

Innovations In Endoscopic Transforaminal Surgical Treatment of Painful Patho-Anatomy in the Lumbar Spine

Becker's 12th Annual ASC Meeting
June 12-14, 2014

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Disclosures (very opinionated)

- Royalties
 - Richard Wolf Surgical Instrument Company
 - Elliquence Disc FX system
- Speakers Bureau
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 - Elliquence, Inc
- Stock or Stock options
 - Surgitech, Ouroboros, Chart (Chymopapain), Bonovo, Minimus spine, Replication Medical (advisory board), Paradigm Spine, Small Bones Innovation, Pioneer Surgical, Trans-1, Osiris, Amendia, (Advisory Board), Stimwave (Advisory Board)
- Founder: and Board Member: Ouroborous, Surgitech,
- Board, Committee Member
 - Exe Secretary, lits; Past President and Gen secretary WCMISST



My experience having trained hundreds of surgeons and non-surgeons since 1992

This is not a "see one, do one, teach one procedure!"

Logo5.jpg
There are surgical pitfalls that require knowledge of surgical principles, careful practice, and mentorship, and recognition of normal vs patho-anatomy based on a gradual build up of surgical skills and understanding the causes of spinal pain.

**Must be able to recognize and handle complications
(or someone will find a reason to sue)**

Surgical Spine Treatment is validated in the peer reviewed literature

- Recent Trend : MIS Decompression and Fusion techniques
- Cost / Benefit of treatment is being challenged
 - Quality Life years range from \$30,000-\$70,000
 - Failed Back Surgery Syndrome (10-30% still too high)
 - Creates an unbearable additional cost to society
 - Calls for cost /benefit/ effective care
 - Ambulatory Surgery Centers

MIS surgery in an ASC (Local Anesthesia recommended)

- **MIS Surgical Procedures**
 - Intradiscal Therapy
 - Percutaneous Transforaminal Decompression and Ablation)
 - Percutaneous dynamic stabilization
 - Percutaneous Fusion
 - Amendia's O-Lif
 - Expandable cages
 - Wireless neuromodulation
 - Stimwave

Traditional Surgical Solutions

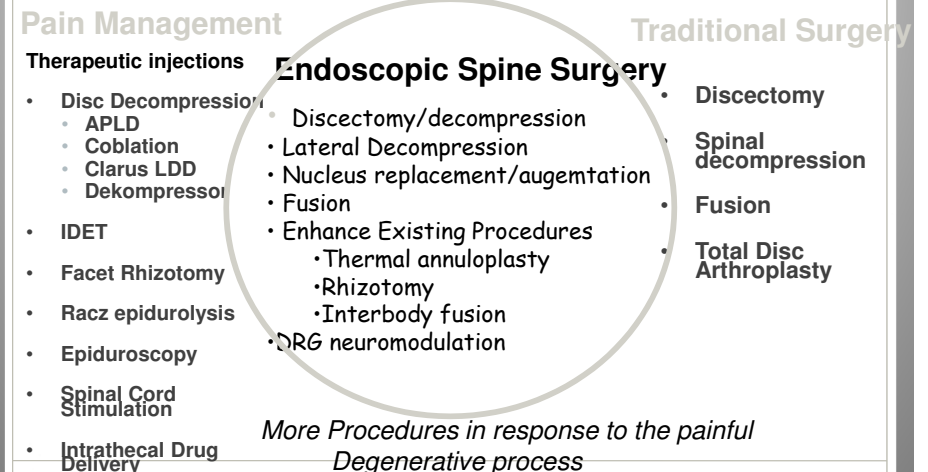
- Decompression
- Fusion
- Dynamic Stabilization
- **Big Gap between pain management and Traditional surgical techniques**
 - intradiscal therapy
 - foraminal decompression.

