Lessons learned from 28 years experience and focus operating on symptomatic conditions of the lumbar spine under local anesthesia only

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Beckers 17th Annual future of Spine and Pain Management Conference
June 12-19, 2019

Take home message

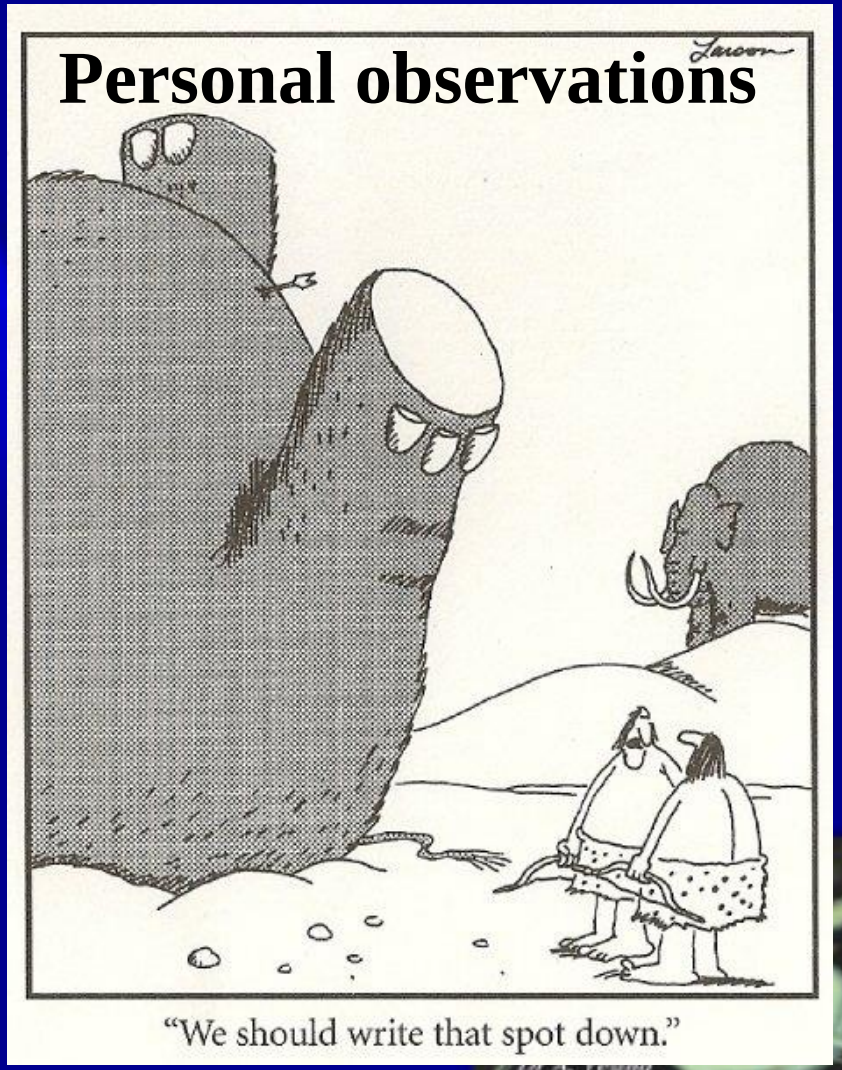
- Endoscopic surgery on the pain generators of spine pain and spine symptoms can be correlated with patho-anatomy visualized by endoscopic visual documentation

- The patho-physiology of pain is better understood than reliance on evolving imaging techniques alone

Initial Response by many traditionalists to “Disruptive” Surgical Platforms

I am "Conflicted" by 28 years >10,000+ Endoscopic Procedures since 1991

- Developed the YESS™ Endoscopic Spine System 1997
  - Personal experience with the first Medicare approved Spine ASC
- Over 140 Level IV and V EBM publications
  - Now **level 3** with collaborators
  - All innovations start as level V



Endoscopic Spine Surgery

- **Endoscopic Spine Surgical Care is in the forefront of new ”disruptive” techniques world wide**
  - Korea is a major player in Endoscopic Spine Care
  - China is becoming dominant in numbers
- **Access to Health Care differ in different Regions**
- **Cost of Health Care**
  - Different in different countries, regions, Continents
- **Medical/ Surgical Politics may differ**
- **There is a Global Economic Effect**

Endoscopic Documentation of Pain

- Patho-anatomy matches the patho-physiology of pain
- Normal and anomalous anatomy in the hidden zone of MacNab
- Diagnostic and therapeutic injections for endoscopic surgical spine care stratification
- Statistical analysis by powered numbers
- Paired analysis with other endoscopic techniques
- NEW EBM considerations from endoscopic evidence

WORLDWIDE POLITICAL DIVIDE

- Communism vs Capitalism
- Conservative vs Liberal
- Progressive vs Traditional
- EAST VS WEST
- Divided American Politics
- **Trump vs "The Swamp"**
  - **Universal Health Care**
  - **One Payer system vs Insurance**
  - **Hybrid system**

"The Swamp"

Being politically correct is not effective for surgeons focused on what's best for our patients

- The country is currently too divided
- Better to be selective on who we treat
- Do your own diagnostic and therapeutic injections for patient stratification unless diagnosis is "obvious"
- Multidisciplinary approach still has a long way to go
- Form your own group of "dream team surgeons"

Endoscopic Spine: More Cost Effective

Out patient Transforaminal Endoscopic Decompression linked to Cost Savings (in IJSS & Spine Universe by Kai Lewandrowski

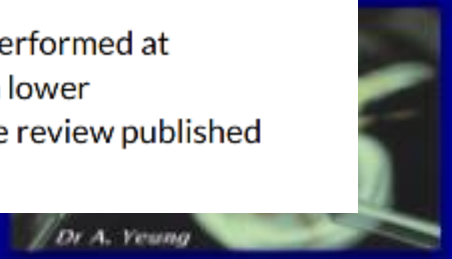
spineuniverse

Outpatient Transforaminal Endoscopic Decompression for Spinal Stenosis Linked to Cost Savings

Written by Kristin Della Volpe (/author/43738/della-volpe) ; *Reviewed by* Kai-Uwe Lewandrowski, MD (/author/50144/lewandrowski) *and* Choll W. Kim, MD, PhD (/author/994/kim)

Peer Reviewed

Outpatient transforaminal endoscopic decompression for lumbar foraminal and lateral recess stenosis performed at ambulatory surgery centers confers an excellent value proposition owing to cost savings associated with lower complication and readmissions rates when compared with microdiscectomy, according to a retrospective review published in the February 22 issue of the *International Journal of Spine Surgery*.



Endoscopic Spine: More Cost Effective

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Conclusions: Complications after outpatient transforaminal endoscopic decompression surgery with respect to reherniation, wound infections, durotomy, and nerve root injury are approximately 1 magnitude lower than equivalent reported complication rates with microdiscectomy while delivering comparable clinical outcomes and lower readmission rates to an emergency room or hospital. Postoperative sequelae are typically self-limiting and successfully managed with supportive care measures. Significant cost savings are realized due to a considerably lower rate of decompensated postoperative medical problems.

Endoscopic Spine: More Cost Effective Than microdiscectomy

Spine J. 2019 Feb 10. pii: S1529-9430(19)30052-X. doi: 10.1016/j.spinee.2019.02.003. [Epub ahead of print]

Cost-effectiveness of microdiscectomy versus endoscopic discectomy for lumbar disc herniation.

Choi KC[1], Shim HK[1], Kim JS[2], Cha KH[1], Lee DC[1], Kim ER[1], Kim MJ[1], Park CK[3].

Author information

CONCLUSIONS: ED was more cost-effective compared with MD at 1-year follow up.

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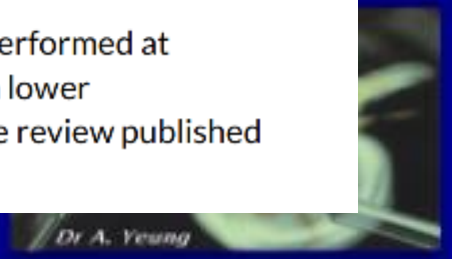

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Cost Effective for Foraminal Stenosis

***Neurospine (PubMed)** March 31, 2019

Treatment of Soft Tissue and Bony Spinal Stenosis by a Visualized Endoscopic Transforaminal Technique Under Local Anesthesia: a 5 year follow-up study

Anthony Yeung1,2, Andrew Roberts1,2, Lifan Zhu3, Lei Qi4, Jun Zhang5, Kai-Uwe Lewandrowski6,7

https://doi.org/10.14245/ns.1938038.019.

5 year results foraminoplasty

The Korean Neuro Spine Journal

5 year results 68 consecutive cases

Neurospine
pISSN 2586-6583 eISSN 2586-6591

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5 YEAR RESULTS Foraminal Stenosis

72% Good/Excellent
> 90% Patient Satisfaction

Table 4. MacNab clinical outcomes in foraminoplasty patients

Outcome	No. of patients (%)
Excellent	32 (37.2)
Good	40 (46.5)
Fair	11 (12.8)
Poor	3 (3.5)
Total	86 (100)

Other Comparisons in Press

- Endoscopic Decompression for ASD
- Endoscopic Decompression vs Open decompression
- Endoscopic Decompression for Various painful conditions of the Cervical, thoracic, Lumbar Spine

Focus on Endoscopic Surgical Benefits

- Patho-anatomy matching patho-physiology of pain
- Normal and anomalous anatomy in the hidden zone of MacNab
- Diagnostic and therapeutic injections for endoscopic surgical spine care stratification
- Statistical analysis by powered numbers
- Paired analysis with other endoscopic techniques
- NEW EBM considerations from endoscopic evidence

Endoscopic Spine is "Disruptive"

Endoscopic spine surgery is where arthroscopic joint surgery was in the 1970's, BUT… slow to be embraced due to lack of adequate formalized training

- **Endosocopy identifies patho-anatomic CONDITIONS that are NOT RECOGNIZED BY SURGEONS who DO NOT adopt endoscopic surgery as part of their surgical platform**
  - **Toxic annular tears, extraforaminal patho-anatomy, osteophytosis, synovial cysts**

Also a “Disparative” Spine Technology

- **DISRUPTIVE procedures also DISPARAGE those are not covered by insurance, cannot afford, but willing to pay cash for a “warrantee”**
- **The Most satisfied patients are those who get LASTING PAIN RELIEF that limit their desired activity level**
- **DIFFERENT LEVELS OF EXPERTISE, Like SPORTS, SEPARATE WEEKEND WARRIORS FROM PROFESSIONAL ATHLETES**

Health Care Disparities: They Exist and Are Relevant to the Orthopaedic Surgeon

*SURGEONS ABLE TO " GUARANTEE" RESULTS SHOULD LET THE FREE MARKET DETERMINE RE-IMBURSEMENT

STELLA JOO LEE, MD

Assistant Professor

University of Pittsburgh School of Medicine

Department of Orthopaedic Surgery

Musculoskeletal Oncology

Be recognized for your Endoscopic Expertise

My Career Background starting as a General Orthopedic Surgeon affects this message

- **Became passionate about endoscopic spine surgery (1991) after practicing general orthopedics and arthroscopic joint surgery for 20 years because endoscopy allowed visualization of patho-anatomy better than open translaminar surgery**

- **Opened first Spine ASC 1998 for same day surgery under local anesthesia for endoscopic disc surgery**

Endoscopic Spine Technology "Disruptive"

Endoscopic spine surgery is where arthroscopic joint surgery was in the 1970's, BUT… slow to be accepted, embraced due to lack of formal training in academic programs

- **Due to endoscopy, there are patho-anatomic variations identified that become symptomatic**
  - **Unrecognized common endoscopic spine findings in the spine**
  - **Toxic annular tears, extraforaminal patho-anatomy, osteophytosis, synovial cysts**

- **Most satisfied patients are those who get pain relief that limit their activity level (supported by Promise Study)**

The Future of Endoscopic Surgery

- The endoscope documents and correlates **symptomatic patho-physiology** with patho-anatomy from trauma or just normal aging

- ***Treat the pain generator early, when the patient is still active, productive, and working, meets "surgical pain care" goals for endoscopic surgery**
  - Decrease personal work and acrivity impediments

Common Low Back Pain begins in the disc

Just the first step as part of a complex procedure

- **Disc Degeneration in asymptomatic patients** increases with age, high risk of low back pain onset
- **Intradiscal Therapy** is the **FIRST** stage treatment
- **Bipolar RF** is a validated energy source of thermal modulation for discogenic pain
- **Elliquence Triggerflex** is the oldest, best and **safest** RF device

The Role of Elliquence and Bipolar RF

- **Temperature controlled unipolar RF (Oratec) did not control heat**
  - Unipolar RF can cause a neuropraxia complication
- **Elliquence: No device related complications with their high frequency low temperature Bipolar RF**

