.

Objective: The purpose of this study was to evaluate the clinical, radiological outcome and the factors predicting excellent outcome of patients underwent full endoscopic posterior cervical foraminotomy procedure assisted by O-arm-based navigation.

Methods: Forty-two patients who had single-level foraminal disk herniation or foraminal stenosis were retrospectively reviewed. Radicular arm pain was the most common presenting symptom in patients. All patients underwent full-endoscopic posterior cervical foraminotomy assisted by O-arm-based navigation. Clinical outcomes were assessed by the visual analog scale (VAS) for neck and radicular arm pain, neck disability index (NDI) score, and by the short form-36 health survey questionnaire (SF-36) in the immediate preoperative period, immediate postoperative and final follow-up. The clinical parameters and radiological parameters included cervical curvature(CA), segmental angle(SA) and range of motion(ROM) preoperatively and last follow up were assessed.

Results: The mean follow up for the patients was 15 months. There were no perioperative complications. The VAS score for radicular arm pain and neck pain, and NDI score improved significantly in all patients. The SF-36 score reflected significant improvement in all 8 domains. Excellent and good outcomes was achieved in 38 out of 42 patients. The cervical curvature range of motion (CA_ROM) statistically significant improved at the final follow-up period compared with preoperative period. The Segmental angle (SA) become less kyphotic after PECD at final follow-up. Postoperative CA and CA-ROM were improved but not significantly changed. On the univariate analysis, patients with Symptom duration less than 3 month had a better outcome than patients with Symptom duration more than 3 month (excellent, 83.33% vs 50.00).

Conclusion: The results show that the full endoscopic posterior foraminotomy assisted by O-arm-based navigation is a safe and effective option for cervical radiculopathy with the advantages of a minimally invasive method. Patients with Symptom duration less than 3 month had a better outcome than patients with Symptom duration more than 3month.

Nov.30th 2017 13:00-14:10
Great Hall 2 Chapter2

FP B2-8

MIS-TLIF: The Evolution From C-arm Guided To Cutting-Edge 3D Navigation- Assisted Surgery

Arvind G Kulkarni

Mumbai Spine Scoliosis & Disc Replacement Centre, Bombay Hospital, Mumbai

This presentation showcases the evolution of Minimally Invasive TLIF in terms of preventing radiation exposure from use of C-arm and then to 2D-Navigation and now – the latest cutting-edge 3D navigation. The benefits of 3D and the elegance of surgery are highlighted with videos.

Nov.30th, 2017 13:00-14:10
Great Hall 2 Chapter2

FP B3-1

The Endoscopic Solution For Degenerative Thoracic Spinal Diseases

Jin-Sung Kim

Seoul St Mary's Hospital, The Catholic University of Korea

The degenerative spinal diseases in thoracic spine such as disc herniation, OPLL, OLF are less common than in the cervical or lumbar spine, and more difficult to be treated well. These diseases usually lead to myelopathy, which is generally treated by decompression of the spinal cord via various kinds of approaches. Various approaches to decompress of the spinal cord have been described, including those that utilize anterior, posterior, circumferential, and posterolateral routes. However, there is currently a lack of consensus about which approach should be considered the standard operative procedure for treating thoracic degenerative spinal diseases, as none of these approaches can adequately mitigate all the complications associated with the decompression procedure. This article reports author's experience of treating cases of myelopathy due to thoracic disc herniation, OPLL, OLF that were successfully treated without any complications by video-assisted thoracoscopic surgery, transforaminal endoscopic approach, hybrid endoscopic approach, and minimally invasive interbody fusion. The results of this study suggest that various kinds of minimally invasive technique can be used to effectively treat localized thoracic degenerative spinal diseases with few complications.

Nov.30th, 2017 14:10-15:00
Great Hall 2 Chapter3

FP B3-2

Clinical Efficacy Of Microendoscopic Lumbar Discectomy Combined With Annulus Suture In The Treatment Of Lumbar Disc Herniation

Qingchu Li, Dadi Jin

The Third Affiliated Hospital of Southern Medical University

Investigate the safety and clinical efficacy of Microendoscopic lumbar discectomy (MED) combined with annulus suture in the treatment of lumbar disc herniation(LDH), and whether it can significantly reduce the recurrence rate after operation. A total of 290 patients with LDH treated with MED from 3. 2012 to 3. 2015. This study included 118 cases of microendoscopic discectomy combined with annulus suture (suture group) and 172 cases of microendoscopic discectomy (control group). The height of disc space were recorded and measured, together with operation time and blood loss.The clinical outcomes were then evaluated by ODI and VAS.

In both groups the ODI and VAS scores were significantly decreased in the last follow up, which is statistically significant (P <0.05); but no significant simultaneous difference was observed (P > 0.05). On average, disc height reduced in the last follow-up, while the difference was not statistically significant between the two groups. The recurrence rate was 8.14% in the control group and 2.54% in the suture group. The reoperation rate was 3.49% in the control group and 0.85% in the suture group. The two groups displayed significant difference in the recurrence rate and reoperation rate.

These findings indicate that microendoscopic discectomy combined with annulus suture is simple in operation, safe and feasible. Compared with discectomy alone, additional annulus suture can obtain equivalent and remarkable clinical outcomes. The recurrent rate and reoperation rate can be reduced significantly if the procedure is performed in patients with certain surgical indications.

Keywords: 1umbar disc herniation; MED; annulus suture

Nov.30th, 2017 14:10-15:00
Great Hall 2 Chapter3

FP B3-3

Stand-alone Lateral Recess Decompression Without Discectomy In Patients Presenting With Claudicant Radicular Pain And MRI Evidence Of Lumbar Disc Herniation: A Prospective Study

Arvind G Kulkarni

Mumbai Spine Scoliosis & Disc Replacement Centre, Bombay Hospital, Mumbai

Introduction: Discectomy is the gold standard treatment for symptomatic lumbar disc herniations refractory to conservative care. Typically patients with positive SLR (Straight
leg raising test) and flexion dominant leg pain are the ideal candidates who can be benefited from discectomy. There is a subset of patients with morphological features of lumbar disc herniation with LRS on MRI and presenting with diametrically opposite symptoms i.e. claudicant leg pain, extension dominant leg pain, relief on flexion and a negative SLR. Until now, no focused prospective study in the literature highlights stand-alone lateral recess decompression in this group of patients. The goal of the current study was to analyze the outcomes of stand-alone lateral recess decompression without discectomy in patients with claudicant radicular pain and MRI showing LRS (lateral recess stenosis) with lumbar disc herniation.

Material and Methods: From January 2007-June 2013, 55 patients having unilateral claudicant radicular pain was selected to undergo stand-alone lateral recess decompression with tubular retractors. Intra-operatively disc consistency and presence of sequestrated fragments were analyzed. VASleg (Visual Analogue Scale), ODI (Oswestry Disability Index) score and Macnab's criteria were used to measure outcomes.

Results: Out of 55 patients, stand-alone lateral recess decompression was successfully executed in 51 patients and remaining four patients had sequestrated discs which required removal. Mean age at presentation was 54.5 years (41-67 years), male: female ratio was 1.12:1 and mean follow-up was 3.8 years (3-5.8 years). Significant improvement (p, <0.0001) was noticed between pre-operative and post-operative VASleg score (8.39±0.84v/s 2.5±0.48) and ODI score (46.79±1.85v/s 18.71±2.41). As per Macnab's criteria 94% patients were satisfied with surgery.

Conclusion: Stand-alone lateral recess decompression without discectomy is clinically effective for a large majority of patients with claudicant radicular pain and MRI evidence of LRS with associated lumbar disc herniation. The ability to perform it with minimal invasive techniques makes it focused and targeted with minimal morbidity.

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FP B3-4

Contralateral Radiculopathy Following Microendoscopy-assisted Minimally Invasive Transforaminal Lumbar Interbody Fusion

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Purpose: To elucidate incidence of contralateral radiculopathy or its aggravation following microendoscopy-assisted minimally invasive transforaminal lumbar interbody fusion (MIS-TLIF) and investigate its main etiologies, prophylactic methods as well as treatments.

Methods: A total of 102 cases underwent microendoscopy-assisted MIS-TLIF (72 cases for bilateral decompression through unilateral route and 30 cases for ipsilateral decompression through unilateral route). For those revealing contralateral radiculopathy or its aggravation postoperation, lumbar computed tomography (CT) scan and conservative treatments were performed immediately, and those who had been resistant to conservative treatments for two weeks underwent revision surgery. Incidences of this complication between bilateral and ipsilateral canal decompression through unilateral route were calculated and compared. Based on visual analogue score (VAS), their pain intensity of contralateral limb at the beginning and final follow-up were evaluated and compared.

Results: Twelve cases showed contralateral radiculopathy or its aggravation postoperatively (nine and three cases for bilateral or ipsilateral decompression through unilateral route respectively), thus its incidence was 11.8% in this series. Based on lumbar CT scan, nine patients were mainly associated with nerve root canal and (or) foramen stenosis and received successful conservative treatments, while three remaining patients were with disc extrusion combined with no restoration of intervertebral height at surgical level and underwent revision operations. Incidence of this complication following bilateral or ipsilateral canal decompression through unilateral route was 12.5% and 10% respectively, showing no statistical difference ($P>0.05$). All of them were followed up for an average of 27.9 months after final discharge. Mean VAS of contralateral lower limbs at the start of symptom was (5.4 ± 1.1), while it decreased to (1.1 ± 1.2) at final follow-up, demonstrating significant difference ($P<0.05$).

Conclusions: Contralateral radiculopathy or its aggravation following microendoscopy-assisted MIS-TLIF is mainly contributed to disc extrusion, no restoration of intervertebral height at surgical level, stenosis worsening of nerve root canal or foramen. Most sufferers can acquire satisfactory recovery following immediate conservative treatments, while those refractory to them need revision surgery.

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FP B3-5

Preliminary Clinical Results Of Adipose Derived Endoscopic Stem Cell Injection For Facet Joint Syndrome

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Introduction: Facet joint syndrome is a common disabling condition. Degeneration of the motion segment leads to a loss of height of the segment resulting in an athrosis of the facet joint. The degenerative changes in the joint result finally in a chronic inflammatory process. Advances in regenerative medicine revealed immune-modulatory properties of stem cells. Recently it could be shown that stem cells (MSCs) can limit inflammatory responses. ADSCs are easier to access and show a higher cell count of regenerative cells than bone marrow derived stem cells. They seem to be ideal for treating degenerative inflammatory processes in the musculoskeletal system. Various injections of stem cells in bigger joints like the knee or hip are reported in human and veterinary medicine.

Methods: We report 39 patients (age range 31-78 years, mean 59) suffering from facet joint syndrome. Adipose derived stem cells were harvested by liposuction, separated by using the InGeneron Transpose system injected into the facet joint under fluoroscopic guidance without adding local anesthesia or cortisone.

Results: All patients reported a decrease in the overall pain level within 48 hours. VAS 7.2 mean preoperatively to 1,8 mean postoperatively. No worsening was observed in any of the patients in the following observation period. The longest observation period was 16 months.

Conclusions: Our results indicate that ADSCs might be used for regulating inflammatory responses and could offer therapeutic benefit in degenerative diseases of the musculoskeletal system. Like Treg cells, ADSCs possibly migrate to the joints where they can act locally inside the inflamed synovium to decrease the proliferation and function of immune cells via the secretion of inhibitory soluble factors. They might also act systemically to suppress the host immune response through a shift in the Th1/Th2 cell balance, indicating that ADSC-induced immune suppression is not mediated by a single or unique mechanism.

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FP B4-1

Management Of Sequestrated Lumbar Disc Herniation Using Percutaneous Endoscopic Lumbar Disc Herniation. A Case Series'

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Background: There are numerous surgical interventions for lumbar disc herniation. They can be broadly classified as open discectomies, microendoscopic discectomy and percutaneous techniques. Percutaneous endoscopic lumbar disc herniation is a relatively new technique, this treatment can preserve spinal stability with a less damage to muscular and ligamentous structures allowing for faster rehabilitation, and earlier return to function. The aim of this study is to determine the technique and outcomes for treating sequestrated lumbar disc herniation with percutaneous endoscopic.

Methods: We collected 4 patients who underwent percutaneous endoscopic procedure for sequestrated lumbar disc herniation that were prospectively followed. We described the technique of percutaneous endoscopic discectomy for sequestrated lumbar disc herniation, and we also evaluated the outcomes of this procedure with Straight Leg Raising (SLR) test, Visual Analog Score (VAS) for leg and back pain.

Results: All procedures were performed with percutaneous endoscopic which a working channel was introduced to the foraminal canal (Kambin Triangle's). We found the sequestrated disc herniation, and from this area we can easily reached the herniated disc materials and removed it with a disc forceps. The outcomes from SLR, and VAS test was significantly improved after surgery, where patient have a shorter hospital stay and quickly return to their daily activities

Conclusions: Percutaneous endoscopic lumbar disc herniation procedure is a safe and effective intervention for sequestrated lumbar disc herniation with a less damage of spinal components. The simple technique, and direct improvement of the outcomes can be described that this procedure can restore the quality of life quickly.

Keywords: Sequestrated lumbar disc herniation; Percutaneous endoscopic; Outcomes.

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FP B4-2

Case Series Of Early Endoscopic Experience From Pain Management Perspective

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FP B4-3

Avoiding Postoperative Dysesthesia In Transforaminal Percutaneous Endoscopic Lumbar Discectomy By Preoperative Evaluation Of 3D CT/MRI Fusion Imaging

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Purpose: Postoperative dysesthesia (POD) because of injury to the exiting dorsal root ganglion is a unique complication of transforaminal percutaneous endoscopic lumbar discectomy (PELD). To avoid POD, the outside-in technique using foraminoplasty was developed. However, criteria for adding the foraminoplasty are unclear. We have introduced 3D CT/MRI fusion imaging to facilitate decisions about the skin entry point, the trajectory of the needle, and the surgical approach (outside-in with foraminoplasty or inside-out technique). We report and discuss the clinical results.

Methods: Between 2015 and 2017, cases of 22 patients (13 men and 9 women) who underwent PELD were analyzed. 3D CT/MRI fusion imaging was conducted using a workstation (AZE, Virtual Place). The fusion images were rotated in 1° steps from PA view until the safety triangle zone could be most widely visualized and this angle was recorded. A needle and working cannula were inserted according to this recorded angle. When a narrow working zone was confirmed by the 3D CT/MRI fusion imaging, the outside-in technique with foraminoplasty was selected.

The distance between the exiting nerve root and superior facet joint (exiting nerve-superior facet distance: ESD) was calculated and compared between the inside-out and the outside-in groups. Occurrence of POD was examined and operation time between the two groups was compared. Surgical outcomes were assessed using a visual analog scale (VAS).

Results: The mean distance of the skin entry point from the midline was 9.8 cm (range: 7–14.5 cm). The mean angle from the horizontal line was 30.2° (range: 20–40°). Inside-out technique was performed in 8 cases and outside-in technique with foraminoplasty was performed in 14 cases. The mean ESD of the inside-out group was 6.3 ± 0.9 mm, which was larger than for the outside-in group (3.9 ± 1.5 mm). Operation time for the inside-out group was 64.8 min, which was shorter than for the outside-in group (80.5 min). POD did not occur in either group. The mean VAS for low back pain decreased significantly after the operation (from 5.1 ± 2.9 to 0.9 ± 1.1, $p < 0.01$). The mean VAS for leg pain decreased significantly after the operation (from 7.4 ± 2.5 to 1.3 ± 1.2, $p < 0.01$).

Conclusion: To avoid POD, preoperative evaluation of ESD by 3D CT/MRI fusion imaging was useful. A narrow working zone may be confirmed by the imaging, and in these cases, the outside-in technique with foraminoplasty can avoid POD.

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FP B4-4

Comparison Of Endoscopic Ultrasonic Bone Scalpel And High-speed Drill In Transforaminal Endoscopic Foraminoplasty

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Objective: Ultrasonic bone scalpel makes use of the principle of high-intensity focused ultrasound to change the electrical energy into mechanical energy for bone cutting. This article remains to confirm the efficacy and safety between ultrasonic bone scalpel and drill during transforaminal endoscopic foraminoplasty.

Methods: A total of 32 patients with lumbar disc herniation who underwent transforaminal endoscopic foraminoplasty by one surgeon were divided into two groups: the ultrasonic bone scalpel group (16 cases) and the microscopic drill group (16 cases). Both groups of patients need to confirm the indication of endoscopic foraminoplasty. Each group had one patient who worried about the relatively higher recurrence rate compared with the intervertebral fusion surgery and they changed their mind to have the intervertebral fusion surgery. The time of foraminoplasty, the total time of operation, occurrence of complications, short-time changes of visual analogue scale (VAS) of leg pain and MacNab scores were observed.

Results: There are no significant differences in the operation time and foraminoplasty time between the ultrasonic bone scalpel group and the drill group. The VAS and Macnab scores were decreased significantly in ultrasonic bone scalpel group when compared with drill group. ($P < 0.05$) 3 cases in drill group reported transient nerve stimulation symptoms as complications. No dural rupture was observed in both groups.

Conclusion: Endoscopic ultrasonic bone scalpel has a tissue-specific effect on making precise osteotomies while protecting the adjacent soft tissue structures. What's more, it can improve accuracy of intervertebral foramen formation and efficacy of surgery. It can also improve the safety of surgery by reducing the risk of neurovascular injury.

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FP B4-5

Experience With Percutaneous Endoscopic Decompression In Revision Lumbar Spinal Surgery For Lateral Recess Or Adjacent Segment Stenosis

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Introduction: The reasons for revision decompressive surgery in lumbar spine may include re-herniation of a disc, surgery-related spine degeneration, or adjacent segment degeneration. There is a subset of patients who has already undergone previous spine surgery and developed lateral recess stenosis. The level usually occurs at the previous operative level after decompressive surgery or adjacent level after fusion surgery. Those patients usually present with symptoms such as claudicant leg pain, extension dominant leg pain, relief on flexion and a negative straight leg raising test. Revision surgery is more complex and the risks are higher than the first surgery. For patients who had undergone conventional open surgery, percutaneous endoscopic transforaminal approach offers a new access to keep away the operative scar and preserve posterior structures. Transforaminal approach may not be suitable for every patients, approach might be affected by a high iliac crest or instruments inserted previously. The central hard herniated disc material is also difficult to be removed by transforaminal approach. Lateral recess stenosis is classified into 3 zones based on the anatomic locations: exit zone, middle zone and entry zone. Transforaminal decompression with foraminoplasty is feasible and works well in patients with lateral recess stenosis in the middle and exit zone of the neuroforamen. Decompression of lateral recess stenosis in the entry zone is difficult by transforaminal approach because the transverse part of the superior articular process is hard to be removed; however, decompression of entry zone is relatively direct and easy through interlaminar approach. Percutaneous endoscopic interlaminar discectomy is the other option and has the advantages to overcome those anatomic problems encountered in transforaminal approach. The previous operative scar or adhesion on neural structures was the main concern when interlaminar approach was selected. The aim of the study was to investigate the strategy of approach and clinical results of percutaneous endoscopic decompressive surgery for selected patients who developed lateral recess stenosis or adjacent degenerative stenosis after previous spine surgery.

Methods: This study was a retrospective analysis of 32 patients who underwent percutaneous endoscopic decompression in revision spinal surgery for lateral recess stenosis or adjacent stenosis from October 2014 to April 2017. Transforaminal or interlaminar approach was selected

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according to the involved level, the location of stenosis and position of iliac crest. Transforaminal approach was the choice of approach in patients who had undergone open surgery previously. Interlaminar approach was indicated for lateral recess stenosis at entry zone, central stenosis or L5-S1 lesions with high iliac crest. The preoperative and postoperative visual analog scale (VAS) scores for pain, Oswestry Disability Index (ODI), the clinical outcome according to modified Macnab criteria, and complications were analyzed retrospectively. The minimum follow-up was 6 months. Student t-test with paired samples was used for the statistical comparison of pre- and postoperative VAS scores and ODI. A p value < 0.05 was considered to be statistically significant.

Results: Of 32 patients, 26 suffered from lateral recess stenosis at the same level and 6 at adjacent level after discectomy, decompression or after fusion surgery. The involved segments were L3-4 in 2 cases, L4-5 in 15 cases and L5-S1 in 15 cases. There were 18 males and 14 females and the average age of patients was 58.6 years (range, 42-72 years) with a mean follow-up of 13 .5 months (range 6-24 months). The mean operating time was 68 minutes. The postoperative VAS scores of back and leg pain, and ODI at 1 month, 3 months, 6 months, and last follow-up were significantly decreased in both groups when compared with preoperative score ($P < 0.05$). Based on the modified MacNab criteria, the results were excellent in 24 cases, good in 6 cases, and fair in 2 at the last follow-up, and the excellent and good rate was 93.8%. Incidental durotomy occurred in one patient who underwent interlaminar decompression. There were no major complications or neurological deterioration after procedure.

Conclusions: Revision spine surgery can be performed effectively using percutaneous endoscopic technique. Endoscopic transforaminal surgery not only caused less damage to surrounding tissues but also provide a new access to the lesion. Endoscopic interlaminar approach provides another option when transforaminal approach is not available. With the improvement of technique, adequate decompression can be achieved by either percutaneous endoscopic transforaminal or interlaminar approach and the results are encouraging. This study showed that the clinical outcome of percutaneous endoscopic surgery for revision lumbar spinal surgery with lateral recess stenosis or adjacent stenosis is favorable in both transforaminal and interlaminar groups. Previous studies revealed that the results of decompression for entry zone stenosis were not good by transforaminal approach because of the anatomic problem and our study showed that this problem can be resolved by interlaminar approach. Compared with open procedure, percutaneous endoscopic interlaminar approach had several advantages including less invasive procedure, more clear and magnified operative views, shorter operating time and hospital stay and there were few approach-related complications such as durotomy or permanent nerve root injury. Our results showed that percutaneous endoscopic surgery is a good option for treatment of revision lumbar spinal surgery with lateral recess stenosis, especially in the entry zone.

FP B4-6

Awake Percutaneous Endoscopic Lumbar Decompression For Lumbar Stenotic Patients In Out Patient Settings-Case Series And Short Term Results

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Orthopaedic Department

Introduction: The necessity of fusion for spinal stenosis has been questioned [2]. Decompression becomes the mainstay of treatment for spinal stenosis. PELD through transforaminal approach for lateral recess stenosis was proved to be effective. [3] Interlaminar approach of PELD had little reports; however, a similar approach of MED was well established in terms of unilateral laminectomy and bilateral decompression (ULBD).[1] This research is to proposed PELD through interlaminar approach for spinal stenosis treatment.

Materials and Methods: Prospective non-randomised case series of 10 levels from a single hospital by a single surgeon (author) from 2017/05 to 2017/09.Preoperational and post-operational MRI CT was conducted to verify the area of decompression. SF-36, JOA score and ODI were recorded preoperatively and postoperatively(immediate postop, 1 month and 3 months). Patients were under local anesthesia (2%Xylocaine injected around the incision and through the surgical wound. No sedation was used and heart rate and blood pressure were controlled with IV medication. Unilateral laminotomy and bilateral decompression were done with endoscopic high-speed burr and endoscopic instruments such as Kerrison through a single portal. Hemostasis was done with endoscopic electrocautery and IV transamine and no drain was inserted. Patients were discharged one hour after surgery. Non-parametric statistical methods were applied(Mann-Whitney U test). Postop decompression area was compared with using 3D CT reconstruction and imaging registering software.

Results: SF-36, JOA score, and ODI revealed major improvements comparing preoperatively and postoperatively conditions (Mann-Whitney U test). Bleeding and operation time were comparable to literature. [4] Complications of asymptomatic minimal dural tear were noted on one PEID case. Surgical time was around 70min/ level eventually **(Video will be shown during the presentation)**. Surgical time was analyzed by dividing the video into bony procedures(laminotomy), hemostasis, ligamentum flavum removal. Bleeding was minimal.

Discussion: Unilateral laminotomy and bilateral decompression is a well established surgical method for spinal stenosis. Using percutaneous endoscopy with endoscopic high-speed burr to perform it under local anesthesia is a novel and breaking through approach with acceptable results.

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FP B4-7

Transforaminal Decomperssion And Forminplasty On Serve Spinal Stenosis Of Elders

Tolgay Satana, MD, Murat Erguven, MD, Ali Fincan Md, Kamil Barlas, MD

Dr Tolgay Satana private clinic

Motto is to keep bone and cartilage structure instead of degenerative changes which changed comes with decades. We should thing about How we could preserve architecture and how could we stop to degeneration processwith surgical treatment. The reality is with increasing age, as growth and skeletal maturation proceed, degenerative processes begin to change the morphology and therefore the function of the disc. This is also reflected by changes in the biosynthesis and denaturation of the extracellular matrix during progressing age" Degeneration Process related injuries due to abnormal loads Malalignment Trauma Genetic predispositionNutritional effects. The Right Direction of Spinal Care is to protect mechanical alignment and keep physiologic status of spine. Preservation of Abnormal/Normal structure even not related recent situation of patient. Because degeneration of spine is physiologic process and more mobile and flexible than fused spine Proper identification and visualization of the target and correlation with function If main complaint was radicular pain. Aware about foramina structural impingement syndromes or stenosis.

Objective: Comparison of results of overall success rates of four Elder patient suffered radiculopathy with stenosis whom merely performing surgery (FBSS) with Spinal Stenosis patient without laminectomy or decomperssion

Material and Methods: Percutaneous endoscopic foraminoplasty (debridement or osseos enlargement with trphine/shaver and the last using all endoscopic tecniques. The comparison criteria included the recurrence and open procedure rates as well as patient satisfaction rates, Oswestry scales and VAS Exclusion Criteria Multiple level (>1 level), Instability, <60 years old or nondegenerative spine, Infection, Tumors Patients 2011-2015 46 patients were included prospective study 38 females 8 males Main age 65 Follow up 18 m (range 3-48 months) 38 patients are treated single miss way8 patients combined with open surgery (hardware removed).

Results: Both groups showed statistically significant improvement in the VAS, SLR test, ODI. In regarding to qualty of life, there was a statistically no significant increament 2 group ($p<0.001$). Pure stenosis patient group treated by ELF has no additional treatment requirement after all Discussion MRI techniques may help in diagnosis of Degenerative spine well as allowing distinguishing pain from other disorders leading to back pain. Radicular or Medular symptoms must be evaluated physical exam.Minimal invasive spine surgeons have been able to conduct percutaneous approaches in order improve patient's functional capacity and to eliminate the severity of pain.However, for decision making of ELF as a surgical option may not available when medullopathic findings exist As Preoperative evaluation is mostly efficient to prepare the appropriate endoscopic equipment and to decide type of the procedure, To make sure of Radicular pain,treatment is the main should have been carried out prior to all MISS procedures. Thus, the surgeon should perceive the available endoscopic devices (Shaver s, Trimers, trephines and RF) those would be necessary during the operation.

Conclusion: We concluded that the patient which are previously detected as single level stenosis by MRI and further be performed endoscopic Lumbar Foraminoplasty outcomes is statsiticaly no significant difference with FBSS group whom already been enlarged laminar level by open surgical methods. Foraminal enlargement could be efficient treatment without laminectomy in selected single level stenosis.

FP B4-8

Transforaminal Endoscopic(TFE) Foraminoplasty & Lumbar Stenotic Decompression: Preliminary Study Of 56 Patients.

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Study Design & Objectives: A retrospective study of 56 patients who underwent the procedure to evaluate its efficacy and access early surgical outcome.

Summary of Background Data: Stenosis decompression by posterior approach is the gold standard. Open decompression-discectomy with or without fusion has been the most common procedure for lumbar stenosis. The invasiveness of the procedure has been reduced by tube assisted techniques and endoscopic decompression. TFE stenotic decompression is questioned for its effectives but are evolving. Studies are awaited with long term outcomes.

Methods: The inclusion criteria were lumbar degenerative stenosis/scoliosis with or without disc herniations with unilateral symptoms at L2 to L5/S1 disc levels. Pure disc extrusions and sequestrations without stenosis were excluded in this study. Schizas stenosis or Lee's foraminal stenosis grading was used to categorise stenosis. Stenosis of Grade Schizas C or all types of Lee's foraminal stenosis were included. Inside out TFE discectomy and lateral recess decompression was performed when discal (bulge, annular thickening, and/or end plate spur) component was present. Otherwise an outside in epidurual technique was used. Lateral recess decompression and foraminoplasty were done with burr or reamers. Carl storz endoscopic System, Richard wolf, Maxmore or Joimax system where used. All was done under local anaesthesia. Adequacy of decompression was confirmed by the visualised decompressed traversing or exiting nerve root.

Results: There were 56 patients with minimum follow-up period of 6 months. Statistically significant ODI improvements noted with no peri-postoperative complications. All patients were discharged in 24 hours.2 patients needed fusion for nonrelieve of symptoms and one patient needed extension of fusion at the operated adjacent level after initial relief for 7 months and one patient needed fusion for adjacent level hypoplastic facet.

Conclusions: TFE decompression will become an effective alternative in management of patients with discogenic or stenotic lumbar segments. Long term results are awaited. Literature support to challenge the Gold standard posterior procedures is scarce and need validated RCT. But, it should be considered as a procedure in concentious patients before more aggressive lumbar fusion procedure.

Keywords: Posterolateral, Transforaminal, Endoscopic Discectomy, Minimal Invasive Spine Surgery, Percutaneous, Stenosis Decompression

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PO01

Degenerative Spondylolisthesis: Is It Always Unstable? A New Scoring System To Aid Decision Making And Apply Value Based Spine Care

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Introduction: To propose a scoring system to differentiate between stable and unstable lumbar degenerative Spondylolisthesis (LDS)and report the mid-term outcomes of stand-alone decompression(SAD) in stable DS. To evaluate the resultant economic implications of stand-alone D in stable DS.

Material and Methods: A retrospective and prospective study was conducted from 2007 to 2012. Degenerative-Spondylolisthesis Scoring system(DSSS) was developed and LDS classified into 2 groups, stable and unstable. Allpatients were scored pre-operatively and were operated for SAD when the DSSS<6and DF for a DSSS of 6+. Clinico -radiological parameters assessed pre and postoperatively were VASback/leg, ODI, Standing dynamic-radiographs and MRI. A perioperative costs analysis was done for both groups. Minimum follow up period was 3 years.

Results: A total of 314 patients suffering from DS were studied. Fortyone patients scored below '6' and underwent a SAD, while 273 patients

above '6' and underwent DF. Pre and post-operative ODI in group-D and group-DF was 59.42 and 74.62, which improved to 23.14 and 26.66 respectively while VASleg improved from 7.4 and 8.2 pre-operatively to 3.2 and 2.8 post-operativelyrespectively. Mean follow-up was 54.5 months. Two patients of group-D developed aggravation of symptoms and required subsequent fusion. Peri-operative expenses were significantly lesser in the group-D as compared to group-DF.

Conclusion: DS is a heterogenous condition requiring surgical intervention tailored to eachpatient. DSSS helps in identifying a stable subgroup of DS, where a stand-alone decompression alone gives excellent results.

Poster

PO02

Full-Endoscopic Discectomy For L5-S1 Disc Herniation Via The Interlaminar And Transforaminal Approaches

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Study Design: A prospective, randomized, controlled study.

Objective: To investigate the clinical outcomes of full-endoscopic discectomy (FED) via the interlaminar approach versus transforaminal approach in the treatment of L5-S1 disc herniation.

Summary of Background Data: Lumbar disc herniation can be treated using FED via the interlaminar or transforaminal approach. Although both approaches are known to achieve reduced traumatization compared to that in open discectomy, it remains unclear which approach is better.

Methods: Between April 2015 and June 2016, 60 patients (43 male, 17 female) with L5-S1 disc herniation were randomly recruited and assigned into groups. One group underwent FED via the interlaminar approach, while the other group underwent FED via the transforaminal approach. Operative time, fluoroscopy time, postoperative bed time, hospitalization time, and complications were recorded. All patients were followed for at least 12 months. The visual analog scale (VAS) scores for leg and back pain and Oswestry Disability Index (ODI) score were evaluated preoperatively and at 3, 6, and 12 months postoperatively.

Results: The mean operative time and fluoroscopy time were significantly shorter in the interlaminar group (66.8±24.4 min, 1.3±0.3 seconds, respectively) compared to that in the transforaminal group (83.8±38.7 min, 1.9±0.7 seconds, respectively). However, the groups did not significantly differ in the bed time, hospitalization time, or complication rate. In both groups, there was no measurable blood loss during surgery, and the mean VAS and ODI postoperative scores were significantly improved over the preoperative scores.

Conclusions: FED via both interlaminar and transforaminal approaches is efficient and safe, and significantly improves pain and function in patients with L5-S1 disc herniation.

Level of Evidence: 2

Keywords: full-endoscopic; discectomy; interlaminar approach; transforaminal approach; laminectomy; foraminoplasty; lumbar; disc herniation; pain; learning curve

PO03

Vertebroplasty Versus Kyphoplasty In Osteoporotic Vertebral Compression Fracture: A Meta-Analysis Of Prospective Comparative Studies

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Purpose: The goal of this article is to evaluate the efficacy and the safety of the percutaneous vertebroplasty (PVP) versus pereutaneous kyphoplasty (PKP) in dealing with the osteoporotic vertebral compression fracture (OVCF).

Methods: In July 2014, a comprehensive systematic computer-based online search was performed by using the datebase of Pubmed, EMBASE, Cochrane library, Web of science, Wan Fang and the China Biological Medicine. Only prospective comparative trials (PCT) and randomized controlled trials (RCT) that compared PVP with PVP were included. Trials were screened based on the inclusion and exclusion criteria previously formed. The Cochrane collaboration guidelines were also used to assess the quality of these included studies. The primary data of these studies [volume of the cement, vertebral height of postoperative, Visual Analog Scale (VAS) score and Oswestry Disability Index (ODI) scores after the surgery and so on] were carefully abstracted and processed by Revman 5.2.0 software. The publication bias of the main results (cement leakage and adjacent-level fracture) were examined by stata 12.0 (Begg's and Egger's test). Furthermore, the stability of the main results were also detected by sensitivity and cumulative analyses

Results: 6 RCT and 14 PCT studies involving 1429 patients met our criteria and were included finally. Comparing these two methods, the PKP group took more operation time [SMD=0.66, 95%CI (0.28, 1.03), p=0.0006] with higher anterior vertebral body height [SMD=1.40, 95%CI (0.49, 2.32), p=0.003], greatly reduced Cobb angle in the long run [SMD=-0.61, 95%CI (-1.04, -0.19), p=0.005] and had lower risk of the cement's leakage. But in VAS scores and ODI scores after the surgery whether from the short-term efficacy (no more than 1 week after the surgery) or long-term efficacy (more than 6 months), Cobb angle in the short run and the new fracture in adjacent-level, no statistically difference were not found between the two groups.

Conclusions: Based on current evidence, the PVP takes less time in the operation, while it has greater risk in the cement's leakage, was inferior in reducing Cobb angle in the long term and results in lower anterior vertebral body height after the surgery. For the pain relief, which is the main pursuit of the patients, the both procedure provides significant improvement in VAS and ODI pain scores, and it demonstrates the PVP is still an effective procedure and cannot be denied.

PO04

Anterior Transcorporeal Approach Of Percutaneous Endoscopic Cervical Discectomy For Disc Herniation At The C4-5 Level : A technical Note

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Background context: Because of the relatively more violation to the anterior nucleus pulposus, there is a higher potential of postoperative IVS decrease in anterior transdiscal approach than in posterior interlaminar access. In addition, when the herniated lesion is migrated upward or downward behind the vertebral body, both approach even ACDF are impractical and corpectomy is commonly considered as the only efficacious treatment. Anterior transcorporeal approach under endoscopy could enable an individual and adjustable trajectory within vertebral body under different conditions of disc herniation preserving the motion of adjacent segment, especially in a migrated or sequestered lesion.

Purpose: To first describe a novel anterior transcorporeal approach under endoscopy in which we addressed a migrated disc herniation at the C4-5 level.

Methods: A novel anterior transcorporeal approach under endoscopy was performed to address a migrated disc herniation at the C4-5 level.

Results: This operation was accomplished in 75 minutes. Postoperatively, the drainage tube was retained into the drilling hole for 24 hours for avoiding from the possibility of hemotoma. The patient was advised to wear a neck collar for 3 weeks. Immediately after the operation, the posterior neck pain relieved from visual analog scale 7/10 preoperatively to 3/10; and the myodynamia of extremities improved stepwise. At 12 hours postoperatively, the range of motion was also improved. In the further follow-up, he was completely recovered from the preoperative symptoms, whose myodynamia of extremities is normal. Besides the postoperative MRI, a total removal of the herniated disc and the transcorporeal drilling tunnel are observed in CT. At postoperative 3-month follow-up, neither disc space narrowing nor instability was observed on CT, in which the bone defect after drilling tunnel was partially decreased indicating bone healing. There were no surgery-related complications.

Conclusions: As a supplement to the described surgical approach of PECD, transcorporeal approach is a novel access for the treatment of CIVDH. The advantages of this approach is not only providing the view clear and decreasing the intraoperative iatrogenic injury to the but also avoiding the violation to the discal tissue. Theoretically, the potential of secondary decline of intervertebral height is low.

PO05

Unplanned Re-operations After Spinal Endoscopic Surgery, A Preliminary Analysis

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Objective: To analyze the occurrence and the causes of unplanned re-operations after spinal endoscopic surgery.

Materials and methods: A retrospective cohort study was conducted. The patients, underwent spinal endoscopic surgery in the spine surgery department of the Third Affiliated Hospital, Sun Yat-sen University between August 1st, 2013 and June 30th, 2017, were enrolled. The concerning operation were lumbar microendoscopic discectomy (or decompression), full-endoscopic lumbar discectomy (or decompression) and lumbar microendoscopic transforaminal interbody fusion. The unplanned re-operations were defined as the revision surgeries within 4 weeks postoperatively of the spinal endoscopic surgeries, in this study. Observed index: Incidence of unplanned re-operation. Statistical method: Chi square test was performed by SPSS13.0 software.

Results: The occurrences of unplanned re-operations were observed as follows: Ten cases underwent full endoscopic spine discectomy (or decompression) had unplanned re-operations: Nine cases for residual protrusion, one for surgical site infection. Two cases of microendoscopic transforaminal interbody fusion had unplanned re-operations because of the compression of the nerve root by migrated bone grafting. And another case of microendoscopic transforaminal interbody fusion, had unplanned re-operation because of the loosening rod-screw linkage cause by the spill and malposition of the bone cement. The overall incidence of unplanned re-operations was 12/693 (1.73%). Between 2013 and 2015, the incidence was 9/305 (2.95%), Between 2016 -and 2017 (till June), the incidence turned out to be 4/388 (0.77%). When incidences of the two periods were compared, statistical significant difference could be seen ($P<0.05$).

Conclusions: These findings showed a decreasing tendency in the occurrences of unplanned re-operations after endoscopic spine surgery, as clinical practice had been carried on in the past 4 years.

Poster

PO06

Percutaneous Endoscopic Discectomy For Thoracic Ossification Of posterior Longitudinal Ligaments

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Background: Thoracic ossification of posterior longitudinal ligaments is common condition. However, the published literature has not reported resection of ossification of posterior longitudinal ligaments with percutaneous endoscopic surgery. Compared with conventional open surgery for ossification of posterior longitudinal ligaments, percutaneous endoscopic surgery is minimally invasive, causing less damage to the tissues. We should achieve the clinical results of established standard procedures and simultaneously minimize the injury of tissues.

Objectives: 1. To introduce the technical possibility of a novel surgical method for thoracic ossification of posterior longitudinal ligaments(OPLL): percutaneous endoscopic surgery. 2. To evaluate the analgesic effect of percutaneous endoscopic surgery for OPLL.

Study Design: Single-center retrospective observational study.

Methods: The study involved all patients managed with percutaneous endoscopic surgery for OPLL between 2014 and 2016. Totally 10 patients were involved in the study. The surgery was performed under local anesthesia, in prone position, with fluoroscopy guidance of C-arm. The surgery consists of orientation and puncture under fluoroscopy of C-arm, exposure of pathology, and removal of pathology with the assistance of burr. Continuous feedback of the patients was achieved to avoid nerve damage. Manipulation of instruments should be gentle to avoid pneumothorax, tear of dural sac, rib fracture and other relevant complications. One portal was developed ipsilaterally on the side of pathology. After a spinal needle was inserted, a small skin incision was made around the needle, sequential dilators were placed. Then a working cannula was placed and the endoscope was introduced. Partial osseous resection could be performed with burrs to make access when necessary. Various instruments were used for exploration of the spinal canal, burrs were used for removal of leaked bone cement.

Results: All the patients tolerated the surgery. A positive clinical response was achieved in these patients in whom percutaneous endoscopic surgery was performed.

Conclusion: Percutaneous endoscopic surgery for OPLL may be considered a valid therapeutic option.

