The Role and Future of Endoscopic Surgery in the Treatment of Symptomatic Conditions of the Spine

Master lecture

Anthony T. Yeung, M.D., Voluntary Professor
University of New Mexico School of Medicine
Executive Director, endoscopicspinetherapy.org
Phoenix, Arizona
Korean Research Society of Endoscopic Spine



The Role and Future of Endoscopic Spine Surgery will steadily evolve as surgeons gain confidence and experience operating on their patients under local anesthesia



This experience will provide a “new” concept of evidence based medicine by treating the pain and symptom generator rather than just the imaging



When the visualized pain generating patho-anatomy is combined with the the patient's response and feedback during surgery, a new type of "evidence based" validation of the surgical effect can be studied



Dr Yeung is reviewing his 27 data base of over 10,000 surgical procedures on endoscopic surgery under local anesthesia to mine the best stratified indications for the role and future of endoscopic spine surgery for the best indications for “surgical pain management”



Key opinion leaders may differ in the promotion of their personal philosophy, concepts, and techniques in endoscopic surgery

Korean and Asian endoscopic surgeons have been in the forefront of endoscopic techniques and



The best technique, defined by safety, efficacy, and cost effectiveness will ultimately prevail and be adopted by followers of the philosophy and technique that provides the best results in the individual surgeon's hands

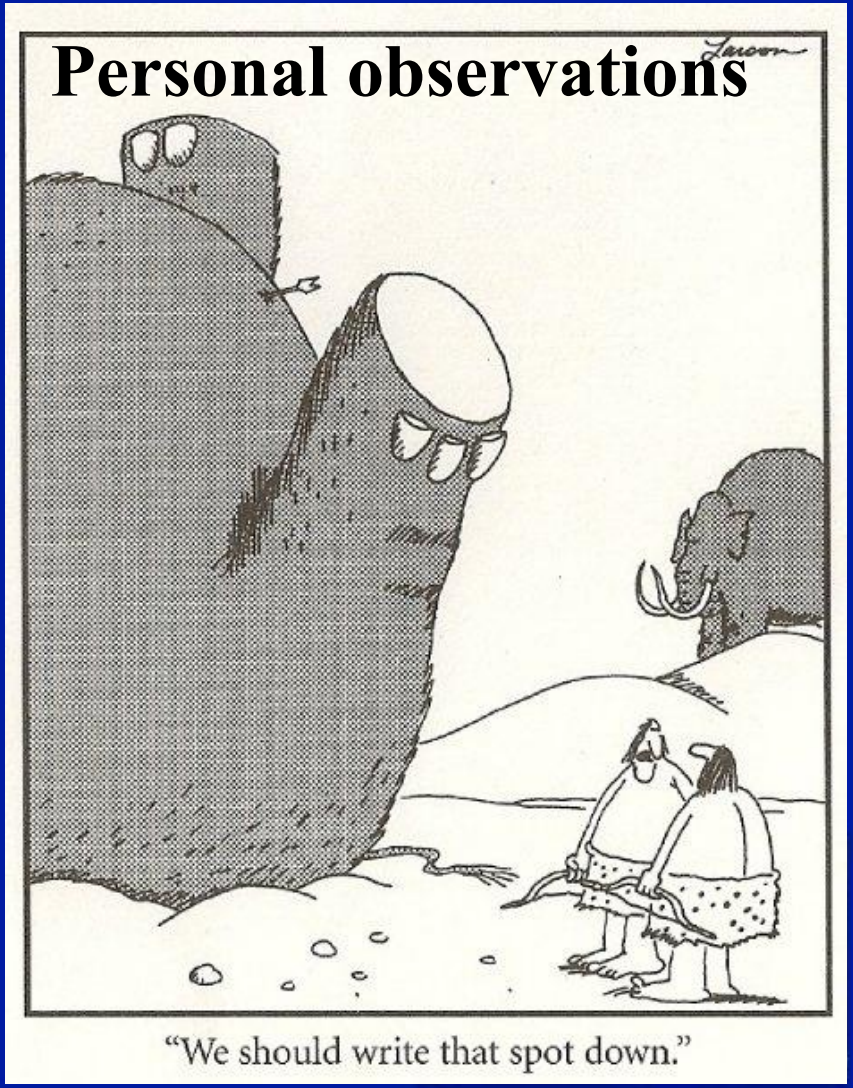


The “Surgeon” factor: Not all surgeons have the skill and focus to perform at a skill level needed to attain the best results