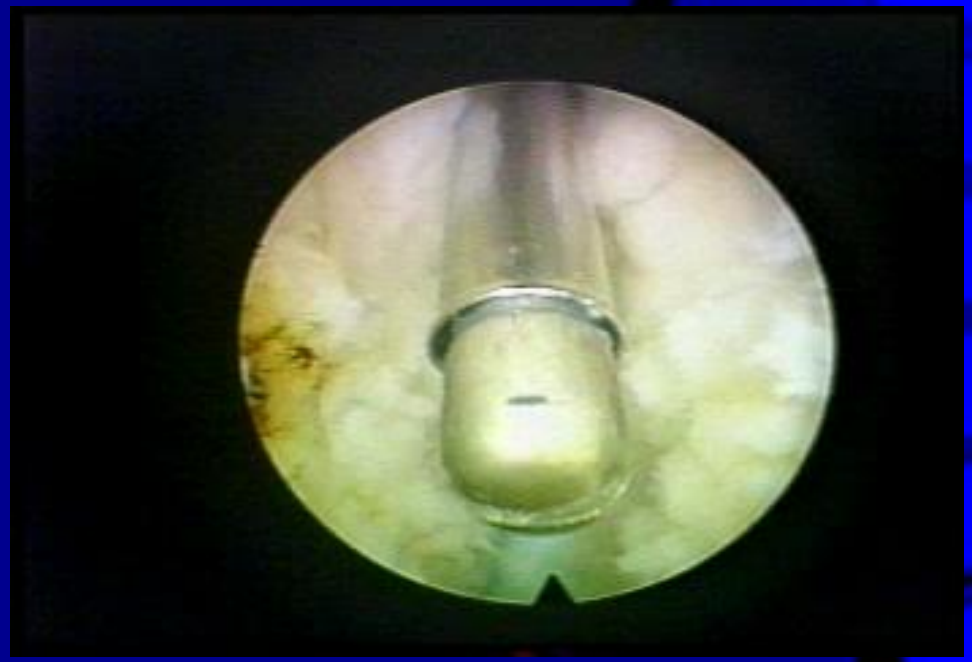
Disc Fx : First line of treatment for Surgical Pain Management

Specimen evidence of a perfectly performed Disc fx (3 grams)

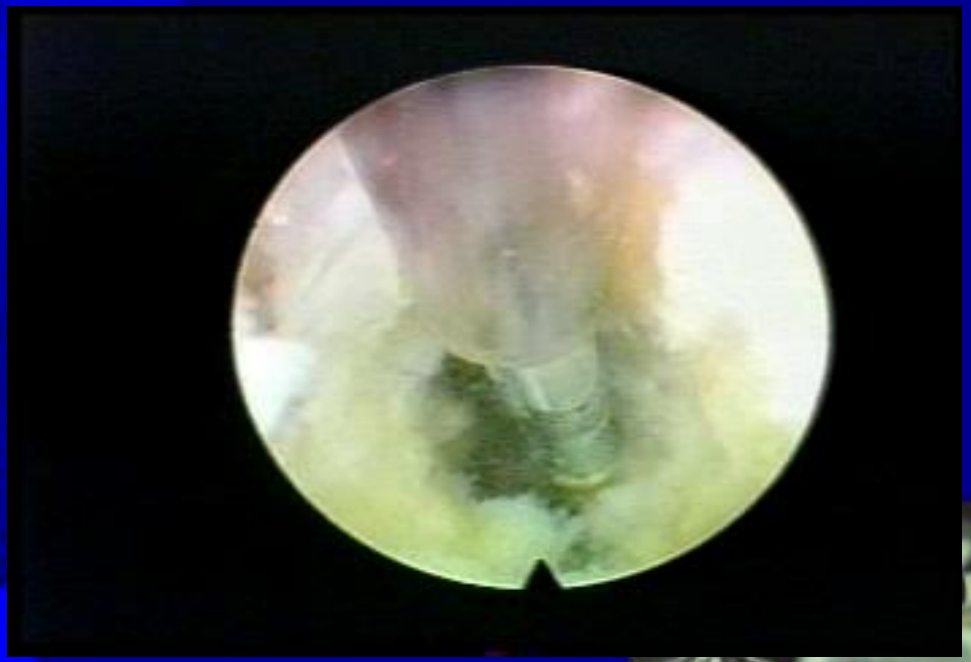
Video of Elliquence bipolar trigger flex

Example: HNP with annular tear

Biportal Technique

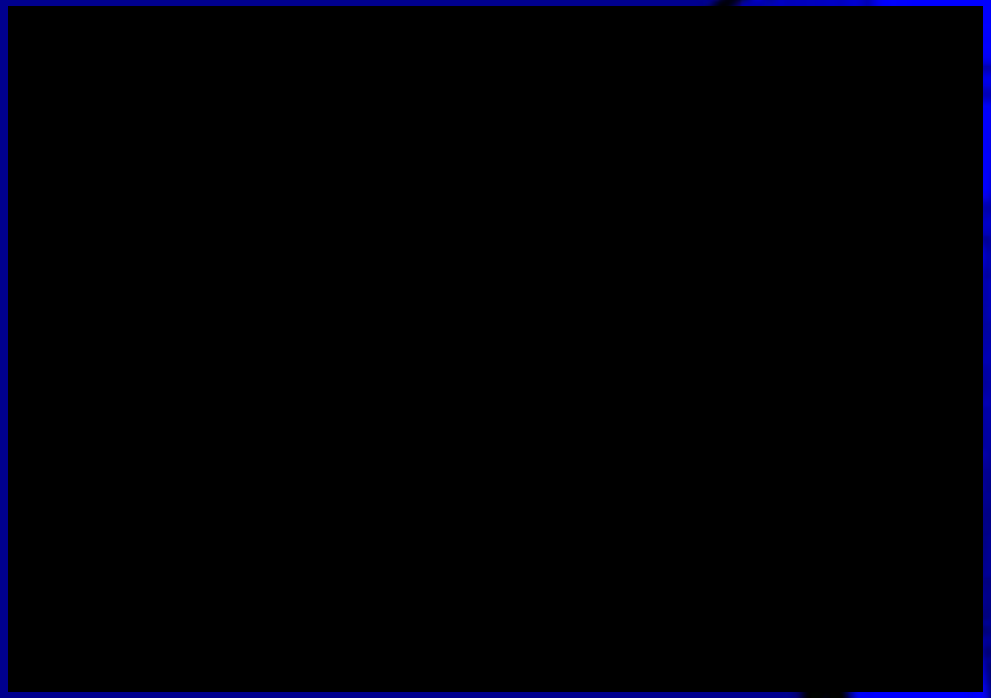


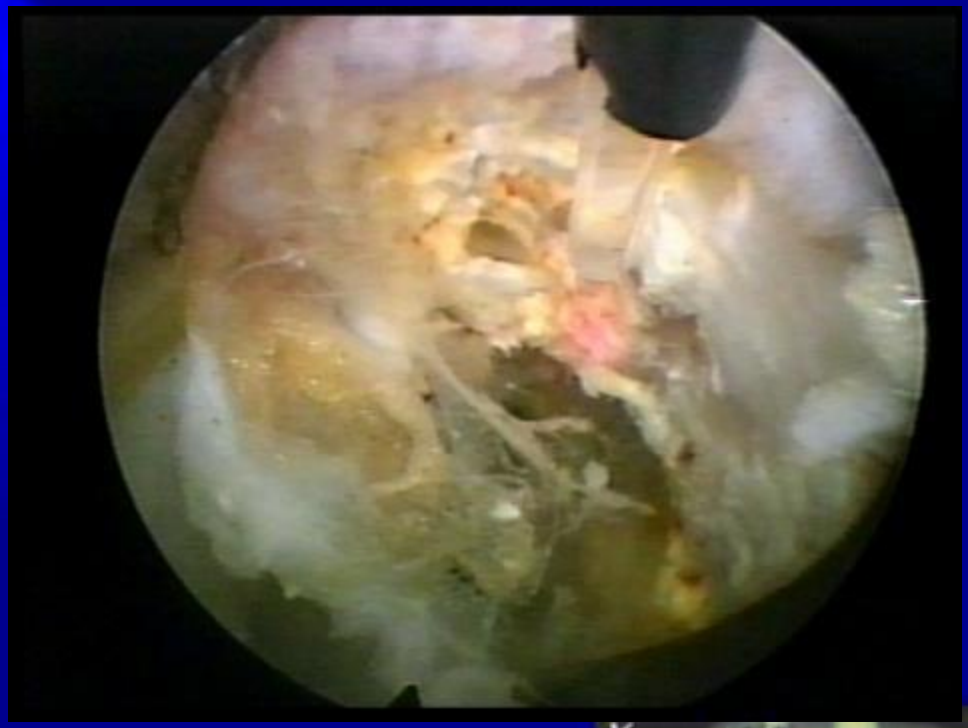
Uniportal Technique



THE BENEFIT OF LASER FOR ABLATION OF BONE AND SCAR

2.5 MIN VIDEO DEMO





LASER DECOMPRESSION

***LASER ABLATION SUCCESSFULLY ABLATES SYMPTOMATIC SCAR**

Clinical Rationale for bipolar RF

- The most efficient and cost effective MIS surgical solution
  - Intradiscal therapy with Endoscopic translaminar and/or transforaminal decompression
  - Add dorsal endoscopic rhizotomy as a hybrid procedure
  - Rhizotomy of the medial branch with foraminoplasty
- **Saves Fusion for last, avoiding " burning bridges" for more invasive procedures as a staged procedure**

What do I hope to bring to all Physicians involved in Spine Care?

Impart what I learned, in my 28 year's focus on endoscopic spine surgery

Degree of Response to therapeutic injections a good prognostic indicator for transforaminal decompression

In Endoscopic Surgery: Multidisciplinary involvement and Cooperation is Desired

Cross training, communication, shared responsibilities

- Training is different
- Background is different
- Concepts are different
- Experience is Different

Technical abilities are different and surgical training is imperative

Decision making and surgical skills are both necessary, and go together

NEW CONCEPT ENABLED THROUGH BECOMING ACCOMPLISHED IN ENDOSCOPIC SPINE CARE

(Personalized care through patient demand)

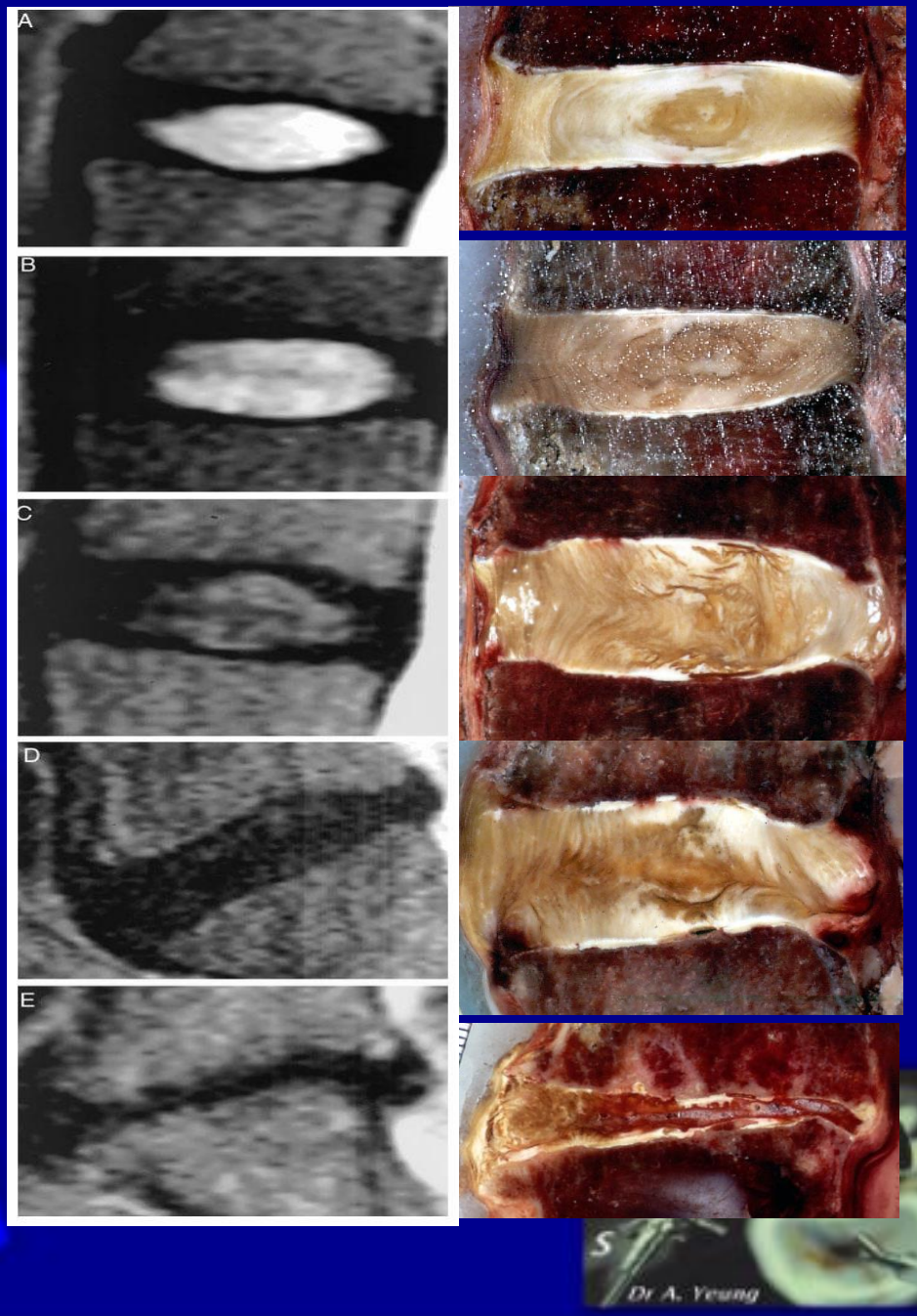
Endoscopic Surgery Advantages

- The endoscope makes it possible to correlate the patho-physiology of pain with visualized patho-anatomy
- When operating under local anesthesia the patient can communicate with the surgeon during surgery
- The physiology of pain can be correlated with patho-anatomy