PO07

Percutaneous Endoscopic Decompression For Cervical Myelopathy Through Posterior Anterior Approaches (93 Cases Experience)

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OBJECTIVE: Reporting the safety, feasibility and clinical efficacy of percutaneous endoscopic decompression for cervical myelopathy through a novel posterior trench approach and anterior transcorporeal approach.

METHODS: From June 2013 to May 2017, a total 93 consecutive patients with cervical myelopathy who underwent percutaneous endoscopic decompression through posterior trench approach and anterior transcorporeal approach were enrolled. Posterior trench approach is a novel designed approach which started drilling at the ipsilateral lateral mass, drilling the 1/2 medial portion of pedicle to the root of pedicle, and then drilling a trench from the root of pedicle to close to the posterior-middle of the vertebral body under endoscopy. Anterior transcorporeal approach under endoscopy which make a tunnel from the anterior vertebral wall to the posterior vertebral wall could enable an individual and adjustable trajectory within the vertebral body under different conditions of disc herniation preserving the motion of adjacent segment. Patients were evaluated neurologically before surgery and followed up at outpatient visits. Besides the demographic characteristic, the primary outcomes were measures of bodily pain and physical function on the Medical Outcomes Study 36-item Short-Form General Health Survey (SF-36) and the visual analogue scale (VAS). Radiographical follow-up included the static and dynamic cervical plain radiographs, computed tomographic scans, and magnetic resonance images.

RESULTS: 58 patients treated with posterior trench approach and 35 with anterior transcorporeal approach. The cases of C3/4, C4/5, C5/6, C6/7 and C7/T1 in single level were 11, 19, 43, 10 and 1 respectively. The cases of two and three levels were 6 and 3 respectively. A total 4 cases were treated with combined anterior and posterior approach. The mean follow-up time is 14.41 ± 9.32 (1 ~ 42) month. The mean VAS score at post-operative 1d and last follow-up showed significant improve compared with pre-operation (3.37±0.60 vs 7.30±0.65 and 1.18±0.66 vs 7.30±0.65, respectively, $p<0.001$). At last follow-up, the patients showed significant treatment effect on bodily pain and physical function of SF-36 compared with pre-operation (32.07±8.13 vs. 64.00±7.30, 33.97±6.21 vs. 78.35±6.07, respectively, $p < 0.01$). Three surgery-related complications of mediastinal effusion, esophagus injury, and epidural hematoma were observed (overall 3 of 93, 3.22%). Radiographical follow-up showed the bone defect of the vertebral body, pedicle and lateral mass partially decreased, indicating bone healing. No cervical spine instability and on pedicle fracture were observed.

CONCLUSION: As a supplement to the described surgical approaches of PECD, the anterior transcorporeal approach and posterior trench approach are two novel access for the treatment of cervical myelopathy. Among the advantages of this two approaches are providing a clear visual field during percutaneous endoscopic surgery and decreasing the intraoperative iatrogenic injury, providing a path to reach the posterior-middle portion of vertebral body to decompress the spinal cord and avoiding violation to the disc tissue and facet joint. However, as the limitation of case volume and short-term follow-up, the efficacious and reliable of these two approaches should be verified in a further comparative cohort study with a larger volume of patients in a long term follow-up.

Poster

PO08

Multicenter Report Of Endoscopic Spinal Surgery In Different Regions Of Brazil. This Is The First Report Of Different Spine Groups Describing The Main Difficulties And Barriers To Develop Endoscopic Spine Surgery In Brazil. One Important Issue Was The Lack Of Believers On Endoscopic Spine Surgery

Eduardo Barreto

Barra Life Medical Center

PO09

Anatomic Considerations Relevant To Trans-Sacral Epiduroscopic Surgery

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Background: The sacral hiatus is used to access the lumbar ventral epidural space (VES) in trans-Sacral Epiduroscopic Laser Decompression (tSELD) Surgery. TSELD is a novel procedure employing high definition epiduroscopic visualization combined with Ho: YAG laser and epiduroscopic flexible-micro-forceps and drill to perform fragmentectomy to decompress nerve roots, do mechanical adhesiolysis and ablate sinuvertebral nerves to manage indicated painful conditions in the lumbar spine. Mastery of trans-sacral access anatomy, the sacral canal and the lumbar ventral epidural space is necessary in performing this procedure. There is paucity of literature regarding the anatomical features and configurations of the lumbar and sacral canal beyond the sacral hiatus relevant to the trans-sacral approach.

Purpose: The purpose of this study were to identify the different morphometric variations of the lumbosacral canal related to successful epiduroscopic approach to the VES, to present a classification system to establish order in the variations and to know the conditions favorable for the uncomplicated entry to the lumbosacral VES.

Setting: Good Doctor Teun Teun Spine Hospital, Anyang City, Korea

Methods: The in-house radiologist blinded from the study collected 130 Magnetic Resonance Imaging (MRI) lumbosacral images. One hundred thirteen lumbosacral midline sagittal T1W MRI images were reviewed on 500% magnification. We measured 1. the L5-S1 angle, 2. the distance of thecal end (T-end) from cranial endplate of S1, 3. VES diameter at mid-L5, 4. VES diameter at T-end, 5. anterior-posterior (AP) diameter at T-end, 6. AP diameter at cranial S3. The shape, orientation and location of the T-end were noted and described. The measurements were done three times and the average was taken as the actual value. Results were presented as mean (range) and percentages. The authors have no relevant disclosures to reveal.

Results: Two general types (shapes) of the T-end in the lumbosacral canal were identified, type A with tapering T-end and type B with blunt T-end. These two types can further be subdivided by the orientation of the T-end in the sacral canal; subtype 1 with dorsal oriented T-end, subtype 2 with ventral oriented T-end and subtype 3 with neutral oriented T-end (Types A1, A2, A3, B1, B2, B3). The T-end can also be described by its location in relation to the vertebral body level; L5, S1a, S1b, S1c, S2a, S2b, S2c, S3. The most common T-end shape is tapering (62%), most common T-end orientation is neutral (46%), and the location of the T-end, 51.2% were found at the caudal third of sacral1 (23.8%) and cranial third of sacral2 (27.4%) vertebral bodies. Dorsal oriented T-end was associated with the widest AP canal diameter at T-end (mean=10.11 mm), widest diameter of the VES at the level of the T-end (mean=5.3 mm), widest diameter of the VES at mid-lumbar5 level (mean=3 mm).

Conclusion: The present study heralds that the morphometric data of vertebral canal of the lumbosacral junction and sacrum and VES in these regions are wide enough to load an epiduroscopic catheter, 3-mm diameter that is currently available in the market. The authors claim that review of preoperative T1WI MRI may provide the operator a blueprint of the access area in order to achieve successful entry to the VES. The configuration of T-end appears to provide necessary information to get into VES safely, and lumbosacral angle along with morphometric information can present an idea of accessibility and difficulty in removal of lumbar lesions with tSELD in certain group of patients, particularly L5-S1 disc herniation. A dorsal oriented T-end (Type A1 and B1) may allow an uncomplicated approach to the VES. Larger scale and multi-racial study is highly recommended.

Poster

PO10

Radiation Reduction Of Minimally Invasive Transforaminal Lumbar Interbody Fusion With Localization System In Overweight Patients

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Aims: Minimally invasive transforaminal lumbar interbody fusion (MITLIF) has been well validated in overweight or even obese patients, which has been indicated to be correlated with higher radiation exposure. This prospective multicenter study aimed to investigate the efficacy of a novel lumbar localization system for MITLIF in overweight patients.

Patients and Methods: Included patients received localization system in Group A, while others underwent conventional methods in Group B. The primary outcomes were the effective radiation dosage to the surgeon and the exposure time. The novel localization system mainly consists of preoperative locator and screw-assisted device.

Results: A total of 62 overweight patients were in Group A, and another 64 patients were in Group B. The effective dosage was 0.0217±0.0079mSv in Group A and 0.0383±0.0104mSv in Group B ($p<0.001$). The fluoroscopy exposure time was 26.42±5.91s in Group A and 40.67±8.18s in Group B ($P<0.001$). The operation time was 175.56±32.23min and 206.08±30.15min ($P<0.001$). The preoperative localization time was 4.73±0.84min in Group A and 7.03±1.51min in Group B ($P<0.001$). The screw placement time was 47.37±10.43min in Group A and 67.86±14.15min in Group B ($P<0.001$). Moreover, the pedicle screw violation rate was 0.35% (1/283) in Group A and 2.79% (8/287) in Group B ($p=0.020$).

Conclusions: The study indicated that the localization system could effectively reduce radiation exposure, exposure time, operation time, preoperative localization time, and screw placement time in overweight patients undergoing MIS-TLIF, which could be another practical option for minimizing potential radiation hazards.

PO11

Percutaneous Stenoscopic Decompression For Lumbar Canal Stenosis And Foraminal Stenosis

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Background: The decompression surgeries for the lumbar stenosis (central canal stenosis and foraminal stenosis) evolved from open decompression, to the Microendoscopic decompression, followed by a less invasive method Percutaneous Endoscopic Decompression. Recently, we have developed "Percutaneous Stenoscopic Decompression". We started this clinical study in 2016.

Material and Methods: Case numbers of performed surgeries were 415 lumbar canal stenoses, 130 foraminal stenoses. We chose bilateral decompression method with a unilateral approach on central canal stenosis, and a unilateral foraminotomy on foraminal stenosis. A) Under continuous water irrigation, a 9.5mm outer sheath was inserted from the affected side of the interlaminar space. The interlaminar surrounding wall of the stenotic segment was reamed using a 4mm diamond-burr. The yellow ligament was detached from the lamina using a 5 mm Kerrison punch. The bilateral nerve roots were decompressed under trumpet shaped. B) For foraminal stenosis, the upper and lower transverse processes (or sacral ala at L5/S1) and superior articular facet were shaved, and transforaminal ligament or lumbo-sacral ligament (at L5/S1) detached. A drainage tube was set in place for 48 hours in all cases.

Results: Average operation time was 69±23 minutes. Adverse incidences were 16 insufficient-decompressions (re-decompressed by the same method), seven dural tears (repaired by bicryl patch technique), two post-operative hematoma (removed by the same method a few days later), and 18 cases of residual numbness (treated with conservative therapy). Finally, 4.0%, 22 cases of the total 545 remained unsatisfactory. Both their JOA scores and intermittent claudication improved month by month. The blood loss during the procedure was unable to be calculated because of the continuous water irrigation. Postoperative blood volume in the port pack was 35±14cc.

Conclusion: Percutaneous Stenoscopic Decompression is the minimally invasive decompression technique for lumbar stenosis. The most important thing is that the amount of muscle and bone damaged in the procedure must be limited to a small area.

Poster

PO12

The Study For The Effect Of Percutaneous Lumbar Foraminoplasty On Intervertebral Foramen Size, Area And Nerve Root Area Aatio

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Objective: To explore the effect of percutaneous lumbar foraminoplasty on the size, area and nerve root of intervertebral foramen, and to provide reference and basis for the precise application of the procedure.

Methods: The preoperative and Postoperative 3-D CT data of the patients who diagnosed as lumbar disc herniation and treated by percutaneous foraminoplasty and discectomy from August 2015 to August 2016 in was collected. The preoperative and postoperative foraminal width, foraminal height, the foraminal wide on intervertebral disc midpoint, foraminal area, nerve root area, osteotomy height, osteotomy width and other data were measured by two physicians. The t-test was used to compare the differences between the data before and after the operation, and the correlation and regression analysis were used to understand the relationship between them and analyze the interaction between the data.

Results: Forty patients with lumbar disc herniation were included in this group, 18 cases were L4-5 and 22 cases were L5-S1. The results showed that the foraminal width and foraminal width on intervertebral disc midpoint was wider after percutaneous lumbar foraminoplasty, significantly ($P \leq 0.042$), and the area ratio of nerve root was significantly decreased ($P=0.001$), indicating that the technology can achieve the purpose of indirect decompression. There was a positive correlation between the foraminal area and the foraminal width, foraminal width on intervertebral disc midpoint and foraminal height; The foraminal width on intervertebral disc midpoint was most significantly. There was a positive correlation between nerve root area ratio reduction and reduction rate in osteotomy width, height and the osteotomy width on intervertebral disc midpoint, and the osteotomy width had the greatest effect. The area ratio of the nerve root and the intervertebral foramen can affect the regression relationship between the height and width of the osteotomy and the rate of increase in the foraminal area.

Conclusion: Percutaneous lumbar foraminoplasty can significantly expand the area of intervertebral foramen, Osteotomy width was the most effective factors influence the intervertebral foramen area and the nerve root area ratio, percutaneous lumbar foraminoplasty can achieve good results.

PO13

Early Experience In Performing Transforaminal Percutaneous Endoscopic Lumbar Discectomy Using Inside-out And Outside-in Technique In Indonesia

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2.Fatmawati General Hospital

Introduction: Percutaneous Endoscopic Lumbar Discectomy (PELD) is a relatively new technique on our country, Indonesia. We begin to use this technique on May 2017. We report our early experience in performing PELD technique in Indonesia.

Method: A total of 70 cases (67 cases with Herniated Nucleus Pulposus and 3 cases with degenerative foraminal spine stenosis) were treated up to September 2017 by using transforaminal approach. We divided into 2 groups, inside-out and outside-in technique. Visual Analog Score (VAS) and Owestry Disability Index (ODI), blood loss, time of operation, complications were measured.

Result: The mean VAS and ODI were significantly reduced postoperatively in both group. Mean operation time was significantly faster after 5 operations in each group. Blood loss was significantly lesser in inside-out group. Two complications were reccorded, one with dural tear in patient with foraminal stenosis (which wasn't repaired) and the other with incomplete extraction of the herniated disc (which needed second surgery with conventional method).

Discussion: Dural tear occured in degenerative foraminal stenosis patient while using outside-in technique due to misplaced equipment when reaming the superior articular process. Lateral confirmation from the fluoroscopy is needed to adequately placed the working channel. Dural tear was not repair, and the patient have no complaint afterwards. Incomplete extraction of the herniated disc was found in 1 patient only (using inside-out technique) in high grade downward migration of L5S1 disk hernitaion.

Conclusion: Inside-out technique seems to be easier to adopt for surgeon whom begin to learn PELD technique. While outside-in technique seems to be advantageous in treating degenerative foraminal stenosis.

Poster

PO14

L5S1 Disc Herniation With Contralateral Symptoms Treated With Transforaminal Percutaneous Endoscopic Lumbar Discectomy Using Inside-out Technique

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Introduction: Contralateral symptoms are rarely observed in cases with lumbar disc herniation. In general, decompression was made in the herniated side. In case with contralateral symptoms, surgical decision have to be carefuly decided.

Method: We reported a case with L5S1 herniated disc in which contralateral leg pain was complained. Transforaminal PELD using inside-out technique was performed from the clinical symptoms side, in attempt to decompress the herniated side also.

Result: Clinical symptoms was relieved immediately after surgery. There is still no recurrency upon 3 months follow up.

Conclusion: When treating patient with herniated disc with contralateral symptoms, we recommend surgical approach from clinical symptoms side.

PO15

Application Of A Narrow-surface Cage In Full Endoscopic Minimally Invasive Transforaminal Lumbar Interbody Fusion

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Background: Spinal endoscopy has been widely applied in lumbar discectomy and decompression. However, endoscopic lumbar interbody fusion still remains a technical challenge due to the limited space within the working trocar for cage implantation. The purpose of this study was to investigate the feasibility and effectiveness of using a narrow-surface fusion cage in full endoscopic minimally invasive transforaminal lumbar interbody fusion (MIS-TLIF) for the treatment of lumbar degenerative disease.

Materials and Methods: From Jun 2013 to Dec 2014, a total of 42 patients (23 males, 19 females) underwent full endoscopic MIS-TLIF at our hospital was recruited. An 8-mm-wide narrow-surface fusion cage was selected for all cases. Perioperative parameters and complications were recorded. Comparisons on visual analog scale (VAS) and oswestry disability index (ODI) scores before and after surgery were performed. At the last follow-up, Nakai grading system was applied to assess patients' satisfaction; meanwhile, interbody fusion was evaluated by computed tomography.

Results: Mean operation time was 233.1 ± 69.5 min, and mean blood loss during surgery was 221.8 ± 98.5 ml. Two patients (4.8%) developed neurological complications. Postoperative follow-up ranged from 24 to 36 months (mean 27.6 ± 3.8 months). VAS and ODI scores were significantly improved 3 months after surgery and at the final follow-up, respectively ($P < 0.05$). Outcome of surgery was graded as excellent for 32 patients, good for 8 patients, and acceptable for 2 patients, corresponding to a success rate ("good" and "excellent") of 95.2%. Thirty-nine of the 42 patients demonstrated solid interbody fusion at the last follow-up, indicating a fusion rate of 92.9%.

Conclusion: Application of a narrow-surface fusion cage in full endoscopic MIS-TLIF for the treatment of lumbar degenerative disease is feasible and effective. The clinical outcome and fusion success of this procedure were acceptable and promising.

Poster

PO16

Stress Distribution Over Lumbosacral Vertebrae And Axial Transsacral Rod After Axial Lumbar Interbody Fusion (AxiaLIF): Finite Element Analysis

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Purpose: To evaluate stress distribution over lumbosacral vertebrae and axial transsacral rod by means of finite element analysis.

Methods: The intact finite element model was established along L4-S1 lumbosacral vertebrae and validated. To build the standalone AxiaLIF model, an axial transsacral rod was inserted into L5-S1 segment of the validated intact model in accordance with the AxiaLIF technique. For patients with spondylolysis or unilateral direct decompression who received AxiaLIF, corresponding models were established. Comparison of Von Mises stress was made to evaluate the stress distribution endured by bony components or transsacral rod with preload imposed on the models.

Results: A higher concentration of stress was registered at the bone-rod interface. The stress distribution over vertebrae was witnessed in the anterior and anterolateral region of S1 vertebra during flexion and axial rotation, while such stress concentration moved to the posterior and lateral region of L5 vertebra in extension and lateral bending respectively. The highest stress turned out to be localizing somewhere one or two thread pitches away from the middle part of the rod. There was no obvious differences of stress distribution among the surgery-simulated models.

Conclusion: Standalone AxiaLIF meets the basic need to provide ample stress resistance for body's normal activities. For patients suffering from spondylolysis, or demanding unilateral direct decompression, of no significance was the influence that was exerted on load transfer after AxiaLIF.

PO17

Unsatisfactory Outcome Analysis In Patients Receiving Percutaneous Endoscopic Lumbar Decompression With Interlaminar A pproach(PEID)

Huang Yi-Hung

Chia Yi Christian Hospital

Introduction: Percutaneous endoscopic lumbar discectomy or decompression (PELD) has become a representative minimally invasive spine surgery for lumbar disc herniation or stenosis. As the technology evolving, the procedure carried out with various approaches, including interlaminar, transforaminal approaches. One major debating issue is that whether PELD is a sufficient for lumbar stenosis combined with spondylolisthesis and degeneration scoliosis. Therefore, we include patients with lumbar stenosis but presenting back pain and sciatica. Degeneration scoliosis and spondylolisthesis were not excluded in the study. Moreover, we reviewed 11 patients who were possibly unsatisfied with operation results due to little improvement of VAS score for back pain or sciatica.

Materials and Methods: In comparison to a total 70 patients with lumbar stenosis receiving open decompression with transpedical screws fixation and fusion, a total of 57 patients with lumbar stenosis (including back pain and leg symptoms) receiving endoscopic interlaminar decompression were followed for 12 months. In addition to general and specific parameters, these measuring instruments were used: VAS, Oswestry Low-Back Pain Disability Questionnaire and Roland-Morris Disability Questionnaire.

Results: Whether the patients have spondylolisthesis/degeneration scoliosis or not, PELD group showed better outcome in VAS, Oswestry Low-Back Pain Disability Questionnaire and Roland-Morris Disability Questionnaire after a mean 12-months follow-up compare to open decompression and fusion group. However, 11 patients showed no improvement on VAS score of either back pain or sciatica. One patient showed complicated multi-segment spinal stenosis combined with foraminal stenosis. One patient showed facet joint osteoarthritis pre-operatively. Dura tear was noted in one patient. Two patients came for operation with drop big toe sign.

Discussion: The recorded results demonstrate that full endoscopic interlaminar decompression could provide a relatively better outcome than open decompression with fusion group. In other words, if offers the advantages of a minimally invasive intervention for both spondylolisthesis and degeneration scoliosis patients. We reviewed some unsatisfied cases for possible pitfalls that might be helpful inpatient selection for endoscopic interlaminar decompression.

Poster

PO18

Adjacent Segment Disease Treated With Percutaneous Endoscopic Interlaminar Decompression In Awaken, Out-Patient Settings- Case Reports And Short Term Results.

Huang Ting-Chun

Orthopaedic Department

Introduction: Adjacent segment disease (ASD) occur in 30% of lumbar fusion surgery and annual incidence is 2-3%. The most effective treatments for ASD has not yet been determined. Fusion does not necessarily improve surgical outcome in primary spondylolisthesis. Decompression only for ASD patient without mechanical back pain or manageable by pain intervention is rarely reported. There have been reports that transforaminal approach has 2 years of the survival rate of near 70%. [5] Preventive decompression for those with stable facet orientation has been reported to be effective for 84% of the patients. This study is aimed to study decompression with percutaneous endoscopic lumbar decompression through interlaminar approach for ASD treatment.

Material and Method: Prospective non-randomised case series of 2 cases of adjacent segment disease from a single hospital by a single surgeon (author) from 2017/07 to 2017/10. Preoperational and post-operational MRI CT was conducted to verify the area of decompression. SF-36, JOA score, and ODI were recorded preoperatively and postoperatively (immediate postop, 1 month and 3 months). Patients were under local anesthesia (2%Xylocaine injected around the incision and through the surgical wound. No sedation was used and vital signs were controlled with IV medications. Unilateral laminotomy and bilateral decompression were done with endoscopic high-speed burr and endoscopic instruments such as Kerrison through a single portal. Hemostasis was done with endoscopic electrocautery and IV transamine and no drain was inserted. Patients were discharged one hour after surgery. Non-parametric statistical methods were applied (Mann-Whitney U test). Postop decompression area was compared with using 3D CT reconstruction and imaging registering software.

Results: SF-36, JOA score, and ODI revealed improvement comparing preoperatively and postoperatively conditions (Mann-Whitney U test). Bleeding and operation time were comparable to literature. No Complications were noted. Surgical time was around 70-90 minutes/level **(Video will be shown during the presentation)**. Surgical time was analyzed by dividing the video into bony procedures(laminotomy), hemostasis, ligamentum flavum removal. Bleeding was minimal.

Conclusions: Careful selection of ASD patient with spinal stenosis without instabilities could warrant decompression only as a treatment of choice as long as no further iatrogenic instabilities are created. Percutaneous endoscopic lumbar decompression via interlaminar approach may be a treatment option for this indication on the advantage of no general anesthesia burden, less further soft tissue damage and a shorter recovery.

PO19

Treatment Of Cauda Equina Syndrome Caused By Lumbar Disc Herniation With Percutaneous Endoscopic Lumbar Discectomy

Qingquan Kong, Xiaolong Li

West CHINA hospital

Purpose: To evaluate the feasibility and clinical efficacy of percutaneous endoscopic lumbar discectomy (PELD) for lumbar disc herniation (LDH) with cauda equina syndrome (CES).

Methods: The patients with CES produced by LDH in early and intermediate clinical stages of Shi's classification were selected as the object of study. 16 enrolled patients underwent PELD. Clinical outcomes were assessed using the Macnab criteria and the visual analogue scale (VAS).

Results: The mean follow-up time of the patients was 26.2±2.2 months (range, 24–32 months). The VAS for leg pain and back pain significantly decreased ($P < 0.05$) from preoperative scores of 7.67±1.23 and 7.52±1.42, respectively, to postoperative scores of 1.71±0.53 and 3.18±0.72. The outcome of the 16 patients was excellent in 7 patients (43.8%), good in 6 patients (37.5%), and fair in 3 patients (18.7%). 13 individuals (81.2%) showed favorable result. Complications included one case of motor weakness (muscle power decrease from grade 4 to 2) recovered within postoperative two weeks, and one patient developed a recurrent herniation after 9-months and underwent further fusion surgery.

Conclusions: PELD is a safe, effective, and minimally invasive procedure, and could be used as an alternative surgical method for the treatment of LDH presented with CES in properly selected cases. The proper/appropriate selection of the cases and the reasonable adoption of the surgical approach are vital to acquire a satisfactory outcome for LDH with CES treated by PELD technique.

Poster

PO20

The Application Of Lateral Recess Partition Method In Spinal Endoscopic Transforaminal Approach To Treat The Lumbar Lateral Recess Stenosis

Qingquan Kong, Yueming Song

West CHINA hospital

Objective: TO retrospectively analyze the surgery parameters and treatment effects of the percutaneous spinal endoscopic technique through transforaminal approach to treat the Lumbar lateral spinal stenosis; TO comparatively analyze the pertaining radiographic indices before and after the surgery; TO summarize the main points and traps of this technology's the clinical application.

Methods: Through the retrospective analysis of the qualified lumbar lateral recess stenosis patients using the percutaneous spinal endoscopic technique from January 2013 to January 2016. According to the anatomy , the lateral recess area can be divided into the following areas: the disk-flava ligament space(A zone), the ditch next to the superior articular process which is the upper part of the lateral recess bony channel (zone B, from the upper edge of the lower vertebral to the pedicle middle level) and the channel under the vertebral pedicle which is the lower part of the lateral recess bony channel(C region, from the middle level to the lower edge of the pedicle level.) The Inclusion criteria are as followings: Using the percutaneous endoscopic treatment of the spine; The type of the lateral recess stenosis (Located in A, B, C area); Not complicated by the central tube or foraminal stenosis; Only single segment Involved with unilateral symptoms ; Not associated with lumbar segmental instability or moderate to severe lumbar spondylolisthesis, as well as the sagittal or coronal imbalance of spinal deformity; Followed up over 6 months, providing completed information of lumbar lateral X-ray films and lumbar MRI before and after 6 months; Summarizing the operation time and postoperative complications ; Through the VAS score to analyze the improvement of leg and low back pain before and after surgery; Evaluating the postoperative clinical curative effect by the Macnab criteria; Through the lumbar mobility analysis of patients before and after surgery, comparing and analyzing the impact to spinal stability of part front facet resection; Analyzing lumbar MRI of 3 months after operation to evaluate the effect of the spinal decompression

Results: From January 2013 to January 2016, there were 938 cases of lumbar degenerative disease accepting transforaminal endoscopic surgery. Among them, 156 cases were diagnosed as the lumbar lateral recess stenosis, 84 cases of male and 72 females; Median age 56 years (19 - 86 years old) ; 2 cases of L3/4 segment, 118 of L4/5 segment, 36 cases of L5/S1 segment. There were 124 patients who met the inclusion criteria, 73 males and 51 females; Median

age 57 years (34-79 years old); 2 patients of L3/4 segment, 93 patients of L4/5 segment, 29 patients of L5/S1 segment. The classified features of this group's patients of lateral recess stenosis were concluded: 68 cases of lateral recess stenosis type A, 11 cases of type B, 45 cases of type A + B. All patients' leg pain VAS score before surgery was 5.7 ± 1.4, back pain VAS score was 1.5 ± 1.3; Six months after the operation, the patients' leg pain VAS score was 0.6 ± 1.2, back pain VAS score was 1.7 ± 1.4; The preoperative and postoperative low back pain or leg pain VAS scores both show significantly different ($P < 0.05$). And there was no clinically significant difference of lumbar spine motion range between the postoperation and after six months' evaluation ($P > 0.05$). All patients were evaluated according to Macnab postoperative standard, the results were as followings: excellent in 56 cases, good in 63 cases, fine in 5 cases, the rate of good up to 96%; There were no reoperation within 6 months after surgery. X-ray examinations' frequency reach to 11 ± 6 times, the puncture completion time of foramen shaping operation was 13 ± 6 minutes, the endoscopic surgery time was 35 ± 20 minutes; 6 months after, lumbar MRI showed that the reduced target area A, or area B or area A + B , both of them have achieved complete bony and soft tissue's decompression. 2 cases of intraoperative had gone through the dural rupture, but none of them had cauda equina or nerve root injury. For typeA, typeB, and type A + B, their surgical satisfaction rate, which was calculated by postoperation VAS score of low back pain, leg pain VAS score and Macnab index, showed no significant difference.

Conclusions: According to the anatomy characteristic , this method of dividing the lateral recess stenosis lumbar spinal area into the disk-flava ligament space(A zone), the ditch next to the superior articular process which is the upper part of the lateral recess bony channel (zone B, from the upper edge of the lower vertebral to the pedicle middle level) and the channel under the vetebral pedicle which is the lower part of the lateral recess bony channel(C region, from the middle level to the lower edge of the pedicle level.) is more conducive to the exchange of clinical experience and the choose of clinical treatment scheme. For type A, B or A + B lateral recess stenosis, using foraminal approach can achieve completely decompression of the nerve roots in these regions. It can get reliable clinical effects, but for different types, the methods are different. And the difficulty degree is different, the difficulty of A+B type's decompression shows slightly larger compared with the others.

PO21

Posterior Dynamic Stabilization With Direct Pars Repair Via Wiltse Approach For The Treatment Of Lumbar Spondylolysis: The Application Of A Novel Surgery

Qingquan Kong, Rong Xing

West CHINA hospital

Objective: The aim of this study was to investigate the effectiveness of posterior ISOBAR TTL stabilization of the lumbar spine with direct pars repair using Wiltse approach for the treatment of lumbar spondylolysis.

Methods: Between August 2010 and January 2013, 13 (9 males and 4 females; mean age: 28.2 yrs), patients with lumbar spondylolysis underwent posterior ISOBAR TTL stabilization of the lumbar spine, with direct pars repair via Wiltse approach. All patients were followed up for at least 24 months at outpatient visits or telephonically. Pre-operative and postoperative radiological assessments included anteroposterior, lateral and flexion extension radiographs, 3-dimensional reconstruction computed tomography(CT), and magnetic resonance imaging (MRI). Data pertaining to intraoperative blood loss, duration of operation, visual analog score (VAS), Oswestry disability index (ODI) scores, and other assessments were collected.

Results: The median follow-up duration was 36 months (range, 24–53 months). Surgery was successful in all patients with no complications; bony fusion of pars was confirmed on CT scan at postoperative 2 years. Significant pain relief was achieved in all patients including those with discogenic pain, those >30 years of age, and those with severe disc degeneration ($P<0.01$).

Conclusion: We evaluated a new surgical technique for the treatment of patients with spondylolysis with or without slight spondylolisthesis. Besides the good clinical results, the indications for this new surgery are much wider and can potentially overcome the limitations of earlier techniques.

PO22

Clinical Efficacy Of Modified Unilateral Approach For Bilateral Decompression Under Endoscope For Degenerative Lumbar Spine Stenosis

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The Third Affiliated Hospital of Southern Medical University

To evaluate the feasibility and clinical efficacy of the treatment of lumbar spine stenosis by modified unilateral approach for bilateral decompression under micro endoscope.

Dating from 2006.3 to 2016. 3, modified unilateral approach for bilateral decompression of central spinal canal and nerve root canal under endoscope performed on 326 cases who suffering from degenerative lumbar spine stenosis. Among of them laminectomy of one segment was done in 237cases, two segments were done in 89 cases. Postoperatively, the CT/MRI /radiograph were carried out on the protocol time, the VAS /Nakai criterion was used to evaluate the clinical outcome. The mean operative time was 49 min, the average blood loss was 43 ml, the average skin incision length was 2.4 cm.

11 cases with dural matter tearing healed 2 weeks. Mislocation was noted in 1 case. No nerve inury and postoperative infection occurred. Postoperative CT/MRI scan demonstrated that central spinal canal and nerve root canal was decompressed satisfactorily. All patients were followed-up for an average of 66 months. At final followed-up, radiograph examination showed that no instability of lumbar spine was found in all of patients. There were significant difference on the average low back pain/ leg pain VAS between preoperative and postoperative（$P < 0.01$）. According to the Nakai criterion, at final follow-up, the the excellent and good rate is 87.6%.

Treatment of degenerative lumbar spine stenosis by modified unilateral approach for bilateral decompression under microendoscope has the advantages, including minimal invasive, less complications and reliable therapeutical effect.

PO23

Therapeutic Evaluation Of ALIF With Self-stabilized Cage To Treat Degenerative Lumbar Disorders

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The Third Affiliated Hospital of Southern Medical University

To investigate the clinical outcome and surgical technique of the ALIF with self-stabilized cage in lumbar degenerative disorders.

32 consecutive patients aged from 41-66 years old were enrolled in this study. Preoperative diagnosis: lumbar spine instability in 6, discogenic low back pain in 17, degenerative spodylolysthesis in 6, revision for failed posterior lumbar surgery in 3. All of them,27 cases received single-level fusion, 5 cases received two-level fusion, mini open extraperitoneal approach for L3/4 and L4/5 segments, transverse incision in the right abandom for L5/S1 segment. Recording the ODI, VAS, height of dics space, angle of dics space, lumbar lordosis, operation time, blood loss, complications, postoperative bed—leaving time and postoperative hospitalization duration. Fusion rate evaluated by CT and X-rays taken routinely during follow up.

Average length of incision is 6.5cm, average blood loss is 103ml, mean operation time is 92 minutes, mean postoperative bed—leaving time is 3 days. Complications: peritoneum dehiscence in 3, bone donor site pain in 13. All cases were followed up successfully for an average of 12months. ODI decreased from preoperative 60.4% to postoperative 21.3%, VAS decreased from preoperative 6.7 to postoperative 2.6. Height of disc space ascended from preoperative 8.2mm to postoperative 13.5mm, angle of disc space ascended from preoperative 10.9°to postoperative 12.3°, lumbar lordosis angle ascended from preoperative 43.6°to postoperative 52.7°. All cases received bone fusion.

The cilinical outcome of ALIF with self-stabilized cage through mini open extraperitoneal approach to treat lumbar degenerative disorders is satisfactory. The Advantages include less invasive, early ambulation.

PO24

Comparision Between Anterior Percutaneous Endoscopic Cervical Discectomy (a-PECD) And Posterior K-hole Approach (p-PECD) For Cervical Spondylosis: The Short-term Clinical Efficacy And Influence To Vertebral Stability

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Objective: To compare the short-term clinical efficacy of anterior Percutaneous Endoscopic Cervical Discectomy (a-PECD) and posterior K-hole approach (p-PECD) in the treatment of cervical spondylosis and its influence on the stability of the cervical spine.

Method: A retrospective study was carried out for 49 patients of cervical spondylosis treated by either a-PECD or p-PECD from May 2016 to June 2017.They were divided into two groups:a -PECD group in 12 cases and p-PECD groups in 37cases.The time of operation, the therapeutic effect and the stability of cervical spine after operation were evaluated and compared between two groups.JOA score and Williams standard were used for therapeutic evaluation, and Katsumi criteria for vertebral stability.

Result: All cases had been successfully operated. Mean time of operation of a-PECD was 69.83±15.93min, and p-PECD was87.41±14.94min.There was significant difference in the operation time between two groups ($P<0.05$) .One patient from p-PECD had suffered from half spinal cord injury syndrome. But,after active treatment, the ASIA gradeof thispatient was improved from B to D.All cases were followed up from 1 months to 13 months, average 5.96±3.89 months for the a-PECD group and 5.56 ±3.79 months for the p-PECD group.JOA scores before and after operation were 9.37±0.98 and 15.52±0.78 for a-PECD group , and 9.42±0.21 and 15.33±0.85 for p-PECD group.There were significant differences in the pre- and post- operation scores of each group ($P<0.05$) , however no singnificant difference between the two groups ($P>0.05$) .Williams results of a-PECD were excellent in 12 cases, results of p-PECD group were excellent in 36 cases, poor in 1 cases, there was no significant difference between the two groups($P>0.05$) . There was no case with instability of cervical vertebra in two groups after operation, and there was no significant difference of cervical vertebra stability in each group before and after operation ($P >0.05$).

Conclusion: The short-term clinical efficacy of anterior Percutaneous Endoscopic Cervical Discectomy (a-PECD) and posterior K-hole approach (p-PECD) in treatment of cervical spondylosis is similar. The time of a-PECD is less than that of p-PECD, The two approaches have little effect on the stability of the cervical spine, and will not cause the instability of the cervical spine.

PO25

Eccentric Reaming Technique In Percutaneous Endoscopic Lumbar Discectomy For The Treatment Of Lumbar Lateral Recess Stenosis: A Five-Year Case Series Study

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Purpose: To investigate the use of Eccentric Reaming Technique in percutaneous endoscopic lumbar discectomy(PELD) for the treatment of lumbar lateral recess stenosis.

Methods: We retrospectively analyzed patients with lumbar lateral recess stenosis between April,2010 to Jun,2012. Age and gender were recorded as demographic data. Peri-operative data includes surgical segments, surgical duration and blood loss. Oswestry Disability Index(ODI) was used as primary outcome and Visual Analogue Score(VAS) for both lower back and legs were used as secondary outcome. The follow-up data were recorded prior to surgery, 1 day, 1 month after surgery and at final follow-up.

Results: A total of 45 patients were included with an average of 49.23±23. 96year-old. 28 cases were male and 17 cases were female. All the patients were followed-up for 60-84 months, average follow-up time is 73.25±8.47 month. Of them, 25 cases were L4/5 and 20 cases were L5/S1. Surgical duration is 61.23±13.89min and average blood loss is 15.02±4.33ml. The ODI in 1 day after surgery decreased significantly（$p<0.05$）, but no significant difference was detected in one month after surgery and at final follow-up compared with 1 day after surgery（$p>0.05$）. The VAS for lower back pain decreased significantly 1 day after surgery（$p<0.05$） and there is no significant difference was found in one month after surgery and at final follow-up compared with 1 day after surgery（$p>0.05$）. The VAS for leg pain decreased significantly decreased 1 day after surgery（$p<0.05$）. Also, significant decrease was found 1 month after surgery（$p<0.05$）, compared with that in one day after surgery, but there is no difference at final follow-up（$p>0.05$）. During the follow-up, 1 case suffered from recurrent lumbar disc herniation（2.22%） and no infection, hematoma and dysthesia was found in our series.

Conclusion: Eccentric Reaming Technique in PELD is a safe and efficient method for the treatment of lumbar lateral recess stenosis.

PO26

The Comparison Of MED And PELD In The Treatment Of Adolescent Lumbar Disc Herniation: A Five-Year Retrospective Follow-up

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Purpose: To compare the efficacy and safety of MED and PELD in the treatment of adolescent lumbar disc herniation(ALDH).

Method: We retrospectively collect 30 ALDH cases received MED and 48 ALDH cases received PELD from Jan.2010 – Jan.2012 in our hospital. For baseline data, age, gender, symptom duration, surgical segment were recorded in our study. Peri-operative data included surgical duration, blood loss, post-operation hospitalization. Oswestry disability index(ODI) and visual analog scoring(VAS) for both lower back and leg were recorded as surgical outcome. All the surgical outcomes were recorded before surgery, one-week after surgery, 6-month after surgery and at final follow-up.

Result: No difference of baseline-data was found between two groups. Both groups showed improvement in ODI and VAS before surgery and at final follow-up time-point ($p<0.05$). However, MED group has higher ODI 1-week (12.44±6.39 vs 7.25±6.40, $p=0.02$) and at 6-month after surgery (9.33±7.43 vs 3.97±7.64, $p=0.04$). Also, MED group suffers greater lower back pain at 1-week (1.93±1.39 vs 0.91±0.85, $p=0.01$), 6-month after surgery (1.80±1.15 vs 0.61±0.94, $p=0.00$) and at final follow-up (1.87±1.46 vs 0.65±0.88, $p=0.00$). In addition, MED group suffers more in radicular pain at 1-week after surgery (1.48±0.76 vs 0.74±0.81, $p=0.01$). Both group have one recurrent lumbar disc herniation and no other complication has been found in our study.

Conclusion: PELD and MED are both effective and safe surgical method for the treatment of ALDH. However, PELD is more advantageous for lower back pain and provide a quick way to resolve radicular pain than MED.

Poster

PO27

Short - term Results Of Percutaneous Endoscopic Lumbar Discetomy In The Treatment Of Far Lateral Lumbar Disc Herniation

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Wuhan General Hospital of PLA

Objective: To evaluate the feasibility and short-term curative effect of percutaneous endoscopic lumbar discetomy in the treatment of far lateral lumbar disc herniation (FLLDH).

Methods: We retrospectively analyzed the clinical data of 25 patients with FLLDH who were treated with PELD in our hospital from January 2010 to January 2016.Visual analogue scale (VAS) and functional index score (ODI) were used to evaluate the surgical outcome before and after discharge, at 1 month and at the end of follow-up. The efficacy of MacNab was evaluated at the last follow-up.

Results: No major complications such as nerve root injury occurred. All patients were followed up for 9-24 months (mean, 16.3 months).There was significant difference between preoperative and postoperative ($P < 0.01$).Modified MacNab standard clinical efficacy evaluation of excellent in 17 cases, good in 6 cases, 2 cases.