MIS spine surgery requires AN ALTERNATIVE APPROACH with less surgical morbidity

Transforaminal Approach Advantage over Dorsal

- Endoscopic **Multi-level HNP** disc decompression
- Endoscopic **foraminal decompression** w/wo HNP
 - Bimodal HNP that otherwise will require fusion after decompression
- Endoscopic **ablation** of nerves intradiscally and axially
- Endoscopic **percutaneous fusion**

Endoscopic Spine Surgery Bridges the Gap Between Pain Management and Traditional Spine Surgery



Endoscopic Spine Surgery Is Ideal for the Ambulatory Surgery Setting

Endoscopic Spine Surgery

- Discectomy/decompression
- Lateral Decompression
- Nucleus replacement/augmentation
- Fusion
- Enhance Existing Procedures
 - Thermal annuloplasty
 - Rhizotomy
 - Interbody fusion
- DRG neuromodulation
- Intradiscal Procedures (biologics)

Why Procedures Attract interventionalists

Diagnostic and Therapeutic Injections can predict the surgical outcome of transforaminal decompressive procedures utilizing percutaneous trajectories

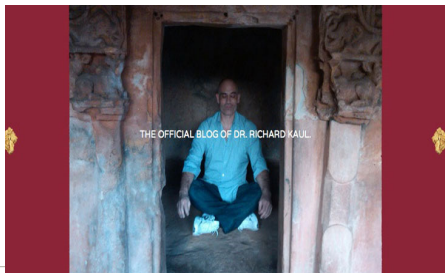
Surgical Decompressive and Neuro-ablation procedures using needle trajectories may cause “Turf Wars” with surgeons

Who “owns” This Evolving Technology?

- Society of Advanced Spinal Interventionalists (SASI ?)
- President Sol Kamson Pain management



New Jersey controversy



Will “turf battles” result?

- Pain Management Groups forming Societies
- Does Pain Management training qualify specialists to do surgery without surgical training?

Surgical vs pain codes payment being debated



NJ Interventionalist lost license

Will Needle guided procedures blur or bridge the Gap between Pain Management and Surgery?

“Surgery” is still Surgery
Surgeons have alternatives relative to their
surgical skills with back up procedures

The Endoscopic Transformational Approach; (Augmented by modified Pain Management Techniques)

- **Diagnostic and therapeutic injections offer prognosis for an MIS percutaneous surgical solution**
 - **YESS™ Technique**
 - **Evocative chromo-discography™ with intradiscal Selective Endoscopic Discectomy (SED™)**

The Endoscopic Transformational Approach; (Augmented by modified Pain Management Techniques)

- **Foraminal decompression is guided by needle trajectories**
 - **Decompression of the foramen and lateral recess**
 - **Ablation of the nerves innervating the disc and facets with endoscopic visualization through foramen and dorsal rhizotomy**

Needle based Tubular Retractors can target patho-anatomy from any surgical portal

- **Effective for a wide spectrum of painful degenerative conditions of the lumbar spine with proper training and guided learning curve**
- **Endoscopic surgical solutions range from Discogenic pain, HNP, FBSS , and lateral stenosis**
- **Most traditional procedure have MIS alternatives**

Needle based Tubular Retractors can target patho-anatomy from any surgical portal

- MIS decompression and fusion is possible through the foramen under local anesthesia. (O-Lif and expandable cages)
- Deformity can target the pain generator rather than the deformity

Posterior MIS vs Foraminal MIS

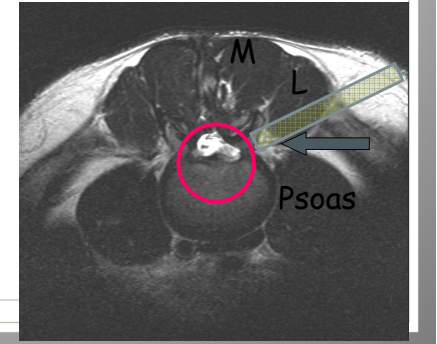
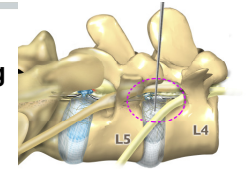


Yeung, AT "Minimally Invasive Techniques for The management of Lumbar Disc Herniation" Orthop Clin N Am 38 (2007) 313-372



Posterior: more invasive, Surgeon more comfortable With anatomy

Foraminal: Avoids injuring multifidus Muscle



361-Young-FINAL

Orthopedic Surgery
SURGICAL TECHNOLOGY INTERNATIONAL XXI

In-vivo Endoscopic Visualization of Patho-anatomy in Symptomatic Degenerative Conditions of the Lumbar Spine II: Intradiscal, Foraminal, and Central Canal Decompression

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Dec. 2012

Abstract

The patho-anatomy in an aging spine is partly defined by Rauschning's anatomic cross-sections. Theories of pain generation and principles of minimally invasive spine surgery are suggested by close examination of these specimens. If the visualized patho-anatomy can be studied *in vivo* in a partially sedated patient by spinal probing, spinal pain can be better understood, and rational endoscopic treatment options may then evolve.¹