Degenerative Conditions of an Aging Disc

SURGICALLY TREAT THE PAIN SOURCE GUIDED BY IMAGING

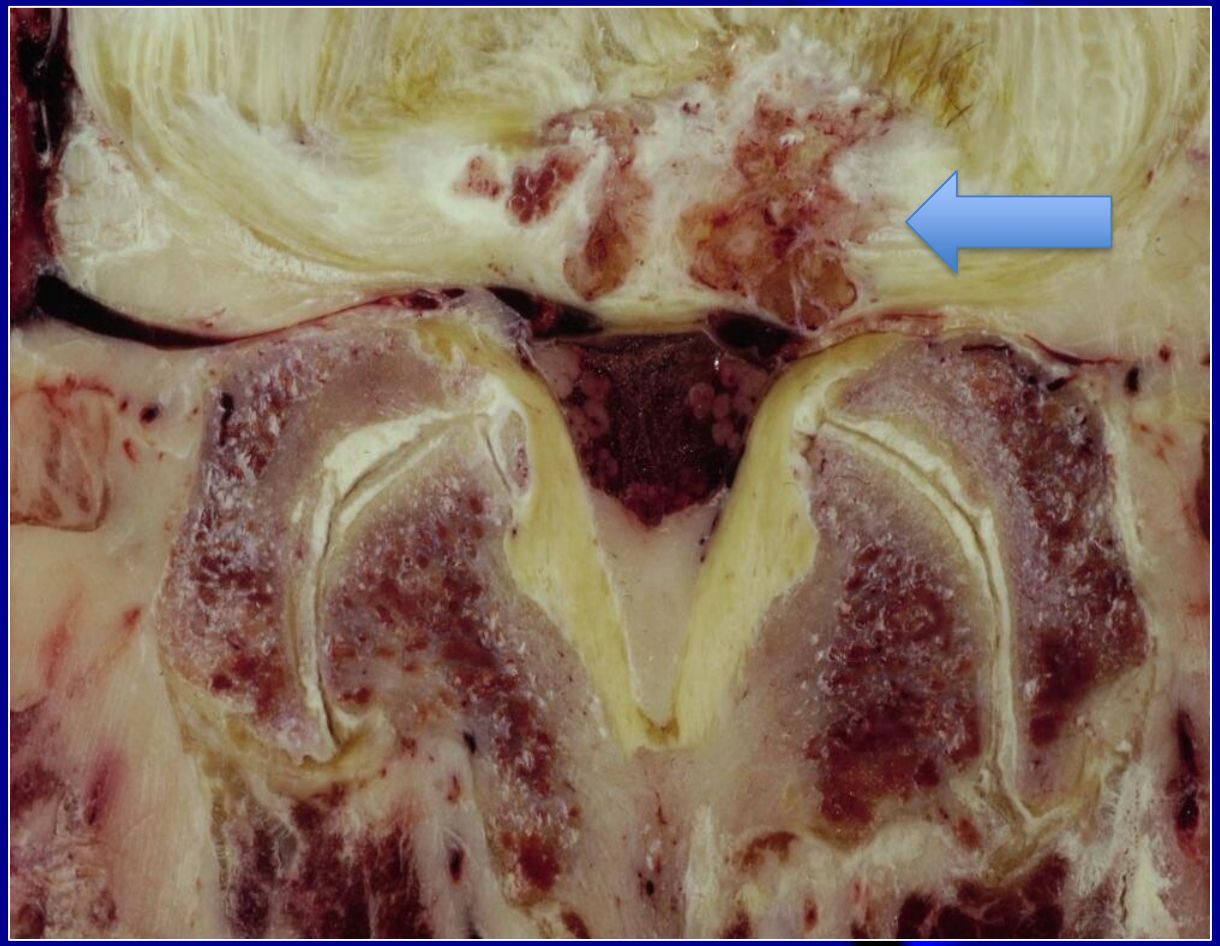
- All discs undergo degradation in a well-described cascade, matched by imaging and patho-anatomy
- **Why some patients have intolerable Pain, and others is NOT completely understood by imaging alone**
- **Facilitated by Diagnostic and therapeutic injections**
- **Pfirrmann C et al, Spine, Sept 2001.**

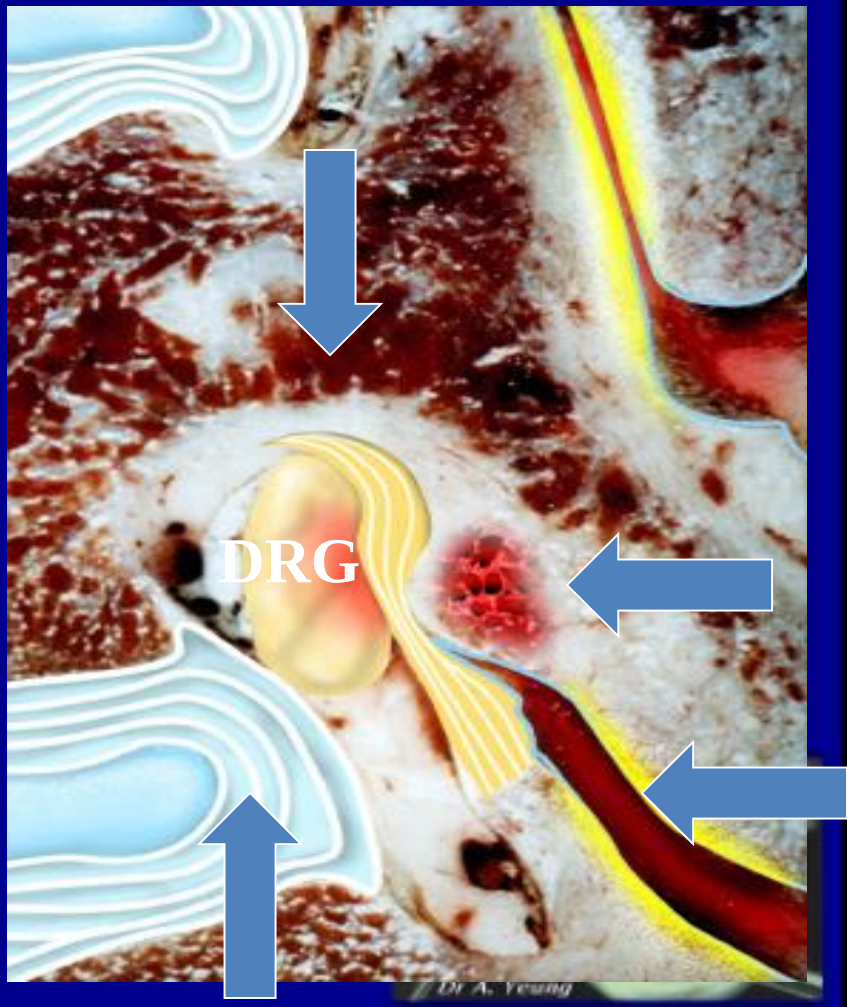


PAIN GENERATORS IN DDD affect the DRG

Courtesy of Wolfgang Rauschning

Granulation tissue in the annulus





The Future of Endoscopic Surgery

- Utilized by non-surgeons as well as surgeons
- Acceptance will depend on the politics, patient physician acceptance, and the business of spine in various parts of the world
- Resolving medical and political turf battles

The Future of Endoscopic Surgery

"Surgery" will not be just for a neurologic deficit, an "abnormal" imaging study, or last resort" for surgical intervention.

Transforaminal Decompression will be for Surgical Pain Care under local anesthesia

When the visualized pain or symptom generating patho-anatomy is correlated with the patient's response and feedback during surgery, a new type of "evidence based medicine" is established

(vs Population Management Analysis)

Example: Endoscopic philosophy and technique

- For patients deemed "too *young*", "too old", " too pain sensitive", with "psychologic disorders" or having "too many co-morbidities" to be good candidates for the risks of traditional surgical intervention

Biportal Endoscopic Technique
Lumbar Spine

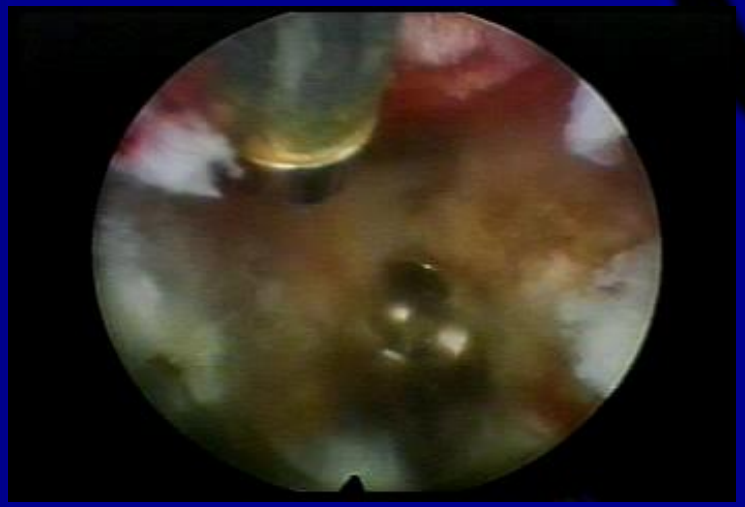
Morbid Obesity >350 #

Rejected by traditional spine surgeons

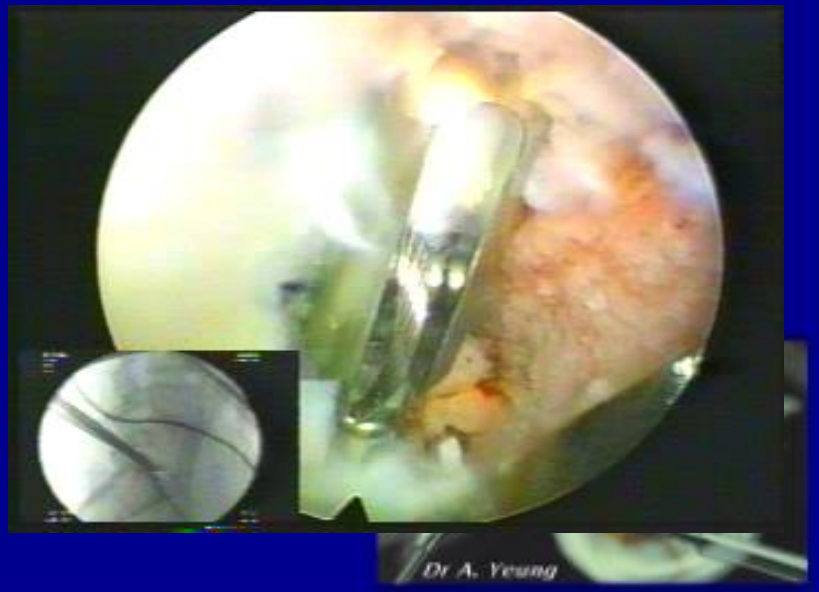
Video example of biportal endoscopic technique

The surgeon and assistant can work together inside the disc

An endoscope Visualizes and documents the surgical process



Audio feedback is recorded



"Least" Minimally Invasive Surgical Technique : Transforaminal Decompression under local anesthesia avoids surgical destabilization

- Safer than traditional open surgery!
- 3.5% published complication rate <1% after overcoming the learning curve*
- *Yeung's case series

FEATURES of Transforaminal Decompression:

- **Clinically Effective, Cost Effective**
  - Local anesthetic (MAC or NO sedation)
  - Outpatient, one hour recovery
  - Surgical time dependent on case complexity and surgeon experience (< 1 hour)
  - *Neuromonitoring **NOT NEEDED (with cost savings)**
  - Earlier Surgical Care provides better results, increases productivity IN WORKING PATIENTS

Systematic review of A YEUNG'S endoscopic database >10,000 cases 1991-2018

- **Discogenic pain** enhanced by evocative chromo-discography (intra-operative vital staining of degenerative nucleus pulposus)
- **Herniated Discs** : contained, protruded and extruded, can be successfully removed, decompressed
- Foraminal decompression mitigates progressive FORAMINAL stenosis from aging

The Future: Endoscopic Spine Growth

- ENDOSCOPIC VISUALIZATION ,EXCISION, DECOMPRESSION AND STABILIZATION of the lumbar thoracic and cervical spine (WIDELY PRACTICED in ASIA)

- Transforaminal Endoscopic Decompression, providing symptom relief is possible for 80%-90% of the Painful Patho-anatomy of each Degenerating Spinal Segment

- Aided by Computer , Image enhancement, Image recognition A.I. (3D being developed)

Endoscopic Spine State of the Art

The future will be by combining all endoscopic approaches, easily "staged", aided by **Robotic A.I.***

Staging is cost effective by first, decreasing pain

- Endoscopic procedures now BEING UTILIZED for trauma, neoplasm, and instability, including fusion as a surgical option for pain resolution from "FBSS"