Conclusion: The short-term curative effect of use of PELD treatment of FLLDH is accurately satisfactory, with less trauma, less intraoperative bleeding, shorter operative time, quicker recovery, shorter hospital stay and fewer postoperative complications, etc.

Key words: PELD; FLLDH; Clinical efficacy

PO28

The Clinical Efficacy Of Percutaneous Endoscopic Lumbar Discectomy Of Treatment In Adjacent Segment Degeneration Diseases After Lumbar Fusion Surgery

Tao Li

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Objective: To explore the clinical curative effect of using PELD to treat adjacent segment degeneration disease after lumbar fusion surgery.

Methods: Retrospect and analyze Clinical data of 23 cases of adjacent segment degenerative disease after lumbar fusion patients between August 2010 and August 2015 in our hospital that of whom have accepted PELD therapy and were followed up .Using visual analogue scale (visual analogue scale / score VAS) to assess the efficacy of surgery,and using the Japanese Orthopaedic Association (Japanese Orthopaedic Association Scores JOA) to assess the function of the lumbar spine.Simultaneously calculate the JOA improvement rate. Evaluate the curative effect of patients by modified MacNab criteria 1 years after surgery.

Results: This group of patients surgery time 40-85 minutes, an average of 55 minutes.Bleeding from 5 to 25 ml, average blood loss is 10 ml.Hospital stay was 3-14d, an average of 7d.All patients were followed for 12-31 months, an average of 18.3 months.Preoperative VAS score was (7.29 ± 0.61) points,3 days after VAS score was (2.23 ± 0.41),Last follow-up VAS score was (1.23 ±0.32) points.Preoperative VAS score significantly vary from postoperative 3 days and the last follow-up ($P < 0.01$).Preoperative JOA score was (9.95 + 0.62) points, the score of discharged day was (18.17 ± 2.18) points,last follow-up score was (28.20 ± 2.08) points.Preoperative JOA score and the last follow-up and at discharge is statistically significant ($P < 0.01$).Improvement rate was calculated based on the lumbar spine JOA score.Of which optimal 18 cases, good in 3 cases, not too bad 1 case and poor in 1 case. The fine rate was 91.3% 1 year after surgery.

Conclusion: The effect of use of PELD treatment of adjacent segmental degenerative disease after lumbar fusion is accurately satisfactory, with less trauma, shorter operative time, quicker recovery, fewer complications, etc.

Key words: PELD; LDH; Postoperative lumbar fusion Surgery; Degenerative disease

PO29

Clinical Efficacy Of Percutaneous Transforaminal Endoscopic Surgery For Cauda Equina Syndrome

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Poster

Objective: To explore the surgical technique and clinical effect of percutaneous spinal endoscope microinvasive technique for the treatment of cauda equina syndrome.

Methods: From November 2014 to May 2017, 10 cases of cauda equina syndrome were treated by percutaneous spinal endoscopic minimally invasive technique, Of which 7 were lumbar intervertebral disc herniation, one at the L2-3 level, two at L3-4and four at L4-5 respectively,2 were lumbar spinal stenosis, one at the level of L3-4 and L4-5, the other atL4-5, 1was Brucellar spondylitisat the level L4-5. Age 13-89 years old.6 cases with radiating pain to both legs preoperatively, 4 with radiating pain in one leg, preoperatively 9 with saddle numbness or hypoesthesia and varying degrees of urine and defecation dysfunction, with a history of three days to four weeks long.One with huge intervertebral disc herniation at the L2-3level,no saddle numbness and urine and defecation dysfunction was found on admission, presented with acute pain in both legs in compulsive lateral position, 10 minutes later after the operation position was prepared during transforaminal endoscopic surgery,presented with extreme pain in both legs, saddle numbness and burning sensation, and weakness of both legs.All cases undergo the spinal canal decompression and nucleus pulposus exciting by transforaminal approach with spinal endoscope.The average time from onset of cauda equina syndrome to surgery was 8.6 days(3-28days) .

Results: Follow up 10 months (2-23), surgery duration 45minutes（30-90min）.The back and leg pain were significantly improved or disappear after surgery in 10 patients, saddle numbness and urine and defecation function recovered within 3 months postoperatively in 8 patients, 2 patients were followed up to 5 months postoperatively, saddle numbness improved markedly, but the sensation of incomplete empting still existed.

Conclusions: Saddle numbness or hypoesthesia is an important symptom for early diagnosis of cauda equina syndrome, bilateral nerve root syndrome is the early symptom of cauda equina syndrome, but also indicates a higher risk of further deterioration. It is effective and feasible to treat cauda equina syndrome by minimally invasive decompression with percutaneous spinal endoscopy.

PO30

Modified Percutaneous Lumbar Foraminoplasty And Percutaneous Endoscopic Lumbar Discectomy: Instrument Design, Technique Notes And 5 Years Follow-up

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Background: Conventional percutaneous endoscopic lumbar discectomy (PELD) with "inside-outside" technique has 4.3%-10.3% surgical failure rate, especially in central herniated discs (HDs), migrated HDs and axillary type HDs. PELD with foraminoplasty has been used for complex HDs. Percutaneous lumbar foraminoplasty (PLF) with trephine or bone reamer in original Tessys technique can quickly cut the hypertrophied bony structure under fluoroscopic guidance, which are introduced over a guide wire without protective working cannula with the risk of injury to the exiting and traversing nerve roots.

Study design: A prospective cohort study

Setting: Hospital and outpatient surgical center

Objective: To evaluate the outcome and safety of modified PLF-PELD with specially designed instrument for complex uncontained lumbar HDs.

Method: From April of 2007 to April of 2009, 148 patients with uncontained lumbar HDs were treated with modified PLF-PELD. MRI checkup was performed in the next morning after operation. Outcomes of symptoms were evaluated by follow-up interviews at 3 months, 6 months, 1 year and 5 years after surgery. Low back pain and leg pain were measured by Visual Analog Scale (VAS) score (1-100). Functional outcomes were assessed by using Oswestry Disability Index (ODI) and modified MacNab criteria.

Result: Follow-up data were obtained from 134 cases, including 14 cases on L3-4, 78 cases on L4-5 and 42 cases on L5S1. 108 cases were prolapse type, while 26 cases were sequestration type. Pre-operative symptoms and deficits included nerve root dermatome hypoesthesia in 98 patients (73%), nerve root myotome muscle weakness in 32 patients (23%), and weakening or disappearance of tendon reflex in 43 patients (32%). No case required conversion to an open procedure during the surgery. Low back pain and leg pain were significantly relieved immediately after surgery in all patients. MRI examination showed adequate removal of herniated disc in all patients. VAS scores and ODI values were significantly lower in all time points after surgery than before surgery. The percentage of pain relief in leg pain was significantly higher than that in low back pain (P<0.01). But there was no significant correlation between duration of the preoperative symptoms and the percentage of pain relief. MacNab scores at 5 years after surgery were obtained from 134 patients. 75 cases were given "excellent"; 49 were given "good". 5 patients experienced heavier low back pain, thus being classified as "fair". 5

cases with recurrence were given “poor”. Preoperative and postoperative (5 years follow-up) related nerve root function status was compared. Sensation and muscle strength recovered significantly (P<0.01), while tendon reflex was not changed (P=0.782). No patients had infections. 5 patients were complicated with dysesthesia in distribution of exiting nerve that was all operated at L5S1. Complains were reduced after one week's treatment with medium frequency pulse electrotherapy. 5 cases required a revision surgery after recurrence.

Limitations: This is an observational clinical case series study without comparison.

Conclusion: Modified PLF-PELD with specially designed instrument is a less invasive, effective and safe surgery for complex uncontained lumbar disk herniation.

Keywords: Lumbar disk herniation; Minimally invasive treatment; Foraminoplasty; Percutaneous endoscopic lumbar discectomy

PO31

Percutaneous Foraminoplasty And Transforaminal Percutaneous Endoscopic Thoracic Discectomy Applied In Thoracic Disc Herniation

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Purpose: There are many methods of surgical treatment for thoracic disc herniation. And those methods could be broadly classified as open surgical approaches, such as laminectomy, transpedicular approach, costotransversectomy, transthoracic, and minimally invasive approaches, such as video-assisted thoracoscopic surgery, thoracic microendoscopic approach, and percutaneous endoscopic thoracic discectomy. It has been demonstrated that there are high morbidity rate and particular complications which are associated with the open surgical approaches. Therefore, the authors practically adopted transforaminal percutaneous endoscopic thoracic discectomy to treat thoracic disc herniation.

Methods: 6 patients aged from 19 to 76 were included into the study and their inclusion criteria were patients with lateral or central thoracic disc herniation who failed in conservative treatment. After underwent transforaminal percutaneous endoscopic thoracic discectomy, the patients' Magnetic resonance imaging (MRI) checkup was performed on the 1st day. Visual analog scale(VAS) and ODI were compared pre- and post-operation. Meanwhile, the patients' satisfactory result was measured using modified MacNab's criteria.

Results: Percutaneous foraminoplasty were applied to 6 patients with specially designed instruments. The resection completeness of prolapsed disc material and the decompression of the thoracic canal were confirmed by post-operation MRI. No surgery-related complications were observed and no open procedure was required for any of the patients. The values of VAS and ODI were significantly improved post-surgery compared with pre-surgery . Excellent or good MacNab scores were obtained in all 6 patients.

Conclusions: The percutaneous foraminoplasty and transforaminal percutaneous endoscopic thoracic discectomy might be a less invasive, effective and safe operative method for patients with thoracic disc herniation.

PO32

Posterior Percutaneous Endoscopic Cervical Discectomy Through Lamina-hole Approach For Cervical Intervertebral Disc Herniation

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Objective: To first describe a novel posterior lamina-hole approach of percutaneous endoscopic cervical discectomy for cervical intervertebral disc herniation(CIVDH). To evaluate the feasibility and short-term clinical effect of this approach.

Summary of Background Data: The optimal PECD surgical approach for CIVDH remains controversial. The conventional posterior K-hole approach for PECD leads to damage of facet joint.

Methods: Single-center retrospective observational study of all patients managed with PPECD using the lamina-hole approach for symptomatic single-level CIVDH between January 2015 and January 2016. Patients were assessed neurologically before surgery and followed up at regular outpatient visits. The clinical outcomes were evaluated with the visual analogue scale and the modified MacNab criteria. Radiographical follow-up included the static and dynamic cervical plain radiographs, computed tomographic scans, and magnetic resonance images.

Results: 12 patients (7 women, 5 men) were enrolled in the study with a mean age of 51.9 years (range 31-72). Technical success was defined as the ability to access the lesion and removal of herniated fragment using the approach. A positive clinical response for pain relief was achieved in these patients receiving posterior percutaneous endoscopic cervical discectomy through lamina-hole approach for cervical intervertebral disc herniation. Postoperative MRI showed complete removal of the disc material in all the patients, no failure due to residual fragment was observed.

Conclusion: As an alternative to the described surgical approaches of PPECD, PPECD through lamina-hole approach is a novel access for CIVDH, and may be considered a valid and safe therapeutic option for cervical intervertebral disc herniation. The advantages of this approach is not only providing a valid and safe access to herniated cervical intervertebral fragment, but also avoiding the iatrogenic damage to the facet joint and relevant functional spinal unit (FSU). Theoretically, the potential of secondary degeneration of FSU is low.

Keywords: cervical intervertebral disc herniation, minimally invasive spine surgery, endoscope, discectomy, laminal hole

PO33

Percutaneous Endoscopic Lumbar Diskectomy And Minimally Invasive Transforaminal Lumbar Interbody Fusion For Recurrent Lumbar Disk Herniation

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Objectives: To compare the clinical outcomes of patients withrecurrent lumbar discdisease undergoing percutaneous endoscopic lumbar discectomy and minimally invasive transforaminallumbar Interbodyfusionat a single clinic.

Methods: Between January 2008 to January 2014, 401consecutive patients with first time of recurrent lumbar disc herniation which weretreated with PELD or MIS-TLIF.The data collected prospectively for analysis were clinical and radiographic results after revision surgeryand complications.

Results: During the follow-up period, postoperative data between both groups showed no significant difference in the mean total postoperative VAS score for leg pain, JOA and ODI score. The recovery rate was92.3% in the PELD and97.4%in MIS-TLIFgroup. For satisfactory rate, the PELD group (91.3%)is lower than the MIS-TLIF (95.2%). Six cases of dural tear were observed in MIS-TLIF group.The second recurrence occurred in 12 patients in the PELD group.In the PELD group, one patient suffered from permanent neurologic deficit.One case of postoperative intervertebral infectionwas captured in the MIS-TLIF group.

Conclusions: Both PELD and MIS-TLIF showed favorable clinical outcomes for recurrent disc herniation. Compared withMIS-TLIF, PELD has the following several advantages; 1) performing under local anesthesia, 2) with very few approach-related complications such as dural tear;3) rare possibility to make the “fusion disease” such as ASD. However, the PELD is also faced with several problems, such as 1) the relative higher rate of postoperative long-term chronic low back pain, (2) the possibility of recurrence, despite the opportunity is low.

Poster

PO34

Development And Current Situation Of Cervical Degenerative Disease Of Minimal Invasive Surgery

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Objective: To summarize the present status and progress of minimally invasive surgery technology of the cervica vertebral degeneration disease.

Methods: The relative researches focused on the present situation and progress of the c minimally invasive surgery technology of the cervica vertebral degeneration disease, then reviewed, analyzed, and summarized.

Result: Cervical vertebra of minimally invasive technology experience Three historical stages of chemical dissolving technology, percutaneous intervention and endoscopic technique. The latest Percutaneous Endoscope Cervical Discectomy Has the following advantages: The microscopic direct operation and Targeted therapy. And follow-up found that percutaneous endoscopic excision of the cervical intervertebral disc is the same as the traditional open surgery such as Anterior Cervical Discectomy And Fusion clinical curative effect. Endoscopic minimally invasive cervical spine surgery the moresafer, more reliable, small trauma.

Conclusion: Percutaneous Endoscope Cervical Discectomy can be decompression for Cervical nerve root and cervical spinal cord achieved by anterior approach and posterior approach. Percutaneous Endoscope Cervical Discectomy maybe The development trend of minimally invasive surgery of cervical vertebra.

PO35

Transpedicular Verterbroplasty And Short-segment Pedicle Screw Fixation For The Treatment Of Old Thoracolumbar Vertebral Fractures Through Wiltse Approach

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Objective: To explore methods and therapeutic effects of transpedicular verterbroplasty (using fracture segment reduction technique) combination with short segment pedicle screw fixation in treating old thoracolumbar fractures through Wiltse approach.

Methods: From March 2012 to February 2014,52 patients with old thoracolumbar fractures were treated by verterbroplasty (using fracture segment reduction technique) combination with short segment pedicle screw fixation in treating old thoracolumbar fractures through Wiltse approach. Among them, there were 35 males and 17 females, ranging in age from 55 to 70 years old (mean,59.3 years old). The time from injury to operation from 4 weeks to 12weeks months(mean, 6.8w）.25 cases were caused by falling down,7 cases were caused by slipping,20 cases were caused by car accident and 5 cases were caused by sport injuries. Dynamic Xrays were checked to evaluate the fracture segment motion before the surgery. 3D-ct and MRI were performed before operation to exclude pathological fracture. The distance between multifidus muscle and longissimus to midcourt line was measured,According to AO classification, there were 35 cases with type A1 compression fracture,5 cases with type A2 cleavage fracture and 12 cases with type A3 burst fracture. Frankel, lumbago Denis classification, TLICS classification and Loading sharing classification were used to evaluate neurological function and indication. The imaging data before, after operation and the latest follow up were used to evaluate correction vision.

Results: All patients were followed up over 24 months. At the time of the latest follow up, Frankel C were 2 cases, Frankel D were 25 cases and Frankel E were 15 cases. According to lumbago Denis classification, P1 (painlessness) were 32 cases,P2 (slight pain without treatment) were 18 cases,P3 （ moderate pain and taking medicine occasionally ） were 2 cases. The anterior vertebral height improved from preoperative （ 12.38±3.72 ） mm to postoperative(21.06±1.36) mm . The Cobb's angle decreased from preoperative (25.08±1.58) ° to (1.0.05±2.08) °. There were no nails broken, rod broken internal fixation lossening and vertebral body recompression.

Conclusion: Transpedicular verterbroplasty (using fracture segment reduction technique)combination with short segment pedicle screw fixation in treating old thoracolumbar fractures through Wiltse approach can reduce intraoperative blood loss and postoperative complications,with well reduction and reconstructing the anterior vertebral body. The well peri-operative plan, eariler exercise and anti osteoporotic therapy are the keys to the success of treatment.

Keywords: Spinal fractures; Operative approach; Fracture fixation; segment fixation; pedicle screw.

Poster

PO36

Percutaneous Endoscopic Lumbar Discectomy For High-grade Migrated Disc Herniation Through Different Approach

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Objectives: percutaneous endoscopic lumbar discectomy (PELD) for high-grade migrated disc herniation has been regarded as a challenging topic, with the remarkable improvement of surgical instruments and endoscopic techniques, it can be used for the treatment of high- or even very high-grade migrated disc herniation. The purpose of this study was to report successful results of PELD for high-grade migrated disc herniation through different approach.

Methods: Between Mar 2014 and Mar 2017, 36 patients with high-grade disc herniation were treated with PELD. There were 21 males and 15 females. The average age of patients was 42.6 ys. The L2-3 level was involved in 1 patients and L3-4 in 3 patients, while the L4-5 level was involved in 18 patients and L5-S1 in 14 patients. The type of up-migrated disc fragment was found in 8 patients and down-migrated in 28 patients. The surgical outcomes were assessed using the visual analogue pain score (VAS), Oswestry disability index (ODI), and modified Macnab criteria.

Results: The approach of regular transforaminal PELD was applied in 11 pateints, transpedicular appraoch in 10 patients and interlaminar approach in 15 patients. The average operative time was 56.8 min, and the average blood loss was 20 ml. The mean VAS for leg pain improved from7.12± 1.32 preoperatively to 1.40±1.08 at 4 weeks postoperatively and 1.91± 1.31 at 1 year postoperatively. The mean preoperative ODI improved from 63.24±5.12 preoperatively to 22.21±4.29 at 4 weeks postoperatively and 20.14±5.25 at 1 year postoperatively. Excellent or good outcomes were obtained in 90.3%. Two patients need revision surgery due to remnant fragments and recurrence respectively.

Conlusions: PELD was effective for high-grade disc herniations and different approach provided reliable results for different involved level and different direction of migration of disc fragment.

PO37

History And Milestones In Transforaminal Access For The Lumbar Disc

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Traditional surgical approach forsurgery for symptomatic prolapsed lumbar disc involved posterior laminectomy/laminotomy and flavectomy until the transforaminal approach for lumbar disc herniations evolved. Transforaminal approach is percutaneous and requires no bony work and also no retraction of neural structures. It can be performed under local anesthesia and is extremely patient friendly. We trace the history of the transforaminal approach and also simultaneous developments which occurred in different parts of the world to understand the evolution in the transforaminal approach. With continuous upgradation in equipment and technology this process of evolution still continues so that we can treat more pathologies transforminally.

PO38

Ultrasonic Bone Dissector In Endoscopic Spine Surgery.

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Poster

Introduction: In recent years, spinal surgery has greately progressed with the help of operating microscopes and high speed mechanical drills, especially microdrills. Last few years of 1900's and initial years of 20's has seen minimalisum in spine surgery with the use of endoscope to treat degenerative spinal diseases. Very recent introduction of high definition camera with HD screen has helped the endoscopic spinal surgeon to understand the anatomy better because of the panoromic view with an endoscope. When the high speed drills are used near to soft tissues like dura, nerve roots, the spinal cord and vessels, there is always some risk of damaging these tissues by drilling even under magnified view of microscope or even endoscope. Ultrasonic aspirators have been succefully used to remove brain tumours, even a fibrous, calcified tumour like meningioma at the skull base. (E. S. Flamm, J. Ransohoff, D. Wuuchinich et al. Preliminary experience with ultrasonic aspiration in neurosurgery, Neurosurgery 2(3) (1978) 240-245, T. Inoue, K. Ikezaki, Y. sato Ultrasonic surgical system (Sonapet) for microsurgical removal of brain tumours, Neuro Res. 22(50(2000) 490-494,). We report the clinical application of ultrasonic bone dissector in endoscopic spinal surgeries- Destandau's technique. And we discuss its advantages and disadvantages in comparison with drills. Every spinal surgeon has in his mind an idea of an instrument which will remove bone near to important structures like dura, nerve root, cord and vessles, safely, easily & fast. And at the same time there is no iatrogenic trauma to these structures. Materials and methods. As an ultrasonic bone dissector we used, Sonoca 300, (Soring Gmbh, Germany), which comprises a power supply unit with suction and irrigation, foot switch, handpiece. The handpiece tip height and width is 3.1 x 4.5 mm, with longitudinal and deformational motions, which are effective in scrapping and cutting bone tissue. The handpiece is lightweight 81 g, with bayonet angle, and both irrigation and aspiration channels. From April 2010, 55 cases of spinal disorder, degenerative spine diseases were operated on using Sonoca 300, involving, lumbar canal stenosis, cervical disc herniation and cervical cord compressive myelopathy etc. Out of 55 cases 30 were lumbar spinal stenosis, 15 posterior endoscopic cervical approach and 10 anterior cervical microforaminotomy cases. In lumbar endoscopic approach, bilateral canal decompression using unilateral approach was performed. Opposite lamina and hypertrophied medial facet undercutting was performed with ultrasonic bone dissector. In cervical region both anterior & posterior endoscopic approaches were used. In anterior cervical transuncal approach, bone near cord, nerve root and near vertebral artery was removed with ultrasonic bone dissector. In posterior cervical approach for foraminotomy deroofing of neural foramen to decompress the nerve root and in canal decompression opposite lamina undercutting was performed with ultrasonic bone dissector. The mechanisum is based on ultrasound frequency vibration of the the tip produced by a piezoelectric element exposed to alternate current. The stack of piezo-electric quartzes transforms the electrical energy of the Generator into a longitudinal, mechanic vibration of the sonotrode tip. The sonotrode is designed such that the entire system (converter, final mass, sonotrode) is in

resonance. The stroke at the distal tip is up to 120 micrometers. The direction of movement of the tip are both longitudinal and deformation. The longitudinal movement is around 120 micrometers and deformation is around 10 to 20 micrometers. The frequency is 35 kHZ. The base of the device's neck has much less motion than the operating end of the tip. The particular tip motion emulsifies bone near the contact area, with benefit of fine selective dissection with minimal heat production as there is continuous irrigation of the tip. After placing the tip of ultrasonic bone dissector at the bone surface, the bone is emulsified by applying theultrasonic vibrations. Surgical techniques and results From August 2009 to Dec 2016 out of 849 lumbar endoscopic spine surgery cases Authour used UBD/rasp/cool knife in 120 cases. UBD/rasp is used to shave off thick osteophyte stretching the nerve root, undercut the opposite lamina, and opposite medial facet. Also in transforaminal approach for foraminal & extraforaminal discs, neural foramen is enlarged at isthumus to decompress the exiting nerve root. Ultrasonic bone cutter/rasp/cool knife is used to undercut thick base of spinous process to reach with Endospine the opposite lateral recess and spinal canal. Out of 55 cases of anterior cervical endoscopic discectomy author used UBD /rasp/cool knife in 47 cases. In anterior cervical approach we use ultrasonic bone dissector to widen the transuncal foraminotomy window. The foraminotomy is medial to the vertebral artery. To use drill medial to VA is really difficult. Also once we are over the cord / dura to use drill is difficult and needs lots of experience. For this we use different currets and 1 mm Kerrison punch. Ultrasonic bone dissector is more safe near the vertebral artery and cervical cord with outgoing root. By angulating the endoscope ultrasonic bone dissector can be used to decompress the anterior surface of cord as it can work end on and upwards through a small window. Out of 31 cases, Ultrasonic bone dissector was used in 23 cases of cervical radiculopathy and compressive myelopathy where we used posterior cervical endoscopic approach. In posterior endoscopic cervical approach we use ultrasonic bone dissector to de-roof the foramen and to remove hard bone in the axilla of the nerve root where Kerrison punch and drill is too difficult to use. In patients with cervical cord compressive myelopathy we perform ipsilateral laminectomy and then we use ultrasonic bone dissector safely to obliquely undercut the opposite lamina from below. The deepness of contralateral corridor requires very small tip instruments and microdrill. One of the major task is the removal of the bone without injuring dura and nerve root. In cervical region space between the opposite lamina and cord is too small, and to use microdrill is too difficult. Thekicking movement of drill or sudden slippage of drill is dangerous, particularly in such deep and delicate areas. There is always high risk of serious sequaelae of iatrogenic trauma in cervical region. Ultrasonic bone dissector is very effective in avoiding injuries to the dura and nerve roots as it can be used without damaging soft tissues and without tangling cottonoids used to protect dura. Another advantage of this ultrasonic bone dissector is that it can be used with one hand as it is light weight. Discussion The regular use of high speed drill and microscope / endoscope has improved the surgical results. But while using drill in spine surgery we always face some risk of iatrogenic injury to dura, neural tissues and vessels. In order to avoid accidents, we have to use both hands to hold the drills in spine surgery. Also the tip of the drills had to be angled away from the suction tip and cottonoids which are used to protect dura or nerve root. Also with use of endoscope there is always chance of getting lens tip dirty due to bone dust spreading over it. For this frequent removal of endoscope to clean the tip is mandatory. Due to fear of accidents in drilling, training of young spinal surgeons is not an easy task. Complications related to spinal injury are reported to occur with a frequency of 8.6% (1569/18334 cases) –Yamamoto H, (1999),Nation wide survey for spine surgery, Japanspine research society, a committee report. Spine surgery 10(2): 332-339. These complications include general complications, neurological and meningeal complications, vascular

complications, infections, bone graft failure, mechanical problems, and so on. Among these complications related to drilling procedures include spinal cord and root injury. These iatrogenic complications although rare are serious and sometimes lifethtreatening in cervical region. The development of ultrasonic bone dissector handpiece for endoscopic use has resulted in value addition in safety of our techniques in minimally invasive spine approach. The ultrasonic bone dissector is able to scrape and cut bone tissues without fear of injuring the dura and nerve roots, or tangling of cottonoids in various approaches of spinal pathology with endoscope. Fear of bleeding from epidural veins is also less while using ultrasonic bone dissector. One more advantage of this light weight handpiece is that one can use dissector with one hand, usually the dominant right hand, but it can also be used with left hand when ever it is absolutely necessary. Long duration use with one hand is also not tiresome due to light weight. The thermal effect of the ultrasonic bone dissector is well controlled with in built irrigation in the handpiece. (A.T. Brooks, C.L. Nelson, C.L. Stewart, et al. Effect of an ultrasonic device on temperature generated in bone and on bone cement structure. J. Arthroplast. 8(4) (1993) 413-418.) Suetsuna et al. (F. Suetsuna, S. Harata, N. Yoshimura, Influence of the ultrasonic surgical aspirator on the dura and spinal cord. An electrohistologic study, Spine 16(5) (1991) 503-509. Reported an elecrtophysiological study on the influence of the ultrasonic bone aspirator on the dura and spinal cord, which suggested that there is a certain safety limit at 60% energy and maximum time duration at one point less than 10s. Therefore when using ultrasonic bone dissector on dura constant irrigation and intermittant usage is advisable. At present we can not think ultrasonic bone dissector as complimentory to high speed drill. But we can use high speed drill for rough drilling as like in anterior cervical approach to remove bone end on at uncovertebral joint, and Sonoca 300 ultrasonic bone dissector for bone removal in deeper and more delicate area adjacent to dura and nerve roots, with complete understanding of advantages and disadvantages of both the appliances. The ultrasonic bone dissector definitely has advantage while working near important structures. There were no complications realted to the use of the device. The ultrasonic bone dissector removes bone in a shaving scrapping likemanner. The bone is removed in thin layers. The ultrasonic bone dissetor enables easy removal of bone with minimal compression pressure against the bone surface. This is one of the biggest advantages in respect to the microdrill where the extent of bone removal is directly related to the power/ pressure used over the bone surface. This ultrasonic bone dissector is easy to use, and surgeon gets familier with the device in a short time. This device does not require a long training curve. But like any other surgical instruments, use of ultrasonic bone dissector is also skill dependent and its use in endoscopic spine surgery should be by surgeons already experienced in endoscopic spine surgery by Destandau's technique.

Conclusion: The ultrasonic bone dissector is a valuable instrument in removing the bone in critical areas, thus increases the overall safety of the endoscopic spine surgery techniques. Even if the ultrasonic bone dissector can not replace conventional highspeed drill at present, it is useful and unavoidable instrument for endoscopic spine surgery, as far as safety of the procedure is concerned.

PO39

Physiological Analysis Of Saline Solucion Pressure During Endoscopic Spine Surgery. Consequences Of Dural Lesion During This Surgery

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The author measured the pressure of saline solution infusion from the endoscopic working channel of twelve patients undergoing interlaminar endoscopic spine surgery. These patients were selected randomly in regard to age, weight and gender. The fluid pressure was measured with a catheter placed inside the endoscopic working channel connected directly to a digital pressure monitor. The use of a constant pressure column of 3,5 meters above the ground (around 2,5 meters above the patient)

Measurements:1- Pressure from the saline solution infusion outside of the endoscopic working channel.2- Pressure from the saline solution infusion inside the endoscopic working channel. These measurements demonstrated that the pressure inside the endoscopic working channel is higher than the venous and cerebrospinal fluid (csf) pressures and lower than the arterial blood pressure. A consequence to this finding is the absense of venous bleeding during a total -endoscopic spine surgery but active visible arterial bleeding. A more important observation was the absence of csf leakage during a unintended dural lesion that allowed the saline solution to enter the subrachnoid space. Although the pressure measurements were performed in only lumbar spine (L5/S1, L4/5) on can infer the same findings in the cervical and thoracic spine.

This situation may cause serious consequences like: Anesthetic infusion into the subarachinoid space in patients undergoing surgery with local anesthesia - Arterial blood infusion into the subarachinoid space The author presents a case of subdural hemorrhage as a complication during an unintended dural lesion during endoscopic spine surgery for cervical disc herniation.

Conclusion:1- Intraoperative complications like headache and hypotension may be caused by unintended dural lesion.2- Unintended dural lesions during endoscopic spine surgery are underdiagnosed.3- The addition of substances to the saline solution infusion should be avoided, specially anesthetics and vasoconstrictors.4- It is the authors opinion that general anesthesia is the safest method to perform this type of surgery.

Poster

PO40

Differences In Short-term Clinical And Radiological Outcomes Depending On Timing Of Balloon Kyphoplasty For Painful Osteoporotic Vertebral Fracture

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Summary of Background Data: Balloon kyphoplasty or vertebroplasty is widely performed as a surgical intervention for osteoporotic vertebral fracture (OVF) and the effects have been investigated in many previous studies. However, the influence of the timing of the procedure on patient outcomes has not been studied formally. The purpose of this study was to investigate differences in the surgical outcomes of OVFs according to the timing of balloon kyphoplasty.

Methods: This was a multicenter cohort study. Participants comprised 72 consecutive patients who underwent balloon kyphoplasty between January 2012 and January 2016. Patients were analyzed in two groups according to the timing of kyphoplasty after onset (Early group: ≤ 2 months; Late group: > 2 months). Follow-up continued for more than 6 months.

Results: A total of 72 patients were effectively analyzed. Of these, 27 (38%) patients underwent kyphoplasty within 2 months after symptom onset. The Late group showed greater angular motion of fractured vertebrae (p=0.005) and compression of anterior vertebral height (p=0.001) before surgery. Final outcomes adjusted for age and preoperative outcome showed lower visual analog scale (VAS) scores for low back pain in the Early group than in the Late group (19.9 vs. 30.4, p=0.049). Final relative anterior vertebral height and kyphotic angle were more preserved in the Early group than in the Late group (p=0.002 and p=0.020, respectively), although absolute differences were not significant.

Conclusions: Vertebral height and kyphotic angle before and after balloon kyphoplasty were greater in patients who underwent kyphoplasty within 2 months after onset, and the VAS score for low back pain at final follow-up was better. Our results support kyphoplasty within 2 months.

PO41

Biomechanical Study Of Novel Unilateral C1 Posterior Arch Screws And C2 Laminar Screws Combined With An Ipsilateral Crossed C1–C2 Pedicle Screw–rod Fixation For Atlantoaxial Instability

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Introduction: Current surgical methods to treat atlantoaxial instability pose potential risks to the surrounding blood vessels and nerves of operative approach. Therefore, more secure and highly effective methods are expected. This study sought to assess the biomechanical efficacy of a novel unilateral double screw–rod fixation system by comparing with traditional and emerging fixation methods in cadaveric models.

Materials and methods: Ligamentous cervical spines (C0–C7) from ten fresh cadaveric specimens were used to complete range of motion (ROM) test in their intact condition (control group), destabilization, and stabilization after different fixations, including unilateral C1–C2 pedicle screws (PS) with a screw–rod system (Group A), bilateral C1–C2 PS with screw–rod systems (Group B), unilateral C1 posterior arch screws (PAS) and C2 laminar screws (LS) combined with an ipsilateral paralleled C1–C2 PS–rod (Group C), and unilateral C1 PAS and C2 LS combined with an ipsilateral crossed C1–C2 PS–rod (Group D). After that, pullout strength test was performed between PS and PAS using ten isolated atlas vertebras.

Results: All fixation groups reduced flexibility in all directions compared with both control group and destabilization group. Furthermore, comparisons among different fixation groups showed that bilateral C1–C2 PS–rod (Group B), unilateral C1 PAS + C2 LS combined with an ipsilateral paralleled C1–C2 PS–rod (Group C) and unilateral C1 PAS + C2 LS combined with an ipsilateral crossed C1–C2 PS–rod (Group D) could provide a better stability, respectively, in all directions than unilateral C1–C2 PS–rod (Group A). However, no statistical significance was observed among Groups B, C, and D. Data from pullout strength test showed that both C1 PS (585 ± 53 N) and PAS (463 ± 49 N) could provide high fixed strength, although PS was better ($P = 0.009$).

Conclusion: The surgical technique of unilateral C1 PAS + C2 LS combined with an ipsilateral crossed C1–C2 PS–rod fixation could provide a better stability than the traditional unilateral PS–rod fixation and a same stability as bilateral PS–rod fixation, but with less risk of neurovascular injury. Therefore, this new technique may provide novel insight for an alternative of atlantoaxial instability treatment.

Poster

PO42

A Comparison Of Different Surgical Techiques For Percutaneous Endoscopic Interlaminar Discectomy Of L5-S1 Disc Herniation

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Study design: retrospective cohort study

Objective: to compare the economy, safety, and efficacy between intermittent endoscopy technique and full endoscopy technique of endoscopic interlaminar lumbar discectomy at the L5–S1 level.

Summary of Background Data: Percutaneous Endoscopic laminar Discectomy (PELD) is one of the typical represented minimal invasive discectomy operations which can be classified into the percutaneous endoscopic transforaminal discectomy (PETD) and the percutaneous endoscopic interlaminar discectomy (PEID). According to methods of ligamentum flavum management, PEID are mainly performed with full endoscope technique and intermittent endoscope technique. There is no study comparing these two techniques in regards to surgical effects and advantages.

Methods: 126 patients with L5–S1 disc herniation were randomly divided into either the Full endoscopy group (FE group) or the intermittent endoscopy group (IE group) from September, 2014 to May, 2015.

Results: In FE group, the mean operation time was 75.0±11.9 minutes. In IE group, the mean operation time was 43.0±16.4 minutes. The average hospitalization expense of FE group and IE group was respectively 32,069±1,086rmb and 22,665± 899rmb. There were significant differences in operation time and hospitalization cost between the two groups ($P<0.01$), but not in the postoperative bedtime, hospitalization time or complication rate ($P>0.05$). The postoperative ODI and VAS were obviously improved in both groups when compared with those of preoperation ($P<0.01$). These two procedures have the same clinic outcomes ($P> 0.05$).

Conclusion: Both full endoscopy technique and intermittent endoscopy technique could achieve good outcomes mastered by experienced surgeons, and intermittent endoscopy technique is a more effective option for shorter operation time and lower hospitalization expense.

Key words: lumbar disc herniation; minimally invasive; percutaneous endoscopic interlaminar discectomy; Full endoscopy; intermittent endoscopy

PO43

Anatomic And 3D-CT Analysis For Posterior Cervical Intervertebral Foramen Decompression By Percutaneous Endoscopic

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Objective: To explore the safe and effective range of decompression of cervical intervertebral foramen by Percutaneous Posterior Endoscopic Cervical Discectomy on the aspects of applied anatomy.

Method: ①Select five adult cervical specimens, observe point O that is the intersection of the inferior and medial margins of lateral mass and Outer inferior margin of vertebral plate and its adjacent anatomical structures in operative region from C3 to C7. ②Selected eight patients with cervical spondylotic radiculopathy with cerebral CTM. Establish vertical plane by point O, Lateral margin of dura mater, medial margin M (in) and exterior margin M (outside) of pedicle isthmus.Distance and angle were measured on cross section including the width of lateral mass(a)、horizontal distance of point V and lateral margin of dura mater (b),point O and M (in)(c),point O and M (outside)(d),point O and point V(e),point O and lateral margin of dura mater(f),the overlap thickness of superior and inferior articular process on cross section through point O(i),the external diameter of pedicle isthmus (k),the camber angle of pedicle of vertebral arch(m). Distance were measured on vertical plane including vertical dimension of O and M (lower) (g), O and M (upper) (h). Statistical methods were used for the analysis of the data.

Result: There no significant difference was found in f(4.17±1.33mm~4.64±1.70mm),i (6.06±2.07mm~7.20±1.93 mm) between the segment from C3-C4 to C7-T1（P＞0.05）.The significant difference was found in b(-0.17±1.74mm~2.42±1.41mm) between the segment from C3-C4 to C5-C6 to C7-T1(P＜0.001),d(-0.75±1.27mm ~2.85±1.69mm)between the segment from C3-C4 to C5-C6 to C7-T1 and C3-C4 to C6-C7（P＜0.001）,g（6.79±1.04mm~9.57±1.27mm）between the segment from C3-C4~C5-C6 to C7-T1(P＜0.001),h(0.19±2.04mm~2.36±1.39mm) between the segment from C3-C4 to C6-C7 to C7-T1(P＜0.01).

Conclusion: There is close relationship between point O and cervical intervertebral foramen. Point O is moreclose to the superior and lateral border of the next pedicle isthmus. The distance between point O and the lateral border of dura mater is constant. There are many morphological and structural changes in C7-T1 segment. We can define the pressure relief, effective range accurately and avoid or reduce spinal dura mater, nerve root, vertebral artery, facet joints and pedicle of vertebral arch damage if we are familiar with the characteristics.

Poster

PO44

Minimally Invasive Endoscopic Assisted Lumbar Spondylolysis Repair

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Background: The lesion in spondylolysis is a nonunion that follows a fatigue fracture of pars interarticularis. Direct repair of the pars defect is a logical alternative to fusion as it helps to preserve the motion segment and prevents abnormal stresses at the adjacent levels. We present the clinical and radiological results of endoscopic assisted direct screw osteosynthesis of the pars defect in patients with symptomatic spondylolysis.

Materials and Methods: Three patients (two males, one female) mean age 21 years with symptomatic pars defect who failed conservative treatment for six months and a normal disc in magnetic resonance imaging (MRI), underwent endoscopic assisted lumbar pars defect direct repair. Two patients had bilateral lysis at L4 level, one had unilateral lysis at L5 level.

Technique: Two portals of 0.5 cm were used on each side, 1 -1.5 cm lateral to the midline after confirmation with fluoroscopy. One portal is used for the endoscope and the second for the surgical instruments. Following endoscopic debridement of the defect, the inferior portal was used for percutaneous placement. The cannula for tubular retractors was tunneled through soft tissues and docked onto the inferior surface of the lamina at the isthmus, under endoscopic/fluoroscopic guidance. The guide wires were then drilled across the pars defect. Once we were satisfied with the position of the wires confirmed with fluoroscopy, wires were drilled and placed 4 mm diameter partially threaded titanium cortical lag screws measuring 36–40 mm in length across the pars defects in order to achieve compression. Bone shavings from the decortication were placed into each defect and final screw tightening was performed. The mean follow-up period was one year. MacNab criteria were used to evaluate the postoperative functional outcome. Healing of the pars defect was assessed clinically as well as plain radiographs.

Results: All patients had minimal post-operative pain which was controlled by oral narcotics. No complications were encountered in the perioperative or postoperative period. At 6 months after the operation, the patient had no back pain with good range of motion. The functional outcome was excellent and radiological fusion was observed in all patients at a mean follow-up of one year.

Conclusions: In carefully selected patients, endoscopic and image guided direct repair of the pars defect was a safe and effective alternative to fusion in younger patients with symptomatic spondylolysis, who failed conservative management.