A 1997 IRB-approved study provided evidence that endoscopic transforaminal surgery was feasible for the treatment of a wide spectrum of degenerative conditions in the lumbar spine. The technique incorporated evocative chromo-diography to correlate reproduction of pain with *in-vivo* probing of patho-anatomy. Laser and radiofrequency ablation augmented mechanical decompression to obtain pain relief.^{2,3}

Endoscopic visualization of patho-anatomy ranging from annular tears to spondylolisthesis and stenosis provided clinical evidence that foraminal decompression, ablation, and irrigation could effectively treat these visualized painful conditions with minimal morbidity. This resulted in a better understanding of the pain generators in the lumbar spine, opening up options for surgical pain management.⁴⁻⁷

The procedure does not burn any bridges for more traditional surgical techniques. The learning curve may be steep for some and long for others, but results are very good, concomitant with each individual surgeon overcoming his personal learning curve.⁸

Abstracts

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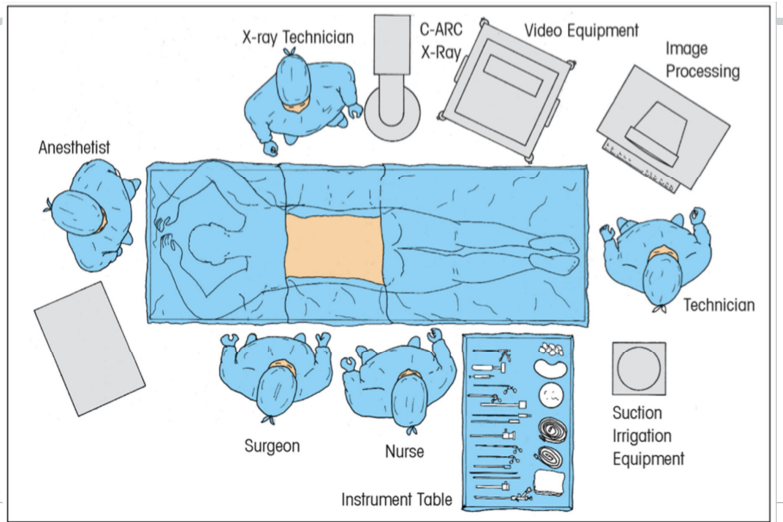
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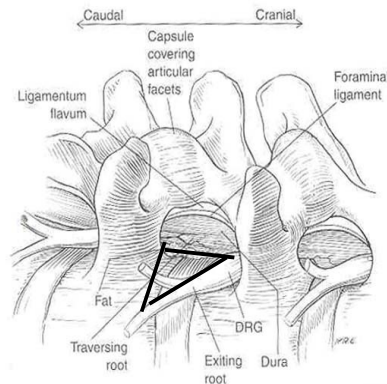
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Prone OR Set-up Provides greater flexibility. Better biportal accessibility and visualization



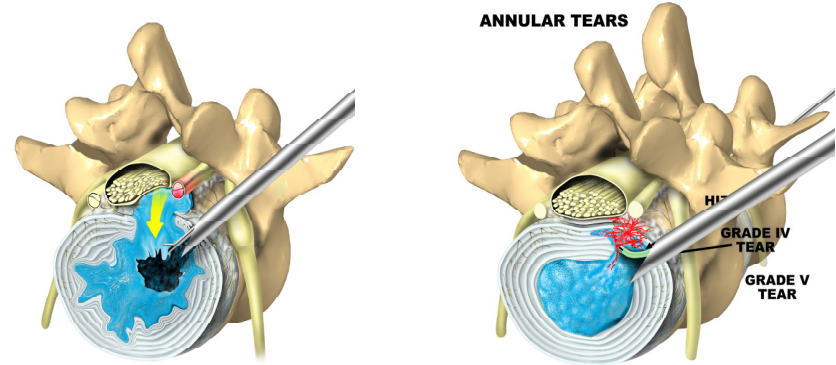
Kambin's Triangle

- Not just a window to the foramen
- DRG very sensitive
- Anomalous and furcal Nerves can reside in Kambin's Triangle
- Inflammation of tissue makes normal structures painful (can visualize, ablate, irrigate)