I am “Conflicted” by 27 years Experience in >10,000 Endoscopic Procedures

- **Developed the YESS™ Endoscopic Spine System in 1997**
- **Published Over 135 Level III, IV, and V EBM (>25 past 3 yr)**
- **Most Published as Level V “expert” opinion**
- **“Hybrid” procedures now provide the best and optimal results**



Endoscopic Spine State of the Art

- **ENDOSCOPIC VISUALIZATION, EXCISION, DECOMPRESSION AND STABILIZATION of the lumbar thoracic and cervical spine Is CURRENTLY BEING PRACTICED WIDELY in Asia**
- **Transforaminal Endoscopic Decompression, providing symptom relief is already possible for 80%-90% of the Painful Patho-anatomy of each Degenerating symptomatic Spinal Segment**



Endoscopic Spine State of the Art

- **A "full endoscopic" approach is already in the literature promoted by S. Ruetten, by combining the Translaminar with a Transforaminal approach**
  - **The future may be combining both approaches in one surgical procedure**
- **Korea, Japan, and China have incorporated novel endoscopic procedures for trauma, tumors, instability (Gun Choi, Xifeng Zheng, Zhenzhou Li, Ding Yu, Hyung sung Kim, et.al. (many others)**



Endoscopic Spine State of the Art

- **In the USA, The Yeung Endoscopic Spine Center has been established at the University of New Mexico as the first academic center to establish an academic multidisciplinary program for Endoscopic Spine Procedures**

- **To maintain credibility, it is imperative to NOT "hype" approaches that may be discredited by OVER PROMOTION for the sake of profit**



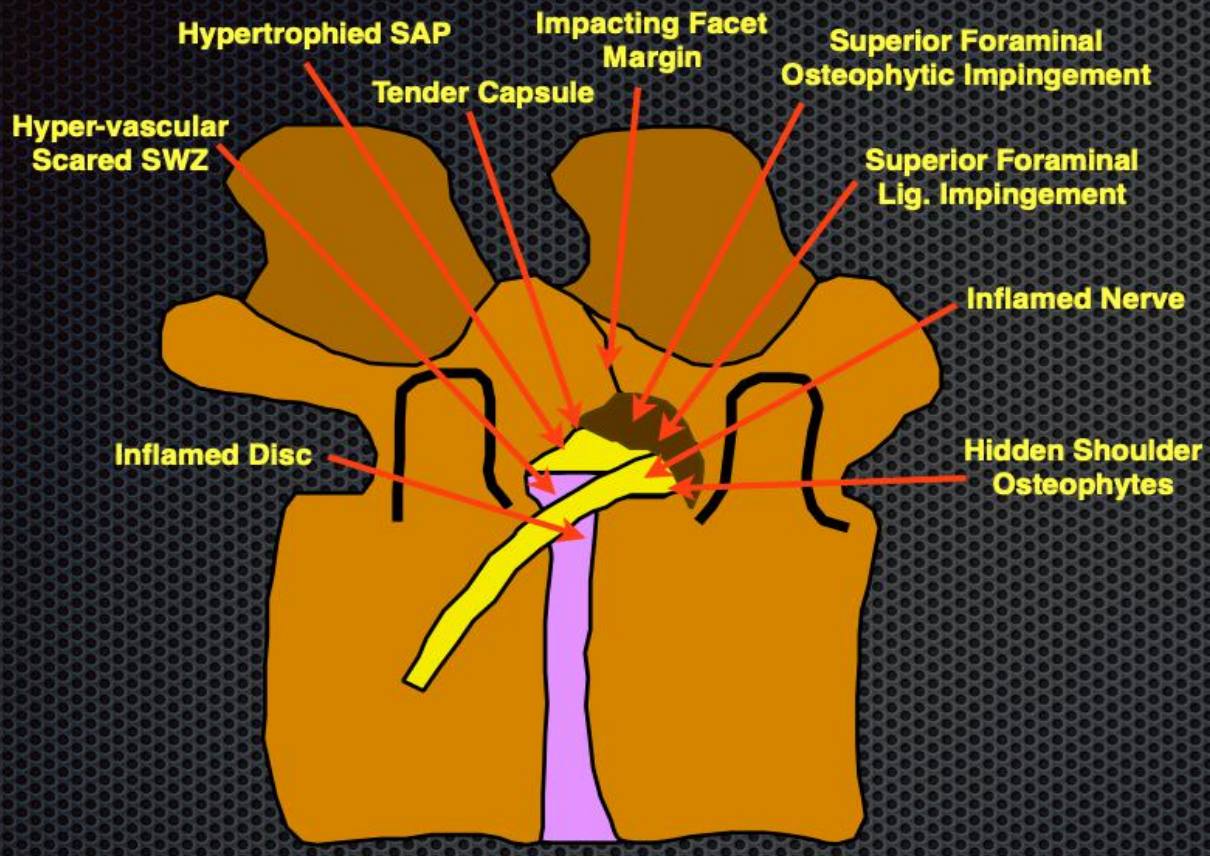
Endoscopic surgery augments open surgery, still the “gold” standard