PO45

Clinical Effects And Feasibility Of Transforaminal Percutaneous Endoscopic Lumbar Discectomy Combined With Anchorage Technique Of Pedicle For Highly Migrated Lumbar Disc Herniation

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Purpose: Transforaminal Percutaneous Endoscopic Lumbar Discectomy as a main technique for lumbar disc herniation, it is regarded as an effective alternative to posterior open surgery. However, there is limitation for highly migrated disc herniation due to lack of the appropriate approach. The purpose of this study was to explore clinical effects and safety of transforaminal percutaneous endoscopic lumbar discectomy combined with anchorage technique of pedicle for highly migrated lumbar disc herniation.

Methods: From April 2016 to January 2017, 15 patients with highly migrated lumbar disc herniation were enrolled in this study, including 8 male cases and 7 female patients, 2 cases in L2-3 level, 4 cases in L3-4 level, 8 cases in L4-5 level and 3 cases in L5-S1 level, average age was 68.09±6.80, average course of disease was 12.60±1.07 months. All patients were performed transforaminal percutaneous endoscopic lumbar discectomy combined with anchorage technique of pedicle. The clinical outcomes were evaluated by Visual Analog Scale (VAS) for leg pain, low back pain and Oswestry Disability Index (ODI) scores at preoperative, first day after operation and sixth month after surgery, all data were statisticed by SPSS21.0 (SPSS, Inc., Chicago, IL, USA).

Results: All patients were follow-up to sixth month after surgery and mean operation time was 104.67±16.39 minutes, average bleeding was 47.93±4.38ml, preoperative mean low back pain VAS was 8.07±0.80, first day after operation was 1.73±0.59, sixth month after surgery was 1.67±0.72, preoperative leg pain VAS was 8.27±0.96, first day after operation was 2.47±0.83, sixth month after surgery was 1.87±0.74, preoperative ODI was 80.47±6.44, first day after operation was 29.13±2.93, sixth month after surgery was 18.93±2.12. There was difference between pre-operation and post-operation at VAS and ODI($p < 0.05$). Postoperative MRI showed that herniated disc was removed. After operation, 1 case were complaint numbness of saddle area and 1 patient in leakage of cerebrospinal fluid, it's disappeared by conservative treatment.

Conclusions: Transforaminal percutaneous endoscopic lumbar discectomy combined with anchorage technique of pedicle for highly migrated lumbar disc herniation can improve clinical effect and it is an effective and safe technique for highly migrated lumbar disc herniation.

Key words: Transforaminal Percutaneous Endoscopic Lumbar Discectomy; Pedicle; Anchorage Technique; migrated lumbar disc herniation

PO46

Anterior Percutaneous Endoscopic Cervical Discectomy with Endoscopic Burr System For The Treatment Of Central Cervical Intervertebral Disc Herniation

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Objective: Our aim was to evaluate the efficacy of anterior percutaneous endoscopic cervical discectomy (APECD), for the treatment of central cervical intervertebral disc herniation (CCIVDH) which a vertical intervertebral distance of less than 4 mm. In addition, the ways to avoid major complications, including case selection and surgical techniques, are highlighted.

Methods: From April 2016 to March 2017, a total of 23 consecutive patients with central herniation CHIVD which a vertical intervertebral distance of less than 4 mm who underwent APECD were enrolled. The clinical outcomes were evaluated using the VAS, NDI and JOA. Radiographic follow-up included static and dynamic plain cervical radiographs and magnetic resonance imaging.

Results: Twenty patients (87%) completed the clinical observation. VAS, NDI and JOA were significantly improved after 1 week, 3 months and 6 months after the operation. ($P < 0.05$). No surgical complications occurred. At 6 months after operation, the height of intervertebral distance was 1.6 mm lower than that before operation. The difference was statistically significant ($P < 0.05$),but,there was no correlation between the height of intervertebral space and clinical curative effect ($P > 0.05$). There was no significant change in cervical curvature ($P < 0.05$), and 6 months follow-up showed no instability and fusion of cervical spine.

Conclusions: APECD with Endoscopic Burr System can effectively improve the patient's pain and dysfunction. Nevertheless, it carries the risk of major complications. With careful patient selection and use of meticulous surgical techniques, it is still a safe and effective alternative for central herniation CHIVD which a vertical intervertebral distance of less than 4 mm.

Key Words: anterior percutaneous endoscopic cervical discectomy; endoscopic burr system; minimally invasive spine surgery; cervical intervertebral disc herniation

PO47

Clinical Experience Of Anterior Cervical Discotomy And Fusion With Self-locking Cages For Multi-segmental Cervical Myelopathy

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Objective: To investigate the feasibility and clinical effectiveness of self-locking stand-alone polyetheretherketone cages（ROI-C）used in the ACDF for cervical myelopathy.

Methods: The short form-36 physical component summary (SF-36) and VAS score was evaluated preoperatively and 3 days, 3 monthes, 6 monthes and 1 year after surgery the recovery of neurofunctional condition and clinical effectiveness. Antero-posterior and flexion-extension position radiography was taken to survey the interspinal height and range of motion of operated levels. Anterior cervical discotomy and fusion with self-locking cages were performed on 73 Patients who suffered from multi-segmental cervical myelopathy. Recroding the JOA and SF-36 scores in the protocol time point, in order to investigate the cilinical outcome, meanwhile, accumulating the preoperation and postoperation X-ray films of cervical spine for measuring the height of intervertebral space, whole curvature of cervical spine and the rate of fusion.

Results: The mean follow-up time was 22.6 months. JOA scores ascended from preoperative 6.4±3.3 to postoperative 13. 5±1.7 (P <0.05), the 7 scores of SF-36 improved significantly after operation, but Mental health not. The fineness rate was 93%. Height of disc space ascended from preoperative (5.8±1.7) mm to postoperative (8.5±0.8) mm, globle curvature of cervical spine ascended from preoperative 5.1°±7.2° to postoperative 9.5°±14.3°, the change of the two index is significantly, respectively. All of the 73 cases achieved bone fusion.

Conclusions: The use of anterior cervical discotomy and fusion with self-locking cages to treat multi-segmental cervical myelopathy posses many advantages as follows: satisfactory clinical outecome, minimally invasive, higher fusion rate, higher orthopaedic ability.

Poster

PO48

Microscopic Assisted Lumbar Discectomy Versus Standard Open Discectomy: The Result Of A Retrospective Study

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Objective: To compare the Microscopic assisted lumbar discectomy(MSLD) with standard open discectomy in terms of therapeutic effect for one-level lumbar disc herniation.

Method: 43 patients with one-level lumbar disc herniation were chosen from January 2015 to October 2016 and they were divided into two groups based on the surgery they received. 27 patients underwent the operation of microsurgery lumbar discectomy (Group A), including 15 cases with L4/5 level protrusion and 12 cases with L5/S1 level protrusion. The other 16 patients underwent traditional posterior open discectomy by fenestration (Group B), including 10 cases with L4/5 level protrusion and 6 cases with L5/S1 level protrusion. Then we compared the parameters of operative time, hemorrhage volume, drainage volume, length of operative incision, length of hospital stay after operation. In this study, the therapeutic effect was assessed by JOA, ODI and VAS score during follow-up period.

Result: All the patients received acceptable results and their symptoms improved in various degree. All the incisions healed well. No complications including wrong level, nerve root injury, cauda equina injury, and infection occurred. MSLD has advantages on hemorrhage volume and drainage volume, as microscope provided a more clear sight and the surgeon can prevent or control small vessel bleeding effectively. The volume of blood loss during operation was (40±5) mL in group A and (60±6) mL in group B. But it takes more time for surgeon to operate MSLD, the operation time was (56±9) minutes in group A and (47±8) minutes in group B. The post-operative JOA, ODI and VAS all improved in both groups post-operation. In the following-up period (3 months and 6 months after operation), there is no significant difference between Group A and B considering the improvement of VAS, ODI and JOA post-operatively.

Conclusion: The clinic outcomes between the two kinds of surgery are similar, but microsurgery lumbar discectomy has less blood loss and drainage volume. The treatment outcome of MSLD is slightly better than that in tradition open discectomy.

PO49

Treatment Of Spontaneous Spinal Epidural Hematoma With Posterior Percutaneous Endoscopic laminotomy: A Case Report And Review Of Literature

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Background: spontaneous spinal epidural hematoma (SSEH) is a rare cause of neck pain and spinal cord compression that requires emergency treatment.

Object: Our goal was to report a case of SSEH that treated with P-PECD.

Case report: A 57-year-old woman who presented to orthopedics department with paraplegia and neck pain. There was no history of trauma and she was not taking any medications. Magnetic resonance imaging revealed a non-enhancing posterior epidural mass lesion between C3 and upper C4 causing severe cord compression at C3-C4. Blood investigations were unremarkable. We use percutaneous endocopy to decompress within 12h of symptom onset. Intraoperatively, clotted blood and prominent epidural vessels were seen. Post-operatively, the patient recovered uneventfully with complete return of motor and sensory function over the following 5 days.

Conclusion: SSEH is a rare cause of spinal cord compression that requires prompt diagnosis and surgical intervention to prevent mobidity. Percutaneous endoscopy may be regarded as an new and mini invasive options to open surgery.

Poster

PO50

The Clinical Appilication Of Lumbosacral Plexus Magnetic Resonance Neurography In The Diagnosis Of Lumbar Spinal Stenosis And Lumbar Disc Herniation

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Objective: To evaluate the application of lumbosacral plexus Magnetic Resonance Neurography (MRN) in accurate diagnosis of nerve compression in lumbar spinal stenosis(LSS) and lumbar disc herniation(LDH).

Methods: From June 2016 to July 2017, patients who were suspected to be diagnosed with LSS or LDH in our center were included. The lumbosacral plexus nerve data including width of dural sac, length, width and included angle of nerve root sheath, length and width of ganglion, etc were measured in MRN. The morphological characteristics of lumbosacral spinal nerves were observed by MRN image through which precise diagnosis was obtained.

Results: Twentytwo patients were included in this study, including 13 patients with LSS and 9 patients with LDH, among whom 12 cases are male and 10 cases are female with average age of 58.8 years old. The lesion segments were L3～S1. Three patients were diagnosed with LSS, including 7 patients with biarticulate segments lesion, and 3 patients with single segment lesion. Patients with LDH are all single segment lesion. Our results showed that the length, width and angle of nerve root sheath and length and width of ganglion in lesion segment were significantly different from that of the healthy side ($P < 0.05$). The difference between the lesion segment and the same normal segment in width of lumbar sac has statistically significance ($P < 0.05$). And the morphology, branch and shape of lumbosacral spinal nerves could be clearly identified in the MRN image, and the circuity and deformation of the compressed nerve root could also be seen clearly. One patient with L5/S1 far lateral disc herniation failed to clear the pathological region in conventional MRI images, but MRN images could show the compression of nerve root outside the intervertebral foramen area which could see an increased exiting angle, upward circuity and deformation of spinal nerves. Three other cases of first were diagnosed with LSS, because the clinical signs and symptoms were similar to stenosis, but conventional MRI presented thickened epidural adipose, so the diagnosis should be Spinal epidural lipomatosis(SEL). Then the following MRN show the only impression in the lesion segment and decreased width of dural sac, so the diagnosis could be clarified as to determine extent of decompression surgery.

Conclusion: Lumbosacral plexus MRN could clearly display the anatomic structure of lumbosacral plexus and region and degree of compressed region, contributing to improve the diagnosis accuracy of LSS and LDH, providing great guidance for operation.

PO51

Anatomical Parameters Measurement In Han Nationality Using Lumbosacral Plexus Magnetic Resonance Imaging

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Poster

Objective: To obtain the database of lumbosacral plexus magnetic resonance imaging (MRI) data in the normal adult of Han nationality, and to conclude the varying pattern of the anatomical parameters of the lumbar vertebrae of normal adult.

Methods: Thirty healthy volunteers (15 male ,15 female) were included in the study (aged from 23 to 26) without low back pain and lower extremity pain, spinal trauma, operation history and lumbar degenerative changes. 3T Siemens MRI machine was used to perform multi-level MRI scan for standard positioning volunteers from which images were obtained and measured to get anatomical parameters of lumbosacral plexus, including vertical diameter and transversal diameter of ganglion, maximum and shortest diameter of ganglion, distance between axilla of nerve root and ganglion, distance between interior edge of both pedicle, distance between axilla of nerve root and inferior edge of lamina, distance between inner edge of nerve root and outer edge of dura mater in horizontal line to inferior border of superior and inferior end plate, width of dura mater, distance between nerve root and superior and inferior pedicle, distance between adjacent ganglion, included angle between nerve root and sagittal plane, traditional safe triangle area, and fused safe triangle area. The average of the anatomical parameters and the chart analysis were completed

Results: In 30 cases of volunteers, 1) vertical diameter of ganglion, maximum diameter of ganglion, distance between axilla of nerve root and ganglion, distance between interior edge of both pedicle, distance between axilla of nerve root and inferior edge of lamina, distance between inner edge of nerve root and outer edge of dura mater in horizontal line to inferior border of superior and inferior end plate, traditional safe triangle area, and fused safe triangle area: measured value shows a gradually increasing trend from L3 to S1. 2) width of dura mater, distance between nerve root and superior and inferior pedicle, distance between adjacent ganglion, included angle between nerve root and sagittal plane: measured value shows a gradually decreasing trend from L3 to S1.3) the base and height of the traditional safe triangle are respectively 14.87±2.3mm and 22.99±3.29mm (L3-L4), 15.85±2.06 mm and 24.02±2.70mm (L4-L5).Therefore, the traditional safe triangle area obtained is 170.52 ±34.33 mm^2 (L3-L4), 191.41 + 38.34 mm^2 (l4-l5).The base and height of fused safe triangle are 23.17±1.71mm and 32.52mm±3.66mm (L3-L4), 27.10±2.39mm and 38.04 mm±4.16mm (L4 - L5), 27.98±2.72mm and 45.85±5.81 mm (L5-S1).Therefore, fused safe triangular area obtained is 377.67±56.23 mm^2 (L3-L4), 517.10±78.31 mm^2 (L4-L5) and 640.87±99.73 mm^2 (L5-S1).

Conclusion: The results were of certain help in the diagnosis and treatment of lumbar diseases, and providing theoretical reference for clinical operations.

Poster

PO52

Microendoscopy-assisted Minimally Invasive Transforaminal Lumbar Interbody Fusion For Lumbar Degenerative Disease

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Purpose: To evaluate short-term and medium-term outcomes of microendoscopy-assisted minimally invasive transforaminal lumbar interbody fusion (MIS-TLIF) and open TLIF for lumbar degenerative disease.

Methods: Fifty cases received microendoscopy-assisted MIS-TLIF (MIS group), while another well-matched 50 cases accepted open TLIF (open group). Parameters between both groups, including surgical duration, intraoperative blood loss and radiologic exposure, postoperative analgesic usage and ambulatory time, visual analogue scale (VAS) for back and leg, functional scores, self-evaluation of surgical outcome (modified MacNab criteria), interbody fusion rate, adjacent segment degeneration (ASD) rate, as well as complication incidence were compared at 1 month and 24 months postoperatively.

Results: Intraoperative blood loss and postoperative analgesic usage were significantly reduced in MIS group (P<0.05). Patients undergoing microendoscopy-assisted MIS-TLIF were able to ambulate earlier postoperatively than those receiving open TLIF (P<0.05). However, it showed prolonged surgical duration and enhanced radiologic exposure in MIS group (P<0.05). At 1 month postoperatively, MIS group was associated with more improvement of VAS and functional scores compared with open group (P<0.05). While at 24 months postoperatively, both groups revealed similar VAS and functional scores (P>0.05). Excellent and perfect scale rating by modified MacNab criteria, interbody fusion rate, ASD rate and complication incidence between both groups were nearly the same (P>0.05).

Conclusions: Microendoscopy-assisted MIS-TLIF owns advantages of less iatrogenic injury, decreased blood loss, reduced analgesic usage and earlier rehabilitation, while it has drawbacks of more surgical duration and radiologic exposure. It is superior than open TLIF in terms of short-term clinical outcomes and has similar medium-term clinical outcomes.

PO53

Free Hand Window Expanding Technique: Endoscopic Interlaminar Approach For L5/S1 Lumbar Disc Herniation With Narrow Interlaminar Space

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Objective: Endoscopic interlaminar approach for L5/S1 lumbar disc herniation with narrow interlaminar space has some problems such as access road difficult and narrow operating space. Endoscopic grinding drill can solve this problem but it is expensive. To evaluate the results of endoscopic interlaminar approach for the L5/S1 lumbar disc herniation with narrow interlaminar space through free hand window expanding technique.

Method: 30 L5/S1 lumbar disc herniation patients with free hand window expanding technique or Endoscopic grinding technology through full-endoscopic discectomy underwent follow-up for more than 6 months. The clinical evaluation data included operative time, blood loss, visual analog scale(VAS) lumbar and leg pain scores, complications.

Results: All patients were observed prospectively for 3d,2w, 1m ,3m, and 6m. The operative time was 83.5 minutes (range 60-125 minutes). Intraoperative blood loss about 10-50ml, average 25ml. There was no nerve root and dural sac damage intraoperative and postoperative infections. The resected bone mass was about 3-10g (average 6g). There was a significant improvement in VAS leg pain scores ($p<0.05$) after surgery compared with preoperative scores. That meaned postoperative were improved to decline and can effectively maintain pain symptom relief effect. That meaned postoperative were improved to decline and can effectively maintain pain symptom relief effect. The operation time of the free hand window expanding group was significantly lower than that of the endoscopic grinding drill group ($P<0.01$), and the amount of bleeding during operation was also significantly reduced ($P<0.01$).

Conclusions: Excellent clinical early stage outcomes can be obtained in the free hand window expanding technique with endoscopic discectomy. There are obviously advantages in this technique, such as shortly operative time, simple surgery procedures and equipments, especially this technique is a safe and sufficient supplementation and alternative to endoscopic interlaminar surgical procedures.

Keywords: lumbar disc herniation; endoscopic discectomy; free hand; interlaminar approach

PO54

A novel Percuntanous Endoscopic Lumbar Discectomy Technique To Remove Extraforaminal Disc Herniation At L5/S1 Segment Through TFS Space

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2. Southern Medical University

Background: Far lateral lumbar disc herniation (FLLDH) is special type of lumbar disc herniation and its surgical treatment is challenging. 43% or so of FLLDH occurred at L5/S1 segment and the surgical treatment is even more difficult due to impedes by the variable anatomical bony structures. So far, a safe, effective, and standardized technique was still yet to know. STUDY DESIGN: A retrospective investigation OBJECTIVES: To introduced a modified percutaneous endoscopic lumbar discectomy (PELD) technique to remove extraforaminal disc herniation at L5/S1 level, including the technical essentials and clinical results.

Materials and Methods: The geometric parameters of transverse process, facet joint and sacrum (TFS) space based on imaging examination were measure on 100 patients with disc herniation. 10 cases of (7 males and 3 females) extraforaminal disc herniation at L5/S1were surgically treated with PELD technique through TFS. Visual analog scale (VAS) assessments for leg pain and and Oswestry disability index (ODI) eveluations were performed before and after operation.

Results: The maximum diameter of the TFS space varied from 2.73 to 11.81 (6.84 ± 2.01) mm on the left and 3.00 to 10.47 (7.02 ± 2.05) mm on the right. The distance from optional skin entry points to midline varied from 33 mm to 84 mm and the vertical distance of extra iliac vessels to skin varied from 70mm to 120mm. The safe distance from herniated disc to blood vessel in front was about 1 cm. All 10 patients were back to pre-herniation activities in one month. VAS score went down to 2.5±2.0 from 7.5±1.3, and ODI score to 25.4±10.8 from75.2±13.3 respectively 1 day after operation, and 30 days after operation VAS score was 1.0±0.6 and ODI was 10.2±3.2. No patient showed neurological deficit or surgical site infection.

Limitations: This study focused on technique introduction and the number of cases was small.

PO55

Clinicaloutcomes Of Posterior Percutaneous Endoscopic Cervical Discectomy For Single Level Cervical Spondylotic Radiculopathy

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Purpose: To investigate the clinical outcomes using posterior percutaneous endoscopic cervical discectomy (P-PECD) for single level cervical spondylotic radiculopathy (CSR).

Methods: From October 2015 to June 2016, 33 patients (23 men, 10 women, mean age 54.0 years, range 30-85 years) who had single level CSR were treated by P-PECD, and the medical records were reviewed. Allpatientswerefollowed for average13.5 months (range, 12 to 22months). The operation related parameters(operation time, estimated blood loss, length of hospitalization, complications), clinical parameters, including neck visual analog scale (Neck-VAS), arm visual analog scale (Arm-VAS) and neck disability index (NDI), the modified Macnab criteria, as well as radiological parameters (disc height, shell angle, C2-C7 Cobb's angle, range of motion) were recorded preoperatively and at 3 months, 6 months, 12 months and last follow-up postoperatively.

Results: The mean operation time was 76.4 minutes (range, 40 to 120 minutes), the mean estimated blood loss was 30.2 ml (range, 20 to 80 ml), and the mean length of hospitalization was 3.5 days (range, 2 to 8 days).There was significant decrease at different time point postoperatively in Neck-VAS, Arm-VAS, and NDI when compared with preoperatively ($P<0.05$).According to the modified Macnab criteria, there was excellent concordance in 20 patients (60.6%), good in 7 patients (21.2%) and fair in 6 patients (18.2%) atthelastfollow-up。The disc height and the range of motion of index level were significantly decreased at postoperative 1 year compared with at preoperative ($P<0.05$). The C2-C7 Cobb's angle and range of motion at upper adjacent level increased significantly at postoperative 1 year compared with at preoperative ($P<0.05$). The range of motion in lower adjacent level, spine functional unit of index level, as well as C2-C7 had no significant difference between preoperative and postoperative 1 year ($P>0.05$). One patient turned into traditional ACDF procedure because of hemorrhage limiting the vision during P-PECD operation. Upper extremity numbness and pain deteriorated in one case after a P-PECD procedure and was revised with ACDF at last. No other complications, like spinal cord injury, cervical root injury, cerebral spinal fluid leakage, infection as well as recurrence were found.

Conclusion: P-PECD, which can maintain normal cervical range of motion and intervertebral disc height, is a minimally invasive and essential procedure for CSR treatment with minor trauma, excellent outcome (overall satisfactory rate was 81.8%) and quick recovery. Surgeon's experience, however, is needed in case of turning into open surgery for good outcome.

Poster

PO56

Percutaneous Endoscopic Decompression For Cervical Myelopathy Through Posterior Trench Approach And Anterior Transcorporeal Approach: A Retrospect Study Of 93 Cases

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Objective: Reporting the safety, feasibility and clinical efficacy of percutaneous endoscopic decompression for cervical myelopathy through a novel posterior trench approach and anterior transcorporeal approach.

Methods: From June 2013 to May 2017, a total 93 consecutive patients with cervical myelopathy who underwent percutaneous endoscopic decompression through posterior trench approach and anterior transcorporeal approach were enrolled. Posterior trench approach is a novel designed approach which started drilling at the ipsilateral lateral mass, drilling the 1/2 medial portion of pedicle to the root of pedicle, and then drilling a trench from the root of pedicle to close to the posterior-middle of the vertebral body under endoscopy. Anterior transcorporeal approach under endoscopy which make a tunnel from the anterior vertebral wall to the posterior vertebral wall could enable an individual and adjustable trajectory within the vertebral body under different conditions of disc herniation preserving the motion of adjacent segment. Patients were evaluated neurologically before surgery and followed up at outpatient visits. Besides the demographic characteristic, the primary outcomes were measures of bodily pain and physical function on the Medical Outcomes Study 36-item Short-Form General Health Survey (SF-36) and the visual analogue scale (VAS). Radiographical follow-up included the static and dynamic cervical plain radiographs, computed tomographic scans, and magnetic resonance images.

Results: 58 patients treated with posterior trench approach and 35 with anterior transcorporeal approach. The cases of C3/4, C4/5, C5/6, C6/7 and C7/T1 in single level were 11, 19, 43, 10 and 1 respectively. The cases of two and three levels were 6 and 3 respectively. A total 4 cases were treated with combined anterior and posterior approach. The mean follow-up time is 14.41 ± 9.32 (1 ~ 42) month. The mean VAS score at post-operative 1d and last follow-up showed significant improve compared with pre-operation (3.37±0.60 vs 7.30±0.65 and 1.18±0.66 vs 7.30±0.65, respectively, $p<0.001$). At last follow-up, the patients showed significant treatment effect on bodily pain and physical function of SF-36 compared with pre-operation (32.07±8.13 vs. 64.00±7.30, 33.97±6.21 vs. 78.35±6.07, respectively, $p < 0.01$). Three surgery-related complications of mediastinal effusion, esophagus injury, and epidural hematoma were observed (overall 3 of 93, 3.22%). Radiographical follow-up showed the bone defect of the vertebral body, pedicle and lateral mass partially decreased, indicating bone healing. No cervical spine instability and on pedicle fracture were observed.

Conclusions: As a supplement to the described surgical approaches of PECD, the anterior transcorporeal approach and posterior trench approach are two novel access for the treatment of cervical myelopathy. Among the advantages of this two approaches are providing a clear visual field during percutaneous endoscopic surgery and decreasing the intraoperative iatrogenic injury, providing a path to reach the posterior-middle portion of vertebral body to decompress the spinal cord and avoiding violation to the disc tissue and facet joint. However, as the limitation of case volume and short-term follow-up, the efficacious and reliable of these two approaches should be verified in a further comparative cohort study with a larger volume of patients in a long-term follow-up.

PO57

Anterior Transcorporeal Approach Of Percutaneous Endoscopic Cervical Discectomy For Cervical Intervertebral Disc Herniation: A 2-Year Follow-up.

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Objective: This cohort study aimed to report the safety, feasibility and clinical efficacy of percutaneous endoscopic cervical discectomy with anterior transcorporeal approach

Methods: From Jun. 2013 to July. 2015, a total 35 (include 11 myelopathy) consecutive patients with symptomatic single-level CIVDH who underwent PECD using anterior transcorporeal approach were enrolled. Patients were evaluated neurologically before surgery and followed up at regular outpatient visits. Besides the demographic characteristics, the primary outcomes were measures of bodily pain and physical function on the Medical Outcomes Study 36-item Short-Form General Health Survey (SF-36) and the visual analogue scale (VAS). Radiographical follow-up included the static and dynamic cervical plain radiographs, computed tomographic scans, and magnetic resonance images.

Results: The mean operative time was 87.49±16.75 min (65~135), volume of removal disc was 0.46±0.13 g (0.3~0.8), times of fluoroscopy was 31.60±6.09 (21~49) and the hospital stay was 5.43±1.22 days (2~9). The mean VAS score at post-operative 1d showed significant improve compared with pre-operation (3.37±0.60 vs. 7.62±0.61, $p<0.01$). At 2 years, the patients showed significant treatment effect on the VAS, bodily pain and physical function on SF-36 (1.14±0.60 vs. 7.26±0.61, 63.92±6.74 vs. 32.55±6.80, 82.14±6.22 vs 34.43±4.50, respectively, $p < 0.01$). Two surgery-related complications were observed (overall 2 of 35, 5.71%). Collapse of vertebral body were observed in 2 patients (5.71%) may cause by the intra-operative injury of the superior endplate at 1year follow-up. The average disc height decreased 5.6% at 2 years compared to pre-operative (from 7.79 ± 0.37 to 7.34 ± 0.46 mm, $p<0.01$). However, it was clinically and radiologically insignificant. The long-term results were favourable and there were no recurrence.

Conclusion: As an alternative surgical approach of PECD, PECD through transcorporeal approach is a novel access for CIVDH. The advantages of this approach is not only providing valid and safe access for central or paracentral CIVDH, especially in a migrated lesion, but also avoiding the iatrogenic damage to the disc. Theoretically, the potential of secondary degeneration of disc is low.

Poster

PO58

How To Prevent Complications Of Percutaneous Transforaminal Endoscopic Lumbar Discectomy In Learning Curve Phase-personal Experience With Systemic Review

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Objective: To summarize how to decrease the complication rate during the learning curve phase in PELD.

Method: We use search strategies developed for a Cochrane systemic review in Pubmed database for complications in learning curve phase in PELD. The author's first 100 PELD cases for lumbar disc herniation(LDH) were retrospectively reviewed from March of 2014 to June of 2016.

Result: The average age of the patients was 37 years old (13-71). The mean reported scores on the VAS and ODI were 6.0 ±3.0 and 56.5 ±21.1 before surgery respectively, the final scores on the VAS and ODI were significantly reduced to 1.4 ±1.1 and 22.4 ±8.1 at final follow-up respectively ($p < 0.05$). The mean follow up was 20.5 months (3 months - 2 years). Open conversion to microdiscetomy was required in two patients during the first 20 cases. Overall 93% of patients had good-to-excellent results using modified MacNab criteria, with two patients having recurrence of whom one was re-operated. The re-herniation rate was 2% and re-operation rate was 1%. Two patients had postoperative dysesthesia may due to exiting nerve injury which recovered in 3 months. Through the systemic review of the literature, we found the major complication of PELD in the learning curve phase include conversion to open discectomy, inadequate decompression of lumbar disc, re-herniation of disc and re-operation.

Conclusion: Good training may help to decrease the complication rate in the learning curve phase for PELD, especially for re-operation rate.

PO59

Finger Guiding Technique In Anterior Percutaneous Endoscopic Cervical Discectomy For Thick Neck Patient：A Technical Note

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Purpose: In this study, we are the first to describe anterior percutaneous endoscopic cervical discectomy using the modified finger guiding technique for thick neck patient with medial cervical disc herniation.

Methods: An anterior transcorporeal approach of PECD, through the vertebral body hole of C5, was performed under endoscopy. Using the modified finger guiding technique, one-finger technique, to dissect through the neck muscles, trachea, esophagus and cervical until the index finger touched the anterior wall of C5 vertebral body. After a blunted 2.0mm diameter K-wire was anchored in the anterior wall of C5 vertebral body following the index finger, then the PKP puncture needle was penetrated in the anterior wall until it approximately reached the posterior wall of C5 body under the control of the AP lateral fluoroscopy. The dilator sheath and working sheath were inserted sequentially after the PKP puncture needle removed. The procedure was then performed.

Results: The operation was accomplished in 90 minutes. Postoperatively the patient was advised to wear a neck collar for 3 weeks. The axial beck pain was alleviated immediately after the operation, with VAS score improved from 7 preoperatively to 3. In the further follow-up, the patient had completely recovered from the symptoms and the postoperative MRI finding was not significant. The patient was advised for 3-month and longer follow-up.

Conclusions: Compared to two-finger technique, one-finger technique is easier especially for the thick neck patient to dissect the cervical anterior anatomic structures without injury.

PO60

Percutaneous Endoscopic Cervical Discectomy And Osteophytes Removal Via An Anterior Transforaminal Approach For Radiculopathy: Technical Notes And Review

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Objective: To address and review the first successful case of cervical radiculopathy through percutaneous anterior transforaminal approach where osteophytes and disc removed.

Methods and Samples: A case was selected to operate in year 2016 July. Patient had neck pain radiating toward right arm for 2 months but severe pain from 20 days, neck deformities, head tilted toward right side. Neurological examination showed decreased sensation and weakness over left sided trapezius, biceps and triceps muscles 3/5 muscles power grading. Physical examination revealed Eaton sign and Spurling sign positive. Preoperative dynamic X ray showed degenerative changes and osteophytes at C3-4, C5-6, CT showed intervertebral foraminal stenosis at C3-4 and C5-6 level, MRI showed disc protrusion severely compressing spinal cord at C3/4 level and minimal at C5-6. We operated the most significant level as first successful newer approach for cervical radiculopathy with osteophytes removal, decompression and discectomy by PECD anterolateral (transforaminal approach) under general anesthesia at our center. This MIS PECD anterolateral approach is less tissue damage and a way to easily access up to transforaminal process to osteophytes and nerve roots for decompression.

Results: Short duration of hospital stay (3 days) after the surgery. There was less amount of blood loss during surgery approximately 100 ml. Operative time was 180 minutes. There was dramatic improvement of preoperative VAS score from 7/10 to 3/10. After surgery drain was fixed for 24 hours to collect some residual fluids and avoid hematomas. There were no significant post-operative events or surgery-related complications such as dysphagia, Horner syndrome, recurrent laryngeal nerve palsy, vagus nerve injury, tracheoesophageal injury, or cervical hematocele. Patient improved their clinical symptoms after operation. Patients were advised to wear cervical collar for 3 weeks.

Post-operative CT and MRI and regular follow up done which show no disc narrowing, instability of cervical spine or no any sign of compression and stenosis and total removal of osteophytes and drilling tunnel. No any uneventful feature found.

Conclusion: This surgical Procedure is superior easy access to the pathological structure than traditional open method. It minimalizes structural tissue damage and the risk of vertebral artery puncture. Under the direct visual and percutaneous endoscopic system, it is easy to visualize the proper minute structure, drill, dissect and lessen the chance of iatrogenic injury. This anterior transformaminal endoscopic surgical approach can be further developed and trained for the treatment of cervical radiculopathy in large population

PO61

MISS-TLIF Assisted By Quandrant Or Pipeline Tube System For The Management Of Lumbar Spondylolisthesis

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Purpose: To evaluate the clinical effects of Minimally invasive transforaminal lumbar interbody fusion(MISS-TLIF) assisted by Quandrant or Pipeline tube system for the management of lumbar spondylolisthesis

Methods: From October 2008 to February 2011, 21 patients suffering from lumbar spondylolisthesis were treated by minimally invasive transforaminal lumbar interbody fusion(MISS-TLIF) assisted by Quandrant or Pipeline tube system and percutaneous or mini-open pedicle screw fixation. There were 12 males and 9 females, with an average age of 58.6(range from 52 to 76 years old).There were 13 lumbar degenerative spondylolisthesis, 8 lumbar isthmic spondylolisthesis, all of which were Ⅰ degree spondylolisthesis. All patients had the symptom of low back pain and intermittent claudication, and 11 patients also suffered from radicular leg pain. The average operating time was 165min, the average blood loss was 86ml; The surgery effects were evaluated according to Oswestry disability index(ODI) and Visual analogue scale(VAS). The results of lnterbody fusion were evaluated by postoperative X-ray and three-Dimensional CT.

Results: The follow-up investigation ranged from 16 to 35 months, with an average follow-up time of 24.6 months. The average VAS scores of all the patients were 7.5, which reduced to 2.6 three months after the surgery and to 1.5 six months after the operation, which had significant differences preoperatively and postoperatively($p<0.01$).The average ODI scores of all the patients were 63.7, which reduced to 21.3 three months after the surgery and to 13.6 six months after the operation, which also had significant differences preoperatively and postoperatively($p<0.01$).Among the 12 patients who had follow-up investigation for more than 12 months, 11 patients got osseous fusion and callus growth could be seen between vertebral body in the other 1 patient. There were no cases of internal fixation loosening and breakage. Hyperalgesia and burning-like neuralgia in the control area of L5 and S1 nerve root appeared in 2 patients 2 days and 3 days after the operation, which relieved after symptomatic treatment and then disappeared 3 months later after the operation. There were no permanent nerve root impairment and infection.

Conclusions: Minimally Invasive Spine Surgery-Transforaminal Lumbar Interbody Fusion(MISS-TLIF) assisted by Quandrant or Pipeline tube system is a safe, effective and minimally- invasive way for the management of lumbar spondylolisthesis, which has the advantages of less injury, less blood loss, faster rehabilitation. The key point of successful surgery is choosing your patients properly

Poster

PO62

Application Of Percutaneous Transforminal Spinal Endoscopy In Surgical Treatment Pf Recurrent Lumbar Degenerative Diseases

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Purpose: Surgical scar and adhesions is one of the challenges of surgical treatment of recurrent lumbar degenerative diseases. In this study, avoiding the posterior approach, percutaneous transforminal spinal endoscopy was used for surgical treatment of recurrent lumbar degenerative diseases.

Methods: A total of 9 patients, 4 males and 5 females with an average age of 48.3 years, with recurrent lumbar degenerative disease were included to this study, including 4 cases of lumbar intervertebral disc herniation, 3 cases of lumbar spinal stenosis, and 2 cases of spondylolisthesis. All cases were investigated by MRI, CT or CTM examination to diagnose recurrence of lumbar disc herniation, spinal steonosis, or clearly nerve root compression. Then, these patients was undergone percutaneous transforminal spinal endoscopic surgery (discetomy, spinal cannal or lumbar nerve root decompression). The patients were followed up for an average of 18 months. The postoperative curative effect was assessed by visual analogue pain score (VAS) and ODI function score.

Results: The effect of revision surgery was statistically significant for the recurrence of lumbar disc herniation, lumbar spinal stenosis and lumbar spondylolisthesis. The post-operative improvement rate of VAS score was 92.3% ($p < 0.05$), 88.5% ($p < 0.05$) and 85.1%, respectively, and the improvement rate of ODI function score was 90.6% ($p < 0.05$), 85.5% ($p < 0.05$) and 83.1% ($p < 0.05$), respectively. As to surgical complications, there was one case of patients with nerve root injury, but nerve function was fully recovered after conservative treatment for 3 months.

Conclusion: Percutaneous transforminal spinal endoscopic surgery is an effective atternative approach for surgical treatment of recurrent lumbar degenerative diseases.

Key words: Recurrent lumbar degenerative disease; transforaminal spinal endoscopy; revision surgery

PO63

The Nerve Root Sedimentation Sign For Differential Diagnosis Of Lumbar Spinal Stenosis: A Retrospective, Consecutive Cohort Study

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Purpose: Using MR imaging, nerve root sedimentation sign (SedSign) was demonstrated to have a high sensitivity and specificity for diagnosis of symptomatic lumbar spinal stenosis (LSS) in selected patients. This study was to evaluate the diagnostic value of SedSign in differential diagnosis of LSS and non-specific low back pain (LBP) in consecutive patients.

Methods: A series of consecutive patients with lumbar spinal MRI examination for back/leg pain in orthopeadic clinic were included. These patients were followed up and divided into two groups, symptomatic LSS and non-specific LBP, according to symptoms and radiological findings. Using MR images, SedSign was assessed by two spine surgeons and one radiologist independently. Then sensitivity and specificity of SedSign was calculated.

Result: A total of 320 patients (105 LSS and 215 non-specific LBP) were included. The SedSign had a sensitivity of 77.1% and specificity of 47.0% in the whole cohort. When these patients were stratified by dural sac cross-sectional areas (CSA), the SedSign had a sensitivity of 95.0% and specificity of 4.7% in patients with CSA≤80 mm^2 (Severe radiologic stenosis), sensitivity of 74.2% and specificity of 22.6% in patients with CSA 80-100 mm^2 (Moderate radiologic stenosis), and sensitivity of 58.8 % and specificity of 61.0% in patients with CSA 100-120 mm^2 (Mild radiologic stenosis). In selected cases composed by LSS patients with CSA≤80mm^2 and non-specific LBP patients with CSA >120mm^2, however, the SedSign had a sensitivity of 95.0% and specificity of 80.0%.

Conclusion: The present data demonstrated that the SedSign was not able to discriminate symptomatic LSS from non-specific LBP after adjusting by dural sac CSA. The diagnostic value of the SedSign was still uncertain.

Poster

PO64

Percutaneous Transforaminal Endoscopic Discectomy In The Treatment Of Complex Degenerative Lumbar Disease For Senior Patients

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2. The Third Hospital of shijiazhuang

Objective: The efficacy of percutaneous transforaminal endoscopic discectomy (PTED) in the treatment of complex degenerative lumbar disease for senior patients and its application were analyzed and studied.

Materials and methods: We retrospectively reviewed the clinical and follow-up data of senior patients with degenerative lumbar diseases. Patients who underwent transforaminal endoscopic spine surgery were divided into Endoscope Group (group E); patients who underwent traditional open reduction and internal fixation were divided into Open Group (group O). The indices, such as operation time, fluoroscopy time, blood loss, postoperative complications, VAS and JOA scores were analyzed.

Results: Compared with group O, the operation time and intraoperative blood loss were lower in group E while the intraoperative fluoroscopy time was higher. VAS and JOA scores of the two groups were statistically significant before and after surgery, and there was no significant difference between the two groups before and twelve months after surgery, while the scores one week after surgery in group E was better than group O. CCI scores in group E before surgery was significantly higher than group O. The incidence of venous thrombosis of the lower extremities in group E was lower than group O. In group O, the incidence of constipation, urinary system infection, and wound infection after surgery were 56.7%, 19.5%, and 9.4%. The number of patients who had gastrointestinal hemorrhagic stress ulcer, pneumonia, pulmonary embolism, myocardial infarction caused death, cerebral infarction caused death, cerebral hemorrhage causes hemiplegia after surgery were 12, 3, 2, 1, 1 and 1. Patients in group E didn't have these complications.

Conclusions: PTED has less trauma and low incidence of severe complications. It is a safe and effective minimally invasive method for senior patients with complex degenerative lumbar diseases, especially for those with underlying diseases and high risks of anesthesia.

PO65

Analysis Of Complications Of Percutaneous Endoscopic Interlaminar Lumbar Discectomy

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Objective: To analyze the complications of lumbar intervertebral disc herniation treated with percutaneous endoscopic interlaminar discectomy(PEID), and discuss how to avoid thesecomplication.