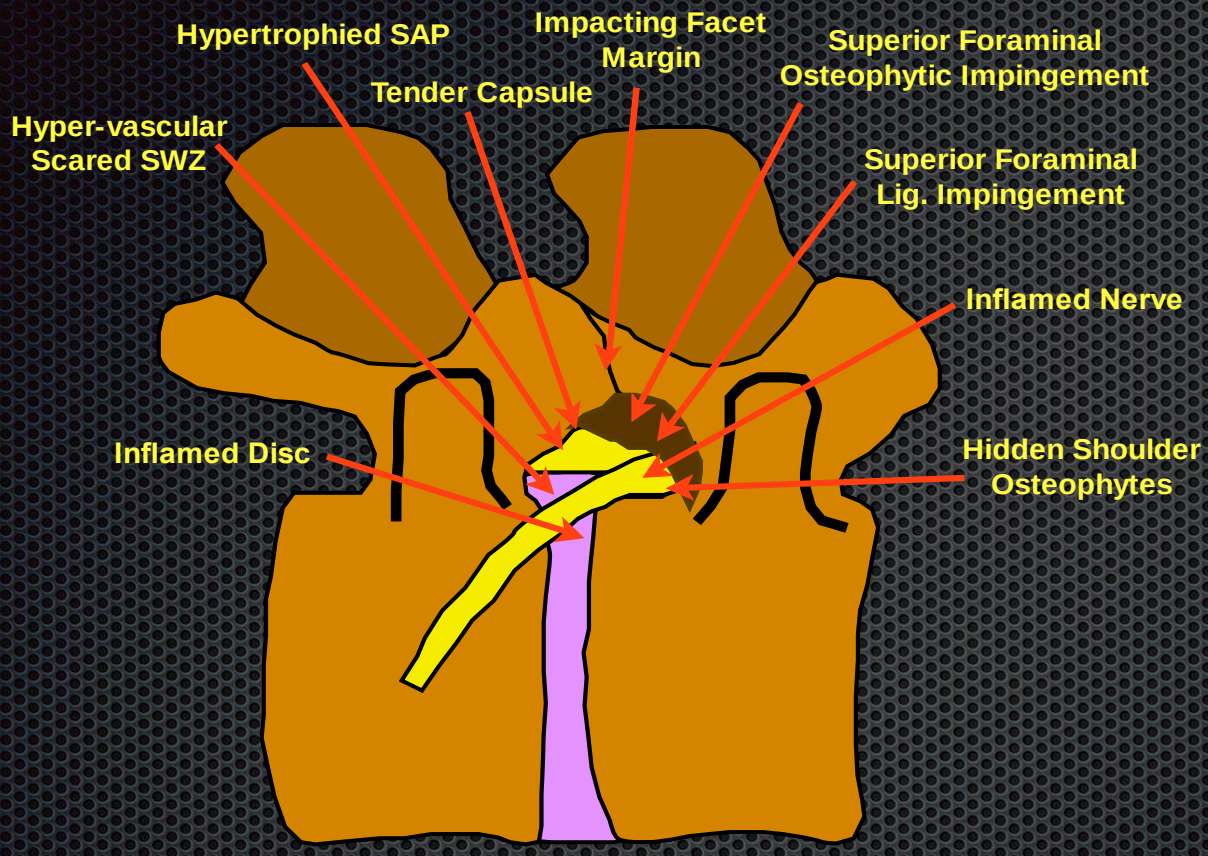
* ATY's A.I. for endoscopic techniques

Endoscopic surgery augments open “gold standard” surgery with intradiscal therapy

- Requires a change in Traditional Surgical Indications
  - DISRUPTIVE AND DISPARATIVE
- Endoscopic Therapy: Selective chromo-Discectomy, thermal ablation ,Irrigation, and neutralization of disc PH
- *Endoscopic visualization of patho-anatomy under local anesthesia augmented by patient feedback during surgery

The Exit Zone

*9 common, 17 endoscopically documented painful conditions and its anatomic locations in the foramen



* Superior foraminal ligament Impingement
* Superior notch Osteophytes
* Dorsal & Shoulder Osteophytes
* Facet Joint Impaction
* Facet Joint Cysts
* Pars Intrarticularis tethering
* SWZ & notch Engorgement
* Ligamentum flavum Infolding
* Disc Pad
* PLL Irritation
* Inter Transverse lig & Muscle Entrapment
*Inferior External Pedicular Tethering
*Annular thinning
*Annular Tears
*Shoulder Osteophytes
*Lateral Osteophytes
*Perineural Tethering

The list is still growing, with endoscopic solutions for FBSS
Ie. compressed or stretched scar tissue previously asymptomatic

9 Common endoscopically visualized Conditions, aided by endoscopic foraminoplasty

- 1. Inflammed disc
- 2. Inflammed nerve
- 3. Hypervascular scar
- 4. Hypertrophied SAP, lig flavum impingement
- 5. Tender capsule
- 6. Impacting facet margin
- 7. Superior foraminal facet osteophyte
- 8. Superior foraminal ligament impingement
- 9. Hidden shoulder osteophyte

Additional endoscopic documented conditions

(Often missed by traditional imaging)

- Symptomatic scar tissue (from stretching or compression)
- Facet joint capsule and osteophyte impingement
- Facet Joint cysts unrecognized by imaging
- Pars defect tethering in isthmic spondylolisthesis
- PLL and annular inflammatory irritation
- Annular thinning and tears and chemical inflammation
- Perineural tethering by scar tissue and inflammation
- Foraminal osteophytosis
- Endplate tethering and impingement

Additional endoscopic documented conditions

(Often missed by traditional imaging)

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Retrospective analysis of accuracy and positive predictive value of preoperative lumbar MRI grading after successful outcome following outpatient endoscopic decompression for lumbar foraminal and lateral recess stenosis

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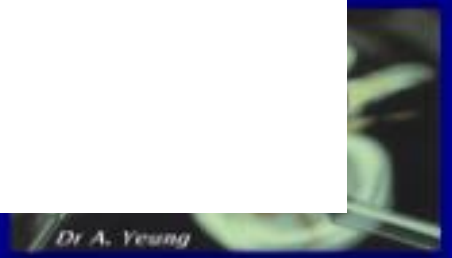
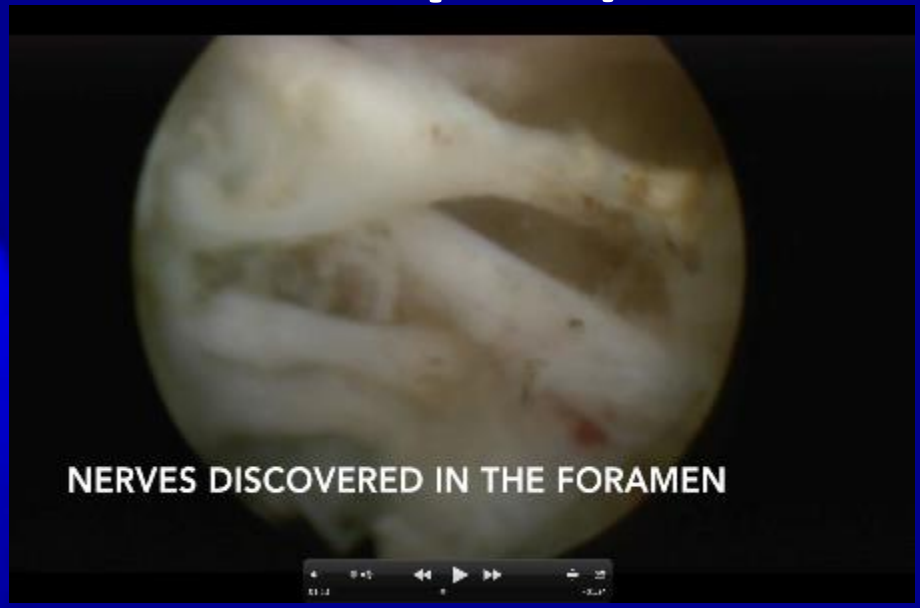
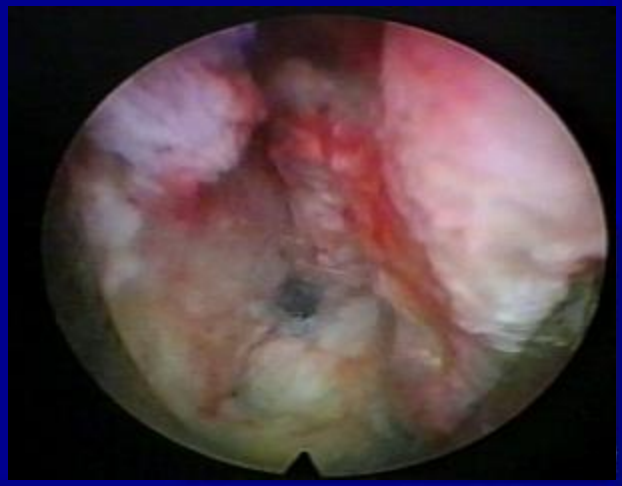


How Robotic A.I. can help Identify Pain Generators (Cardan Robotics for pain)

- These 17 symptom generators can be identified by a collection of endoscopic images to correlate with current accepted imaging technology like CT Scans, Mri, 3D image reconstruction.
- Image recognition will help the surgeon identify endoscopically treatable conditions

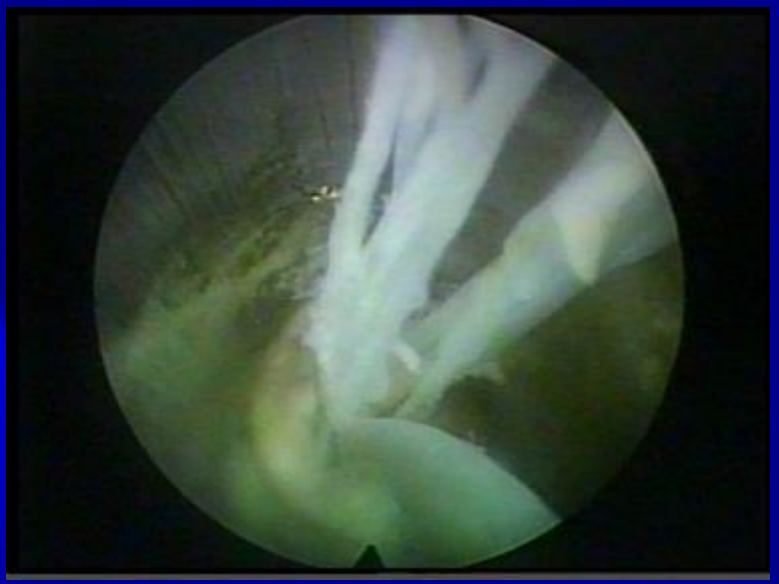


Grade V Annular Tear

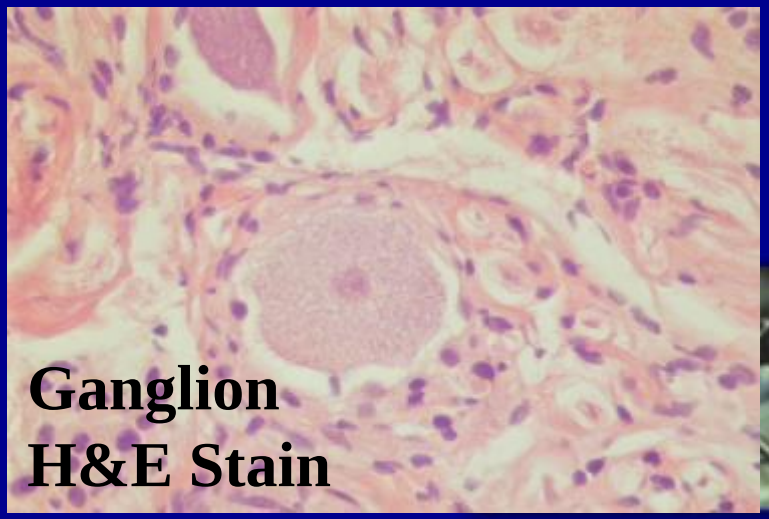


The Biggest Obstacle

- Difficult for traditional surgeons to accept unfamiliar patho-anatomy and variations of normal anatomy visualized and described by endoscopic images
- Difficult for traditional surgeons to accept different approaches
- Most frequent comment is how to get traditional surgeons and nonsurgeons to accept unrecognized imaging, by treating the pain generator first, in academic teaching centers