- **Endoscopic Selective Decompression and thermal ablation of the Intervertebral disc**
- **Irrigation and neutralization of disc PH**
- **Intradiscal Therapy**
- **Endoscopic visualization under local anesthesia with patient feedback during surgery is an important to form of scientific evidence**



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 i.e. compressed or stretched scar tissue previously asymptomatic

2 Basic Endoscopic Techniques

Courtesy of Luke Kim

Inside Out Technique

Anthony Yeung

Richard WOLF

Outside In Technique

Hoogland

MaxMore
Joimax



Both Target the Patho-Anatomy

“The gospel according to Luke”



2 Different Targeting Techniques

"Gospel of Yeung"

YESS

Inside Out Technique
"SAFEST" Due to
Intradiscal Therapy

DIRECT VISUALIZATION

Outside In Technique
SERIAL DILATION
Hoogland design change

MaxMore
Joimax



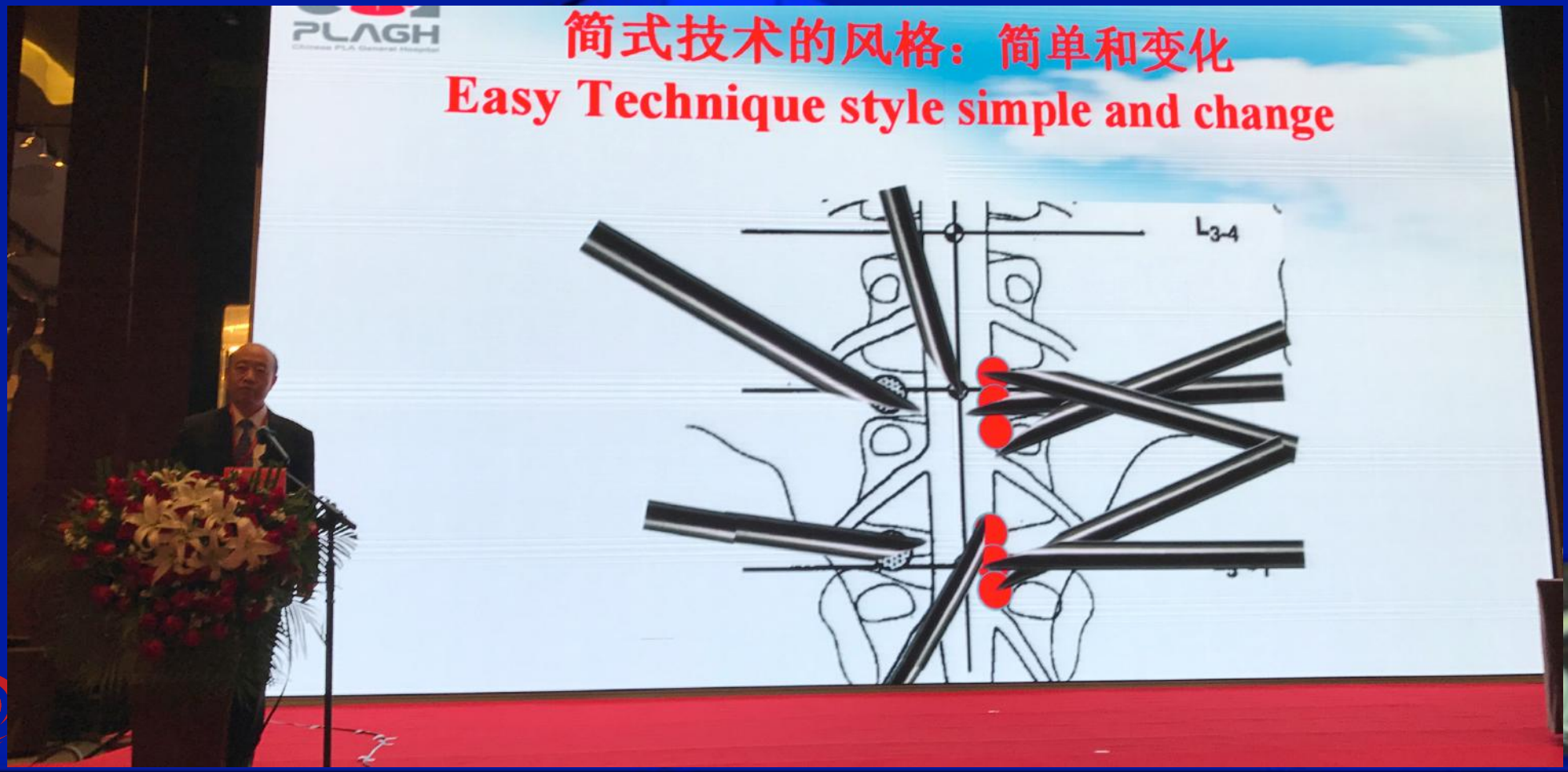
The Best Designed Endoscope = YESS Scope (personal opinion)
not reflected by Wolf's Marketing plan