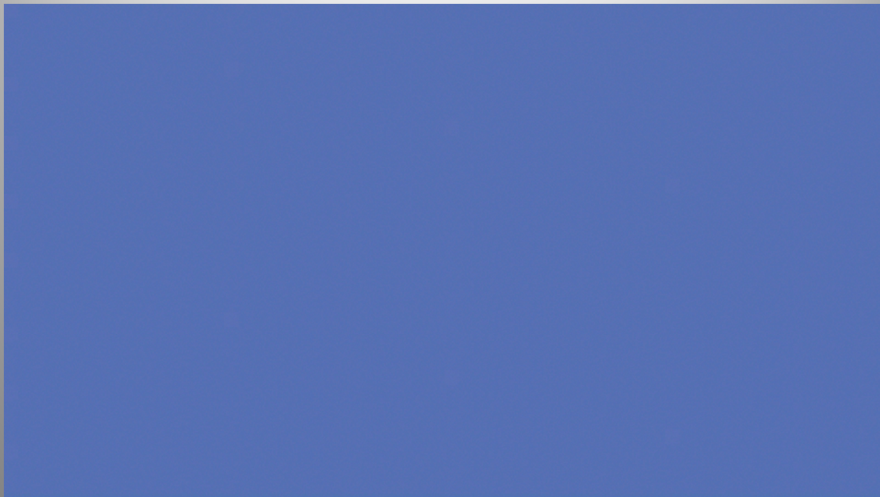


Treatment of Discogenic Pain (SED™ vs IDET)

Nuclear material must be extracted from annular layers for effective thermal annuloplasty

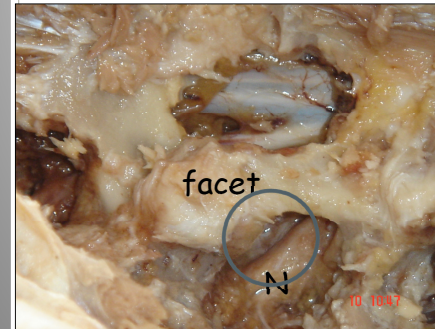


Disc fx for discogenic pain and small contained HNP (1.1 min)



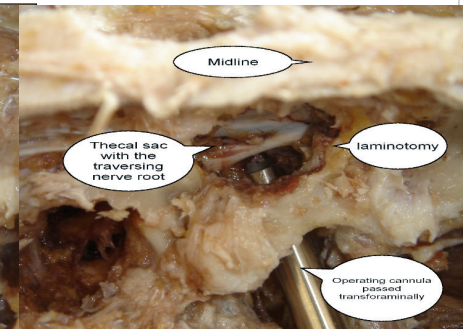
The anatomy is the same, approach different !
Comparative Surgical Anatomy from the Approach
(Courtesy of Satish Gore, R Pai)

Dorsal Approach



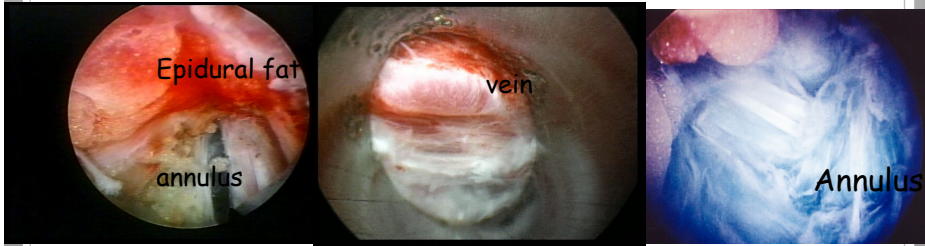
Cannula used to retract
And shield exiting nerve

Foraminal Approach

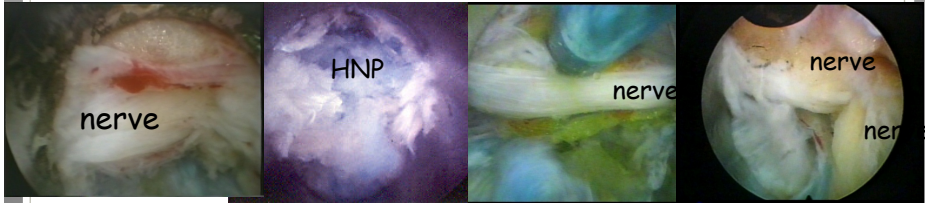


The beveled cannula tip provides
a greater operative field.