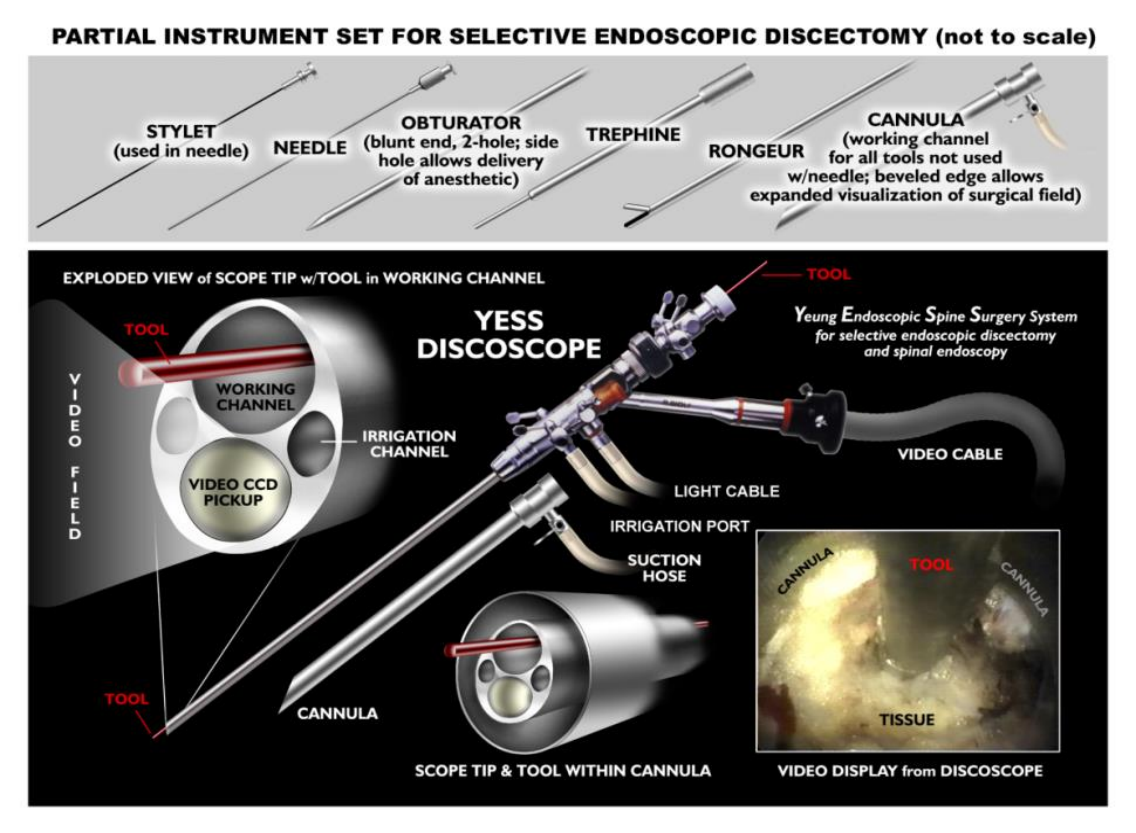


Sympathetic Nerves



How the Endoscope Should be Utilized

For Diagnosis and Treatment:
Identify Painful Patho-anatomy

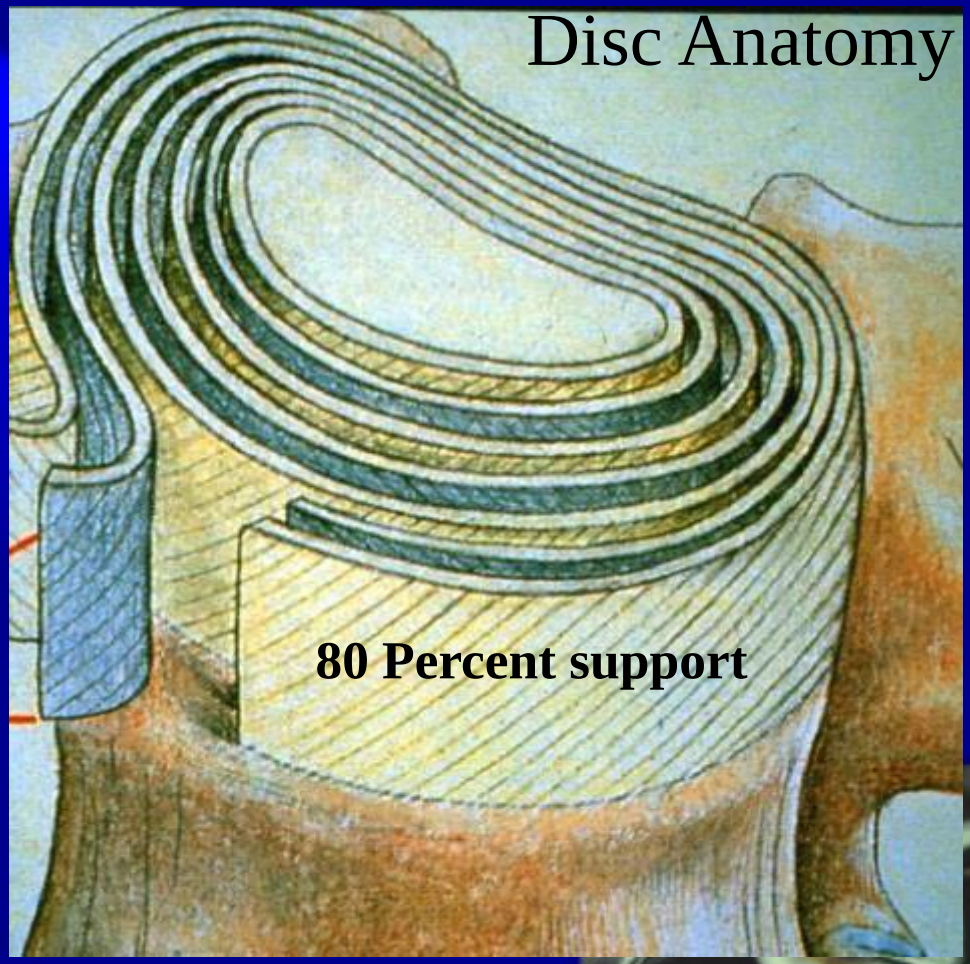


- **As a surgical tool:**
  - **Discectomy, Nuclectomy**
    - **Decompression**
  - **Intradiscal Therapy**
    - **Decompression**
    - **Thermal annuloplasty**
    - **Disc irrigation**

Y.E.S.S™. Multi-Channel flow integrated Spine Scope

Primary Pain Source: The Disc

- **Current research and interest should start with intradiscal therapy**
  - **Validated by level I EBM Chymopapain**
- **New technologies for nucleus augmentation and biologics is still in its infancy, but promising**

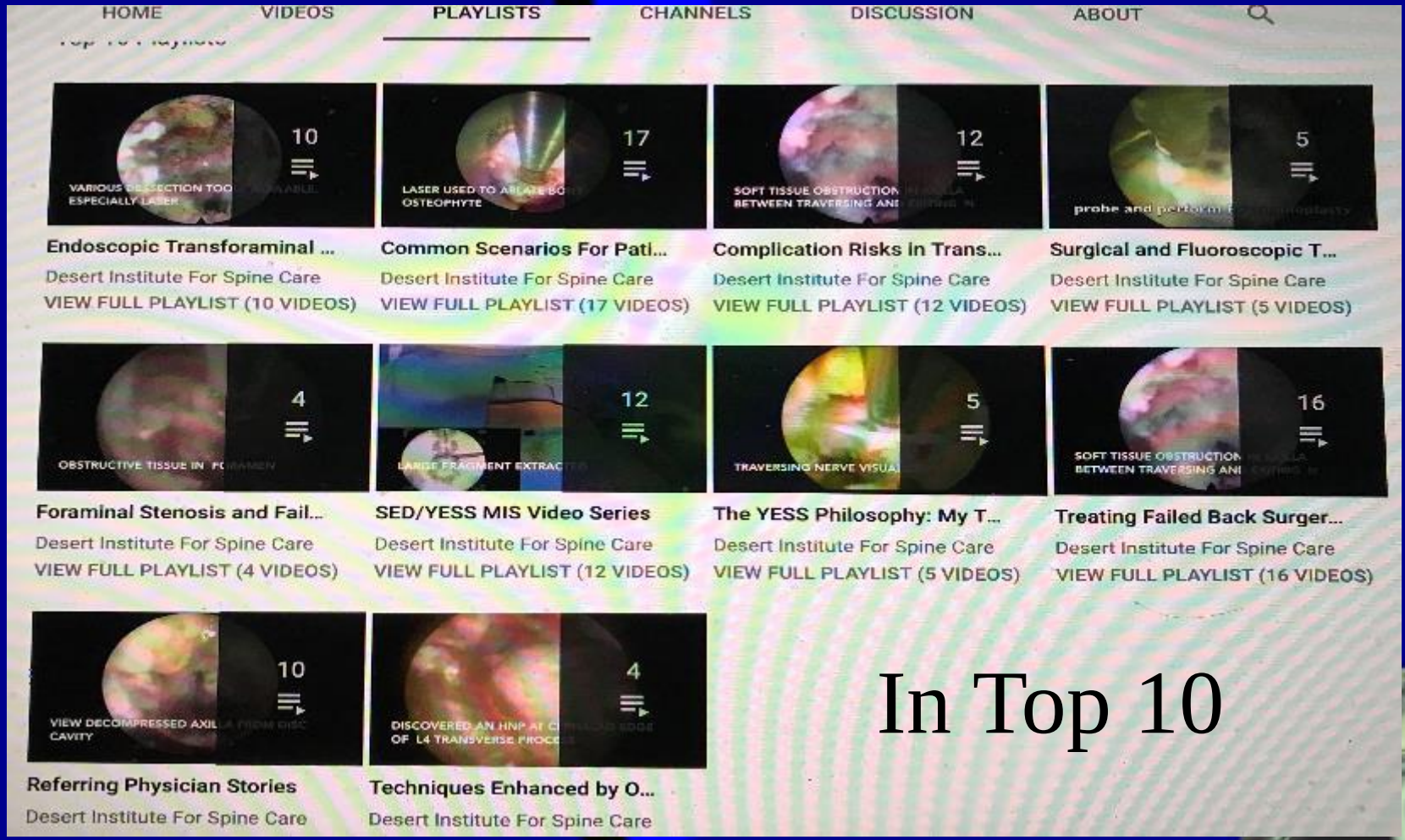


You tube playlists and lectures on DISC website
www.sciatica.com

*>100 categorized video demonstrations available by request for YESS research fellows