Methods: The date of 230 patients with lumbar intervertebral disc herniation underwent PEID from march 2014 and March 2017 were retrospectivelu analyzed, including 110 males and 120 females with an average age of 46.2 years old.There were 3 cases of L3/4， 75 of L4/5 and 152 of L5S1.The incidences of intraoperative and postoperative complications were analyzed.

Results: There was spinal dura mater injury in 4 patients(adhesion between nucleus pulposus and spinal duramater), 2 cases continue to finish operation by PEID, 1 case of postoperative cerebrospinal fluid leakage and hypodermic cyst formation, disappear after compression bandage, 2 cases of intraoperative epidural crevasse is bigger, horsetail overflow disturb the endoscopic operation and changed to open surgery immediately, but no nerve function deficit was found,the muscle strength did not decrease postoperatively and the incision healed well. 6 patients complicated with early recurrence (in 3 months); nucleus pulposus residue developed in 5 patients; all of them were treated by PEID or PETD and got satisfactory results. A case of intervertebral space infection occurred and recovery by anti-infection treatment. 2 patients with the increased cerebrospinal fluid pressure intraoperative and complied with transient neurologic dysfunction after surgery, was improved by symptomatic treatment. In 20 cases, numbness increased after surgery, and were healed by use of neurotrophic drugs after 3 months.

Conclusion: PEID have a steep learning curve, and the technology is a safe and effective method in treating lumbar disc herniation, but the beginners must have enough open surgery experence, and to grasp indications strictly.

Keywords: Percutaneous; endoscopic; interlaminar; discectomy; Complications

PO66

Percutaneous Endoscopic Transforaminal Discectomy For Lumbar Disc Herniation: Clinical Observation And Prognostic Factors Analysis

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Objective: To investigate the Clinical efficacy of percutaneous endoscopic transforaminal discectomy（PETD） for lumbar disc herniation（LDH）, and to explore the related factors affecting the clinical efficacy of PETD for LDH. Providing the basis for the application of this technique in the treatment of LDH.

Methods: The study design was a prospective cohort study. We selected patients based on inclusion and exclusion criteria from August 2013 to August 2014 in our hospital diagnosis of LDH and treated with PETD. The VAS score, OSWESTRY Disability index and JOA score was evaluated at 1 day preoperative, 1 day postoperative and 3, 6 and 12month follow-up, the clinical efficacy was assessmented, and using single-factor analysis analyzing the 12 possible factors, then to proceed the multiple-factor analysis with Logistic regression from the significant related factors of single-factor

Results: The study enrolled 126 patients, there were 68 patients with complete follow-up data for one year, including 52 males and 16 females, mean age of 45.26 ± 14.65 years (19ys to 88ys), the herniation Segment was 7 cases for L3-4, 25 cases for L4-5 and 36 cases for L5-S1, the mean follow-up were 14.7(12-16 months). According to the evaluation criteria of the modified MacNab, excellent rate was 88.3%, the total efficiency was 94.1%, the complication rate was 1.5%, the recurrence rate was 4.4%. With respect to the preoperative leg and lumbar pain VAS score, ODI index and JOA score, the scores were significantly decreased at the first day postoperative and three, six and twelve months follow-up, meanwhile, JOA score increased significantly ($P < 0.001$). For single factor suggest that significant postoperative pain relief at MSU size 2 and 3, MSU location of type B, Pfirrmann grade IV, the difference was statistically significant ($P \leq 0.05$); The major postoperative functional upgrade was associated with BMI, herniation nucleus size, straight leg raising test and lumbar disc degeneration($P \leq 0.05$). By multiple-factor analysis with Logistic regression analysis, there were two factors showed independent significance, included herniation nucleus size and straight leg raising test (OR values respectively 5.673 and 5.283), indicating that the two factors may be an independent factor affected the clinical efficacy of PETD.

Conclusion: PETD can achieve good results for treating lumbar disc herniation. BMI, straight leg raising test, the size of disc herniation, disc protrusion position and degeneration degrees are relevant factors can affect the clinical efficacy of PETD. The straight leg raising test and the size of herniation disc may be the major independent factors.

PO67

Surgical Removal Of Cervical Intradural Lesions Using Unilateral Hemi-semi-laminectomy Technique: The Most Minimally Invasive Approach?

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Objective: To evaluate the efficacy, safety and technical considerations of minimally invasive surgical removal of cervical intraspinal lesions with the unilateral hemi-semi-laminectomy approach.

Methods: A retrospective review was conducted on patients who underwent minimally invasive resection of cervical intradural-extramedullary lesions at the Second Affiliated Hospital of Zhejiang University School of Medicine. By using a microscope or a combination of microscope and endoscope, the authors were able to treat all patients with a unilateral, paramedian, hemi-semi-laminectomy technique. Data including preoperative neurological conditions, lesion location and size, pathological diagnosis, intraoperative blood loss, length of hospital stay, and clinical outcomes were obtained through clinical and radiological examinations.

Results: Forty-nine patients diagnosed with cervical intradural-extramedullary tumours were treated from September 2013 to September 2016. There were 29 males and 20 females with an average age of 43.9 years old. Pathological examinations revealed 26 schwannomas, 14 meningiomas, 3 cavernous haemangiomas, 3 enterogenous cysts, 2 hemangioblastomas, and 1 chondroma. The estimated blood loss was about 20 – 50 mL, and the average operative time is 109 min, with an average postoperative hospital stay of 4.7 days. Clinical follow-up revealed relief of patients' symptoms, e.g. reduced pain level and improved neurological functions, and there was no sign of relapse in any of the patient during the follow-up.

Conclusion: Given the anatomical feature like relative small and thin lamina, the intradural cervical lesions were readily accessible via the key-hole approach after lateral retraction of the muscle. The advancement in surgical microscope, endoscope, microsurgical instruments and navigation systems also make it possible to access those lesions at the expense of even fewer bony structures. Accumulation of surgical experiences, strict patient selection and careful preoperative surgical planning were the key elements to the success of management of cervical intraspinal lesions with this unilateral hemi-semi-laminectomy technique.

Keywords: Cervical; Intradural extramedullary; Minimally invasive; Unilateral hemi-semi-laminectomy; Microscope; Endoscope

Poster

PO68

Treatment Strategy Of Percutaneously Endoscopic Decompression For Highly Migrated Lumbar Disc Fragment

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Peking University Third Hospital

Purpose: To investigate the treatment strategy of percutaneous endoscopic decompression for highly migrated lumbar disc fragment.

Method: Highly migrated disc fragment was defined as the extent of disc migration greater than the posterior marginal disc height measured from the adjacent endplate level on T2-weighted sagittal magnetic resonance image. Patients with highly migrated disc fragment were treated with PELD in Peking University Third Hospital pain medicine center from September 2014 to September 2017. Inter/translaminar approach, transforaminal(TESSYS) approach, modified TESSYS approach, supra/transpedicle approach, supra/transpedicle approach combined with TESSYS were used during the PELD surgery.

Results: Down-migrated disc fragment at L5-S1 level is the best indication of Interlaminar approach. Down-migrated disc fragment at L4-L5 level with large interlaminar space, which isn't connected with disc space, is also the indication of Interlaminar approach. Transforaminal(TESSYS) approach can be used in the migrated disc fragment connected with disc space at all levels. Modified TESSYS approach is suitable for up-migrated disc fragment. Once TESSYS failed to remove giant down-migrated disc fragment, additional supra/transpedicle approach is needed.

Conclusions: The patient with highly migrated disc fragment is easy for open surgery, but a challenge for endoscopic surgery. The level of herniation, the migrated direction of disc fragment, relationship between the migrated disc fragment and disc space, relationship between the migrated disc fragment and nerve root in the axial MRI images, suitable surgical instruments are the factors for surgeons to choose surgical approach. Proper surgical approach will get twice the result with half the effort.

PO69

Complications Of Percutaneous Endoscopic Lumbar Discectomy : Experiences And Literature Review

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Purpose: To explore the type, morbidity, risk factors and treatment strategies of postoperative complication following percutaneous endoscopic lumbar discectomy (PELD) surgery.

Overview of Literature: PELD became one of the main operation methods for degenerative lumbar diseases, including disc herniation, stenosis and discogenic low back pain. However, complications following PELD surgery are a considerable challenge for spinal surgeons and seldom addressed publicly.

Methods: More than 10000 patients after PELD surgery were studied. These surgeries were finished by 6 surgeons from 3 main minimal invasive spine centers from January 2012 to June 2017. Most of patients are regularly followed up to explore the type, morbidity, risk factors and treatment strategies of postoperative complication following PELD surgery.

Results: There are 2 patients died in the perioperative period and 2 patients with permanent impairment of neural function after surgery, which should be the severest complication of PELD surgery. Transient paresthesia, intraoperative bleeding and dura sac tear are the most common complications reported by 6 surgeons. There are 2 suspected cases of postoperative hematoma, several cases of surgical instruments broken during the surgery and estimated 20 cases of infection in 10000 patients, regarded as rare complications of PELD. Recurrence rate of PELD surgery is 4.7-6% reported by 3 surgeons. However, Recurrence defined as complications of PELD surgery remain controversial.

Conclusions: Excellent clinical outcome of large case series after PELD surgery is reported. However, we need to face the limitations and complications of the surgery. The complication rate should be reduced by caring about the treatment, surgical indications strictly selected and the guidance of experienced surgeons.

Poster

PO70

The Spinal Canal Was Eroded By Schmorl's Node Mimicking A Spinal Tumor: A Case Report

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The prevalence rate of Schmorl's nodes (SNs) accounts for 30%-76% in the general population, however, it was very rare that the spinal canal was eroded by Schmorl's node directly. Previous studies showed that osteolytic SNs and spinal tumor could cause similar clinical symptoms. Hence, it is very important to distinguish osteolytic SNs and spinal tumor in order to provide an optimal treatment for patients. A rare case on the back wall of lumbar vertebral body was eroded by SN , nucleus pulposus herniated through the ruptured wall and the spinal dura and nerve root was compressed occurred in our clinical practice.

PU01

Endoscopic Discectomy: Transforaminal Or Interlaminar Approaches

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Introduction: The rapid increaseof minimal invasive surgeries of intervertebral disc hernia was observed in thelast two decades. Some authors think that endoscopic surgery has strict limits, while others suggest it for all cases [1-3]. Endoscopic surgery can be performed through transforaminal orinterlaminar approach. We have performed both of them for the comparison of theresults.

Material and method: Themethod of endoscopic surgery through transforaminal approach has been performed in 487 cases during the last 5 years. In 187 cases interlaminar or transforaminal approach was performed. Operations were done under general or epidural anesthesia. Results: The generalcriteria for assessing the outcomes was pain syndrome. In both groups the results were identical: in89.6% cases the results were excellent or good, in 2,5% cases the results wereenough, in 1% cases the results were bad because of inflammatory complicationsand in 6,9% cases the patients were re-operated because of reherniation.

Discussion: In our practicedifficulties were seen in three conditions, in the group of patients whom transforaminal approach was performed. In the first case it was impossible to perform discectomy, as the disc space was very narrow than the diameter of the forceps. The second case is typical for surgery on level L5-S1 in patients with high located cresta ilica and the thrird case was difficult because of bilateral spinal canal stenosis. The surgery through the interlaminar or transforaminal approaches can be performed in all cases. We compared the surgical approaches of both methods. The transforamial approach is less invasive than the interlaminar one. This is really an advantage.

Conclusion: The surgical opportunity of the endoscopic surgery is as effective as of the open one and at the same time it is less invasive. It is very important to make a choice between transforaminal or interlaminar surgical approaches depending on the disc level, patients' anatomical peculiarities. For the surgeons who wants to start endoscopic surgery the translaminar approach is more suggested, because it is safer and easier to understand. Keywords: intervertebral disc hernia, endoscopic discectomy, disc hernia extraction, transforaminalapproach, interlaminar approach.

PU02

Treatment Of Adjacent Segmental Disc Herniation After Internal Fixation For Prolapse Of Lumbar Intervertebral Disc With Percutaneous Transforaminal Endoscopy Discectomy

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Foshan Hospital of Traditional Chinese Medicine

Objective: To analyze the clinical effect of adjacent segmental disc herniation atfer internal fixation for prolapse of lumbar intervertebral disc with percutaneous 7.9mm transforaminal endoscopy discectomy.

Methods: Retrospective analysis lumbar fixation of adjacent segment disease (ASD) cases（from 2012.06 to 2016.06）in our hospital.19 patients met the inclusion criteria were judged by imaging for adjacent segmental disc herniation atfer internal fixation for prolapse of lumbar intervertebral disc ,with no spinal instability,no internal fixation displacement and etc.All cases were used percutaneous transforaminal endoscopy discectomy for adjacent target responsibility segments.Then neurotrophic drugs were given after the operation.VAS score was used to evaluate the pain improvement before operation, first days, first weeks after operation, third months, sixth months, twelfth months.Functional improvement was evaluated by ODI index in preoperative and last follow-up,and the curative effect was evaluated by modified Macnab method.

ResuIts: All operations were successfully completed, no serious complications occurred during the operation, first days'(2.25 + 0.64), first weeks' (2.35 + 0.75), third months' (1.90 + 0.64), sixth months'(1.85 + 0.59), twelfth months' VAS scores' (1.75 + 0.85) were significantly lower than that before operation (7.90 + 0.72) ($P < 0.05$).The preoperative ODI index decreased from (66.90 + 1.89)% to the last follow-up (17.90 + 2.38)%, with the difference was statistically significant ($P < 0.05$) .The modified Macnab score was excellent in 5 cases, good in 9 cases, fair in 5 cases and poor in 0 cases. The excellent and good rate was 73.68%.

Conclusion: The method of percutaneous 7.9mm transforaminal endoscopy technique for internal fixation of adjacent intervertebral disc herniation is feasible, simple operation, small trauma and relatively low cost. It can avoid the original internal fixation surgery area behind the accurate surgical approach, reducing the barriers, which is worthy of clinical promotion.

PU03

The Safety And Efficacy Of Minimally Invasive Discectomy: A Meta-Analysis Of Prospective Randomized Controlled Trials

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Purpose: The objective of this study was to compare the safety and efficacy of minimally invasive discectomy (MID) with the standard discectomy (SD) and determine whether the use of MID technique could decrease the recurrence of lumbar disc herniation (LDH) after the surgery.

Methods: In February 2014, comprehensive search was performed in Pubmed, EMBASE, Web of science, Cochrane library, and the China Biological Medicine Database. Only randomized controlled trials (RCT) that compared MID with the SD of the surgical management to LDH were included. These trials were carefully picked out following the inclusion and exclusion criteria. Using the Cochrane collaboration guidelines, two authors independently extracted data and assessed these trials' quality. The age of the patients, size of incision, surgical time, blood loss, Visual Analog Scale (VAS) score after the surgery, hospital stay, disc herniation recurrence, X-ray exposure, and the surgical costs in these studies were abstracted and synthesized by a meta-analysis with Revman 5.2.0 software, and the main results (VAS score after the surgery and disc herniation recurrence) of publication bias were examined by stata 12.0.

Results: Overall, 16 trials involving 2139 patients meeting our criteria were included and analyzed. Comparing MID and SD, the former was more likely to increase disc herniation recurrence [RR=1.95, 95%CI (1.19, 3.19), p=0.008]. And it had little size of incision [MD=-1.91, 95%CI (-3.33, -0.50), p=0.008], a shorter hospital stay, spend more operation time [MD=11.03, 95%CI (6.62, 15.44), p<0.00001] and with less blood loss [MD=-13.56, 95%CI (-22.26, -4.87), p=0.002]. While no statistical difference appeared with regard to the age of the patients, VAS score after the surgery, X-ray exposure, hospital stay and the surgical costs.

Conclusions: Based on available evidence, the MID results in less suffering for patients during the hospital course with the similar clinical efficacy compared to the SD. This makes the MID a promising procedure for patients with lumbar disc herniation, however to popularize it asking for more effort to reduce disc herniation recurrence.

PU04

Mixed Reality Guided Percutaneous Transforaminal Endoscopic Discectomy For Lumbar Disc Herniation: A Series Of 10 Cases

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Objective: To demonstrate the feasible of mixed reality (MR) technique assisting lumbar transforaminal puncture in patients underwent percutaneous transforaminal endoscopic discectomy.

Methods: Ten patients with lumbar disc herniation failed to conservative treatment were studied. All of them had indications of percutaneous transforaminal endoscopic discectomy. Intraoperatively, CT-based mixed-reality navigation of transforaminal puncture were performed. After the procedure, a G-arm scan were conducted to confirm the deviation. The primary outcome was puncture error, which evaluated in the coronal and sagittal section of CT image (x, y, z-axis) by measuring the distance of puncture target between mixed reality based navigation and traditional G-arm prediction. The secondary outcome were puncture relative complication, time of puncture, and etc.

Results : In our study, no complication occurred in these patients followed by 3 months. The mean puncture error in coronal section was 2.53±1.02 mm. The mean puncture error in sagittal section was 3.20±1.56 mm. Mean overall time of puncture was 10.2±4.2 min.

Conclusion: Compared with the conventional G-arm guidance, the mixed reality navigation can accurately guide the lumbar transforaminal puncture with full-endoscopic technique and reduce radiation risk. However, further large sample and compared studies were required to validate the new technology.

Keywords: Mixed reality, Percutaneous transforaminal endoscopic discectomy, Transforaminal puncture, Lumbar disc herniation

PU05

Implications Of Morphometric Measurements Related To The Exiting Root And Traversing Root In Percutaneous Transforaminal Endoscopic Lumbar Discectomy: MRI Analysis

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Purpose: Injuries of the nerve root and dura mater, owing to the blind puncture procedure, are the common potential complications in percutaneous transforaminal endoscopic lumbar discectomy (PTED). This study aimed to obtain measurements in the vicinity of the exiting root (ER) and traversing root (TR) using lumbar-spinal magnetic resonance imaging (MRI) and to seek for the radiological evidence for a safe puncture approach.

Methods: In this study, lumbar-spinal MRIs of 143 outpatients were retrospectively used in radiographic analyses from L2–3 to L5–S1. All the discs showed mild to moderate degeneration (Grade II–IV of Pfirrmann's classification). On the sagittal plane, the vertical distance from the ER to the base of the intervertebral foramen was measured (Distance A), and on the transversal plane the shortest distance from the ER to the superior articular process along the superior/inferior disc margin was measured (Distance B/C). Images of the TR on both the superior and inferior disc margins (Value α) were also evaluated.

Results: On the sagittal plane, Distance A was 9.95±1.82 mm. On the transversal plane, Distance B was 2.49±0.57 mm and Distance C was 6.41±2.34 mm. Distance A decreased caudally except at L4–5, Distance B remained comparatively stable, and Distance C increased caudally except at L2–3. At lower lumbar levels, the TR was more likely to be visible in MRI, particularly on the inferior disc margin plane (40.6% at L4–5 and 87.4% at L5–S1).

Conclusions: In routine cases of lumbar disc herniation in the spinal canal, we recommend the puncture target be located on the base of the superior articular process and the transversal puncture angle be determined based on the MRI-visible TR at lower lumbar levels. This approach may help to improve the puncture safety in PTED.

PU06

Percutaneous Endoscopic Surgery For Removal Of Leaked Bone Cement After Percutaneous Vertebra Plasty

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Background: Percutaneous vertebra plasty(PVP) has long been a popular technique for osteoporosis compression fracture of vertebra. Leakage of bone cement is an intraoperative complication of PVP. The conventional open surgery is traumatic for the patients. Moreover, psychologically, it's hard for the patients to receive an open revision surgery after a fainled minimally invasive surgery. The technique of percutaneous endoscopic transforaminal lumbar discectomy (PELD) has rapidly evolved and is currently becoming a preferred choice for lumbar disc herniation. However, as far as we know, no literature reported percutaneous endoscopic revision surgery for leakage of bone cement after PVP. Compared with open revision surgery, percutaneous endoscopic surgery for removal of leaked bone cement after PVP is less invasive and more likely to be accepted by the patients.

Objectives: To evaluate the short-term analgesic effect of percutaneous endoscopic lumbar discectomy via pedicle and to present this technique as an option for treating the highly down-migrated lumbar disc.

Objectives: To introduce the technical possibility and evaluate the clinical effect of percutaneous endoscopic surgery for the removal of leaked bone cement after percutaneous vertebroplasty (PVP). Study Design: Single-center retrospective observational study.

Methods: We reviewed 2 patients who underwent percutaneous endoscopic surgery for the removal of leaked bone cement after PVP. The surgery was performed under local analgesia, in the prone position, with C-arm fluoroscopy guidance. The surgical approach was similar to conventional PELD. The leaked cement was removed with the assistance of burr. Results: A positive clinical response was achieved in the patients according to physical examination and imaging results.

Limitations: This study is limited by its sample size.

Conclusions: Percutaneous endoscopic surgery is a effective surgery for removal of leaked bone cement after PVP

PU07

Percutaneous Endoscopic Lumbar Discectomy Combined With Non-fusion Internal Fixation For Huge Lumbar Disc Herniation

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Objective: To evaluate the safety, feasibility and clinical efficacy of percutaneous endoscopic lumbar discectomy combined with PEEK rod dynamic fixation via minimally invasive channel for huge lumbar disc herniation.

Methods: from June 2014 to October 2015, 21 patients were treated with percutaneous endoscopic lumbar discectomy combined with PEEK rod dynamic fixation via a minimally invasive channel. Visual analogue scale(VAS) scores (back, leg) were recorded before operation and at 1 days, 1, 3, 6 months, the latest follow-up after operation. Oswestry Disability Indexes (ODI) were recorded before operation and at the latest follow-up after operation. The latest follow-up modified Macnab scale were recorded. All the data were statistically analyzed to evaluate the clinical efficacy.

Results: All the patients underwent operation successfully. Follow-up (range, 7-22 months, mean 13±4.1 months) was achieved in 21 patients. The mean operation time was 189.8 ± 50. 6min. And the mean blood loss was 102.4 ± 88. 7ml. The mean hospital stay was 9 ± 3. 1d. VAS scores(back) improved significantly at postoperative 3, 6months, as well as well as the latest follow-up compared to the preoperative scores, the difference was statistically significant($P<0.05$). VAS scores(leg) improved significantly at postoperative 1 days and 1, 3, 6months, as well as well as the latest follow-up compared to the preoperative scores, the difference was statistically significant($P<0.05$). There was an increase in VAS scores(back) at postoperative 1 day compared to the preoperative scores, the difference was statistically significant($P<0.05$). VAS score(back) at postoperative 1 months compared to the preoperative scores was not statistically significant($P>0.05$). The latest follow-up modified Macnab scale shows that 18 excellent, 2 good and 1 fair.

Conclusions: The technique is reliable and effective in treatment of huge lumbar disc herniation.

PU08

Percutaneous Endoscopic Discectomy For The Treatment Of Cervical Spondylotic Radiculopathy: Preliminary Clinical Observation

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Objective: To investigate the clinical efficacy and safety of percutaneous endoscopic discectomy for the treatment of cervical disc herniation with spondylotic radiculopathy.

Methods: Five patients (mean age 48.8 yrs, one man) with posterolateral cervical disc herniation with spondylotic radiculopathy were performed between Nov 1st, 2016 and May 30th,2017. The patients suffered from upper limb pain and numbness for an average of 5 months, and maganetic resonance imaging confirmedcervical disc herniation at C5/6. Under general anaesthesia, percutaneous endoscopic discectomy. The visual analog score (VAS) and neck disability index (NDI) were compared before and after the surgery. The operation time, blood loss, and complications were recorded to assess the safety.

Results: The average operation time was 122±19.4 minutes, with an average bleeding of 27±9.7 ml. The VAS decreased after surgery (5.6±0.9 vs 1.8±0.4). At 6-month follow-up, both the VAS (5.6±0.9 vs 0.8±0.8) and NDI (41.8±3.0% vs 10.2±3.9%) decreased substantially. One patient had thumb numbness and another patient had triceps weakness after the operation. No spinal cord injury or massive bleeding occurred during the operation.

Conclusion: Percutaneous endoscopic discectomy was a safe and effective minimally invasive surgery to treat posterolateral cervical disc herniation with spondylotic radiculopathy.

Keywords

PU09

Surgical Treament Of Lumbar Spine With Percutaneous Plasma Nucleoplasty

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Objective: Improvement of specialized medical service to patients with degenerative

diseases of spine by mini invasive high-tech treatment methods.

Materials and methods: Plasma nucleoplasty was performed in 56 patients at the age of 18 to 62 yearswith lumbar disc herniation. Indication was disc herniation without relapse of fibrous annulus in MRI with clinical symptoms. Coblation in the lumbar spine was made in patients. All patients before surgery received conservative treatment which did not give any effect. Preoperative examination included clinical, radiological, and MRI studies. Every patient was tested with VAS and JOA before and after the procedures. Procedure was performed under C arm x ray control.

Results: Examinations were performed in all patients at 1 to 12months after nucleoplasty. It isrevealed a reduction of herniation by 1.2mm–3.3 mm in 56 patients. Five patients did not present herniation reduction but a change to drop-shaped form accounted for a decrease in intradisc pressure.

Conclusion: Conducted mini invasive nucleoplasty patients with degeneration of lumbar part of spine brings to decreasing of pain syndrome, reducing of volume of disc and dropping of intradisc pressure.

Keywords degenerative disease of the spine, disc herniation, nucleoplasty

PU10

Percutaneous Endoscopic Treatment Of Special Types Of Lumbar Disc Herniation

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Objective: To investigate the clinical application of special puncture channel for special type of lumbar disc herniation (L5-S1 far lateral lumbar disc herniation).

Method: Screening 15 patients with L5-S1 the far lateral lumbar disc herniation, high iliac crest and the people who`s transverse hypertrophy lead to conventional puncture approach is difficult, Using the proximal articular process, the large angle vertical puncture was performed by percutaneous endoscopic discectomy.

Results: 14 patients were successfully completed operation, postoperative symptoms and signs were relieved, one case can not bear the pain did not complete the operation.

Conclusion: high iliac crest、transverse hypertrophy , L5-S1 far lateral lumbar disc herniation unable to use conventional lateral puncture approach, can not achieve the purpose of minimally invasive treatment, using near facet, large angle vertical puncture percutaneous endoscopic discectomy can effectively solve the problem of the puncture of lumbar intervertebral disc herniation.

PU11

Percutaneous Endoscopic Interlaminar Approach: Medial Foraminal Decompression In Treating Lumbar Disc Herniation Or Spinal Stenosis

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Background: The technique of transforaminal endoscopic spine surgery is being widely used for lumbar degenerative diseases. But the interlaminar endoscopic surgery, which is more familiar and easier to be operated for spine surgeons, is more easily applied by traditionally trained surgeons.

Objective: We propose the technique of percutaneous endoscopic medial foraminal decompression through interlaminar approach for the treatment of lumbar disc herniation (LDH) and spinal stenosis (LSS), and to explore the safety and efficacy of using this technique clinically.

Methods: Thirty-two LDH and eleven LSS patients received medial foraminal decompression surgery with 22.6±7.9 months follow-up. Through interlaminar space, we are able to perform discectomy and lateral recess decompression to decompress the medial foraminal area. Clinical efficacy was assessed by calculating the scores of VAS, SF-36, and lumbar disease JOA and ODI respectively at preoperative, postoperative and the discharge period, 3-6 months postoperatively and the final follow-up time pointwhen patients were considered having received maximum surgical benefit. Follow-up time period varied because of the patients' follow-up logistics in China serving a large referral area made it difficult for rural patients to return at established intervals for the study.

Results: For both LDH and LSS patients, the observational indexes of the follow-up time points showed significant differences compared with those preoperatively ($P<0.01$). Surgical results were assessed according to JOA scores: 22 cases were excellent, 16 cases were good, and 5 cases were fair by modified MacNab criteria. The satisfaction rate of PEMFD was 88.37% during the follow-up period with the improvement of daily life quality. One patient had postoperative radiation calf pain and foot numbness, and another one had the dorsal remnant of the dural sac without symptom.

Conclusion: The treatment for LDH and LSS with medial foraminal decompression is safe and effective with minimal tissue trauma, less surgical morbidity to the lumbar canal, with full decompression of nerve roots and the cauda equina. It is more similar to traditional open surgery and easier to achieve adequate canal decompression, especially for LSS.

PU12

Remnant Fragments After Percutaneous Transforaminal Endoscopic Surgery: How It Happened And Which Is Preferred Revision?

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Objective: To analyze the cause and the revision strategy of remnant fragments after percutaneous transforaminal endoscopic surgery.

Methods: Thirteen consecutive patients with remnant fragments after percutaneous transforaminal endoscopic surgery received re-operation from August 2012 to December 2015. There were lumbar disc herniation in 7 cases, lumbar disc herniation with lateral recess stenosis in 4 cases, and lateral recess stenosis in 2 cases. Seven cases with lumbar disc herniation included posterolateral protrusion in 2 cases, high-grade migration in 2 cases, extreme lateral herniation in 1 case and calcified central protrusion in 2 cases respectively. Re-operations were performed for 6 cases by percutaneous transforaminal endoscopic surgery again, for 4 cases by microendoscopic discectomy, for 1 case by open posterior lumbar interbody fusion and for 2 cases by minimally invasive transforaminal lumbar interbody fusion.

Results: Malposition of working channel (3 cases), missed endoscopic manipulation (4 cases), inadequate decompression at lateral recess stenosis (2 cases), inappropriate indication (2 cases) and comprehensive factors (2 cases) were responsible for the remnant fragments. Completed removal of remnant fragments was confirmed by instant postoperative MRI or CT in all cases. All patients were followed up with a mean duration of 18 months (range, 6-46 months). According to Macnab criteria, Tewelve patients (92%) had a satisfactory outcome (excellent or good) and one patient was considered fair clinical result. There was no recurrence or more revision during follow-up.

Conclusions: Malposition of working channel and missed endoscopic manipulation are the main causes of remnant fragments after percutaneous transforaminal endoscopic surgery, which percutaneous transforamina endoscopic discectomy again or microendoscopic discectomy is the main alternatives for re-operation.

PU13

Trajectory-guided Technique Of Transforaminal Percutaneous Endoscopic Lumbar Discectomy For L5–S1 Lumbar Disc Herniation With High Crest: A Prospective Control Study

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Background: Percutaneous endoscopic lumbar discectomy (PELD) is a popular minimally invasive technique for lumbar disc herniation (LDH) in 2 routes, namely transforaminal (TF-PELD) or interlaminar (IL-PELD). In L5–S1 LDH with high crest, large facet joint, narrow foramen, and small disc space. IL-PELD is preferred in practice because anatomic limitations for TF-PELD. However, it remained questionable whether TF-PELD was equivalent or even superior to IL-PELD when navigator-assisted technique combined with foraminoplasty for L5–S1 cases.

Methods: Navigator-assisted TF-PELD was a validated technique mainly based on isocentric guidance. High iliac crest cases are defined when the iliac crest is above the mid L5 pedicle in lateral radiography. We prospectively evaluated the feasibility of punctureguided TF-PELD versus IL-PELD in L5-S1 LDH cases between May 2014 and March 2016.

Results: A total of 66 patients with paracentral or central LDH by a single surgeon were included in this study, while there were 31 cases in TF-PELD group and 35 cases in IL-PELD group. There were no significant differences in preoperative radiographic assessment such as iliac height, iliosacral angle and foraminal height ($p>0.05$). In addition, there were no significant differences in operation time or improvements of patient-reported outcomes including VAS, ODI, MacNab satisfaction between the two groups during the follow-up ($p>0.05$). However, two cases of dural tear were found in IL-PELD group.

Conclusions: Navigator-assisted technique combined with foraminoplasty was feasible in L5–S1 LDH with high crest, which has equivalent clinical outcomes with IL-PELD but has merits of local anesthesia and non-traction of dura.

PU14

The Effect Of Preoperative Administration Of Morphine In Alleviating Intraoperative Pain of Percutaneous Transforaminal Endoscopic Discectomy Under Local Anesthesia: A STROBE compliant study

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Purpose: Local anesthesia is routinely recommended for percutaneous transforaminal endoscopic discectomy (PTED). However, the intense intraoperative pain remains a serious problem. The purpose of the current study is to find a safe and effective method to alleviate the intense pain during PTED for lumbar disc herniation (LDH) under local anesthesia.

Methods: This study retrospectively analyzed 63 LDH patients who accepted PTED under local anesthesia. 31 patients received intramuscular injection of morphine before PTED while the other 32 were not. The 10 points visual analogue scale (VAS) was used to assess the patients' maximum leg and back pain. Patients were asked to grade their experiences of surgery and anesthesia on a 5-point Likert-type scale after the surgery. Modified Mac Nab Criteria was used to evaluate the surgical outcomes after 3- month follow-up.

Results: The intraoperative VAS scores of patients who accepted preoperative intervention decreased significantly. The postoperative VAS scores of both groups showed no significance. Patients who received preoperative intervention reported a higher subjective satisfaction rate with the surgery experience. According to the Modified Mac Nab criteria, the surgical outcomes of both groups were similar through the 3-month follow-up. After injection of morphine, 4 patients complained nausea and 2 patients experienced vomiting.

Conclusion: Preoperative intramuscular injection of morphine could reduce the patients' pain during the PTED surgery and improve the patients' satisfaction without affecting the surgical outcome. Except for a higher incidence of nausea and vomiting, this method is relatively safe and convenient.

PU15

Endplate Cartilage Avulsion AlwaysOccurred In Non-contained Disc Herniation At Lumbar Spine: Observations Under Percutaneous Endoscopic Discectomy

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Objective: To determine the frequency of endplate cartilage avulsion in lumbar disc herniation and its association with age, gender, and type of disc herniation.

Methods: Between Jan of 2014 to Aug of 2017, all lumbar disc herniation patients who underwent percutaneous endoscopic discectomy at the authors' hospital were included. Disc herniation was classified as contained and non-contained on magnetic resonance images and further confirmed in endoscopy. Cartilage avulsion was first examined under the endoscopic observation. After the herniated disc was removed, the tissues was further inspected to evaluate endplate cartilage avulsion. Cartilage avulsion as rated as present if there was hard and semi-transparent cartilage attached to the disc tissues, and otherwise absent.

Results: In total, 263 patients (mean age 47.4 yrs, 156 men) were underwent endoscopic discectomy. There are 148 (56.3%) cases were classified as non-contained disc herniation, and the other 115 patients as contained disc herniation. Overall, cartilage avulsion was present in 116 (44.1%) patients. Patients with non-contained disc were older than patient with contained disc (48.9±1.0 vs 45.5±1.2, P=0.03). Men were more likely to have non-contained disc herniation (P=0.04). Furthermore, the presence of cartilage avulsion was more frequently observed in non-contained disc herniation (80/148, 54.1%) than that in contained disc herniation (36/115, 31.3%) (P=0.0002).

Conclusions: Cartilage avulsion was common in disc herniation at lumbar spine, especially in non-contained disc herniation.

PU16

Percutaneous Transforaminal Endoscopic Surgery (PTES) For Symptomatic Lumbar Disc Herniation: A New, Easy And Effective Technique In Minimally Invasive Spine Surgery

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Objectives: We designed an easy posterolateral transforaminal endoscopic decompression technique, termed PTES, for radiculopathy secondary to lumbar disc herniation. We found that the entrance point was located at the corner of flat back turning to lateral side, and as high as, or more cranially or slight more caudally than the horizontal line of target disc, which was similar to "All roads lead to Rome (herniated fragment)". We named this entrance point after "Gu's Point". In PTES, press-down enlargement of foramen could make it easy to advance the working cannula into the spine canal between the dura and disc even if the angle of puncture was 45° and to remove the fragments underneath the nerve root and the central dura, even the contralateral nerve root. The purpose is to describe the technique of PTES, evaluate the efficacy and safety for treatment of lumbar disc herniation, and report outcome and complications.

Methods: PTES was performed to treat 328 cases of 1-level intracanal or extracanal herniations with or without extruding or sequestrated fragment, high iliac crest, scoliosis or calcification including recurrent herniation after previous surgical intervention at the index level or adjacent disc herniation after decompression and fusion. Preoperative and postoperative leg pain was evaluated using visual analog scale (VAS) and the results were determined to be excellent, good, fair, or poor according to the MacNab classification at 2-year follow-up.

Results: The mean frequency of intraoperative fluoroscopy was 5（3-14）times per level. The patients were followed for an average of 27.4±3.2 months. The VAS score of leg pain significantly dropped from 9 (6-10) before operation to 1 (0-3) ($P<0.001$) immediately after surgery and to 0 (0-3) ($P<0.001$) 2 years after surgery. At 2-year follow-up, 97.0% (318/328) of the patients showed excellent or good outcomes, 1.8% (6/328) fair and 1.2% (4/328) poor. No patients had any form of permanent iatrogenic nerve damage and a major complication, although there were 1 case of infection and 2 cases of recurrence.

Conclusions: PTES for lumbar disc herniation is an effective and safe method with simple orientation, easy puncture, reduced steps and little X-ray exposure, which can be applied in almost all kinds of lumbar disc herniation, including L5/S1 level with high iliac crest, herniation with scoliosis or calcification, recurrent herniation, adjacent disc herniation after decompression and fusion. The learning curve is no longer steep for surgeons.

PU17

Endoscopic Versus Open Transforaminal Lumbar Interbody Fusion In The Treatment Of Single-level Lumbar Degenerative Diseases: A Prospective Randomized Controlled Trial With A Minimal Follow-up Of 2 Years

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Introduction: Endoscopic transforaminal lumbar interbody fusion (E-TLIF) is technically demanding and requires specialized skills and instruments. Evidences supporting the clinical efficacy and safety of E-TLIF are still in paucity. The objective of this prospective randomized controlled study was to investigate the clinical and radiological outcomes of E-TLIF in the treatment of single-level lumbar degenerative diseases, and compare it with the conventional open transforaminal lumbar interbody fusion (O-TLIF).

Methods: From Sep 2013 to Dec 2014, a total of 80 consecutive patients suffering from single-level lumbar degenerative diseases were recruited. Patients were randomly assigned to receive endoscopic (E-TLIF group) or open (O-TLIF group) surgery. Demographic data and clinical characteristics were collected. Perioperative data, clinical and radiological outcomes were compared between the 2 groups.

Results: Finally, there were 39 patients in E-TLIF group and 36 patients in O-TLIF group available for analysis. Demographic data and clinical characteristics were comparable between the 2 groups ($P > 0.05$). Intraoperative blood loss and amount of transfusion were significantly less in E-TLIF group than those of O-TLIF group ($P < 0.001$). Postoperative ambulatory time and hospital stay were significantly shorter for E-TLIF patients than O-TLIF patients ($P < 0.001$). On the 3rd day postoperation, E-TLIF patients had significantly less back pain (VAS-back) compared to O-TLIF patients ($P < 0.001$); no significant difference was found in leg pain (VAS-leg) between the 2 groups ($P > 0.05$). At 3-month follow-up, E-TLIF patients had significantly better physical function (ODI) than O-TLIF patients ($P = 0.001$). However, no statistical difference existed in VAS-back, VAS-leg and ODI scores between the 2 groups at last follow-up ($P > 0.05$). Complication rate was 10.3% (4/39) for E-TLIF group and 13.9% (5/36) for O-TLIF group ($P > 0.05$). At 2-year follow-up, fusion rate and patients' satisfaction were similar between the 2 groups ($P > 0.05$).

Conclusion: E-TLIF can offer magnification of the operation field and excellent deep visualization, improving the safety of surgery and minimizing iatrogenic injury. E-TLIF was superior to conventional O-TLIF in terms of smaller muscle trauma, less blood loss, decreased need for transfusion, faster recovery and better early postoperative performance.

PU18

Effect Of Percutaneous Endoscopicsurgery In Treatment Of Low Back And Leg Pain After Lumbar Spine On The Posterior Approaches

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Objective : To investigate the clinical application and short- term effect of percutaneous endoscopicsurgery in treatment of low back and leg pain after lumbar spine on the posterior approaches.

Methods: From January 2012 to October 2013, 20 patients with low back and leg pain, who needed reoperations of lumbar vertebrae were treated using percutaneous endoscopicsurgery.There were12 males and 8 females, aged from 35 to 85years old with an average of （51.4±18.9） years. Visual analogue scale（VAS）were compared before and after surgical revision. Macnab standard was used to assess the clinical effect.

Results: All the patients were followed up for 6 months. Preoperative VAS score was 7.30±0.86 , and in 1month, 3 months and 6 months after operation were 2.95±0.60 、1.85±0.67 、1.30±0.66 , respectively , which were significantly decreased when compared with preoperative score ($P<0.05$). According to the modified Macnab criteria, 8 patients got an excellent results, 10good, 2 fair. The nerve root injury of L5 occurred in 1 case during paracentesis and no other complications were found.

Conclusion: For low back and leg pain after lumbar spine on the posterior approaches , percutaneous endoscopicsurgery can avoid the original approach, is minimally invasive , causes few complications and obtain satisfactory clinical outcomes.