Pitfalls: Recognize Normal vs Patho-Anatomy



Annulus and Epidural Fat Epidural venous plexus Stained Annulus



Autonomic nerve Herniated Disc Furcal Nerve Furcal Nerve

Recognize Normal Foraminal Anatomy: Ligamentous tissue

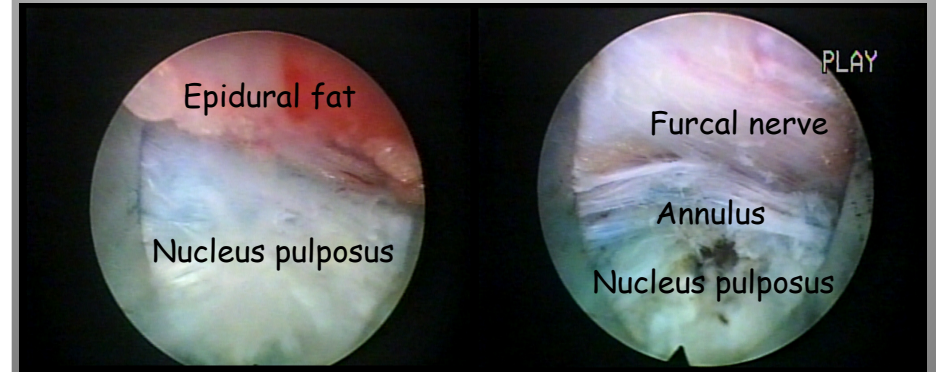


vs

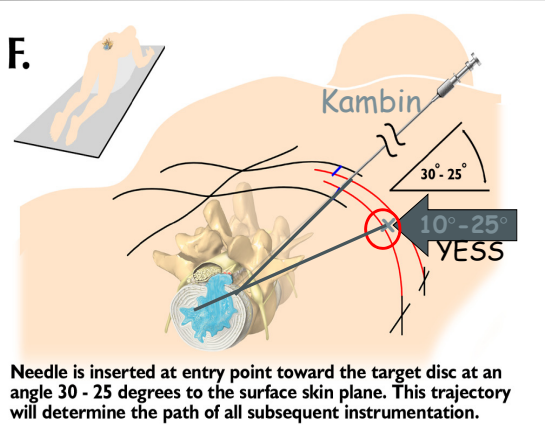
Furcal Nerve in lateral epidural space

Normal

Furcal Nerve



Perfect Needle Insertion and Trajectory will vary by techniques of KOL surgeons



Needle is inserted at entry point toward the target disc at an angle 30 - 25 degrees to the surface skin plane. This trajectory will determine the path of all subsequent instrumentation.

- "Inside- Out" YES
- "Outside- In"
- "Targeted"-- for up or down migrated HNP
- Angle to disc 15- 20° to see traversing nerve
- **Lever against facet and perform partial facetectomy to gain access to epidural space**

Neuromonitoring not needed (local anesthetic safer)

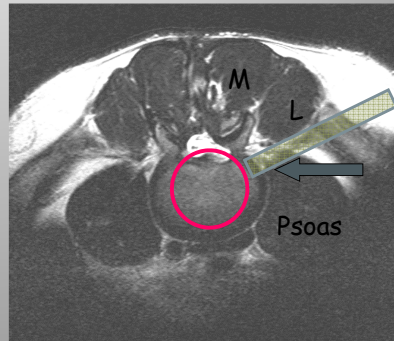
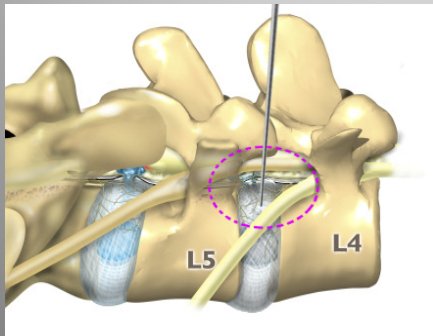
- Local anesthetic sufficient to anesthetize annulus, but not the nerve
- **Needle placement techniques** will mitigate anatomic variations and presence of furcal nerves
- **Blunt dilation techniques** with serial dilation or blunt (YES obturator) guided placement techniques
- **Cannula configurations** protect nerves but expose tissue to be cut



Yeung, AT "Minimally Invasive Techniques for The management of Lumbar Disc Herniation"
Orthop Clin N Am 38 (2007) 313-372