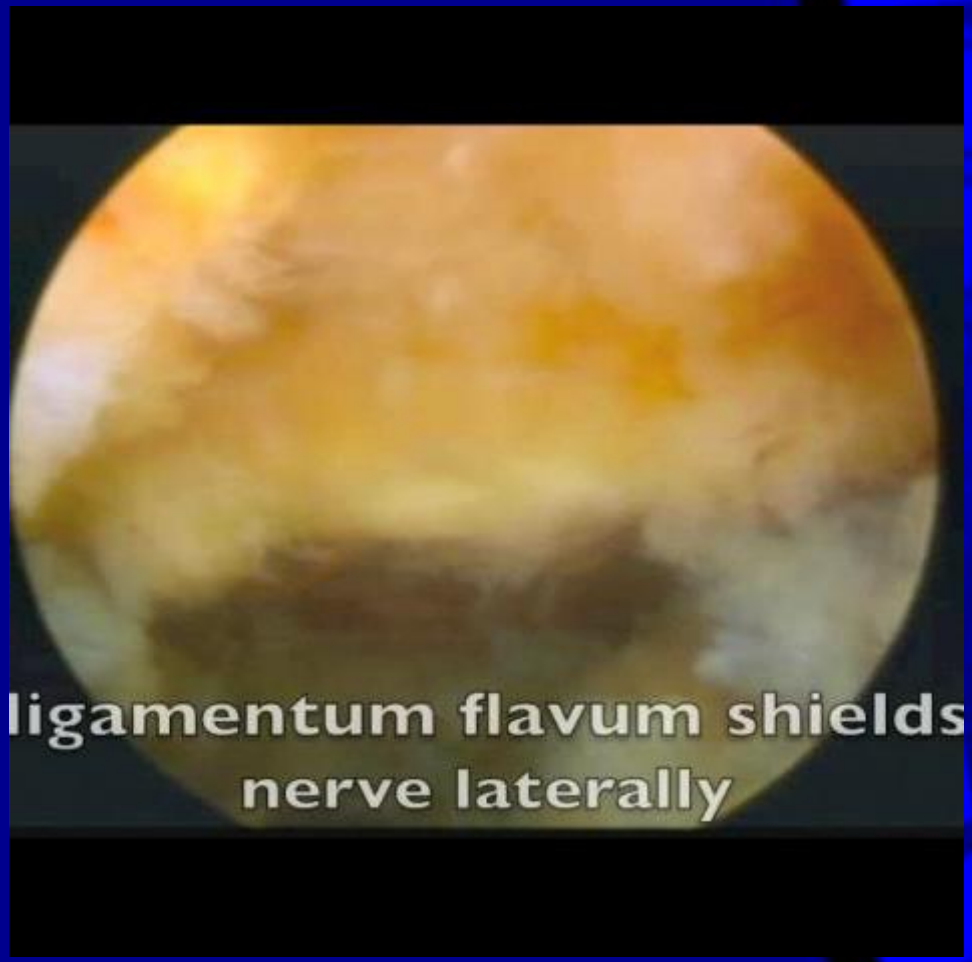
Playlists (U tube) www.sciatica.com

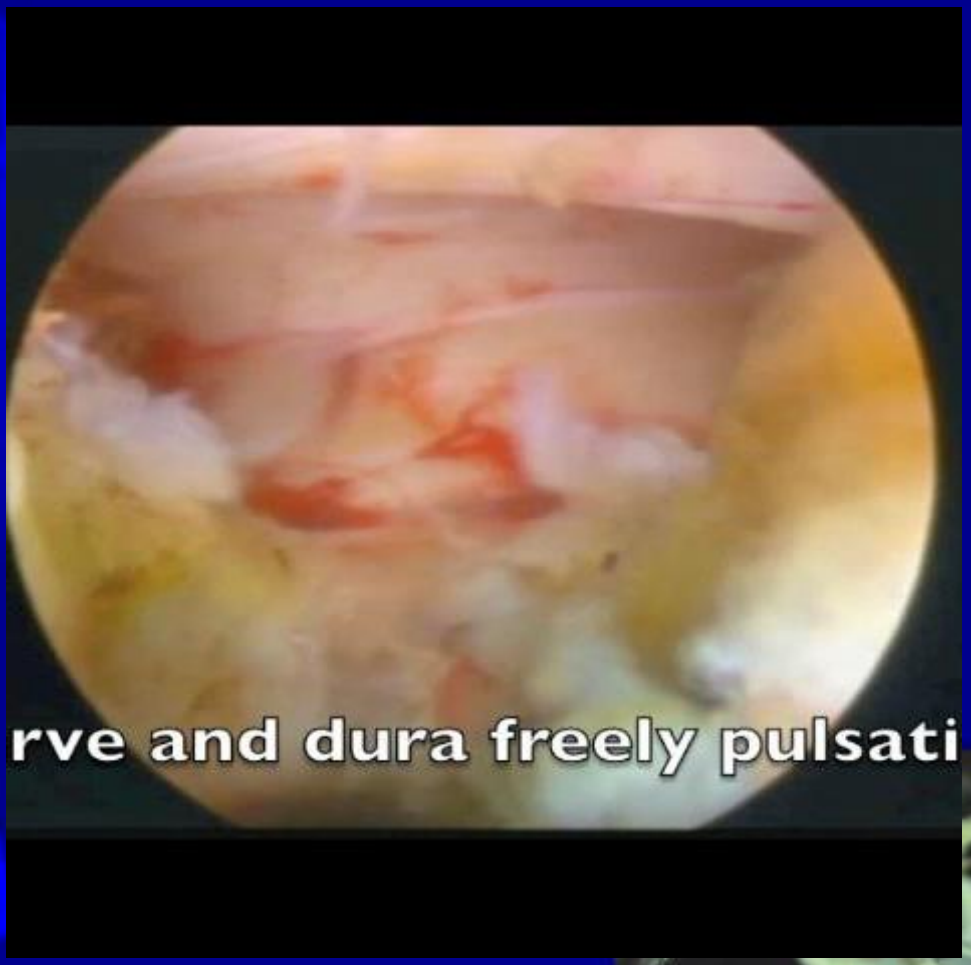
96 case examples with audio-video illustrations



In Top 10

HNP: decompressed traversing nerve visualized and confirmed by resecting flavum





Safe bipolar Radio-frequency equipment

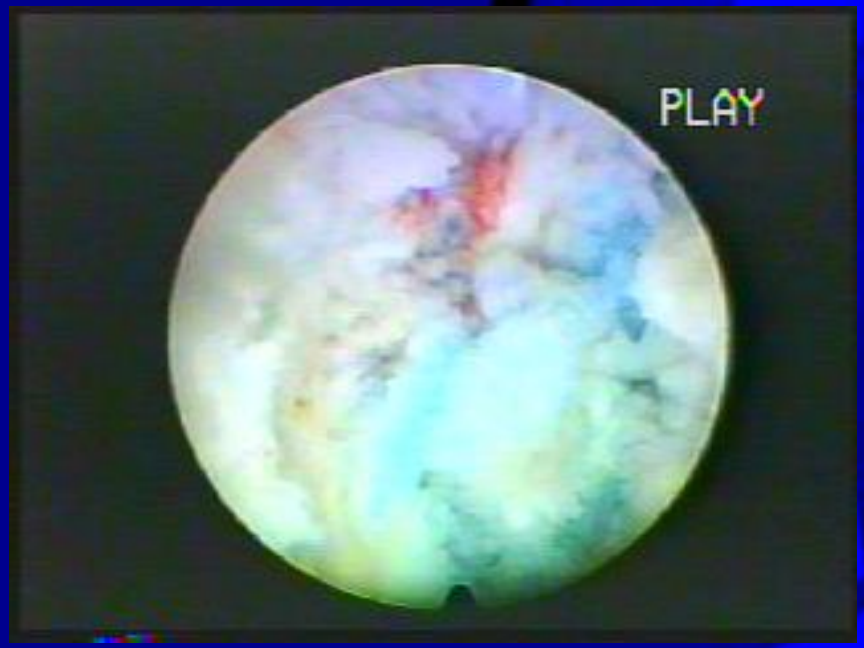
Elliquence RF Generator

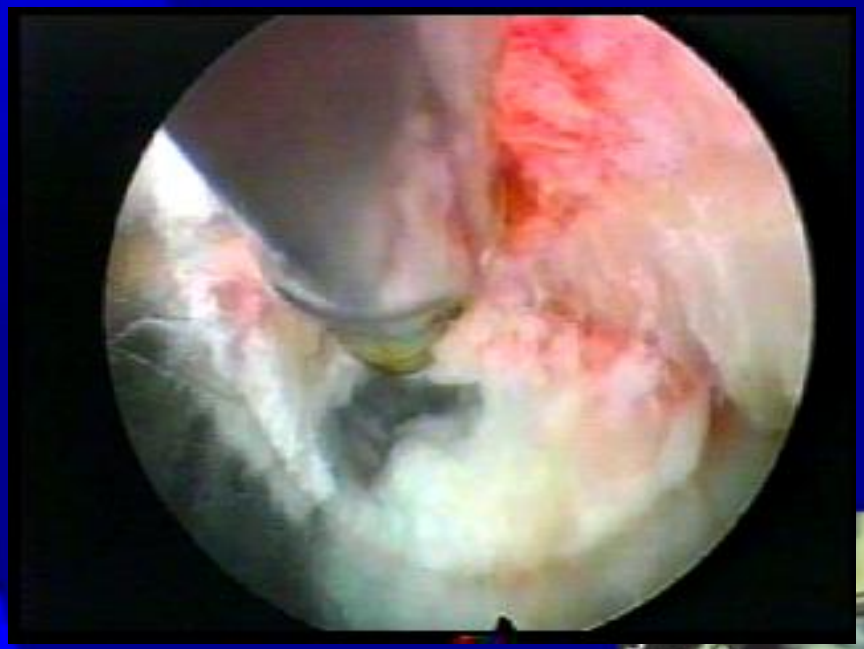
Safe in patients with pacemakers

Patho-anatomy with the YESS Scope system

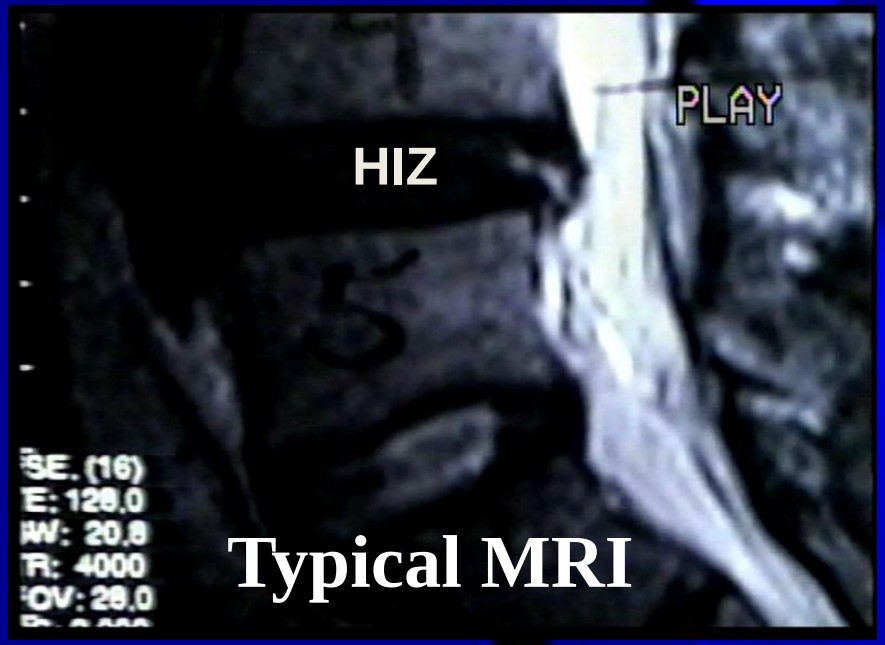
In vivo visualization of patho-anatomy : Toxic Annular Tears

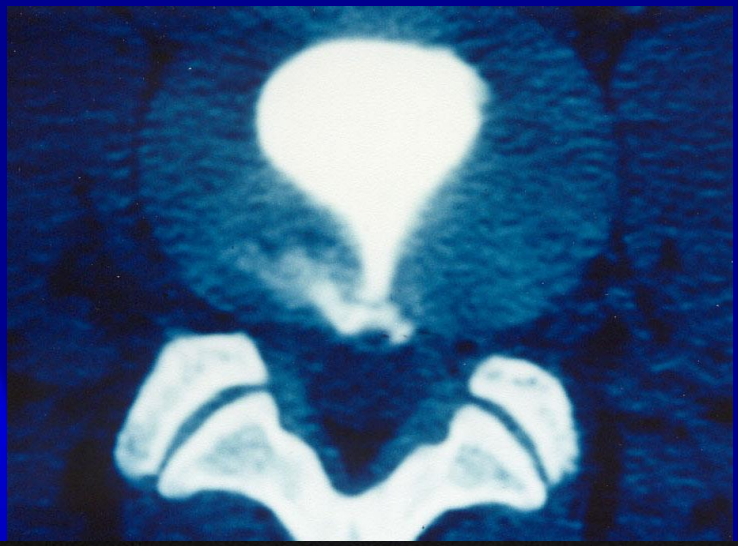
Inside out philosophy



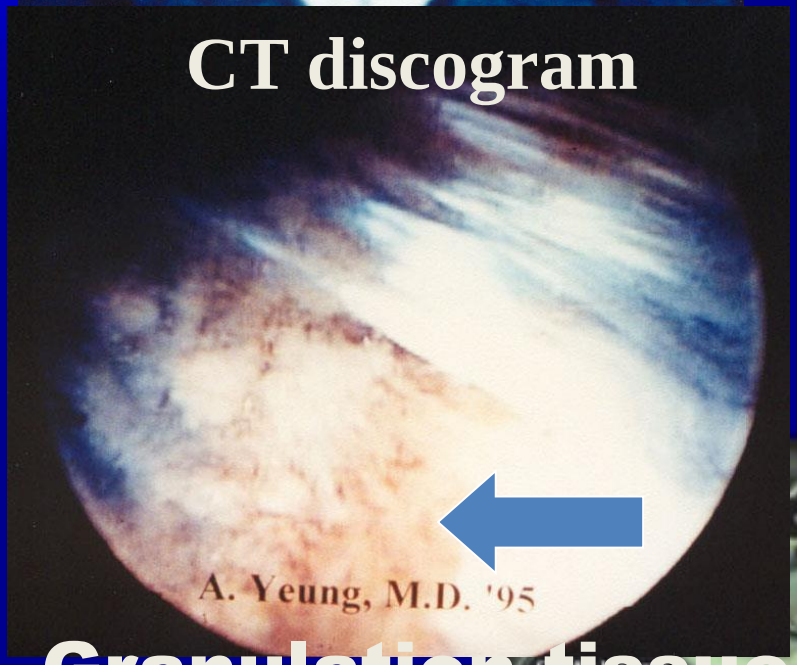


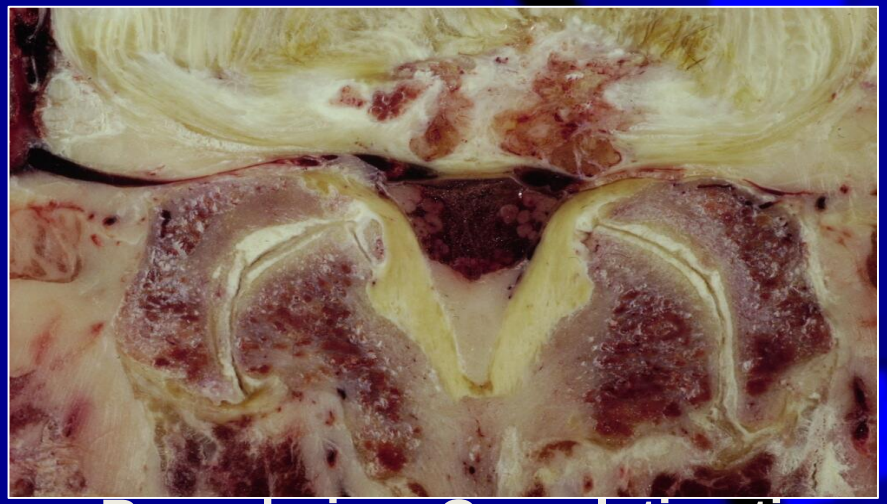
“Painful Discs associated with granulation tissue