PU19

A MRI Study Of Lumbar Plexus With Respect To The Lateral Transpsoas Approach To The Lumbar Spine

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Purpose: To evaluate the relative position between lumbar plexus and access corridor of minimally invasive lateral transpsoas lumbar approach, as well as the approach safety.

Methods: Three-dimensional fast imaging employing steady-state acquisition (3D FIESTA) sequence images of lumbar spine were obtained from 58 patients with lumbar degenerative diseases for reconstruction to analyze the distribution of lumbar plexus from L1–L2 to L4–L5 level with respect to the transpsoas lumbar approach. The axial image distance (AID) between the anterior edge of lumbar plexus and the sagittal central perpendicular line (SCPL) of disc was measured. SCPL was drawn perpendicularly to the sagittal plane of intervertebral disc and it passed through its central point, which is initial dilator trajectory for transpsoas approach. As related to the SCPL of disc, the distance with a positive value was set to indicate neural tissue posterior to it, while anterior to it was represented by a negative value.

Results: In relation to SCPL of disc, the AID of lumbar plexus was measured 13.01 ± 1.70, 8.61 ± 2.26, 1.12 ± 2.37 and -5.42 ± 3.26 mm from L1–L2 to L4–L5 level, respectively, while the AID of genitofemoral nerve was recorded -1.13 ± 2.87, -5.78 ± 2.33 and -10.53 ± 3.30 mm from L2–L3 to L4–L5 level accordingly.

Conclusion: With respect to the SCPL of disc, a trajectory of guide wire or a radiographic reference landmark to place working channel, lumbar plexus lies posteriorly to it from L1–L2 to L3–L4 level and shifts anteriorly to it at L4–L5 level, while genitofemoral nerve locates anteriorly to the SCPL from L2–L3 to L4–L5 level. Neural retraction may take place during sequential dilation of access corridor especially at L4–L5 level.

PU20

Comparing Transforaminal And Interlaminar Learning Curve For Beginners-Case Series And Short Term Results

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Introduction: The necessity of fusion for spinal stenosis has been questioned [2]. Decompression becomes the mainstay of treatment for spinal stenosis. PELD through transforaminal approach for lateral recess stenosis was proved to be effective. [3] The interlaminar approach of PELD for spinal stenosis had little reports. It is challenging to decide whether transforaminal approach or interlaminar approach to utilizing for individual spinal stenotic patients. This research is to analyze decompression effects of two approaches imagewise and functionwise.

Material and Method: Prospective non-randomized spinal stenosis with radiculopathy or claudication case series of 17 cases of PETD (PELD via transforaminal approach) and 8 cases of PEID (PELD via interlaminar approach) for spinal stenosis with unilateral/ bilateral radiculopathy from a single hospital by a single surgeon (author) from 2016/07 to 2017/10. Preoperational and post-operational MRI CT was conducted to verify the area of decompression. SF-36, JOA score, and ODI were recorded preoperatively and postoperatively (immediate postop, 1 month, 3 month and 6 months). Patients were under local anesthesia (2%Xylocaine). No sedation was used and heart rate and blood pressure were controlled with IV medications. Endoscopic high-speed burr was used only in PEID and endoscopic instruments such as Kerrison through single portal were utilized in both approaches. Hemostasis was done with endoscopic electrocautery and IV transamine and no drain was inserted. Patients were discharged one hour after surgery. Non-parametric statistical methods were applied (Mann-Whitney U test). Postop decompression area was compared with using 3D CT reconstruction and imaging registering software.

Results: SF-36, JOA score, and ODI revealed no obvious differences comparing both approaches with unilateral radiculopathy; however, the interlaminar approach has better improvements for bilateral radiculopathy (Mann-Whitney U test). Bleeding and operation time were comparable for both approaches and to literature [4] Surgical time was analyzed by dividing the video into bony procedures (foraminoplasty or laminotomy)., hemostasis, ligamentum flavum removal and annuloplasty. Surgical time was obviously shorter than for transforaminal approach (40min/level) than interlaminar approach (70 min/ level). Complications of asymptomatic minimal dural tear were noted on one PETD case and one PEID case. Decompression area (3D and 2D) data was pending. Preliminary data revealed transforaminal approach could decompress foramen and lateral recess lateral to inner side of pedicle within the endoscopic trajectories; however, interlaminar approach could decompress the ligaventum flavum from origin to superior lamina of next vertebra and could decompress to inner side of the pedicle and to foramen.

Discussion and Conclusion: Case series has its limitation of no control group and its subject to bias. Limited follow-up time also needed improvements. For both approaches, preoperative 3D planning utilizing 3 views of MRI(coronal, sagittal and axial views) was the key points for relieving patient's symptoms and the accessibility of pathologies. For unilateral radiculopathy caused by lateral recess stenosis, posterior epidural space was not severely stenotic and both approaches could accomplish adequate decompression for lateral recess and foramen. For bilateral radiculopathy caused by central stenosis, the interlaminar approach could decompress posterior epidural space adequately but transforaminal approaches could not. (Videos could be showed during presentation)

PU21

The Analysis Of Percutaneous Full Endoscopic Discectomy Combined With Local Application Of Steroid In Lumbar Disc Herniation: A Prospective, Randomized, Controlled Trial

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Objective: To explore the clinic value of treating lumbar dis herniation with sciatica by percutaneous transforaminal endoscopic discectomy (PTED)with or without local application of steroid.

Methods: From May 2012 to June 2013,65 cases undergoing PTED technique were perspective, randomized, controlled analyzed.32 males and 33 females, mean age 42.3±13.2 years old, were enrolled. There were 41 cases in $L_{4/5}$ and 24 cases in L_5S_1. The straight leg test of all patients was positive. PTED with local application of steroid as experiment group and those without steroid as control group were set up scrupulously. The Visual Analog Scale and Japanese Orthopedic Association score were followed up in different interval time. **Result:** All procedure were accomplished successfully within 80.2±27.9 minutes. Follow-up time were 19.2±3.1 months. The VAS of experiment group in pre-operation, post-operation one day, one week, two weeks, three months, six months and one year was 7.0±1.3，0.8±1.3,0.7±1.2，1.0±1.6,0.7±0.7. The control group was 7.2±1.4,0.6±1.0，1.3±1.1,0.9±1.1，0.6±0.7.The JOA score of experiment group in pre-operation, post-operation one month, six months and one year was 8.4±1.9，26.6±1.6，27.3±1.6,27.7±1.6. The control group was 8.3±1.2,27.2±1.8,27.1±1.9,27.5±1.4.There was significant improvement in pre and post operation in both of VAS and JOA score（$P<0.05$）. However, no different was revealed in two groups（$P>0.05$）.

Conclusion: It is safe and effective to deal with the lumbar disc herniation with sciatica by percutaneous transforaminal endoscopic discectomy. The local application of steroid after this procedure should not be recommended because cannot offer improvement in short or long-term.

PU22

The Analysis Of Treatment In Multi-level Lumbar Disc Herniation With Percutaneous Endoscopic Technique By Transforaminal Approach

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Objective: To analyse the indication, identity of responsibility segment, operation details and clinical outcome of treatment in multi-level lumbar disc herniation by percutaneous transforaminal endoscopic technique.

Methods: A retrospective study, from June 2011 to June 2014, involved 32 cases which were confirmed multi-level lumbar disc herniation were treated using percutaneous transforaminal endoscopic technique was performed. All procedures were performed in local anesthesia. The intra-operation straight leg raise test was applied not only to confirm the effective of decompression around nerve root, but make sure the responsibility segment again. The preoperative Visual Analogue Scale (VAS) score of low back pain and the sciatica were 6.6±1.9 and 3.3±1.6. The preoperative Oswestry disability index(ODI) score were 68.9±15.0. The VAS and ODI scores in final follow-up were recorded to compare with the data in preoperatively and MacNab criteria was applied to evaluate the functional recovery. **Results:** The mean follow-up time was 26.5 months(12～38 months). The VAS scores of low back pain and the sciatica were 0.7 ±0.7 and 0.6±0.7 in final follow-up. The ODI score of ODI was 14.6±5.4 in final follow-up. There are significant improvement in statistic between preoperation and postoperatin. Excellent and good rate was 90.6% according to MacNab (Excellent:22, good:9, fair:2, bad:1).

Conclusion: It is effectively to deal with the multi-level lumbar disc herniation by percutaneous transforaminal endoscopic technique. The accurate diagnosis and precisely locating responsibility segment were extremely important. The case which involved two consecutive segments could be performed in one incision. The intra-operation straight leg raise test plays a important role in determining the responsibility segment eventually.

PU23

The Treatment Of Lumbar Lateral Recess Stenosis Using Percutaneous Coaxial Endoscopic Technique Combined Transforaminal And Interlaminar Approaches: A Primary Report

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To retrospectively study the clinic outcome, indication and risk of the therapy in lumbar lateral recess stenosis using percutaneous coaxial endoscopic technique combined transforaminal and interlaminar approaches.

Method:13 cases with lumbar lateral recess stenosis were involved that were treated in percutaneous endoscopic decompression combined transforaminal and interlaminar approaches. The neurogenic intermittent claudication was shown in all patients. The visual analogue scale(VAS) scores and Oswestry disability index(ODI) scores were recorded preoperatively and the last follow-up time to evaluate the pain of back and sciatica and the function of the lumbar. The Nakai criteria was involved to assess the recovery rate.

Result: All procedures were performed in local anesthesia successfully. There are two complications, one sheath of nerve root tear and one bleeding hardly to control intraoperatively. Fortunately, no severe consequences remained after the procedure. The mean duration of the hospital stays was 4.7 days and the average follow-up time was 19.6 months. The VAS scores of back pain and the sciatica were decreased from 4.6±0.8 and 4.7±0.9 preoperatively to 1.8±0.9 and 1.0±0.7 at last follow-up. The ODI score was decreased from 32.7±6.9 to 10.5±3.0 for preoperatively and last follow-up. All data was mentioned above showed significant statistics different between pre and postoperative ($P<0.01$). The excellent and good rate was 76.9% according with Nakai criteria.

Conclusion: It is effective and safe to treat lumbar lateral recess stenosis using percutaneous endoscopic technique combined transforaminal and interlaminar approaches, which has the advantage such as less invasive, rapid recovery and short duration of hospital stays. This technique could be an alternative for the lumbar lateral recess stenosis, especially for the patient who involved high risk for general anesthesia. The priority of the transforaminal approach is rationally.

PU24

Three Targets For Percutaneous Transforminal Endoscopic Discetomy In Treatment Of Migrated Lumbar Disc Herniation Via Contralateral Transforaminal Approach

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Abstract Objective: To determine the safety and efficacy of three targets for percutaneous transforaminal endoscopic discectomy in the treatment of migrated lumbar disc herniation via contralateral transforaminal approach.

Methods: A retrospective review was performed on 13 patients with migrated lumbar disc herniation between January 2014 and March 2017, all of them were performed three targets for percutaneous transforaminal endoscopic discectomy via contralateral transforaminal approach. The postoperative neurological function and pain status were evaluated by the Visual analog score(VAS) and the Oswestry disability indox (ODI). The patient satisfaction was evaluated by the Macnab criteria.

Results: The mean follow-up period was 11.8 months. The mean preoperative VAS decreased to postoperative at final follow-up respectively. The mean ODI decreased to postoperative at final follow-up, which showed statistical significance ($P < 0.01$). The excellent and good outcomes were 92.3%.

Conclusion: Three targets for percutaneous transforaminal endoscopic discectomy via contralateral transforaminal approach provides a safe and very effective alternative for migrated lumbar disc herniation.

PU25

Uniportal Bilateral Endoscopic Decompression: Possible Complications

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Bilateral endoscopic decompression is a good alternative surgical approach for spinal stenosis. The operation can be done as a day-case. This study is based on a surgeon who has 10 years experience of this technique. We started from drilling for endoscopic interlaminar discectomy at the spinal level above L5-S1 before we started with stenosis cases. Outcomes, complications and techniques to avoid common problems in central stenosis cases are shared here.

PU26

A Preliminary Study On Short-term Effect Of Percutaneous Endoscopic Lumbar Discectomy (PELD) For Symptomatic Lumbar Spinal Degeneration In Elderly Patients

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Background: With the acceleration of aging in China, more elderly are suffering from lumbar spinal degeneration. The efficacy of percutaneous endoscopic lumbar discectomy (PELD) for symptomatic lumbar spinal degeneration in elderly patients is still controversial.

Objective: To analyze short-term outcomes of PELD for lumbar spinal degeneration in elderly patients. Methods: Totally 31 elderly patients with symptomatic lumbar spinal degeneration treated by PELD were enrolled in this study. There were 17 males and 14 females with an average age of (79.6±5.1) years (range, 75-97 years). Visual analogue scale (VAS) score, Japanese Orthopaedic Association (JOA) score, and modified MacNab evaluation criteria were used to assess clinical outcomes before surgery, on the first day, 3 months and 1 year after surgery.

Results: VAS for leg and JOA score was improved on each time point of follow-up as compared with preoperative ones ($P<0.05$). VAS for back at 3 months and 1 year after surgery was significantly lower than that before surgery and on the first day after surgery ($P<0.05$). VAS for back in first day after surgery was higher than that before surgery ($P<0.05$). The excellent and good rate of treatment was up to 83.9% in 1 year after surgery according to modified MacNab evaluation criteria. No surgery-related complications or underlying diseases exacerbation occurred in any of the 31 patients in perioperative period.

Conclusions: PELD is a safe and effective minimal invasive therapy technique for symptomatic lumbar spinal degeneration in elderly patients. It has a remarkable advantage for elderly patients with underlying diseases.

PU27

Minimally Invasive Posterior Decompression Combined With Percutaneous Pedicle Screw Fixation For The Treatment Of Thoracolumbar Fractures With Neurological Deficits - A Prospective Randomized Study Versus Traditional Open Posterior Surgery

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Purpose: To evaluate the surgical results of minimally invasive posterior decompression combined with percutaneous pedicle screws fixation surgery (MIS) compared to traditional posterior open surgery (OS) for the treatment of thoracolumbar fractures with neurological deficits.

Methods: From December 2011 to June 2014, a total of sixty consecutive cases of thoracolumbar fractures with neurological deficits were randomized into MIS group and OS group. Thirty patients in MIS group underwent minimally invasive posterior decompression combined with percutaneous pedicle screw fixation surgery, whereas the other thirty patients in OS group received traditional posterior open surgery. Incision length, blood loss, postoperative drainage volume, hospitalization days, blood transfusion rate, analgesic use rate and X-ray exposure time were used to evaluate the perioperative information and Visual Analog Scale(VAS), Japanese Orthopedics Score(JOA) and ASIA grade for the patients' symptom. For radiological assessment, sagittal cobb angle, percentage of vertebral height and vertebral wedging angle were measured with plain radiographs.

Results: Fifty-nine of sixty patients were completed follow-up for at least twelve months. MIS group was superior to the OS group in the perioperative information ($P<0.05$), except in the operative time ($P=0.165$) and X-ray time ($P=0.000$). The operative time seemed longer in MIS group, but no significant difference was found. The X-ray time was significantly higher in MIS group. The mean VAS and JOA scores of the final follow-up in MIS group were acquired than that in OS group（$P<0.05$）. Patients in both group achieved the similar neurological recovery according to ASIA grade($p=0.760$). A broken screw was found in one patient in MIS group and a broken rod was found in one patient in OS group.

Conclusion: Compared with OS group, MIS group has achieved the similar effect of OS group. Meanwhile, minimally invasive surgery minimizes the approach-related caused by traditional surgical trauma to patients. However, it is also faced with some shortages, such as the larger dose radiation exposure and the longer learning curve.

PU28

Dural Tear In Percutaneous Endoscopic Lumbar Discectomy: A Case Report

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Objective: To report a patient mannaged by conservative treatment who expierenced symptomatic dural tear after percutaneous endoscopic lumbar discectomy (PELD).

Methods: A 29-year-old woman manifested left leg pain due to disc herniation at the L5–S1 level treated by endoscopic interlaminar lumbar discectomy. The dural tear was detected intraoperatively, and repair was not performed during surgery. There were mild CSF leakage, wound swelling and mild radicular pain after surgery. Magnetic resonance imaging showed CSF accumulating behind the dural sac and the dural sac was compressed significantly. Conservative treatment was conducted.

Results: The symptoms of CSF leakage and wound swelling were completely resolved after one monthes by conservative treatment. Radicular pain was mild and dispeared after six monthes. Follow-up magnetic resonance imaging showed a decompressed lumbar canal. The final outcome was excellent.

Conclusion: As application of the PELD has been broadened to more complex cases, the risk of dural tear may increase. Because of most dural tear is very minimal in the endoscopic procedure, not all the patients needed repairment.

PU29

Clinical Study Of Single-gap False Lumbar Spondylolisthesis Vista System Combined With Minimally Invasive Treatment Of Sextant-R System

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Objective: To evaluate the clinical efficacy of minimally invasive treatment of lumbar pseudo-single-gap spondylolisthesis Vista System United Sextant-R system.

Methods: Study subjects were in July 2015 - between May 2016 in patients undergoing surgery single-gap lumbar degenerative disease.The group of degenerative lumbar spondylolisthesis treated 25 patients, 10 males and 15 females,aged 48-79 years, mean 61 years,Wherein L4/5 spondylolisthesis 12 cases, L5/S1 spondylolisthesis13 cases,According Meyerding classification, Ⅰ spondylolisthesis 23 cases, 2 cases of spondylolisthesis Ⅱ.The surgical approachis consistent with Mis-tlif approach.First in Vista system downstream decompression, bone, after Sextant-R system reset downward, fusion, internal fixation.Using visual analogue scale (visual analogue scale / score VAS) and the Japanese Orthopaedic Association Assessment Treatment (Japanese Orthopaedic Association Scores JOA) for preoperative and postoperative three days (at discharge), last follow-up lumbar function to assess and calculate JOA improvement rate, using standard evaluation Suk fusion rate.

Results: 25 patients were followed up (6-13 months follow-up period, an average of 9.5 months).Preoperative VAS score was (7.13 ± 0.73) parts, 3 days after VAS score was (1.58 ± 0.51), VAS score of last follow-up (1.21 ± 0.31) points.And after three days, the last follow-up compared preoperative are significant difference (P <0.05).Preoperative JOA score was (9.55 ± 0.71) points, the score was discharged the same day (19.32 ± 2.21) points, the score for the final follow-up (27.57 ± 2.38) points,preoperative and last follow-up and discharge comparison statistically significant (P <0.05).In 25 cases, one case with due ossification, ossification tissue and epidural adhesions, cerebrospinal fluid leakage after surgery after continuous drainage, pressure and other wound treatment, all patients wounds healed.All patients had no nerve root or spinal cord injury, spondylolisthesis have a certain degree of reduction and bony bony fusion, internal fixation in good position.

Conclusion: Vista System United Sextant-R system is a minimally invasive treatment of single-gap degenerative lumbar spondylolisthesis exact clinical effect and practical.

Key words: Vista System Sextant-R System Minimally Invasive Lumbar Pseudo Spondylolisthesis

PU30

A Technique Named I SEE Of PELD For The Treatment Of Lumbar Disc Herniation And Stenosis--with 10 Patients

Tao Li

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Objective: To explore the short-term effect of I see technique of PELD in treatment of lumbar disc herniation and stenosis.

Methods: The clinical data of 10 patients who were treated with I SEE of PELD with lumbar spinal stenosis combined with lumbar disc herniation were retrospectively analyzed from January 2017 to March 2017 in our hospital. The visual analogue scale /score (VAS),was used to evaluate the efficacy of the operation, and the lumbar vertebrae was evaluated using the Japanese Orthopaedic Association Scores (JOA), and calculated the JOA improvement rate.

Results: All patients surgery time 60-110 minutes, an average of 88 minutes.Bleeding from 5 to 20 ml, average blood loss is 11.5 ml.Hospital stay was 3-7d, an average of 5.4d.All patients were followed for 3-6 months, an average of 4.5 months.Preoperative VAS score was (8.10±0.61) points,three days after surgery was（2.81±0.40）,Last follow-up VAS score was (1.44±0.28) points.There was significant difference between preoperative and postoperative ($P < 0.05$).Preoperative JOA score was (7.93±0.73) points, the score of discharged day was(18.73±0.91) points,last follow-up score was（31.16±1.10） points.Preoperative JOA score is statistically varied from that after surgery ($P < 0.05$). Calculatd the improvement rate according to the JOA scoring criteria,of which optimal 8 cases, good in 1 cases, not too bad 1 case and poor in 0 case.

Conclusion: Application of I see technique of PELD in treatment of lumbar disc herniation and stenosis is effective, with small trauma, short operation time, quick recovery, less postoperative complications and so on.

Keywords: I see technique of PELD；Lumbar Stenosis ；Lumbar Disc Herniation

PU31

Percutaneous Endoscopic Lumbar Discectomy For Treatment Of double-segmental Lumbar Disc Herniation With Single Incision

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Objective: To explore the feasibility and efficacy of percutaneous endoscopic lumbar discectomy for treatment of double-segmental lumbar disc herniation with single incision**.**

Methods: Retrospective analysis from March 2010 - March 2016 in our hospital for PELD with single incision surgery and access to follow-up of 27 cases of double-segment lumbar disc herniation patients. The visual analogue scale / score (VAS), functional index score (ODI) were used to evaluate the efficacy of the operation,preoperative,discharged,one month after operation,and the last follow-up improved MacNab criteria to evaluate the efficacy of the patients.

Results: All patients surgery time 75-135 minutes, an average of 95 minutes.Bleeding from 15 to 25 ml, average blood loss is 20 ml.Hospital stay was 3-14d, an average of 6d.All patients were followed for 9-60 months, an average of 26 months.Preoperative VAS score was (9.00±0.35) points,when discharge VAS score was (3.15±1.25),one month after surgery was（2.51±1.67）,Last follow-up VAS score was (1.41±0.33) points.There was significant difference between preoperative and postoperative ($P < 0.05$).Preoperative ODI score was (71.21±15.22) points, the score of discharged day was(29.46±9.23) points,one month after surgery was （ 17.58±7.16 ）,last follow-up score was （ 10.13±5.29 ） points.Preoperative ODI score is statistically varied from that after surgery ($P < 0.05$). Improved MacNab standard evaluated clinical efficacy ,of which optimal 18 cases, good in 6cases, not too bad 1 case and poor in 2 case. The fine rate was 88.9%（24/27）.

Conclusion: Percutaneous endoscopic lumbar discectomy for treatment of double-segmental lumbar disc herniation with single incision need an experienced surgeon, but with less damage, less complications, faster postoperative recovery, etc. And it is feasible and safe meanwhile.

Keywords: PELD; LDH; single incision; double-segmental

PU32

The Clinical Efficacy Of Percutaneous Endoscopic Lumbar Discectomy Of treatment In Adjacent Segment Of Disc Herniation Or Stenosis After Lumbar Fusion Surgery

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Objective: Retrospectively analyze the clinical curative effect of using PELD to treat adjacent segment of disc herniation or stenosis after lumbar fusion surgery.

Methods: Forty-five patients with disc herniation or stenosis after lumbar fusion were followed up from February 2008 to February 2016 in our hospital for PELD.Using visual analogue scale (visual analogue scale / score VAS) and the Japanese Orthopaedic Association (Japanese Orthopaedic Association Scores JOA) and modified MacNab criteria 1 years after surgery to assess the curative effect of patients.

Results: All patients surgery time 45-83 minutes, an average of 62.5 minutes.Bleeding from 5 to 20 ml, average blood loss is 10 ml.Hospital stay was 3-14d, an average of 6.5d.All patients were follow-ed for 10-31 months, an average of 18.3 months.Preoperative VAS score was (7.29 ± 0.61) points,3 days after VAS score was (2.23 ± 0.41),Last follow-up VAS score was (1.23 ±0.32) points.There was significant difference between preoperative and postoperative ($P < 0.01$).Preoperative JOA score was (9.95 ±0.62) points, the score of discharged day was (18.17 ± 2.18) points,last follow-up score was (28.20 ± 2.08) points.Preoperative JOA score is statistically varied from that after surgery($P < 0.01$).Improvement rate was calculated based on the lumbar spine JOA score.Of which optimal 36 cases, good in 5 cases, not too bad 3 case and poor in 1 case. The fine rate was 91.1% 1 year after surgery.

Conclusion: The effect of use of PELD treatment of adjacent segmental degenerative disease after lumbar fusion is accurately satisfactory, with less trauma, shorter operative time, quicker recovery, fewer complications, etc, but need to grasp the indications.

Keywords: PELD; Postoperative lumbar fusion Surgery; LDH; Stenosis

PU33

Discography In PELD Treatment Of multiple Lumbar Disc Herniation Of Value Of Diagnosis And Treatment

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Purpose: TO discuss the discography's clinical value in the PELD treatment of lumbar disc herniation, for the sake of providing new ideas on clinical treatment of lumbar disc herniation.

Methods: From October 2013 to February 2015 31 patients were diagnosed and treated with PELD surgery, of which 13 females and 18 males, aged 23-55 years, mean 40 years. Wherein the L3/4 and L4/5 projecting in 9 cases, L3/4 and L5/S1 prominent in 5 cases, L4/5 and L5/S1 prominent in 15 cases, L2/3 and L5/S1 prominent in 1 case, L2/3, L3/4 and L5/S1 highlight 1 case. All patients were confirmed by discography, the segment of positive contrast accepted the PELD surgery. Using visual analogue scale (visual analogue scale / score VAS) and modified MacNab criteria for assessing surgery.

Results: 31 patients conducted a total of 63 row disc puncture angiography, single-gap positive in 16 cases, 15 cases of double gap positive, three positive gap 0 cases, contrast positive rate was 73%. 46line segments implemented PELD surgery, all patients were successfully completed; Operation time 70-155 minutes, average 113 minutes; bleeding 7-25ml, average blood loss was 15ml, all patients were followed for 12-44 months, an average of 25.5 months. Postoperative 3dVAS score (2.81 ± 0.72) points and after 3 months (1.15 ± 0.52) points and after 12 months (1.21 ± 0.69) points with preoperative VAS score was (6.25 ± 1.03) points are comparative statistics significance (P <0.01); 3, 12 months after surgery and postoperative 3dVAS scores were significantly different (P <0.01) compared to; after 12 months, with no significant difference after three months VAS scores (P>0.05), excellent and good rate of 93.5%.

Conclusion: Discography combined PELD treatment of multiple lumbar disc herniation has a curative effect, Providing a new way of thinking on the clinical treatment of lumbar disc herniation .

Keywords: Discography PELD multi-segmental lumbar disc herniation

PU34

A Clinical Research Of Percutaneous Endoscopic Surgery For Degenerative Lumbar Spinal Stenosis

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Objective: Describe and evaluate the clinical outcomes and Surgical techniques of percutaneous endoscopic decompression (PED) surgery for degenerative lumbar spinal stenosis.

Methods: From September June 2016 to February 2017, 58 cases（Segment L3-4 11 cases,Segment L4-5 36 cases and Segment L5-S1 11 cases) were treated with percutaneous endoscopic decompression surgery. The mean age was 65.1 ± 10.4 years. The neurogenic intermittent claudication was presented in all patients. Visual analogue scale (VAS) and Oswestry disability index (ODI) were used for evaluation before and 1 day, 6 weeks, 3 months and 6 months after surgery, and the clinical efficacy was evaluated by modified Macnab criteria. 51 cases were treated with transforaminal approach and the other 7 cases were with interlaminar approach.

Results: The cases were followed up for 6 - 10 (6.9 ± 1.8) months. The operation time was 45-82 (63.5 ± 17) min. blood loss was 10-50 (23 ± 10) ml. preoperative and postoperative VAS for back have no significantly difference. At the final follow-up, VAS for leg and ODI scores were significantly improved than that of preoperative scores. According to MacNab, “excellent” was found in 42 cases, “good” in 9 cases, and “fair” in 7 cases, the rate of excellence and good was 87.9%.

Conclusions: Percutaneous endoscopic surgery is effective for degenerative lumbar spinal stenosis, there are many advantages：minimal invasiveness, less bleeding and so on. Before the surgery, detailed physical examination and Imaging diagnosis is very helpful to confirm the site of stenosis. Surgical approaches is chosen according to the site and nature of stenosis, which need high requirements of surgical techniques. Some special equipments for example microscopic drill are also necessary.

PU35

Comparison Between Posterior Short-segment Instrumentation Combined With Lateral-approach Interbody Fusion and Traditional Wide-open Anterior-Posterior Surgery for the Treatment of Thoracolumbar Fractures

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Objective: To compare the radiographic and clinical outcomes between posterior short-segment pedicle instrumentation combined with lateral approach interbody fusion and traditional anterior-posterior (AP) surgery for the treatment of thoracolumbar fractures.

Methods: Inclusion and exclusion criteria were established. All patients who meet above criteria were prospectively treated by posterior short-segment instrumentation and secondary-staged minimally invasive lateral approach interbody fusion and classified as group A. A historical group of patients who were treated by traditional wide-open AP appraoch were used as control group and classified as group B. The radiological and clinical outcomes were compared between the two groups.

Results: There were 12 patients in group A and 18 patients in group B. The mean operative time and intraoperative blood loss of anterior reconstruction were significantly higher in group B than those in group A (127.1±21.7 minutes versus 197.5±47.7 minutes, $P<0.01$; 185.8±62.3ml versus 495±347.4ml, $P<0.01$). Two of 12 (16.7%) patients in group A experienced 2 surgical complications: 1 (8.3%) major and 1 (8.3%) minor. Six of 18 (33%) patients in group B experienced 9 surgical complications: 3 (16.7%) major, 6 (33.3%) minor. There was no significant difference between the two groups regarding loss of correction (4.3°±2.1° versus 4.2°±2.4°, $P=0.89$) and neurological function at final follow-up ($P=0.77$). In both groups, no case of instrumentation failure, pseudarthrosis or nonunion was noted.

Conclusions: Compared to wide-open AP surgery, posterior short-segment pedicle instrumentation combined with minimally invasive lateral approach interbody fusion can achieved similar clinical results with significant less operative time, blood loss and surgical complication. This procedure seems to be a reasonable treatment option for selective patients with thoracolumbar fractures.

PU36

Efficacy And Safety Of Percutaneous Endoscopic Interlaminar Discectomy In Lumbosacral Disc Herniation

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Objective: To assess the efficacy and safety of percutaneous endoscopic interlaminar discectomy (PEID) in patients with single-level lumbosacral disc herniation (LDH).

Methods: From February 2013 and August 2013, 134 consecutive patients with single-level LDH who underwent PEID were enrolled in this retrospective study. There were 58 patients with L4/5disc herniation and 76 patients with L5/S1 disc herniation. Radiographic and clinical results were analysed.

Results: Prevalence of shoulder disc herniation (77.6%) was more prevalent at L4/5 level, and interlaminar window size was smaller than that of L5/S1 level. However, inlet spinal canal diameter was no difference between 2 levels. The postoperative outcome measures after endoscopy discectomy was improved significantly in all of the patients ($P < 0.05$). Mean VAS leg pain decreased from 7.8±1.9 to 1.7±1.2, and mean ODI scores improved from 69.2±10.8 to 22.6±10.1. VAS, ODI, and modified MacNab criteria were similar between 2 levels. No significant nerve injury or segmental instability occurred.

Conclusions: PEID yielded similar clinical improvement at L4/5 and L5/S1 disc herniation. Although a partial laminectomy is required at L4/5, it was not associated with nerve injury and lumbar instability.

PU37

Treatment Of Mono-segment Thoracic Spinal Stenosis Caused By Ossification Of Ligamentum Flavum With Percutaneous Endoscopic Decompression Aided By Ultrosonic Osteotome

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Objective: To evaluate the safety and early clinical outcome of percutaneous endoscopic resection of mono-segment ossification of the ligamentum flavum that cause thoracic spinal stenosis with ultrosonic osteotome.

Clinical data and methods: 6 cases of mono-segment thoracic spinal stenosis caused ossification of ligamentum flavum, aged 45-67 years (mean 53.6 years), with high muscle tension of lower limb, hypoesthesia, positive pathological sign. T8-9 1 case, T9-10 2 cases, T10-11 2 cases, T11-12 1 case. Under local anesthesia, percutaneous endoscopic ulrosonic osteotome was used to gradually resect the ossification of the ligamentum flavum, complete decompress the spinal cord until the pulse of thecal sac recovered.

Results: 6 cases of surgery were successfully completed; High muscle tension of lower limb decreased significantly postoperatively, Sensation gradually restored. No complication occurred. The second day after surgery, CT and MRI were reexamined, showing that the ossification of the ligamentum flavum was excised and the spinal cord was decompressed. Conclusion: Percutaneous endoscopic resection of ossification of the ligamentum flavum with ultrosonic osteotome is safe and effective in the treatment of mono-segment thoracic spinal stenosis caused by ossification of ligamentum flavum. The use of ultrasonic osteotome can improve the operation efficiency and improve the safety of operation. It is a kind of promising endoscopic bone-cuttng tool.

Keywords: thoracic ligamentum flavum ossification; thoracic spinal stenosis; percutaneous endoscopic surgery; decompression; minimally invasive; ultrasonic osteotome.

PU38

Clinical Efficacy Of A Surgical Treatment For Thoracic Ossification Ligamentum Flavum Via Posterior Translaminar Transforaminal Endoscopic Decompression

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Objective: To evaluate the efficacy of a surgical treatment for single-segment thoracic ossification ligamentum flavum (OLF) using posterior translaminar transforaminal endoscopic decompressive operation and to analyze the affecting factors.

Method: Cases from eight patients were retrospectively reviewed. These patients with OLF-induced thoracic myelopathy underwent surgeries between Jan 2017 and June 2017 using posterior translaminar transforaminal endoscopic decompressive operation. It is worth mentioning that cases caused by other tandem spinal diseases, by OLF of more than one segment, or by trauma are exclusive in this investigation. The cases studied involved 6 males and 2 females, with ages ranging from 45 to 71 and averaged 55.8. The following segmental distributions were studied: 4 cases of T10/11, 2 cases of T11/12, 1 case of T9/10, and 1 case of T8/9. The pre-surgery JOA Score (Japanese Orthopedic Association Score, a grading system with top score of 11) was estimated to be between 4 and 9, with an average score of 6.43°±1.35. The surgical efficacy was graded according to the improvement of JOA Scores in the last follow-ups and, accordingly, the outcomes were evaluated.

Results: For the cases studied, the surgical duration ranged from 155 to 310 minutes, with an average of 205 minutes. The blood loss during surgery fell between 10 and 50ml, averagely 17.5ml. The incision pain during surgery was measured to fall between 1 and 4 according to VAS (Visual Analog Scale), averagely 2.2. The neck pain during surgery was found to have VAS between 6 and 10, with an average of 8.4. Cases were followed up for 3 to 8 months, averagely 5 months. For the last follow-ups, JOA scores of 6 to 11 were obtained and the average score was 7.13°±1.79. Improvement rates were evaluated to be between 60% and 100%, averagely 83.19%. Effectiveness of the surgical treatment was as follows: 5 cases were found to be excellent, 2 cases were found to be satisfactory and 1 case was found to be average. Thus 87.5% of the results (7 out of 8 cases) were found desirable.

Conclusions: The surgical treatment of single-segment thoracic ossification ligamentum flavum using posterior translaminar transforaminal endoscopic decompressive operation is effective and safe. It is desirable and worth promoting. However, the neck pain during the surgery is still under investigation.

Keywords: Thoracic ossification ligamentum flavum; efficacy of surgical treatment; translaminar transforaminal endoscopy

PU39

Endoscopic Discectomy For The Treatment Of Lumbar Disc Herniation With Spondylolysis

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Purpose: Lumbar spondylolysis is a common pathologic condition (incidence between 6% and 8%) that leads to lumbar instability and significant clinical symptoms such as low back pain, claudication symptoms, and radicular symptoms. Fortunately, most spondylolysis is asymptomatic or can be managed conservatively. Symptomatic spondylolysis are generally treated with diverse fusion surgeries. Percutaneous Endoscopic Transforaminal Discectomy (PETD) is minimally invasive surgery for lumbar disc herniation and has been regarded as an effective alternative technique to conventional open discectomy with satisfactory results. Recently, LDH at the spondylolytic level treated with PELD has been reported. This study aimed to evaluate the outcomes of endoscopic spine surgery to treat lumbar disc herniation (LDH) in patients with spondylolysis at the same or adjacent lumbar segment from a single center.

Methods: We retrospectively reviewed the medical records of 16 adult patients with LDH and spondylolysis who received PETD at our hospital of between June 2013 and January 2016. All patients complained of severe radiculalgia worsen than low back pain. The pars defect was bilateral in all patients, with the affected vertebrae being L5 in 8 patients, L4 in 9 patient.There were no spondylolithesis or mild isthmic spondylolithesis (no more than 25% slippage of one vertebral body over the other, Meyerding Grade I) in those patients. In addition, instability was not shown as indicated by movement < 3 mm on flexion-extention spine x-rays. Demographic variables, radiographic parameters, and pre- and postoperative clinical outcomes determined by Visual Analog Scale (VAS) for leg pain, Oswestry Disability Index (ODI) scores and Japanese Orthopedic Association (JOA)were assessed.

Result: The mean VAS score decreased from 6.88 to 1.50 (P< 0.01), and the mean ODI score decreased from 62.83 to 13.75 (P< 0.01) at 1year follow-up. The mean modified JOA scores increased from 9.13 preoperatively to 22.16 postoperatively (P< 0.01). The recovery rate as measured by the JOA score after surgery was excellent results in 14 (94%) patients, good results in 1 (2%) patients, fair results in 1 (2%) patients, and poor results in 0 (0%)patients, indicated a satisfactory curative effect in our patients. There were no serious neurovascular complications including injury to the aorta and nerve root in this series. Spinal instability were not found in our finial follow-up.

Conclusion: Percutaneous Endoscopic Transforaminal Discectomy (PETD) was a satisfactory technology to treat lumbosacral radiculopathy with the same effect of classic open discectomy. Using this minimally invasive surgery can effectively solve the radiculopathy symptom with small trauma, rapid recovery, low complication, good satisfaction in LDH patients associated with pars defects. Furthermore, this procedure did not affect the lumbar activity and stability especially in LDH at neighboring level which may need two segmental fusion surgery. Thus, PELD could used as another treatment options for symptomatic spondylolysis without lumbar instability.

PU40

Percutaneous Endoscopic Lumbar Discectomy For Highly Migrated Lumbar Disc Herniation

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Objectives: The purpose of this study was to present a detailed surgical approach selection and individualization of procedure in the treatment of highly migrated LDH with PELD. We also mean to compare the outcomes of patients with highly migrated LDH treated with PELD by the 3 approaches. Study Design: Single-center retrospective observational study. Setting: An interventional pain management practice, a medical center, major metropolitan city,

China.

Methods: In our retrospective analysis between March 2011 and March 2013, 73 patients with single level highly migrated LDH received PELD. Clinical outcomes were assessed with the visual analogue scale (VAS) score, the modified MacNab criteria, and the Oswestry disability index (ODI). Relevant data such as operation duration and fluoroscopy frequency of the 3 operative approaches were recorded.

Results: The mean operating time of IL was 56 minutes, compared with 64 minutes for TF and 112 minutes for CTF. The mean intraoperative fluoroscopy times were 5.5 for IL, 9.7 for TF, and 14.6 for CTF. In each group, the mean VAS and ODI after surgery and 3 months after surgery improved dramatically compared with preoperative counterparts. However, the difference between postoperative results and the results 3 months after surgery was not significant ($P > 0.05$). The overall excellent rate was 90.4% according to the modified MacNab criteria; there was no significant statistical difference between the 3 operative routes. Operative complications occurred in 3 patients (2 after IL and one after CTF, 3 of 73, 4.1%).

Conclusion: In our research, PELD with all 3 approaches was similarly effective to highly migrated disc herniation. The CTF approach required the longest operation duration and the most intraoperative times. On the contrary, the least operation time and radiographfrequency was required with the IL approach. In addition, we came to a conclusion of surgery approach selection when it comes to varied HM-LDH.

Keywords: Highly migrated; lumbar disc herniation; percutaneous endoscopic lumbar discectomy; minimally invasive treatment

PU41

Three-dimensional Reconstruction Of Ultrasound Image & Multi-mode Image Registration: Initial Research Based On The Spinal Model

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Object: With the rising incidence of spine cord diseases, minimally invasive surgeries become the most dominant therapy method. Nevertheless, the growing minimally invasive demand of patients is more prominent with the difficulty of precise positioning and operation technique. In recent years, ultrasonic imaging technology has attracted the extensive attention. As the technology speeding up, it is possible to explore the application of ultrasonic imaging to vertebra. The authors are aimed at intra-operative puncture localization assisted by burgeoning imaging technique. An initial research is designed for the imaging feasibility based on a spinal model. What most noteworthy are the method and precision of image reconstruction and registration.

Methods: Standard adult spinal model is chose as the experimental subject, which made by polyvinyl chloride (PVC). Free-hand ultrasonic scanning is used for image acquisition, while spatial orientation is provided by magnetic tracking system. By means of morphological processing, we extract the surface profile of the vertebra and prepare for three-dimensional reconstruction. As for Computed Tomography images, converting them into three-dimensional point cloud data beforehand, multi-mode image registration is the final step.