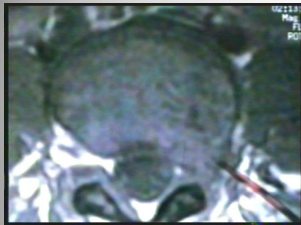


Ideal for Endoscopic Surgery Foraminal and Extraforaminal HNP



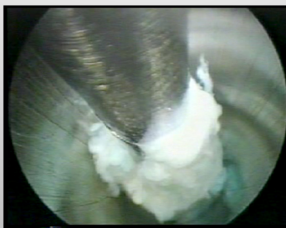
Other Ideal Indications

- Discitis
- Discogenic Pain (annular tears)
- FBSS: due to Recurrent HNP and lateral stenosis following transforaminal or open discectomy
- Primary Lateral Recess Stenosis, lumbar spondylosis



Extruded Foraminal HNP

Case Example: Foraminal HNP L3-4



Direct extraction of HNP
6mm cannula in Foramen



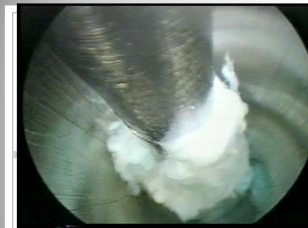
Intraoperative Discogram
Exiting nerve obstructed



Extravasation=extrusion



Lateral Mri

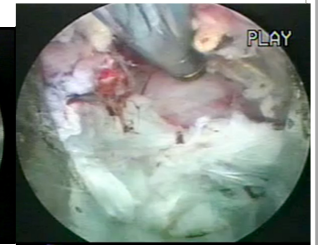


Direct extraction of HNP

Case Example Foraminal HNP L3-4



Inspect decompressed foramen



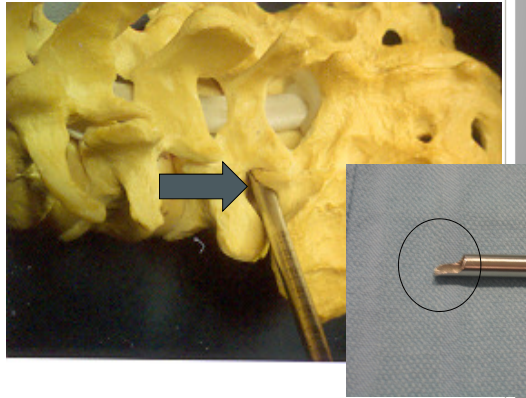
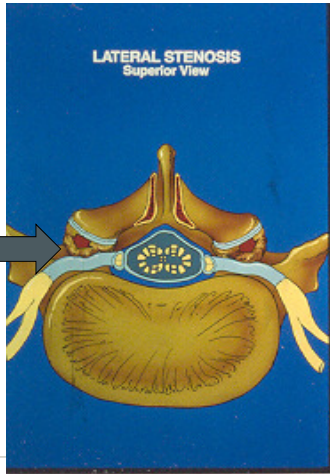
Dr Sol Kamson
witnessed this
Procedure

specimen



Endoscopic Foraminal-plasty

for lateral and subarticular recess stenosis



Specialized cannula isolates facet, Protects nerve root: Safe to use trephine or kerrison

Endoscopic Tools for Foraminal Decompression



Trephines



Foraminoplasty Cannula



Full Size Endoscopic Kerrison And Cannula set

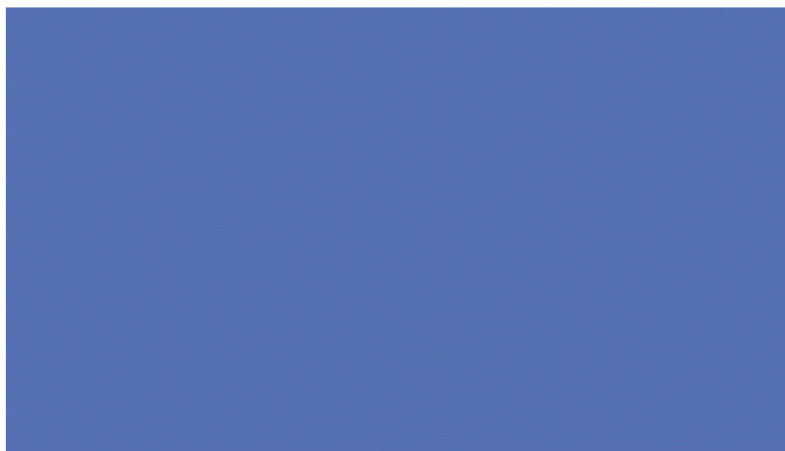
Endoscopic straight and Articulating Burrs