CT discogram



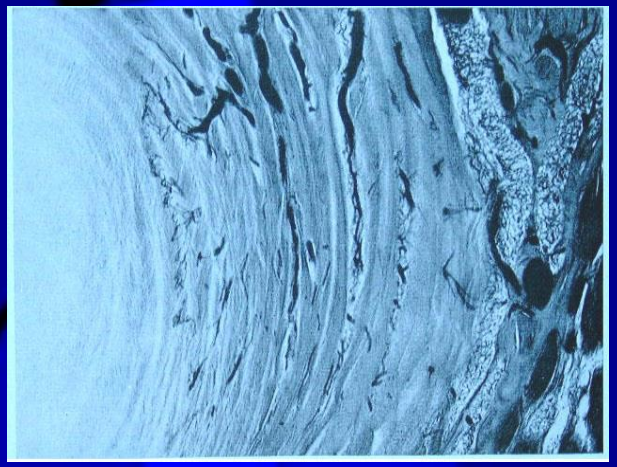


Rauschning: Granulation tissue

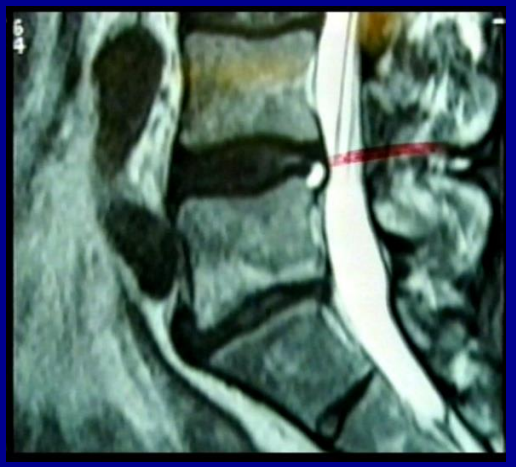
Granulation tissue

Rationale for surgery : low frequency MHZ bipolar RF

Original Ellman Triggerflex

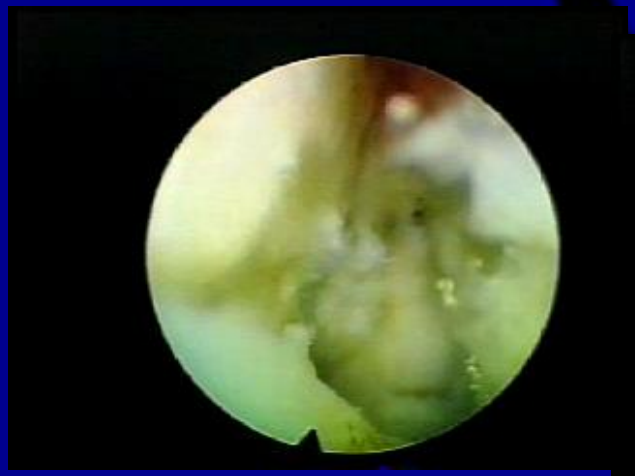


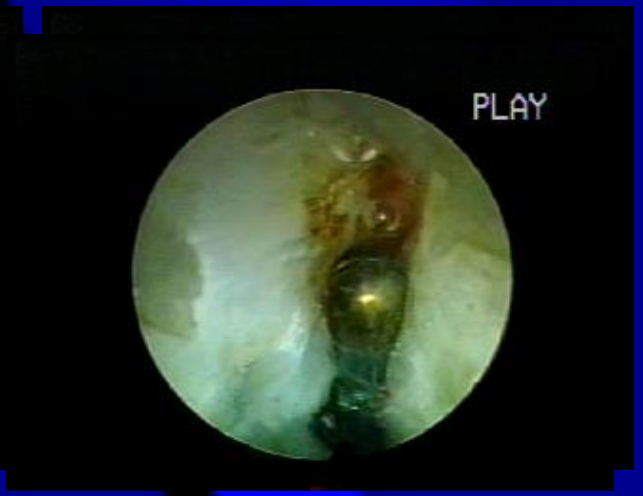
Pain Nociceptors in annulus

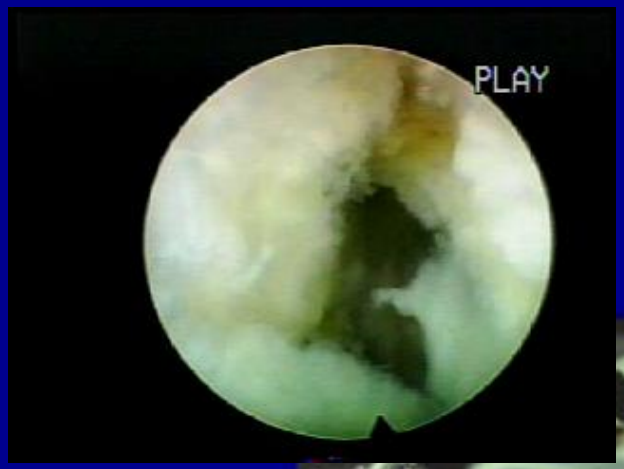


HIZ

(Based on YESS™ Visualized Thermal annuloplast

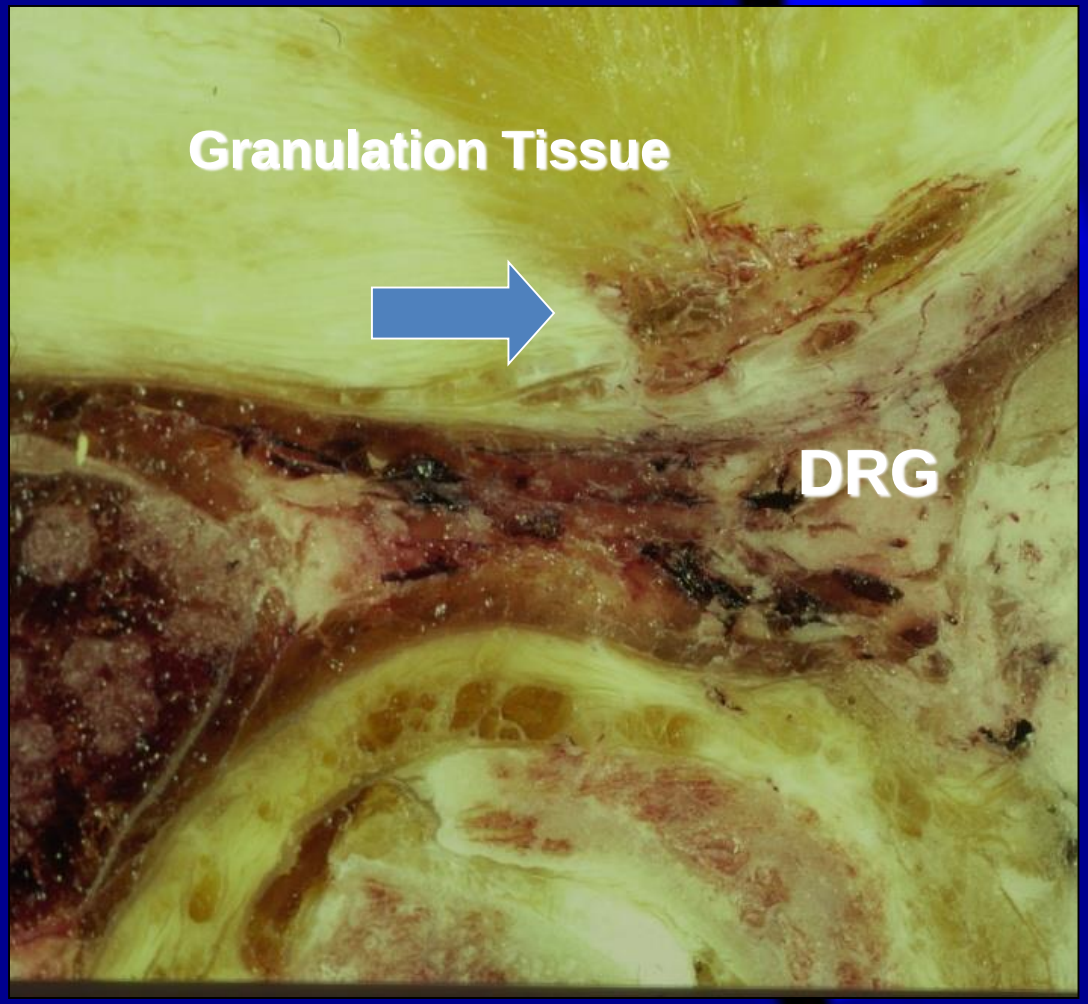


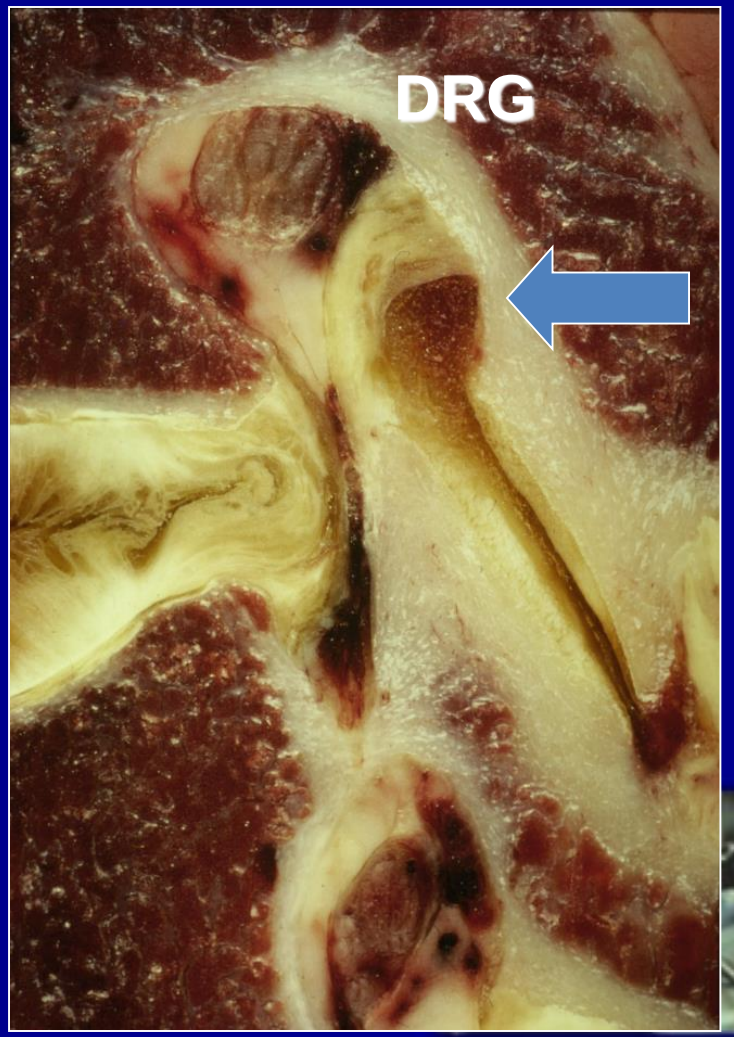




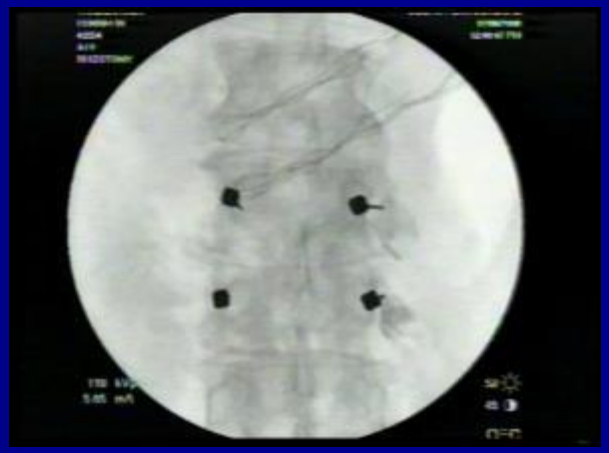
The Phases of SED ™ with thermal annuloplasty

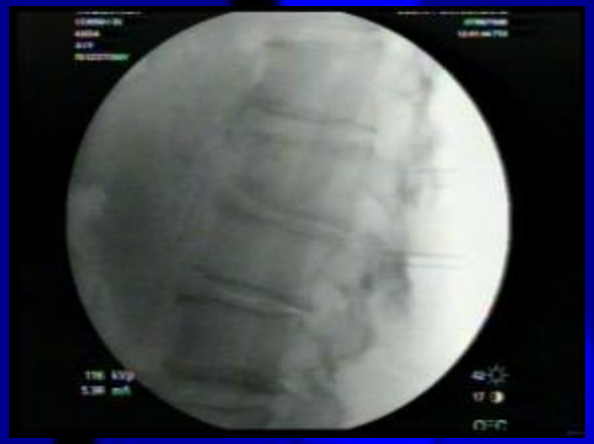
Stenosis: Disc Annulus and Facet synovium in close proximity to the DRG: Responsible for severe neuropathic pain