Results: As for ultrasonic image acquisition, relying on magnetic positioning system, information can be integrated, despite of arbitrary angle, direction when freehand scanning. As for image processing, morphological and three-dimensional reconstruction are completed, on the basis of software and algorithms. Meanwhile, fusion images can be obtained by multi-mode image registration between Computed Tomography and ultrasonic images. All experiments and data are appropriate for standard adult spinal model, scanning under water.

Conclusions: It becomes possible for ultrasonic scanning of vertebra with the development of imaging technology. Combining with the magnetic positioning system, standard adult spinal model makes the idea come true. Software and algorithms provide researchers for multi-mode image processing and fusion, which brings high precision as well as low deviation. Despite of great difficulty for human body application, the attractive prospect is offered by this initial research.

Keywords: spinal model; ultrasonic imaging; three-dimensional reconstruction; image registration

PU42

Comparison Of Percutaneous Endoscopic Transforaminal Discectomy，Microendoscopic Discectomy And Microdiscectomy For Lumbar Disc Herniation- More Than Two Years Follow-up

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Objective: To evaluate the clinical outcome of percutaneous endoscopic transforaminal discectomy (PETD), microendoscopic discectomy (MED), and microdiscectomy (MD) for treatment of symptomatic lumbar disc herniation (LDH).

Methods: One hundred and ninety patients with symptomatic LDH at L3-4 and L4-5 were included in our study. The average age of patients was 34.2 ± 2.6 years (range from 18~62 years). The patients were divided as follows: group A was treated with PETD and included 60 patients (31 males, 29 females) with a mean age of 36.2 years; group B was treated with MED and included 63 patients (32 males and 31 females) with a mean age of 33.1 years; group C was treated with MD group and 69 patients (36 males and 33 females) were included with a mean age 34.0years. Japanese Orthopedic Association (JOA) scale for low back pain (LBP), Owestry disability index (ODI), creatine phosphokinase (CPK) activity three days after surgery, as well as the visual analog scale (VAS) scores of low-back pain and leg pain were used for evaluation of clinical results.

Results: There was no significant difference in pre-operative JOA score, ODI, VAS of LBP and leg pain between the group A, B, and C. Incision length, operation time, blood loss, CPK, length of hospital stay, and postoperative incision pain VAS were best in PETD group ($P<0.05$). The seconds of intraoperative fluoroscopy was highest in PETD group ($P<0.05$), while there was no difference between MED and MD groups. Three cases from MED group and two cases from MD group had intraoperative durotomy, respectively. No cerebral spinal fluid leakage was observed after surgery. One case from MED group and three cases from MD group had incision infection, respectively. No neurological deficit related to the surgeries occurred in all groups. Fifty-five patients (91.6%), Fifty-nine patients (93.7%), and sixty-two patients (89.9%) acquired at least 2 years follow-up in group A, B, and C, respectively. At the latest follow-up, JOA scores and VAS of LBP, leg pain, and ODI in both group were significant better than preoperation data in all three groups. JOA scores, JOA recovery rate, ODI and VAS of leg pain had no difference among the three groups. VAS of LBP was best in PETD group ($P<0.05$). No lumbar instability observed in all three groups. Recurrent LDH occurred in 3 cases（5.5%） in PETD group, while 2 recurrent cases (3.4%) were confirmed in MED group.

Conclusion: PETD, MED, and MED were all reliable techniques for the treatment of symptomatic LDH. With restricted indication, PETD can acquire rapid recovery and better clinical results in 2-years follow-up.

PU43

How To Start Full-endoscopic Spine Surgery, Learning Curve An Pitfall's

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Backgrounds: Full-endoscopic spine surgery is a very powerful tool that makes it able to perform the most minimal invasive spinal operative treatments possible for our patients. In Europe there is no widespread academic tradition of teaching full-endoscopic spinal procedures. Different private courses are being organised to help spine surgeons start to introduce full-endoscopy in their clinical practice. These courses combine a theoretical overview with practical cadaver workshops to prepare surgeons for endoscopic surgery. Basic and advanced skills education exists. First patient procedures are performed under supervision and with assistance of an experienced surgeon.

Methods: The skills needed and learning curve of the first one hundred and fifty full-endoscopic surgeries in a private practice were recorded and are analysed. The problems encountered and complications ar discussed. This data is presented in order to help other spine surgeons who are starting full-endoscopic spine surgery .

Results: A surgeon who has an existing spinal practiceintroduced full-endoscopy in his practice 3 yeas ago. A personal learning curve is of the first one hundred and fifty endoscopic full-endoscopic surgeries, with special attention to the milestones and challenges encountered, are being presented. The progression in skills with the possible surgical and organisational

problems is shown. The time lapse in evolution from simpler cases to more complex decompression surgery is evaluated. Personal suggestions to make introduction of endoscopic surgery easier and safer are presented.

Conclusion: full-endoscopic spine surgery can be introduced in a excising spinal surgery practice. Good training and preparation with careful attention to many details makes full-endoscopic surgery easier tot adopt. Constant evaluation of previous full endoscopic surgeries and feedback from more experienced surgeons' helps to make the leaning curve easier.

PU44

Learning Curve Of Microendoscopy-assisted Minimally Invasive Transforaminal Lumbar Interbody Fusion: 65 Consecutive Cases Of One Surgeon

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Purpose: To evaluate the learning curve of microendoscopy-assisted minimally invasive transforaminal lumbar interbody fusion (MIS-TLIF) performed by one senior surgeon.

Methods: A total of 65 patients suffering from lumbar degenerative disease underwent single-level microendoscopy-assisted MIS-TLIF. Piecewise regression analysis using R statistical software was performed to define the turning point of learning curve (early and plateau phase). Perioperative evaluations included surgical duration, intraoperative fluroscopic time and blood loss, postoperative analgesic usage and ambulatory time. Clinical outcome assessments involved visual analogue score (VAS) for back and leg, Japanese Orthopaedics Association score (JOA), Oswestry disability index (ODI) and modified MacNab criteria. All these indicators, as well as complication incidence and interbody fusion (Birdwell classification) between both phases were compared.

Results: The asymptote of learning curve was reached following previous 21 cases. Comparing latter 44 cases with first 21 cases, surgical duration (178.9 minutes *versus* 195.5 minutes), intraoperative fluroscopic time (53.2 seconds *versus* 77.5 seconds), blood loss (184.0 ml *versus* 205.5 ml), postoperative analgesic usage (43.0 mg *versus* 73.6 mg) and ambulatory time (2.1 days *versus* 2.6 days) revealed significant differences ($p<0.05$). While at 20 months postoperation, VAS-back (0.8 *versus* 0.8), VAS-leg (0.7 *versus* 0.5), JOA (25.0 *versus* 25.0), ODI (12.2 *versus* 12.0), perfect or good assessment based on modified MacNab criteria (20/21 *versus* 43/44) and interbody fusion rate of grade I (18/21 *versus* 37/44) were nearly the same ($p>0.05$). There were 5 complications (23.7%) and 10 complications (22.7%) at early and latter phase respectively, also showing no statistical significance ($p>0.05$).

Conclusions: The turning point of this surgeon's learning curve for microendoscopy- assisted MIS-TLIF is achieved at the 21st case. Patients at its both phases acquire similar clinical outcomes, while latter patients can get additional advantages.

PU45

Percutaneous Transforaminal Endoscopic Decompression For The Treatment Of Lumbar Spinal Stenosis: Analysis Of Clinical Outcomes And Prognostic Factors

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Purpose: To evaluate the clinical efficacy and find out the prognostic factors of percutaneous transforaminal endoscopic decompression surgery (PELD) for the treatment of lumbar spinal stenosis (LSS).

Methods: From September 2012 to June 2017, 45 patients who were diagnosed with LSS underwent the treatment of PELD and were followed up at 1 week and 3 months postoperatively. Low back pain and leg pain were measured by Visual Analogue Scale (VAS-back and VAS-leg) score, while functional outcomes were assessed by using Oswestry Disability Index (ODI). Recovery rate that higher than 50% was defined as good outcomes. According the predefined recovery rate, patients were divided into two groups: good outcomes group and poor outcomes group. Then we compared the clinical outcomes and radiographic results between the two groups..

Results: All the patients completed more than three months follower up. Their VAS-back score was 7±1.2, 4±1.3, 3±1.0 in pre-surgery, 1 week after surgery and 3 months follow up. The VAS-leg score was 6±2.0, 3±1.1, 2.5±0.8 in pre-surgery, 1 week after surgery and 3 months follow up. The ODI score was 40±16.4, 21±8.6, 20±10.3 in pre-surgery, 1 week after surgery and 3 months follow up.31, 29 and 30 cases achieved more than 50% recovery rate at 1 week after surgery, while 32, 30 and 29 cases were associated with more than 50% recovery rate at 3 months, in regard with VAS-back, VAS-leg and ODI respectively. Poor outcomes group had significantly higher proportion of lumbar instability, severe lumbar canal stenosis and surgical history of same segment.

Conclusion: ELD is an effective surgery for the treatment of LSS. Lumbar instability and surgical history of same segment are the risk factors relating to poor outcomes. Keywords: percutaneous transforaminal endoscopic surgery, decompression, lumbar spinal stenosis, lumbar instability.

PU46

Is Foraminoplasty An Indispensable Procedure During Transforaminal Endoscopic Discetomy?

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Objective: In classic TESSY technique, it is a standard endoscopic transforamnial procedure to widen the foramen. However, foraminoplasty may not be an indispensable procedure by using a variant version of Yeung technique. In this study, we aimed to evaluate the clinical outcomes and safety in patients with this technique.

Methods: From 2014 to 2016, a total of 131 patients with lumbar disc herniation who underwent transforaminal endoscopic discectomy were enrolled into the study and divided into two groups: the foraminiplasty group (32 cases) and the non-foraminiplasty group (119 cases). Compared with the TESSY technique, the entrance point is laterally and cephalad directed for 1-2cm respectively. If 2/3 of the ventral nerve root can't be observed, foraminoplasty was performed and the patient was enrolled into foraminiplasty group. The total time of operation, occurrence of complications, short-time and long-term changes of visual analogue scale (VAS) of leg pain and MacNab scores were observed.

Results: There are no significant differences in changes of VAS and Macnab scores between the two groups. The operation time can be shortened by 10min on average. 3 cases in foraminiplasty group reported transient nerve stimulation symptoms as complications. No dural rupture was observed in both groups.

Conclusion: Foraminoplasty may not be an indispensible procedure in during transforaminal endoscopic discetomy. By changing the entrance point, we can achieve same clinical effects and improve the safety of surgery.

PU47

Observation on Clinical Outcome of Interlaminar Transforaminal Endoscopic Discectomy in Treating Massive Lumbar Disc Herniation

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Objective: To evaluate the clinical outcome and safety of discectomy through interlaminar access by transforaminal endoscopy in treating massive lumbar disc herniation.

Methods: The patients with lumbar canal encroachment ratio > 50% were diagnosed as massive lumbar disc herniation and underwent interlaminar transforaminal endoscopic discectomy. Preoperative and postoperative radiological and clinical parameters including the compression degree of dural sac or nerve root, visual analogue scale (VAS) of low back pain and MacNab score were compared.

Results: All the surgeries were successful with the mean operation time of 40 minutes per segment, mean blood loss of 15 ml without complications. After surgery, the herniated disc of all patients was removed with dural sac or nerve root being decompressed completely according to MRI and CT. The VAS at the first day and 3 months after surgery both decreased significantly compared with preoperative values ($P < 0.01$). The numbers of patients who were evaluated as excellent, good, fair and poor at 3 months after surgery were 64, 34, 3 and 1 respectively and the final rate of curative effect reached 96.1% according to MacNab scores.

Conclusions: Discectomy through interlaminar access by transforaminal endoscope is safe and can obtain favorable clinical outcome in treating massive lumbar disc herniation

PU48

Endospine - Endoscopic Anterior Cervical Discectomy & Cord Decompression – Destandau's Technique

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Objective: We are using endospine in degenerative lumbar pathologies like disc herniation, radiculopathy due to disc hernia & bony canal & foraminal stenosis since 2002. After going through the initial steep learning curve we started using endospine for posterior foraminotomies & disc removal with canal decompression for cord compression since 2004. Since 2006 we started using Endospine for anterior cervical endoscopic microforaminotomy and cord decompression. We report use of Endospine for anterior cervical endoscopic discectomy & cord decompression. I used Jho's technique with Endospine for endoscopic anterior cervical discectomy and cord decompression in 60 cases between 2006 and 2016. Their demographic data, clinical presentation, and surgical outcomes were recorded. 43, patients were males and 17 patients were females. Their ages range from 24 to 74 yrs. There were 29disc herniations at C5/6, followed by 16 at C4/5. In 10 patients there were nerve root compression at C6/7. One patient had disc herniation at C3/4. One patient had disc herniation at C3/4 & C4/5, one had at C4/5 & C5/6 level, and two patients had disc herniation at C5/6 & C6/7 vertebral level. Seven patients had myeloradiculopathy at C4/5, and 11 had myeloradiculopathy at C5/6 leval. One patient had myeloradiculopathy at C6/7.

Results: In anterior endoscopic cervical approach, out of 60, 59 patients had excellent results, 1 had fair results considering modified MacNabcriteria. Dural puncture was seen in one patient in anterior approach. Muscle piece with fibrin glue wasused to seal the puncture. In anterior cervical approach 2 patients had Horner's symdrome and 2 patient had transient recurrent laryngeal nerve paresis which recovered in 2 weeks to 8 weeks period completely. Pseudoaneyrysm of VA was reported in one case in anterior approach. This was a case demonstrated in one of the workshop & not included in the study but for the purpose to know the technique related complication we are mentioning this. The complications can be reduced by selecting the cases for approach, and by exact knowledge of endoscopic anatomy through small incision. Opposite canal decompression in both the approaches can be safely done with help of ultrasonic bone dissectors of various types. It reduces surgeons stress while working in these narrow corridors. Bleeding from vertebral artery in anterior approach should not be tackled with bipolar cautery. Rather we use surgicell packing over vertebral artery venous plexus which helps in reducing oozing from VA.

Conclusion: Endospine in cervical region can be used for both anterior as well as posterior approaches. Endospine has a very steep learning curve. Endospine with Jho's approach is a better technique for disc preserving functional spine surgery. Cord decompression also can be achieved with anterior approach. Use of endospine with posterior and anterior, Jho's approach should be by experienced surgeon to avoid complications like dural injury.

Keywords: Cervical disc herniation; cervical foraminotomy; Jho's technique; endospine; intervetebral disc; radiculopathy.

PU49

Novel posterior artificial atlanto-odontoid joint for atlantoaxial instability: a biomechanical study

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Objective: To investigate the stability and function of a Novel Posterior Artificial Atlanto-odontoid Joint (NPAAJ), using cadaveric cervical spines.

Methods: Cervical areas C0 through C7 from 10 cadaveric spines were used for anteroposterior (AP) translation and range of motion (ROM) tests in the following sequence: intact group, destabilization group, NPAAJ group, and double rod group.

Results: The mean AP translational distances of C1-C2 in the intact, destabilization, and double rod groups were 6.53 ± 1.07, 11.54 ± 1.59, and 3.24 ± 0.99 mm, respectively. The AP translational distance of the NPAAJ group (3.75 ± 0.87 mm) was not significantly different from that of the double rod group. The average flexion, extension, and axial rotation ROM of the NPAAJ group were 9.87 ± 0.91°, 8.75 ± 0.99°, and 61.93 ± 2.93°, respectively, which were less than those of the intact group ($p < 0.05$). The average lateral bending ROM of the NPAAJ group (9.26 ± 0.86°) was not significantly different from that of the intact group ($p = 0.23$). The flexion, extension, and rotation range of the NPAAJ were 79.5%, 85.2%, and 82.3% of those in the intact group, respectively.

Conclusions: A NPAAJ for correction of atlantoaxial instability (AAI) can be placed using a posterior approach with a larger view of the surgical field and less risk of complications. It can restore the stability and preserve most movement function of C1-C2. Additionally, the NPAAJ can prevent soft tissue embedding into the joint. Further studies should be performed before it is used clinically.

PU50

Short Effect Of Articular Process Guide And Slide Method On Lumbar Spinal Stenosis

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Objective: To explore the articular process guide and slide by transdermal spinal endoscopy in the treatment of lumbar spinal stenosis.

Method: 30 patients with lumbar spinal stenosis were enrolled from August to November 2016, 19 males and 11 females, aged from 41 to 83 years, with an average age of 56.7 years. 10 cases with L3/4 and L4/5 stenosis, 1 case with L4/5 and L5/S1 stenosis, 5 cases with bilateral L4/5 and 14 cases with single level stenosis (10 cases with L4/5, 4 cases with L5/S1). Lateral transforaminal approach and superior articular process guide and slide intervertebral foramen plasty was used. The part above the trailing edge line of the posterior longitudinal ligament called "up", the part under the trailing edge line of the posterior longitudinal ligament called "down", then we used "up and down" sub-regional decompression. During the following 3 months, we detected the visual analogue scale (VAS), Oswestry disability index (ODI) and modified MacNab assessment to assess the efficacy; meanwhile, we also compare the images before and after the operation, the fluoroscopy frequency and operation time to compare with localization of cusp of superior articular process in previous literature.

Results: The VAS score of waist and legs decreased from 5.43±1.24 before operation to 1.88±0.49 at one day after operation and 1.58±0.46 at 3 months after operation with significant differences. ODI score decreased from 43.40±18.11 before operation to 34.87±16.02 at one day after operation and 15.67±7.54 at 3 months. At follow-up 3 months after operation, according to modified MacNab assessment, 93.33% patients got good prognosis, the operative time reduced from 90.0±15.0 minutes to 55.0±14.6 minutes, which was also significant shorter than 86.0±15.4 minutes of the literature. The fluoroscopy times decreased from 16±2.3 to 8±1.3, which was also significant less than 37.5±7.5 of the literature.

Conclusion: Articular process guide and slide by transdermal spinal endoscopy is of satisfactory shortterm curative effect in the treatment of lumber spinal stenosis, which could improve the clinical symptoms, reduced the number of fluoroscopy and shorten the operation time, and "up and down" sub-regional decompression could avoid nerve injury.

PU51

Minimally Invasive Transforaminal Lumbar Interbody Fusion Versus Percutaneous Endoscopic Lumbar Discectomy Revision Surgery for Recurrent Herniation After Microendoscopic Discectomy

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Background: Most patients with recurrence of microendoscopic discectomy (MED) need to receive revision surgery. Minimally invasive transforaminal lumbar interbody fusion (MIS-TLIF) and percutaneous endoscopic lumbar discectomy (PELD) are common operative methods for MED recurrence, but no study has been made to compare the clinical outcomes of these 2 surgical methods as revision surgery for MED recurrence.

Methods: A total of 105 patients who underwent either MIS-TLIF (58 patients) or PELD (47 patients) for revision of MED recurrence were included in this study. Perioperative outcomes (operation time, blood loss, and hospital stay), total cost, pain and functional scores (visual analog scale, Oswestry Disability Index, 12-item short form health survey) with a 12-month follow-up visit and review of complications and recurrence within 12 months postoperatively were recorded and assessed.

Results: No significant difference of clinical outcome over time was observed between these 2 approaches. Compared with MIS-TLIF, PELD was associated with greater satisfaction in the early stage after surgery; this effect was equalized after 3 months postoperatively. PELD brought advantages in terms of shorter operation time, shorter hospital stay, less blood loss, and lower total cost compared with MIS-TLIF; however, PELD was also associated with a higher recurrence rate than MIS-TLIF.

Conclusions: Neither of these 2 surgical methods gave a clear advantage in long-term pain or function scores. Compared with MIS-TLIF, PELD could lead to a better perioperative result and less cost; however, the higher recurrence rate could not be ignored. Taking these characteristics into consideration was instrumental in pursuing personalized treatment for MED recurrence.

PU52

Analysis Of Related Causes Of Lumbar Instability After Transforaminal TESSYS Technique

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Objective: Discuss analysis of the causes of lumbar instability after lumbar disc herniation treated by transforaminal lumbar discectomy.

Method: Select 396 cases of lumbar disc herniation (LDH, the same below) patients with TESSYS technique from September 2012 to August 2013 in our hospital. The follow-up period was 2 years, 2 months to 2 years, 6 months, with an average of 2 years and 3 months, eliminate 67 patients who loss to follow-up. Calculate the age of the patient and the total of surgically removed nucleus pulposus, perform 3D-CT and reconstructed examination of the facet joint areas of the surgical region before and after operation respectively, assess the degree of grinding of the joint of the patients. Count up the number of lumbar instability occurred after operation as the lumbar instability group, other patients were in the lumbar stabilization group.

Result: 1. The average age of the patients with lumbar instability was 53.21±12.65 years old, the average age of the patients with stable lumbar spine was 49.30±14.53 years, there was no significant difference between the two groups. 2.The average volume of nucleus pulposus removal was 3.21±0.65ml in the patients with lumbar instability, the average volume of nucleus pulposus removal was 1.62±0.79ml in the patients with lumbar stability, the amount of nucleus pulposus removal in the lumbar instability group was significantly higher than that in the lumbar stabilization group, the difference was statistically significant.3.The average grinding ratio of facet joints was 39.89±6.25% in the lumbar instability group, the average grinding ratio of facet joints was 10.25±3.97% in the lumbar stability group, the proportion of facet joint grinding in the lumbar instability group was significantly higher than that in the lumbar stabilization group.4.The proportion of the patients with lumbar instability who occurred chronic lumbar back pain, degenerative spondylolisthesis and other complications is 69.53%,that of the patients with lumbar stability who occurred corresponding complications is about 9.43%, there was significant statistical difference between the two groups.

Conclusion: It may cause postoperative lumbar instability and increase the probability of complications if the amount of nucleus pulposus removal is too large and the grinding degree of the facet joint is too large.

PU53

Application Of Navigation Rod For Puncture And Positioning In Percutaneous Endoscopic Lumbar Discectomy

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Objective: To discuss the effect of navigation rod in use of puncture in percutaneous endoscopic lumbar discectomy（PELD）, and analyze its feasibility and the value of clinical application.

Methods: According to the order of admission, 60 patients with lumber disc herniation were divided into navigation group and traditional group, each group was 30case. Two groups patients received percutaneous endoscopic lumbar discectomy. Those who received self-made navigation rod to puncture were considered as navigation group, and those who received the traditional C-arm fluoroscopy to puncture were considered as traditional group. Compared two groups of puncture times, fluoroscopic exposure times, puncture time and VAS after operation.

Results: Two groups patients pain relive, and straight leg raising turn to negative. Compared with the two groups, the navigation group average of puncture times was (1.10±0.31), and (10.53±5.55) in traditional group (P<0.001). The navigation group average of fluoroscopic exposure times was (8.30+1.24), and (60±15.15) in traditional group (P<0.001). The navigation group perspective times less than the traditional group. The navigation group average of puncture time was (5.05±2.01) min, and (34.80±6.32) min in traditional group (P<0.001). The postoperation(1 day,3 months,6 months) VAS score of navigation group is（2.6±0.8）、（1.8±0.4）、（1.4±0.3）,while the VAS score of traditional group is（2.8±1.1）、（2.1±0.2）、（1.6±0.5）, postoperation VAS score of the two groups was lower than preoperation(P<0.05). There was no statistically difference between two groups postoperation(P>0.05).

Conclusion: Using the navigation rod can solve the bottleneck problem of PELD, and improve the success rate of puncture, reduce puncture times, avoid injury and reduce puncture time, greatly reduce the X-ray exposure to the surgeon and patient, and it is worthy of clinical application.

PU54

Unsuccessful Full-endoscopic Interlaminar Approach For Lumbar Disc Herniation: An Analysis Of The Causes Of Surgical Failure

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Purpose: To analyze the causes of surgical failure and evaluate the risk factors of full-endoscopic translaminar discectomy(FEID).

Method: A retrospective review was performed on all patients who had undergone FEID between August 2008 and August 2017. Clinic data was collected. Unsuccessful FETD was defined as a case requiring reoperation winthin 6 weeks after primary surgery. Causes of surgical failure were analyzed. Unsuccessful cases were statistically analyzed by relative risk factor inculuding age, sex, duration of sick, herniated level, types of herniation, extruded disc migration and location relation of nerve root.

Result: As a result, 1024 cases had performed FEID during the 7 years; 68(6.6%) cases were unsuccessful. Among of them, there were 47 male and 21female. The mean age was 35.9±13.2 (18-55) and the mean duration of sick was 62.1±27.5 months. 12, 26 and 30 cases with herniated disc located at L3/4, L4/5 and L5/S1, respectively. According to the types of herniation, there were 7 cases of lateral herniation, 15 cases of lateralcentral herniation and 46 migrated herniation including 38 high-grade and 8 low-grade; Among of them, 7 cases of shoulder type, 31 axillary type, 9 cases of ventral type, 21 cases of mixed type. Surgical failure occurred in 42 cases with incomplete discectomy, 9 cases with inappropriate positioning of working channel, 10 cases with recurrences, 6 cases with poor vision resulted from bleeding and 2 cases with postoperative hematoma. 15 cases were converted to mini-open surgery and 53 cases were performed reoperation postoperatively. Confirmed by Logistic regression analysis, L3/4 or L4/5 level, high-grade migration and axillary disc herniation were independent risk factors of FEID surgical failure.

Conclusion: Proper surgical indications, good working channel position and great deal of experience are important for successful FEID. FEID techniques should be specifically designed to remove the disc fragments completely in various types of herniated disc.

PU55

Early Experience Of Full-endoscopic Interlaminar Discectomy For Adolescent Lumbar Disc Herniation With Sciatic Scoliosis

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Objective: This study aims to evaluate the clinical and radiological results of FEID in the treatment of ALDH with sciatic scoliosis and to identify the effects of sciatic scoliosis on complication and recurrence.

Methods: A series of cases under age 20 with single-level ALDH underwent FEID between January 2010 and December 2014 were retrospectively analyzed. The patients were divided into two groups according to the fact that they had scoliosis or not. Clinical outcomes were evaluated using visual analog scale (VAS) for low back and leg pain, Oswestry Disability Index (ODI) for the functional assessment and modified Macnab criteria for the patient satisfaction. Radiological parameters of the scoliosis group such as Cobb angle, CVSL-max and CVSL-C7 were statistically analyzed.

Results: No significant differences were found between both groups in terms of the mean operative time, the mean length of hospital stay, complications and recurrences ($P > 0.05$). VAS and ODI were significantly improved in both groups ($P < 0.05$). However, there were no statistically significant differences between the 2 groups in VAS, ODI, and modified MacNab criteria ($P > 0.05$). For scoliosis group, significant improvements were observed in the postoperative sagittal and coronal alignment parameters ($P<0.05$).

Conclusions: The application of FEID in the treatment of ALDH could achieve satisfactory clinical and radiological outcomes. Sciatic scoliosis was corrected spontaneously without increasing the risk of complication and recurrence.

PU56

The Efficacy Of Percutaneous Endoscopic Interlaminar Discectomy For Treating Prolapsuss And Sequesteted Lumbar Disc Herniation

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Objective: To investigate the efficacy of percutaneousendoscopic interlaminar discectomy(PEID) for prolapsuss and sequesteted lumbar disc herniation.

Methods: we treated 37 patients who diagnosed as prolapsuss and sequesteted lumbar disc herniation during September.2014 to December.2016 with 16 cases in L4-5 , 21 cases in L5 - S1. L4-5 lumbar disc herniation located at superior edge of the L5 pedicle level in 10 cases, located at L5 pedicle level in 6 cases; L5 -S1 disc herniation located at superior edge of the S1 pedicle level in 13 cases, located at S1 pedicle level in 7 cases, while located at L5 pedicle level in 1 case;All patients were adopted the endotracheal intubation anesthesia, kneeling recumbent position; Intra-vertebral plate approach was invited, microscopic high-speed grinding drill and vertebral wrench were used to remove part of the vertebral plate and ligamentum flavum, the herniated disk and nucleus pulposus was exposed and removed. VAS (visual analogue scale) score of leg pain was recorded pre-operative, 1 day and 3 months post-operative separately; MacNab score was recorded 3 months post-operative to evaluate the safety and effectiveness.

Restults: All surgery were completed without compliation.Operation time was 65-130 minutes(the average time was 86.6 minutes).No complications such as dural ruprure , nerve root injury and infection. The VAS score of 1 day, 3 months Postoperative were recorded respectively (1.9 + 1.1), (1.8-1.3) and decreased obviously than preoperative (6.7 + 2.4) points. It has statistically significant ($p<0.01$).Three months after operation according to the Macnab criteria for the evaluation of curative effect, the results were excellent in 22 cases, good in 13 cases, and fair in 2 cases, and the excellent and good rate was 94.6% .

Conclusion: PEID is a security and effective method for treating prolapsuss and sequesteted lumbar disc herniation.

PU57

Short-term Clinical Outcomes Of Single-level Lumbar Degenerative Diseases Treated Using Oblique Lumbar Interbody Fusion

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Purpose: To investigate the short-term clinical outcome of one-level degenerative diseases for a single surgeon during his initial phases of performing a minimally invasive surgery oblique lumbar interbody fusion (MIS-OLIF) on the basis of perioperative parameters and follow-up data.
Methods: A prospective analysis of 49 consecutive patients that underwent a MIS-OLIF between November 2014 and March 2016 by corresponding author was performed. Only those patients that were single level, index surgeries were included. Every patient had a diagnosis of degenerative lumbar diseases including lumbar spondylolisthesis (25 cases), discogenic low back pain (14 cases) or segmental instability (10 cases). Patients underwent an indirect decompression and fusion using an expandable tubular retractor and single intervertebral cage with bilateral percutaneous pedicle screw fixation. 49 patients were divided into the A group (the first 24 patients) and the B group (25 patients after the initial 24 patients). The following data were compared between the two groups: surgical time for (Skin-Skin, minutes), estimated blood loss (ml), radiograph exposure time (seconds), the clinical and radiographic results, and intra-/postoperative complications. All intraoperative parameters only included the measurement and findings related with the MIS-OLIF procedure. The short-term clinical outcome of single level degenerative lumbar diseases treated by MIS-OLIF was assessed on the basis of follow-up data. The learning curve was measured using a logarithmic curve-fit regression analysis.
Results: Average operative time was significantly longer in the A group (47.1±10.6 min) compared with the B group (37.2±10.0 min) (P=0.002). In comparison with the B group, the A group had significantly more X-ray exposure time (25.3±6.1 sec versus 17.1±6.9 sec, P<0.000). The operative and X-ray exposure time gradually decreased as the series progressed, and an asymptote was reached after about 20 cases. There was no statistically significant difference in intraoperative blood loss between the A group (28.1±18.2 ml) and the B group (24.4±10.9 ml) (P=0.642). The most observed complications was donor site pain (11 cases, 45.8%), followed by thigh numbness/pain (5 cases, 20.8%) and psoas/quadriceps weakness (2cases, 8.3%), paralytic ileus (one case, 4.2%) and sympathetic nerve injury (one case, 4.2%) in the A group. Donor site pain occurred in four patients (16.0%), thigh numbness/pain in three patients (12.0%), psoas/quadriceps weakness in one patient (4.0%) and sympathetic nerve injury in one patient (4.0%) in the B group. All complications were transient and resolved within 3 months. The incidence of complications excluding donor site pain in the early period (A group) and the later period (B group) was 37.5% and 20.0%, respectively, showing temporal improvement after the introduction, although there were no significant differences in perioperative complications between both groups (P=0.175). Fortynine patients were followed up for more than 1 year, and the average follow-up period was 18.5±3.9 months. The back pain VAS and ODI scores decreasedrespectively from 6.4±2.3 before surgery to 1.5± 0.9 in final follow-up（P=0.004）and from 37.1±9.4 before surgery to 11.8±3.9 in last follow-up （ P=0.003). Total fusion rate was 89.8% （ 44/49 cases ） in final follow-up. Radiographic evaluation showed similar bony fusion in the A group (22 of 25 cases) with the B group (22 of 24 cases) in last follow-up.
Conclusions: Single level degenerative lumbar diseases can safely and effectively been treated by using MIS-OLIF with a good short-term clinical outcome. The procedure presents a learning curve to the practicing spine surgeon with regards to operative time, X-ray exposure time and intra-/postoperative complications. Intraoperative parameters improved with understanding the minimally invasive technique. Close attention to detail can minimize complications that may be associated with the learning curve.

PU58

Clinical Effects Of Percutaneous Endoscopic Lumbar Decompression Combined With Percutaneous Foraminoplasty For Lateral Recess Stenosis：A Retrospective Study

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Background: To investigate clinical effects and feasibility of patients with lateral recess stenosis, whose were performed percutaneous endoscopic lumbar decompression and percutaneous foraminoplasty through transforaminal approach. **Methods**. Between March 2012 and July 2013, 36 cases with lateral recess stenosis were treated by percutaneous endoscopic lumbar decompression combined with percutaneous foraminoplasty, 34 patents were followed up to 24 months. Outcomes were evaluated by follow-up interviews at 6months, 12 months, 18months and 24months. Assessment index include Visual Analog Scale (VAS), Oswestry Disability Index (ODI), modified MacNab criteria and related complications.

Results:4 months follow-up data were obtained from 34 cases, including 7 cases on unilateral L3-4, 16 cases on unilateral L4-5, 9 cases on unilateral L5-S1, 2 cases on bilateral L4-5. All patients were decompressed and ranged in age from 50-82 years (mean age, 68.09±6.80), including 19 females and 15 males. 12 cases combined with disc herniation. Postoperative MRI examination showed adequate decompression of lateral recess and removal of combined herniated disc in all patients. VAS and ODI were significantly lower in all time-points after surgery than before surgery. MacNab scores at 24 months after operation including 11 cases were given “excellent”, 20 patients were given “good”, 2 cases were given “fair” because of sever low back pain and 1 case was given “poor” result from recurrence. There were no infection, dysfunctional nerve root injury or iatrogenic segmental instability after surgery. However, 2 cases were complaint symptom of transient nerve irritation, it’s disappeared at 2-4 weeks by NSAIDs and trophic nerve treatment.

Conclusions: Percutaneous endoscopic lumbar decompression combined with percutaneous foraminoplasty are a beneficial and feasible intervention for patients, whose were attacked by lateral recess stenosis.

Keywords: lumbar lateral recess stenosis; percutaneous endoscopic lumbar decompression; percutaneous foraminoplasty

PU59

Percutaneous endoscopic interlaminar discectomy using a modified local anaesthesia

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Objectives: To investigate efficacy and safety of a modified local anesthesia for the percutaneous endoscopic interlaminar discectomy (PEID).

Methods: Seventy-six patients having L5/S1 disc herniation were performed PEID under a modified local anesthesia between Jan of 2014 to Aug of 2017. Anesthetic drug was the combination of 10 ml lidocaine and 10 ml ropivacaine, diluting in 30 ml normal saline. The skin, subcutaneous tissue, and the surface of lamina were first blocked as routine. Interlaminar endoscopy was then performed. After ligament flavum was cut, 2-3ml anesthetic medicine was injected into the epidural space. When the nerve root was exposed, 1-2 ml anesthetic medicine was further injected to the proximal nerve root under endoscopy with a home-made long needle. Interlaminar endoscopic discectomy was then continued as usually. The highest visual analog score (VAS) was recorded during the surgery. Related complications and the corresponding management were recorded.

Results: Among the 76 patients, 62 cases (81.6%) experienced slight pain (VAS < 4) after the local anaesthesia during the surgery, and eleven patients reported moderate pain and three suffered from severe pain (VAS>7). Moderate to severe pain often occurred when we entered into the spinal canal. Therefore, epidural anaesthesia was used before we cut the ligament flavum. Nerve root block was performed if severe pain happened when exposing nerve root. Related complications were noted in 9 cases. Whole spinal medullary anaesthesia occurred in two patients during the surgery. Five patients experienced an increased numbness and 2 cases had lower limb weakness, all of the symptoms were relieved at 1-month follow-up.

Conclusion: For L5/S1 disc herniation, PEID can be performed using the modified local anesthetic technique. Local anesthesia was safe and effective, especially for the patients have contraindications of general anesthesia.

PU60

Comparison of PELD and interlaminar PEID surgery in the treatment of patients with giant herniation disc

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Objective: Transforaminal endoscopic treatment of huge lumbar herniation disc (protrusion of spinal canal accounted for more than 2/3) commonly used surgical approach with transforaminal (dypass) and posterior interlaminar approach, all can obtain good effect. But both of the anatomical structure damage, operation technology learning curve, complications are not the same, this article makes a comparison based on clinical cases

Methods: After huge disc herniation cases treatment with PELD or interlaminar PEID surgery, comparative analysis of anesthesia method, working channel establishment, X-ray radiation protection, nerve root loose and complications, different characteristics of the learning curve. The experience is provided between laminectomy surgery method of PEID and PELD.

Results: Both can achieve good curative effect, no significant statistic differences. For PELD operation, general anesthesia is commonly need, learning curve is steep, to establish a working channel in L5S1 is difficult, X-ray perspective is more, but the decompression of the nerve root is easy, slightly less complications. Interlaminar approach of PEID in MED based learning to use is easy. The PEID learning curve is slightly lower, less general anesthesia operation, less X-ray fluoroscopy, but surgical complications are slightly higher.

Conclusion: Lateral PELD and interlaminar PEID can achieve good results in the treatment of giant disc herniation. The surgeon can choose the surgical approach and techniques according to his proficiency and experience.

PU61

Comparison Of Four Kinds Of Cervical Keyhole Surgery For The Treatment Of Cervicalspondylotic Radiculopathy -- From Traditional Techniques To Endoscopic Techniques

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Objective: To compare the advantages of four kinds of posterior cervical keyhole surgery among traditional posterior open transforaminal keyhole surgery, working channel keyhole surgery, MED and p-PECD, and to provide references for such operation.

Methods: By introducing the origin, theory and anatomy of transforaminal keyhole surgery, combined with traditional open surgery, under working channel operation, posterior cervical MED, endoscopic p-PECD surgery for the treatment of cervicalspondylotic radiculopathy, to find the advantages and disadvantages of the four kinds of operation on incision, operation skills, tools etc. WAS and ODI scores were used in the process to value the operation results.

Results: The traditional open surgery, under working channel operation, MED and p-PECD operation are all effective for the treatment of cervicalspondylotic radiculopathy. But the operation time, intraoperative bleeding, incision size and recovery time are different.

Conclusions: The traditional open surgery is more easy to master, but more traumatic. Grasping the cervical endoscopic p-PECD is more difficulty, but minimal incision, minimal bleeding, clearer surgical field, minimal trauma, which possesses the obvious minimally invasive advantages. The four surgical techniques should be carried out step by step for the beginner.

PU62

Percutaneous Endoscopic Lumbar Reoperation For Recurrent Sciatica Symptoms

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Background: Recurrent sciatica symptoms after the prior surgical intervention is a relatively common and troublesome clinical problem. Percutaneous endoscopic lumbar decompression has been proved an effective method for recurrent lumbar disc herniation. However, the prognostic factors and outcomes of percutaneous endoscopic lumbar reoperation (PELR) for recurrent sciatica symptoms were still unknown. The purpose of this study was to evaluate the outcomes and prognostic factors of patients who underwent PELR for recurrent sciatica symptoms.

Methods: From 2009 to 2015, 94 patients underwent PELR for recurrent sciatica symptoms were enrolled. The primary surgeries include Transforaminal Lumbar Interbody Fusion (TLIF, 16), Micro-endoscopic Discectomy (MED, 31), Percutaneous Endoscopic Lumbar Decompression (PELD, 17), and Open Discectomy (OD, 30). The mean follow-up period was 36 months, and 86 (91.5%) patients had obtained at least 24 months' follow-up.

Results: Of the 94 patients with adequate follow-up, 51 (54.3%) exhibited excellent improvement, 23 (24.5%) had good improvement, and 7 (7.4%) had fair improvement according to modified Macnab criteria. The average re-recurrence rate was 9.6% with no difference among different primary surgery groups (PELD, 3/17; MED, 2/31; OD, 3/30; TLIF, 1/16). There was a trend towards higher rates of symptom recurrence in the primary group of PELD underwent percutaneous endoscopic lumbar reoperation compared to other groups, but this did not reach statistical significance ($p > 0.05$). Multivariate analysis suggested that age, body mass index, surgeon level was independent prognostic factors. Obesity (HR=13.98, 95% CI=3.394 to 57.57; $P<0.001$) was the risk factor affecting re-recurrence according to logistic regression analysis.

Conclusions: PELR is a safe and effective treatment for recurrent sciatica symptoms regardless of different primary operation type. Obesity, inferior surgeon level and patient's age over 40 years were associated with a worse prognosis. Obesity was also a strong and independent predictor of re-recurrence sciatica symptoms after percutaneous endoscopic lumbar decompression.