Lasers



YESS Cannula SET

Endoscopic Techniques for Foraminal stenosis (1.28 min)



Other Promising MIS Transforaminal Surgical Techniques

- Transforaminal O-lif fusion (peek cage) without excision of the facet (Amendia)
 - Expandable cages
- Endoscopic Neuro ablation (SED™ and YESS dorsal rhizotomy)
- MIS percutaneous Interspinous spacers (may combine with percutaneous transforaminal decompression)
- Neuromodulation (DRG, subcutaneous, selected nerve targeting, SCS (Stimwave, Scottsdale Arizona)

The Art and Science of Transforaminal Endoscopic Decompression

- **Percutaneous Transforaminal Endoscopic Surgery**
 - True alternative MIS approach that preserves normal anatomy
 - Traditional concept: smaller incision is not “true” MIS
- **Very surgeon and technique dependent** (formal training desired) Most accomplished endoscopic surgeons find that their patients who have experienced both open and endoscopic are more satisfied with transforaminal surgery)
- **Compare with Concert pianist or Professional athletes**



Disc decompression and Laser Rhizotomy for discogenic and axial back pain (2.21)



Painful Degenerative Conditions of the Lumbar Spine (favoring MIS techniques)

- Sequestered, extruded HNP Possible, but traditional MLD as successful as transforaminal discectomy
 - **We do not need to emphasize the transforaminal approach for conditions treated effectively with traditional approaches, but select the transforaminal approach for conditions that are less invasive and equally effective (ie foraminal and extraforaminal HNP)**
- Combine with dorsal endoscopic rhizotomy for axial back pain in lieu of fusion. (75% can avoid fusion)

Surgeon skill, understanding, and experience is Critical!

- Few surgeons have the skills to perform **all** procedures equally well
- Surgeons should select the types of painful conditions that he is accomplished performing and gradually expand his repertoire as he gains experience and skill
- Non surgeons can be qualified to perform the technical aspects of some surgical procedures, but **Non surgeons will not have the training and background to recognize and correct the complications that may arise.**



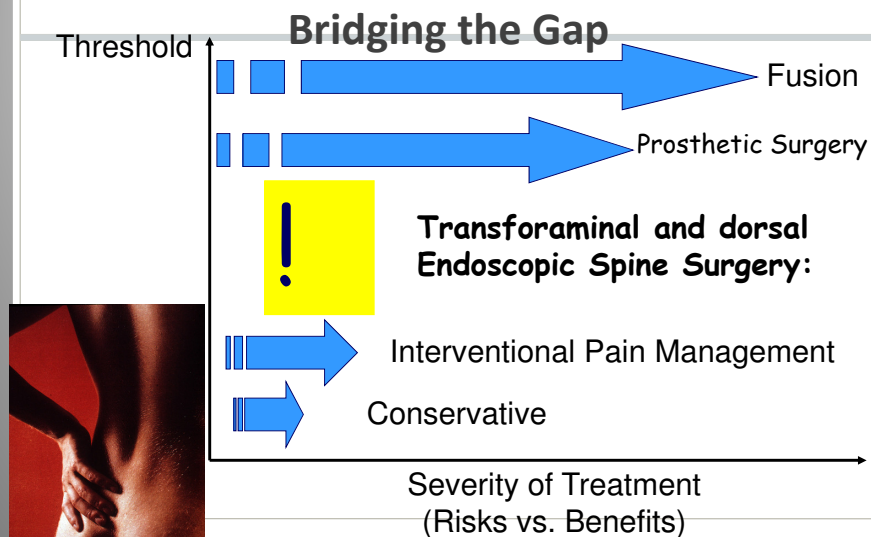
Foraminal decompression as an alternative to fusion (3.18)



Conclusion

- The Endoscopic Foraminal Approach to the Lumbar Spine is the LEAST invasive and most versatile of the MIS surgical approaches
- It has the potential ranging from Diagnostic and therapeutic Injections to fusion
- Literature on comparing percutaneous MIS to Open: "Same" results with less surgical morbidity
- Provides first line procedure in lieu of fusion with decompression and ablation
- Surgeon experience the most important factor in endoscopic surgery

Treatment Options



Jeff Katzell



Dr Zhou Yue



Xifeng Zhan



Huebner Ranade Wang

Thank You

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First YESS fellows



Zhenzhou Li



Yinggang Zheng



Dr Gun Choi