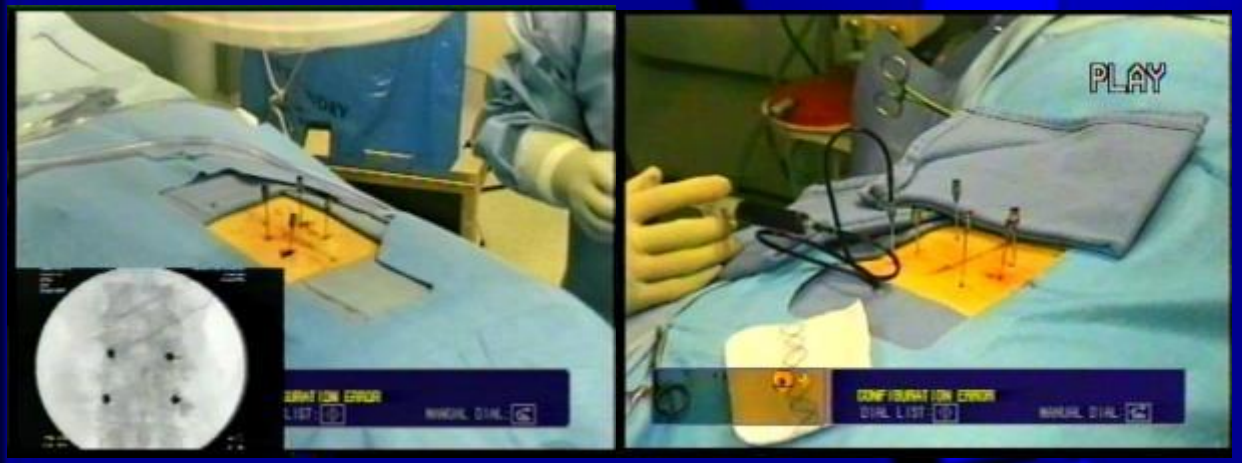


HYBRID PROCEDURES



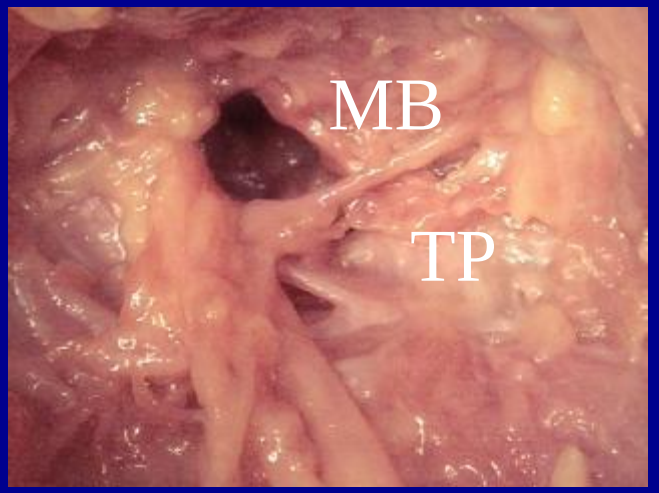


Needle Placement Wiltse Plane

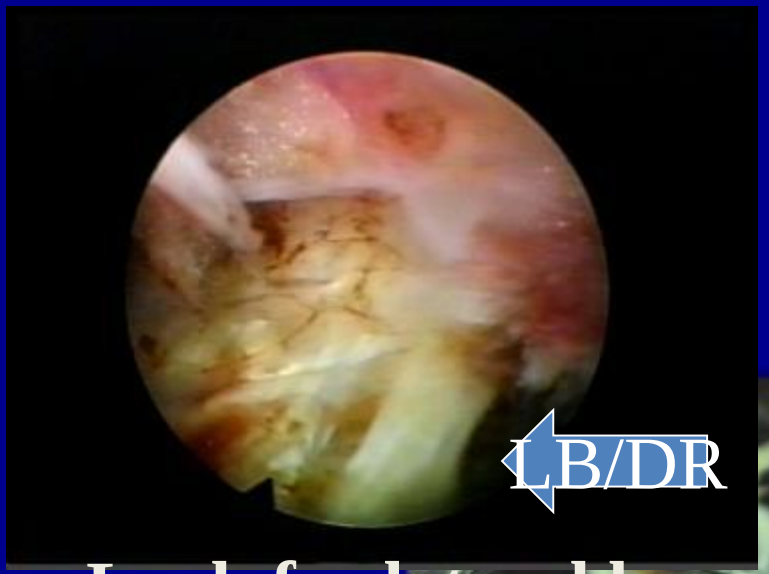


Isovue 300 + 10% indigocarmine

RhizotomyTechnique



Ablate MB at transverse proces



Look for lateral branch

Endoscopic Spine surgery can be applied to all spinal locations

- Cervical
- Thoracic
- **Lumbar is Predominant**
- Degenerative, traumatic, neoplastic,
- Deformity

  staged, Hybrid, stratified, personalized

Treatment Options

Bridging the Gap

Threshold

Fusion

Prosthetic Surgery

Endoscopic spine surgery:

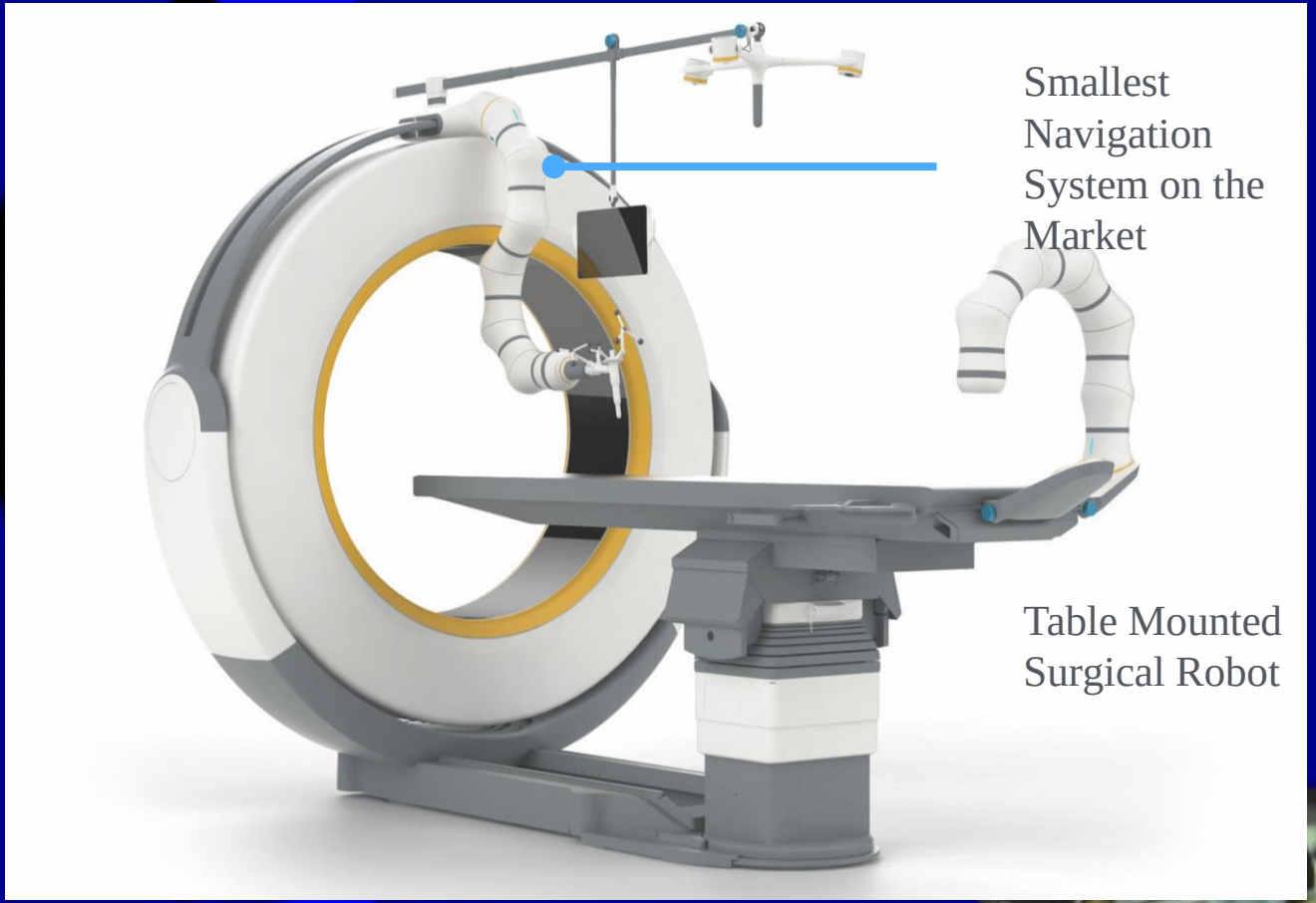
Interventional Pain Management ,
SCS, Drg neuromodulation

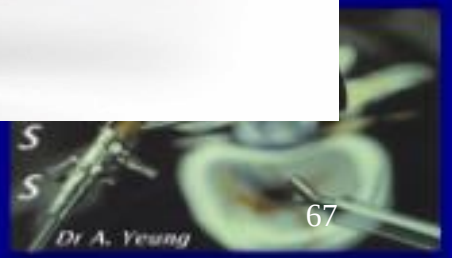
Conservative

Severity of Treatment
(Risks vs. Benefits)

IMAGE GUIDANCE AND ROBOTIC SURGERY UNDER DEVELOPMENT

- System Mounting Platform
- Custom Surgical Robot
- Mobius Airo
- Cardan Robot





I support Rational Open Techniques

Endoscopic Techniques requires training

Most of my patients do not need opiod post-op medication

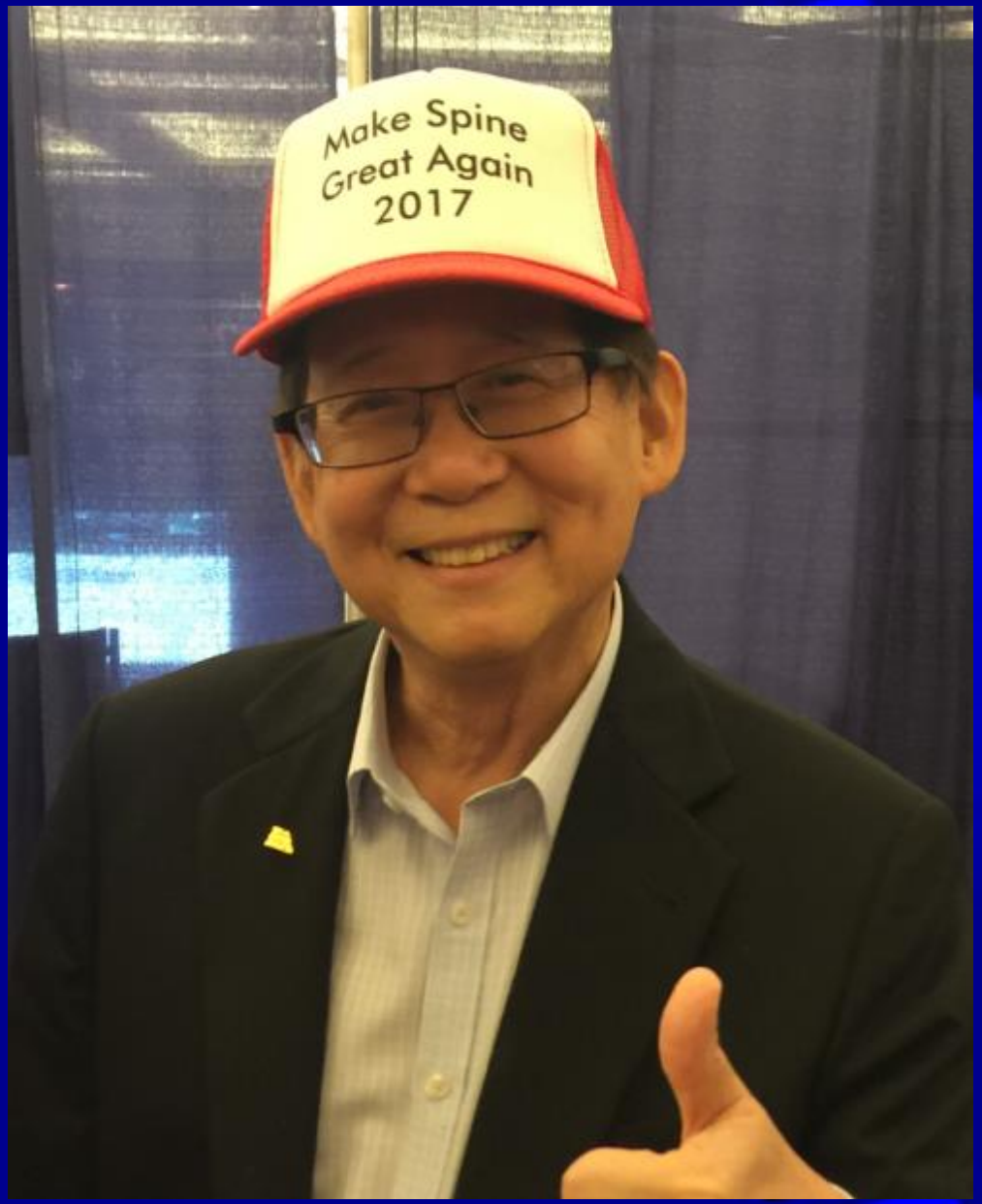
Throw Away The Script

With opioid-sparing surgery, most patients won't need prescription painkillers.

Becoming an opioid-sparing surgeon was the most liberating thing I've done in 25 years of practice. Why? Because before I started down this revolutionary path, I'd unwittingly become a pain-management specialist. True, I was an orthopedic surgeon and a healer — what I wanted to be — but I was also writing prescriptions for narcotics. And I was writing refills. And I was spending time trying to wean patients off their med-

Free Health Care for All will Ruin Quality for All

- Already gamesmanship for reimbursement is Rampant
- Increasing cost and decreasing quality and access
- Physician autonomy and patient choice needed to be preserved



MSGA

"Make Spine Great Again"

Thank you

Hat courtesy of Morgan Lorio, ISASS coding chair