PU63

Comparison Of Clinical Outcomes And Multifidus Muscle Injury Of A Novel Inextensible Endoscopic Tube Versus Extensible Retractor System In Single-level Minimally Invasive Transforaminal Lumbar Interbody Fusion

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Objective: Currently, various retractor systems are widely used for access to lumbar spine in minimally invasive transforaminal lumbar interbody fusion (MIS-TLIF). Nevertheless, studies concerning the comparison of extensible retractor and inextensible tube system are quite rare. This article was to compare perioperative characteristics, clinical outcomes and multifidus muscle Injury of obconical inextensible tube versus extensible retractor system for single-level MIS-TLIF.

Methods: From April 2015 to May 2016, 98 consecutive patients underwent MIS-TLIF procedure using a obconical inextensible endoscopic tube or extensible retractor system were enrolled in this study. Operation parameters such as incision length, blood loss, postoperative drainage volume, surgical time, analgesic use rate, time to ambulation and postoperative hospitalization days were evaluated. The concentration of WBC, IL-6, IL-8, TNF-a and CPK-MM of the enrolled patients were measured for postoperative traumatic stress and muscle injury. Multifidus muscle edema and atrophy were evaluated by MRI T2 weighted image at three different time points (preoperative, postoperative and one-year follow-up). Clinical outcomes such as Visual Analog Scale (VAS), Japanese Orthopedic Association (JOA) score, Oswestry Disability Index (ODI) score, fusion rates, and Macnab criteria were assessed for patients' symptom.

Results: In terms of baseline characteristics, the two groups were similar about sample size, gender, age, symptoms duration, operation level, body mass index, physical examination and all the clinical outcomes measures ($P>0.05$). Perioperative analysis showed that Inextensible group had comparative incision length, blood loss, time to ambulation, and postoperative hospitalization ($P>0.05$). Inextensible tubular group had less postoperative drainage volume and analgesic use rate ($P<0.05$). The concentration level of CPK-MM and CRP was lower in Inextensible tubular group compared with Extensible retractor group. No significant difference was found between two groups about MRI T2 signal intensity ratio of multifidus muscle at the immediate postoperative period. The MRI T2 signal intensity ratio of multifidus muscle was lower in inextensible tubular group than extensible retractor group at one-year follow-up period. The VAS scores for low back pain, leg pain improved significantly in both groups after surgery, as did the JOA and ODI scores. However, there were no significant differences between the two groups regarding the preoperative and final follow-up VAS, JOA, ODI scores, fusion rates and the distribution of the Macnab criteria.

Conclusion: The obconical inextensible endoscopic tube system via transforaminal approach for lumbar interbody fusion is a safe and sufficient technique. When compared to extensible retractor system, it has comparable clinical outcomes, with additional significant benefits of less postoperative drainage volume and analgesic use rate, less multifidus muscle injury in terms of lower CPK-MM levels at immediate postoperative period, less change in CRP and less change in MRI T2 signal intensity ratio of multifidus muscles at one-year follow-up.

PU64

A Finite Element Analysis To Value The Safety Of Anterior Percutaneous Endoscopic Transvertebral Cervical Discectomy

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Purpose: A biomechanical comparison of intact C2-T1 segments and C2-T1 segments with C4 drilled in different diameters and methods to simulate anterior percutaneous endoscopic transvertebral cervical discectomy and measure flexion-extension safety by finite element model.

Methods: We made a intact C2-T1 cervical FE model by Mimics 17.0, Geomagic 12.0, Hypermesh 12.0 and Abaqus 6.14 software and made the validation by comparison the flexion, extension, lateral bending and rotation angle among our FE model, reported FE models and researches in vitro study. In consideration of the block of thyroid gland, we chose C4 vertebra to do the simulation. We made 2 kinds of drilling holes (A. from anterior vertebra to posterosuperior vertebra with partial superior endplate excision, B. from anterior vertebra to posterosuperior vertebra without partial superior endplate excision) of different diameters (6mm, 8mm, 10mm) on C4 vertebra to simulate the APETCD operation and made the post-surgery C2-T1 FE models respectively. Loaded 1N/m moments on superior of post-surgery FE model C2 odontoid to simulate normal flexion and extension movements. Measure the mises stress and strain on different path of drilled C4 vertebra and compare the value and distribution with C4 vertebra of intact FE model to analyse the biomechanical changes of different drilling methods and diameters.

Results: 1. From the cloud charts we can see there were different extent of mises stress concentration on the endplate edges of model A with different drilling diameters. Meanwhile the model B with different drilling diameters there were no mises stress concentration until the drilling diameter reached 10mm. 2.We measured the distribution of pressure on C4 superior endplate in different models under flexion and extension movements and compared those values with the intact model, the difference analysis showed that there was no significant difference of the pressure of anterior part endplate between B6 model and the intact model under flexion and extension movements. As for the pressure on posterior part of endplate, there were no significant difference between B6 and intact model under flexion movements. Besides there was no significant difference of pressure on anterior part of endplate between B8 and intact model under flexion and extension movements. For the other models the pressure distributions on endplate were significant different between them and intact model. 3.By measurements of the mises stress on lateral wall of drilling holes, the peak value of mises stress was positive correlated with the diameter of hole. When the diameter reached 10mm, the peak value of mises stress on lateral wall reached the break strength of cancellous bone, which means the risks of fracture could be high. 4.Besides we made the fracture risk prediction of those cortical bone of different models according to previous researches, the strain distribution showed that there were different amount of high-risk fracture elements on the superior endplates of model A (A6:0.8% A8:2.3% A10:7.2%) which could indicate that there were high risk of endplate fracture of model A under drilling hole of 8-10mm.

Conclusion: There was positive correlation between the drilling diameter and mises stress concentration, when the diameter reached 10mm there could be high risks of cancellous fracture of lateral drilling hole, however the excision of endplate could cause mises stress concentration on the edges of endplate, excessive endplate excision could bring risks of endplate fracture. The approach without endplate excision with diameter of 6-8mm could made not much significant changes of pressure distribution of endplate and low mises stress and strain concentration, which could be relatively safety surgery approach.

PU65

Surgical Outcome Of Two-Level Transforaminal Percutaneous Endoscopic Lumbar Discectomy For Far-Migrated Disc Herniation

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Objective: To describe the two-level percutaneous endoscopic lumbar discectomy (PELD) technique in transforaminal approach for highly migrated disc herniation and investigate its clinical outcomes.

Methods: Total of 22 consecutive patients with highly migrated lumbar disc herniation were enrolled for the study from June 2012 to February 2014. Patients were evaluated by Visual Analog Scale (VAS) and Oswestry disability index (ODI) before operation, and three months, twelve months, final follow-up after operation. The clinical outcome was assessed according to modified Macnab criteria, in addition to VAS and ODI, at the final follow-up.

Results: There were 12 males and 10 females, with a mean age of 41.1 (range 23-67) years. The mean follow-up period was 18.05 (range 14-33) months. According to the modified Macnab criteria, the clinical outcome at the final follow-up was excellent in 14, good in 6 and fair in 2 patients, the rate of satisfactory results (excellent and good) was 90.9%. The preoperative VAS of back pain was 7.82±0.96, which significantly decreased to 2.91±0.61, 2.00±0.54 and 1.14±0.71 at three, twelve months and final follow-up. The preoperative VAS of leg pain was 8.59±1.05, which significantly decreased to 2.73±0.46, 1.77±0.69 and 0.95±0.72 at three, twelve months and final follow-up. The preoperative ODI was 71.18±7.90, which significantly decreased to 36.55±5.17, 23.36±5.25 and 16.91±4.13 at three, twelve months and final follow-up. The improvements in VAS and ODI were statistically significant. One patient had recurrent herniation in 18 months after the first surgery and underwent open discectomy. One patient showed symptoms of postoperative dysesthesia (POD), however the POD symptom was transient and partial remission in two months after conservative treatment.

Conclusion: Two-level PELD in transforaminal approach can be a safe and effective procedure for highly migrated disc herniation.

PU66

Learning Curves Of Percutaneous Endoscopic Lumbar Discectomy In Transforaminal Approach At The L4/5 And L5/S1 Levels: A Comparative Study

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Objectives: This study aimed to compare the learning curves of percutaneous endoscopic lumbar discectomy (PELD) in a transforaminal approach at the L4/5 and L5/S1 levels.

Methods: We retrospectively reviewed the first 60 cases at the L4/5 level (Group I) and the first 60 cases at the L5/S1 level (Group II) of PELD performed by one spine surgeon. The patients were divided into subgroups A, B, and C (Group I: A cases 1–20, B cases 21–40, C cases 41–60; Group II: A cases 1–20, B cases 21–40, C cases 41–60). Operation time was thoroughly analyzed.

Results: Compared with the L4/5 level, the learning curve of transforaminal PELD at the L5/S1 level was flatter. The mean operation times of Groups IA, IB, and IC were (88.75±17.02), (67.75±6.16), and (64.85±7.82) min, respectively. There was a significant difference between Groups A and B ($P<0.05$), but no significant difference between Groups B and C ($P=0.20$). The mean operation times of Groups IIA, IIB, and IIC were (117.25±13.62), (109.50±11.20), and (92.15±11.94) min, respectively. There was no significant difference between Groups A and B ($P=0.06$), but there was a significant difference between Groups B and C ($P<0.05$). There were 6 cases of postoperative dysesthesia (POD) in Group I and 2 cases in Group IIA ($P=0.27$). There were 2 cases of residual disc in Group I, and 4 cases in Group II ($P=0.67$). There were 3 cases of recurrence in Group I, and 2 cases in Group II ($P>0.05$).

Conclusions: Compared with the L5/S1 level, the learning curve of PELD in a transforaminal approach at the L4/5 level was steeper, suggesting that the L4/5 level might be easier to master after short-term professional training.

PU67

Ultrasound Fusion Imaging With Real-time Navigation For Percutaneous Endoscopic Lumbar Discectomy

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Recently, ultrasound fusion imaging with the real-time navigation system was introduced as a navigation technique for many kinds of surgery.

Objective: To investigate the effectiveness of ultrasound fusion imaging with real-time navigation for percutaneous endoscopic lumbar discectomy.

Methods: From September 2016 to June 2017, 40 patients with single- level lumbar disc herniation were divided into two groups. One group (C arm group) was underwent percutaneous endoscopic lumbar discectomy with C arm guidance, the other group (US group) was guided by Ultrasound fusion imaging with real-time navigation. The patient in US group was take MRI before surgery with vitro marker. Then the image was downloaded and input into the US system. While US and MR images were fused together. Herniation and nerve root can be easily differentiate by the MR image. With the needle tip technique, guide pin and trephine were monitored and predicted direction in the image. The total puncture time and C- arm fluoroscopy times were recorded.

Result: Patients had no obvious discomfort during the puncture procedure and no postoperative complications. In US group, the average preoperative time was 21.3±5.6min, the average times of C- arm exposure was 3.1±1.1 min. While in C arm group, the average preoperative time was 30.8±9.1 min, the average times of C- arm exposure was 19.3±7.8 min.

Conclusion: Ultrasound fusion imaging was useful to differentiate the nerve root and vital tissue. Ultrasound fusion imaging with real-time navigation has equal accuracy to C arm guide, reducing the puncture time and the amount of X- ray radiation significantly.

PU68

The Clinical Effects Of Percutaneous Endoscopic Lumbar Discectomy In The Treatment Of Recurrent Lumbar Disc After Interlamina Fenestration Discectomy

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Objective: To observe the clinical effects of percutaneous endoscopic lumbar discectomy in the treatment of recurrent lumbar disc after interlamina fenestration discectomy, and to analyze the feasibility of this method.

Methods:25 cases with recurrent lumbar disc herniation met inclusion criteria in our hospital were retrospective analysed：All patients were diagnosed with the same segment recurrent lumbar disc herniation and were used the percutaneous transforaminal endoscopic lumbar discectomy (THESSYS).Then neurotrophic drugs were given after the operation.VAS score was used to evaluate the pain improvement before operation, first days, first weeks after operation, third months, sixth months, twelfth months.Functional improvement was evaluated by ODI index in preoperative and last follow-up,and the curative effect was evaluated by modified Macnab method.

Results: All operations were successfully completed, no serious complications occurred during the operation, first days'（2.31±0.72）, first weeks'（2.24±0.69）, third months'（1.87±0.56）, sixth months'（1.72±0.55）, one year's VAS scores'（1.77±0.75）were significantly lower than preoperative's（7.95±0.65）($P < 0.05$).The preoperative ODI index decreased from（66.73±1.80）% to the last follow-up（17.45±2.56）%, with the difference was statistically significant ($P < 0.05$) .The modified Macnab score was excellent in 3 cases, good in 12 cases, fair in 9 cases and poor in 1 cases. The excellent and good rate was 60%.

Conclusion: Percutaneous transforaminal endoscopic lumbar discectomy is one of the feasible methods for the treatment of recurrent lumbar disc herniation, Relative to the interlamina fenestration discectomy, it has the following advantages: To avoid the original surgical scars and reduce the obstacles of this operative approach; To surgery under local anesthesia and shorten the hospitalizatio, related research was few reported and its long-term effects need to be further studied.

PU69

Initial Application Of Percutaneous Posterior 5.9mm Endoscopic Discectomy For The Treatment Of Cervicalspondylotic Radiculopathy

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Objective: To investigate the feasibility, surgical techniques, postoperative effect and methods' characteristic of percutaneous posterior 5.9mm endoscopic discectomy for the treatment of cervicalspondylotic radiculopathy.

Methods: 4 cases of cervicalspondylotic radiculopathy were selected from 2015-01 to 2017-01, among them, there were 1 cases of C3/4, 2 cases of C5/6, 1 case of C5/7 section. All patients were underwent preoperative X ray, CT and MRI to confirm the responsibility segment and exclude the contraindication of operation. The patients were taken dorsal decubitus under general anesthesia for anterior lumbar discography.Then prone position were Kept for Endoscopic operation.The technique was used electric drill to remove the posterior vertebral plate and then 5.9mm endoscopic was used (spinendos) assisted posterior discectomy.Then confirmed the release of pressure nerve root, closed the incision and sent them back to the ward.Nutrition nerve and relieve pain treatment was given after the operation, mean while the patient could be told to wear the neck brace to got up in second days.The operation time, intraoperative blood loss, side effects and complications were recorded, and the clinical effect was evaluated by VAS score, JOA score,and ODI index,Further more, radiographic changes were analyzed by postoperative X-ray, CT, and MRI.

ResuIts: All cases were successfully completed the operation, all were followed up for a short period of time, the curative effect was satisfactory, and no complication occurred.The operation time was between 46min-94min and the amount of bleeding was less than conventional anterior approach.The last follow-up VAS score, JOA score and ODI index after operation were significantly improved compared with preoperative, postoperative CT or MRI showed nucleus pulposus or calcified tissue were removed completely, nerve root was loosened, and X-ray showed no surgical instability.

Conclusion: percutaneous posterior 5.9mm endoscopic discectomy for the treatment of cervicalspondylotic radiculopathy has the following advantages: The less trauma, the faster recovery and the excellent short-term curative effect. But it requires higher demands in surgical instruments, equipment and skills, longer learning curve.Meanwhile, long-term effect remains to be further studied, so We think this approach should be carried out carefully.

PU70

Full-Endoscopic Discectomy Via Interlaminar Approach For Disc Herniation At L4-L5 or L5-S1 With Minimally Invasive Laminectomy: A Prospective Clinical Study With 12-month Follow-up

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Objective: To investigate the clinical outcomes of full-endoscopic discectomy (FED) via interlaminar approach with minimally invasive laminectomy in the treatment of lumbar disc herniation (LDH) at L4-L5 or L5-S1.

Methods: Eighty-two patients (55 male, 27 female) who underwent FED via interlaminar approach at L4-L5 or L5-S1 were included. Operating time, volume of blood loss, size of incision, duration of immobility after the surgery, length of hospitalization, and complications were recorded. Visual analog scale (VAS) score for leg and back pain, and Oswestry Disability Index (ODI) score were evaluated preoperatively and at 3, 6, and 12 months postoperatively.

Results: Mean operating times in the patients, categorized according to procedure (L4-L5, laminectomy performed; L5-S1, laminectomy performed; and L5-S1, laminectomy not performed), were 34.4 ± 6.6 minutes, 35.4 ± 6.7 minutes, and 30.3 ± 6.4 minutes, respectively. Mean radiation time during surgeries was 1.08 ± 0.19 seconds. Mean size of the incisions was 11 ± 2 mm. There was no measurable blood loss during surgery, and the mean duration of hospitalization was 2.3 ± 0.5 days. Mean VAS and ODI scores improved significantly postoperatively compared with preoperative scores. Intraoperative epineurium injury occurred in one case without nerve injury, cerebrospinal fluid leakage, or cauda equina syndrome. Postoperative bleeding occurred in 5 cases resulting in subcutaneous hematoma. The total recurrence rate after 12 months was 1.2%.

Conclusions: FED via interlaminar approach with minimally invasive laminectomy is efficient and safe in significantly improving the pain and functioning in patients with LDH at L4-L5 or L5-S1.

Keywords: full-endoscopic; discectomy; laminectomy; minimally invasive; interlaminar approach; drill

PU71

With The Analysis Of The Effect Of Trephine Intervertebral Disc Endoscope For Treatment Of Degenerative Lumbar Spinal Stenosis

Chunping Ye

Jinhua People's Hospital

Objective: To investigate the indications, surgical techniques and Postoperative effect in bilateral decompression with one side approach for the treatment of degenerative lumbar spinal stenosis use intervertebral disc endoscope combined with protective cover for endoscopic safety trephine.

Method: From April 2016 to March 2017, 126 elderly patients with lumbar spinal stenosis were randomly divided into two groups: A and B, A group of 63 patients bilateral decompression with one side approach use intervertebral disc endoscope, B group of 63 cases with endoscopic safety protective sleeve with trephine and intervertebral disc endoscope, decompression of unilateral approach to treat lumbar spinal stenosis in elderly patients. There were 66 males and 60 females. Age 62-85 years, average 66.7 years old, course of disease 6-254 months, average course of diseases is 83.7 months. According to the JOA score, preoperative, postoperative 1 months, 3 months and 6 months after surgery.

Results: 122 patients were followed up for half a year. The scores of JOA between 1 months, 3 months and 6 months after operation were statistically significant ($P < 0.01$).

The JOA score of group B and group A had statistical difference in the low back pain symptoms and the limitation of daily activities, compared with the 1 months and 3 months after operation ($P < 0.05$), but this difference in 6 months ($P > 0.05$). The bleeding volume, the time of single operation and the time of waking up in group B and group A were statistically different ($P < 0.05$).

Conclusion: With protective cover under the microscope with safety trephine intervertebral disc endoscope into the side of the road on both sides of decompression in the treatment of degenerative lumbar spinal stenosis is a relatively safe and feasible operation, especially suitable for beginners, obviously on the side of the dorsal decompression, complete decompression, reduce the risk of injury of dura and nerve root, operation time shorter, less bleeding, faster postoperative recovery advantages. Choosing the appropriate indications and postoperative rehabilitation is also the key to successful treatment.

Keywords: protective sleeve; safety trephine; intervertebral disc endoscope; elderly; lumbar spinal stenosis

PU72

Endoscopic Transnasal Odontoidectomy To Treat Basilar Invagination Without Atlantoaxial Dislocation

Yong Yu, Xiaobiao Zhang, Fan Hu, Ye Gu, Tao Xie, Chongjing Sun

Zhongshan Hospital Fudan University

Purpose: Most patients with basilar invagination and atlantoaxial dislocation can be treated direct posterior reduction and fixation. But for patients without atlantoaxial dislocation, the anterior decompression is necessary. Transoral resection of the odontoid has been accepted as a standard procedure to decompress the cervicomedullary junction during the past several decades. The endoscopic transnasal odontoidectomy is emerging as a feasible surgical alternative to conventional microscopic transoral approach. In this article, we describe several operative nuances and pearls from our experience about this approach, which provided successful decompression.

Methods: 13 patients with basilar invagination without atlantoaxial dislocation, of which the etiology was congenital osseous malformations, underwent endoscopic transnasal odontoidectomy. All patients presented with myelopathy. 9 cases also received occipitocervical fixation and bone fusion during the same surgical episode to ensure stability.

Results: All the patients were extubated after recovery from anesthesia and allowed oral food intake the next day. Cerebrospinal fluid rhinorrhea was found in one case and cured by continuous lumber drainage of cerebrospinal fluid. No infection was noted. The average follow-up time was more than 24 months. Remarkable neurological recovery was observed postoperative in all patients.

Conclusion: The endoscopic transnasal odontoidectomy is a feasible approach for anterior decompression of pathology at the cervicomedullary junction. The advantages over the standard transoral odontoidectomy include elimination of risk of tongue swelling and teeth damaging, improvement of visualization, alleviation of prolonged intubation, reduction of need for enteral tube feeding and less risk of affecting phonation. The minimally invasive access and faster recovery associated with this technique make it a valid alternative for decompression of the ventral side of the cervicomedullary junction.

PU73

Treatment of lumbar spinal stenosis by percutaneous endoscopic interlaminar decompression

Jiancheng Zeng
West China hospital of Sichuan university

Objectives: To assess the clinic results of percutaneous endoscopic interlaminar decompression for lumbar spinal stenosis.

Methods: From January 2014 to August 2014, 126 patients with lumbar spinal stenosis accepted percutaneous endoscope interlaminar decompression. The mean age was 65.8 years old (range: 46-83 years). There were 82 males and 44 females, including 73 stenosis in L4-5 and 53 stenosis in L5-S1. Preoperatively and at the follow-up, Visual Analogue Score (VAS), Oswestry Disability Index (ODI) and modified MacNab were applied to evaluate clinical outcomes.

Results: All the patients had a average follow up of 14.5 months (range: 12-20 months). Average operation time is 61.4±12.6min, and average intraoperation time is 0.5±0.3s. 126 patients with intermittent claudication, lumbocrural pain, decreased feeling and muscle strength all have different degrees of improvement. In preoperation and postoperative 1 day, 1 month, 3 months, 6months, and 12months, waist pain VAS score respectively are 6.00±1.46，3.81±0.75，1.88±1.15，0.81±1.05，0.63±0.62，0.25±0.45, and leg pain VAS score respectively are 7.88±0.81，2.88±1.45，2.13±1.02，1.38±0.62，0.88±0.62，0.81±0.54, and ODI score ,not involving postoperative 1 day, respectively are 47.63±9.91，38.4±10.46，26.75±6.88，13.81±5.95，9.19±6.04. Difference of lumbocrural pain scores and ODI scores in preoperative and postoperative multi-period was statistically significant (P<0.01). With evaluation to clinical effect in 12 months after surgery by modified MacNab, the fineness rate was 90.5%.

Conclusions: Percutaneous endoscopic interlaminar decompression have advantages in little trauma and bleeding, short intraoperative radiation exposure time, fast recovery after surgery and clear view for protecting nerve and thorough decompression. The recent efficacy is satisfactory, but its long term result is up to further followup.

PU74

Percutanous Endoscopic Interlaminar Discectomy For Sequestered Disc Herniation Of L5-S1

Jiancheng Zeng

West China hospital of Sichuan university

Objective: To evaluate the clinical results of percutaneous endoscopic interlaminar discectomy (PEID) in treatment of L5-S1 sequestrated lumbar disc herniation.

Methods: 100 consecutive patients with L5-S1 sequestrated lumbar disc herniation were treated by PEID from January 2010 to June 2012. Among them, 59 were male and 41 were female. The age ranged from 13 to 56 years with an average age of 29.69 years. Preoperative MRI image data of the patient has been carefully analysed and measured to record the features of L5-S1 prolapsed and sequestrated lumbar disc herniation. Lumbar MRI scan was taken preoperatively and 6 months, 1 year postoperatively. Visual Analogue Scale (VAS) was recorded preoperatively and 24 hours, 1 month, 3 months, 6 months and 12 months postoperatively. Oswestry Disability Index (ODI) was also recorded preoperatively and 1 month, 3 months, 6 months and 12 months postoperatively. The modified MacNab criteria was used for efficacy evaluation at the last follow-up. Single Effect of Variance in Repeated Measures Data was used to analyse and compare the differences of VAS and ODI among different follow-up time. All the datas were analyzed based on SPSS 20.0 software. The degree of affected side straight leg raising test, conditions of sensory disturbance and muscle weakness, different sides of prolapsed and sequestrated nucleus pulposus, average operation time， average fluoroscopy times during operation and average length of hospital stay after operation was carefully recorded.

Results: All the patients were followed up for a mean period of 26.5 months (range; 12-37 months). The mean operation time was 66.4±8.4min. Sensory disturbance ,muscle weakness and leg and low back pain was alleviated in different degrees in all the 100 patients. The VAS scores of back pain was (5.40±1.12)，（3.36±0.96），（1.86±0.99），（1.18±0.83），（0.78±0.62），（0.58±0.64）preoperatively and 24 hours, 1 month, 3 months, 6 months and 12 months postoperatively. The VAS scores of leg pain was（8.40±0.95)，(2.66±1.53)，(1.98±1.00)，(1.20±0.81)，(0.82±0.66)，(0.68±0.62）in corresponding follow-up time with statistically significant differences. The ODI scores was(51.88±8.88)，(33.22±10.33)，(23.46±7.47)，(15.10±5.72)，(10.38±5.93)preoperatively and 1 month, 3 months, 6 months and 12 months postoperatively also with statistically significant differences. The excellent and good rate of modified MacNab criteria at the last follow-up was 95%.

Conclusion: PEID can remove intervertebral disc herniation precisely with advantages of shorter operation time, minimal traumatization, bleeding and scar formation, quick recovery, shorter in-bed time and good cosmetic effect, which excellently satisfies L5-S1 sequestrated lumbar disc herniation.

PU75

The Clinical Efficacy Of Percutaneous Kyphoplasty For The Management Of Osteolytic Thoracolumbar Tumour

Jiancheng Zeng

West China hospital of Sichuan university

Purpose: To evaluate the clinical effects of Minimally invasive transforaminal lumbar interbody fusion(MISS-TLIF) assisted by Quandrant or Pipeline tube system for the management of lumbar spondylolisthesis

Methods: From October 2008 to February 2011, 21 patients suffering from lumbar spondylolisthesis were treated by minimally invasive transforaminal lumbar interbody fusion(MISS-TLIF) assisted by Quandrant or Pipeline tube system and percutaneous or mini-open pedicle screw fixation. There were 12 males and 9 females, with an average age of 58.6(range from 52 to 76 years old). There were 13 lumbar degenerative spondylolisthesis, 8 lumbar isthmic spondylolisthesis, all of which were Ⅰ degree spondylolisthesis. All patients had the symptom of low back pain and intermittent claudication, and 11 patients also suffered from radicular leg pain. The average operating time was 165 min, the average blood loss was 86ml; The surgery effects were evaluated according to Oswestry disability index(ODI) and Visual analogue scale(VAS). The results of lnterbody fusion were evaluated by postoperative X-ray and three-Dimensional CT.

Results: The follow-up investigation ranged from 16 to 35 months, with an average follow-up time of 24.6 months. The average VAS scores of all the patients were 7.5, which reduced to 2.6 three months after the surgery and to 1.5 six months after the operation, which had significant differences preoperatively and postoperatively($p<0.01$).The average ODI scores of all the patients were 63.7, which reduced to 21.3 three months after the surgery and to 13.6 six months after the operation, which also had significant differences preoperatively and postoperatively($p<0.01$).Among the 12 patients who had follow-up investigation for more than 12 months, 11 patients got osseous fusion and callus growth could be seen between vertebral body in the other 1 patient. There were no cases of internal fixation loosening and breakage. Hyperalgesia and burning-like neuralgia in the control area of L5 and S1 nerve root appeared in 2 patients 2 days and 3 days after the operation, which relieved after symptomatic treatment and then disappeared 3 months later after the operation. There were no permanent nerve root impairment and infection.

Conclusions: Minimally Invasive Spine Surgery-Transforaminal Lumbar Interbody Fusion(MISS-TLIF) assisted by Quandrant or Pipeline tube system is a safe, effective and minimally- invasive way for the management of lumbar spondylolisthesis, which has the advantages of less injury, less blood loss, faster rehabilitation. The key point of successful surgery is choosing your patients properly

PU76

Percutaneus Endoscopic Interlaminar Large Excision Of Ligamentum Flavum And Decompression For Lumbar Lateral Recess Stenosis In Elderly Patients

Jiancheng Zeng

West China hospital of Sichuan university

Objectives: To assess the clinical outcomes, the technical characteristics of percutaneus endoscopic interlaminar large excision of ligamentum flavum and decompression lumbar lateral recess stenosis in elderly patients.

Methods: From May 2014 to June 2015, 76 elderly patients with lumber lateral recess stenosis were accepted percutaneus endoscopic interlaminar arge excision of ligamentum flavum and decompression, including 48 males and 28 females aged from 60～91 years old (average, 71.7±8.8 years). There were 40 patients with stenosis in L4-5, 29 patients with stenosis in L5 -S1 and 7 patients with stenosis in L4-S1. the backpain VAS, leg pain VAS scores and Oswestry Disability Index(0DI) scores were recorded preoperatively and at 1 week, 3 months, 6 months, 12 months after operation and last follow-up. The MacNab scores were evaluated at last follow-up.

Results: All of the 76 operations had been completed successfully with averge operation time of 64.3±23.9 min (range,56~98 min). an average follow-up of 31.5 months (range, 24～36 months). Before surgery, 1 week , 3 months, 6 months, 12 months after surgery and last follow-up, the back pain VAS score was (4.30±1.46), (3.51±1.35), (1.71±1.38), (1.68±1.25), (0.73±0.62), (0.45±0.34)respectively, and leg pain VAS score was (7.68±0.81), (3.68±1.25), (2.03±1.14), (1.48±0.83), (1.48±0.62), (0.81±0.54) respectively. ODI score before surgery, 1 week, 3 months, 6 months, 12 month after surgery and last follow-up was (69.63±10.31)、(36.4±9.56)、(29.35±7.68)、(15.67±5.45)、(10.19±5.74)、(9.63±5.62) respectively. Differences in lumbocrural pain scores and ODI scores between preoperation and postoperation inmultiperiod were statistically significant($P<0.05$). In the modified MacNab last follow-up, the fineness rate was 92.1%, including 52 cases of excellence, 18 cases of good, and 6 cases of fair.

Conclusions: Percutaneus endoscopic interlaminar large excision of ligamentum flavum and decompression for lumbar lateral recess stenosis in elderly patients is a safe, effective and minimally invasive method of operation with the characteristics of precise decompression bone stenosis and efficient resection of ligamentum flavum to decompression soft stenosis.

About Guangzhou

Guangzhou is a famous culture city and a splendid tourism city with a history of more than 2,200 years and a homeland of overseas Chinese as well. It enjoys the name of “Flower City” as the superb geographic and climatic conditions in the South contributed to the natural beauty here.

As a city of heroes, Guangzhou has a reputation of great eminance in the modern history of China. The historical sites of Sun Yat-sen Memorial Hall, Huanghuagang 72 Martyr Cemetery, Guangzhou Luxun Memorial Hall, Peasant Movement Institute, Sanyuanli Anti-British Invasion, and the Former Site of Huangpu Military Academy are the witnesses of the modern history of China, and, together with Baiyun Mountain, Yuexiu Park, Liuhuahu Park, Lu Lake and South-China, constitute colorful landscape groups.

Meanwhile, Guangzhou was the starting point of the “Maritime Silk Road” and is an important port city for the opening and reform of China, making great contribution to the economic and cultural exchange and friendly contacts between China and the rest of the world and demonstrating everlasting prosperity.

About Guangzhou

Culture

Cantonese Opera
Cantonese Opera first began enchanting music lovers in Guangdong and Guangxi during the Jiajing period of Ming Dynasty. Combining performing arts such as singing, speaking, incidental music and elaborate costumes and make, it remains a vital part of southern China's cultural heritage.

Guangdong Music
Guangdong's music scene is a treasure of the instrumental folk and Cantonese opera music that has been spreading around the Pearl River Delta area for centuries.

Piaose of Shawan
This popular Panyu, Guangdong folk art involves itinerant performers wandering along the street and entertaining passers-by. In ancient times, the performances normally took on the birthday of the Bei Emperor on the 3rd of March in the Chinese lunar calendar. Nowadays, the event is a much loved part of all important local festivals.

Guangdong Puppet Plays
First performed in Guangzhou during Han dynasty, puppet plays originated the west of Fujian Province during Yuan Dynasty. In 1956, Guangdong Province Puppet Show Troupe was set up by Guangzhou city, subsequently going on to create puppetries which are greatly appreciated by art lovers of all nationalities.

Tips

Climate

The average temperature in November in Guangzhou is around 20℃,but it can also be quite hot some days.

Please also check www.weather.com for up-to date weather forecasts.

Language

Chinese is the official language in China. Cantonese, local dialect, is originated from ancient central China, with a complete nine-tone six tone, which retains the ancient Chinese characteristics perfectly. It was defined by UNESCO as a language in 2009. It is widely used in Guangdong, Guangxi and Hong Kong, Macau and Chinese communities in North America, Britain and Australia.

Currency & Exchange

Chinese Currency is known as Renminbi (RMB). The official basic unit is the “yuan”. Major credit cards like Master, American Express and Visa can be accepted in most big shopping centers and hotels. Major foreign currencies can be changed into Chinese currency RMB
at the airport, Bank of China or hotels.

Power & Electricity

Electricity supply in China is 220V 50Hz. Most, but not all, sockets will accept both European and US style plugs. Please check the power supply before use.

Useful Numbers

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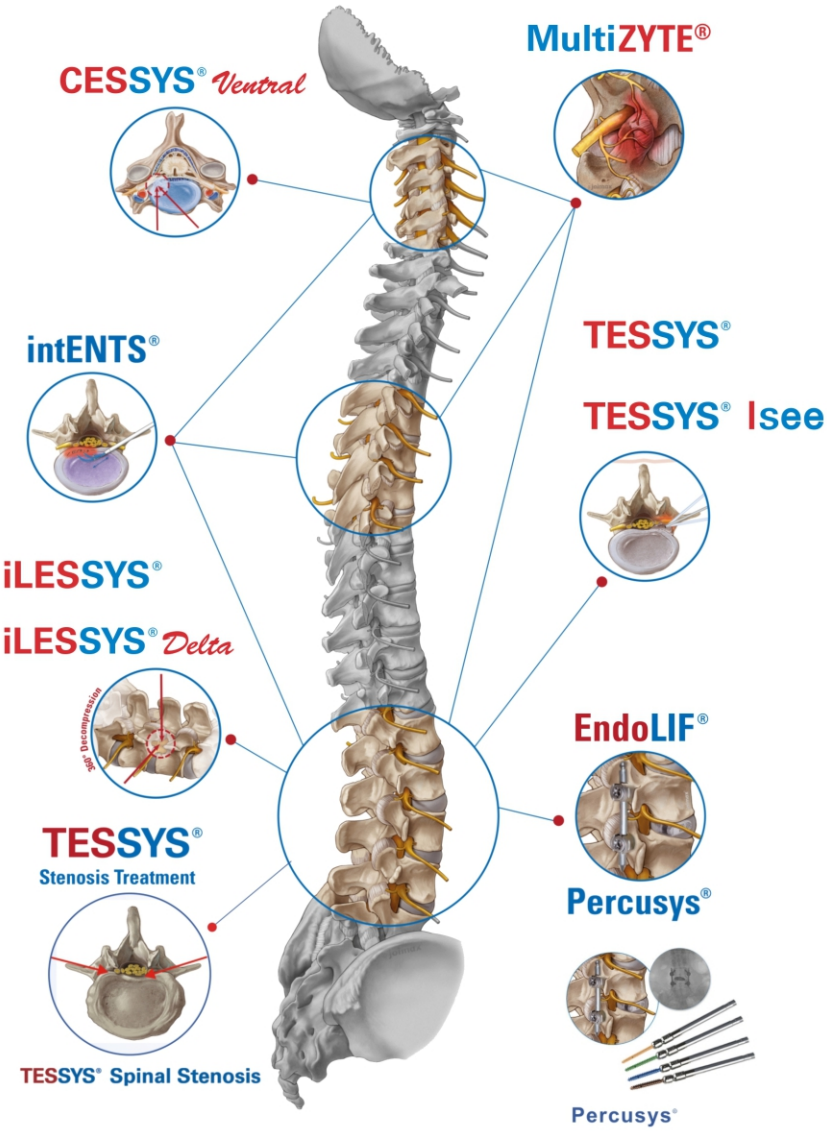

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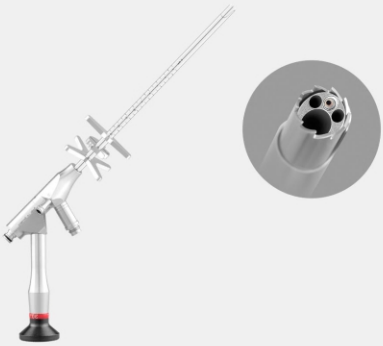

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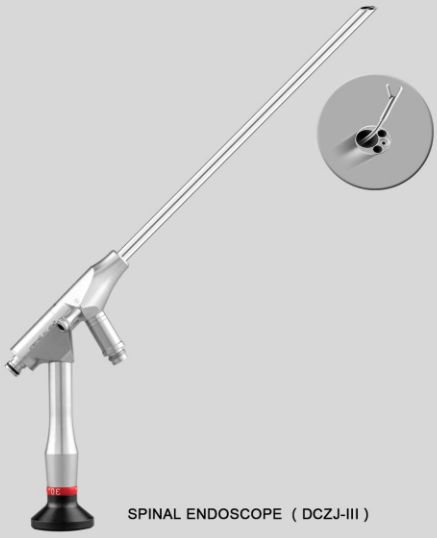

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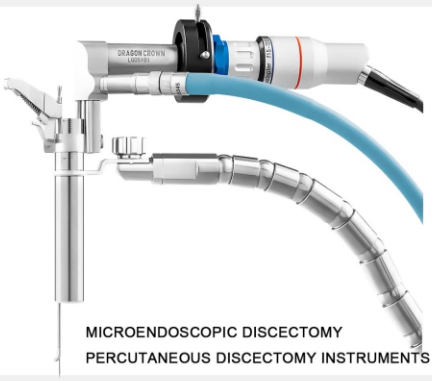

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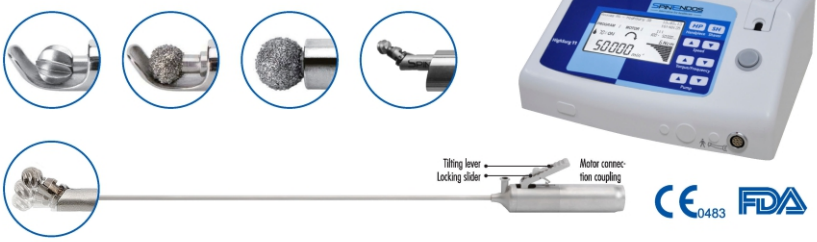

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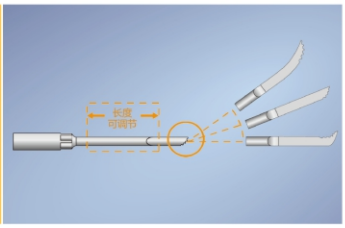

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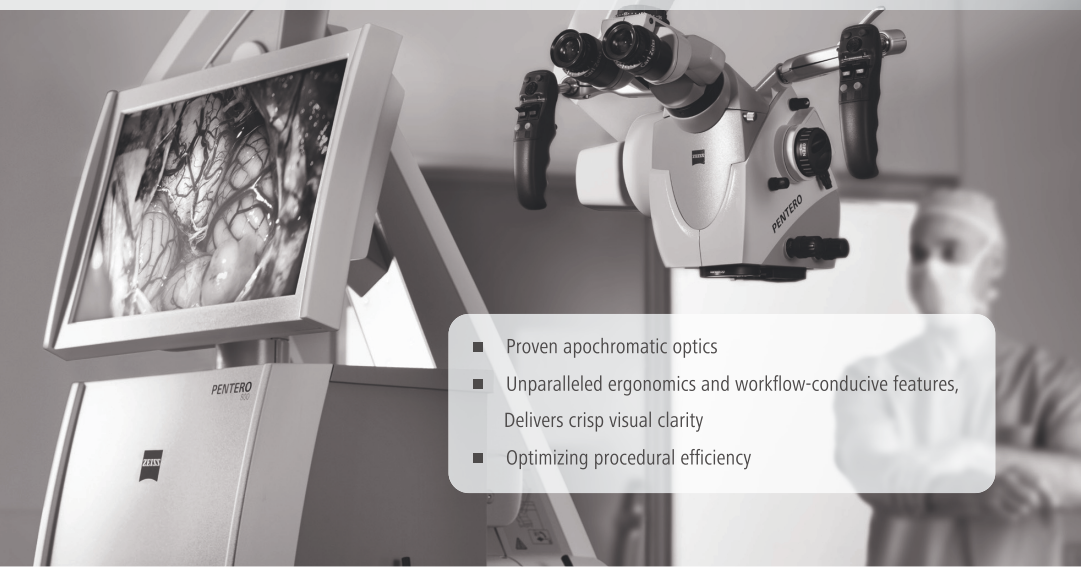

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