YESS Technique = “Easy” Technique

Zifeng Zhang, first YESS Chinese spine fellow

Mobile cannulas, direct visualization, local anesthesia



Similar Approach with “outside in” mobile cannulas

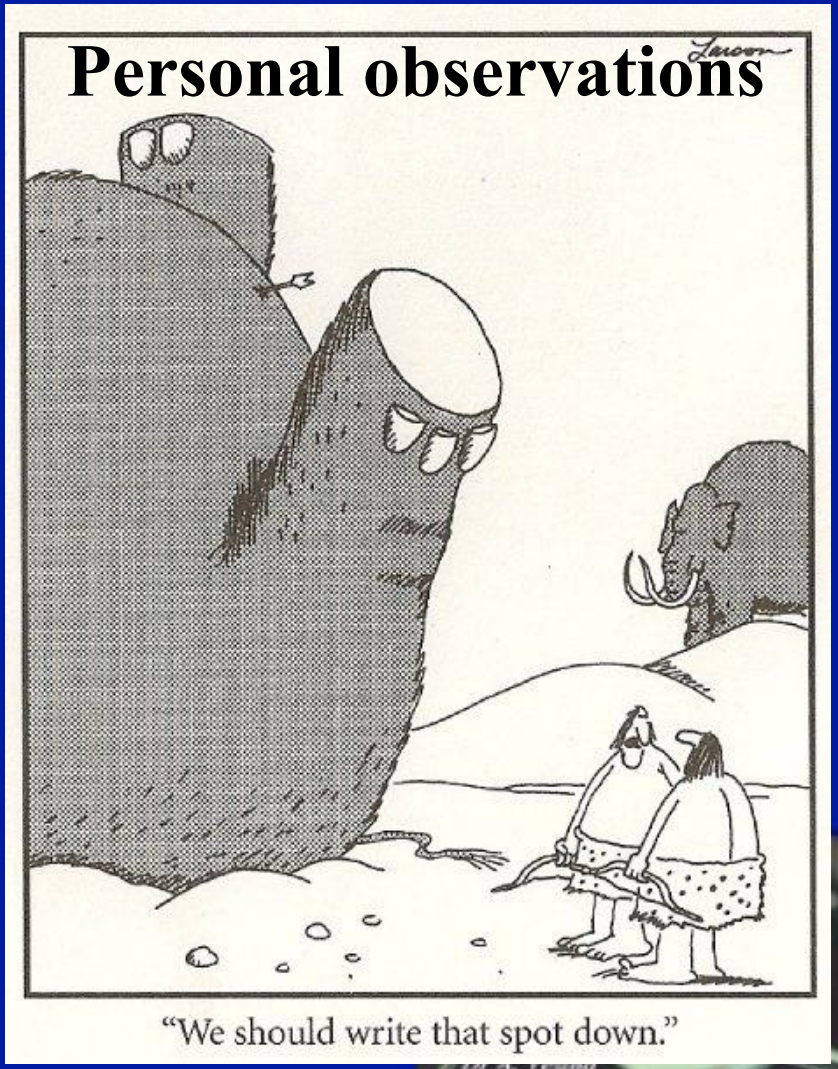
Hyung sung Kim et.al., Gun Choi, others

- **“Novel” targeted “outside in” approach using Joimax system and mobile retractors in a modified approach**
- **Hoogland converted his original Thessys serial dilation and outside trephines for safer reaming (Maxmore System)**
- **Endoscopic excision techniques developed for trauma, tumors, and alternative approaches**



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Yeung et al., J Spine 2017, 6:5
DOI: 10.4172/2165-7939.1000388

Journal of Spine

The future will have Multi-disciplinary contributions

Endoscopic Surgery of the Spine as a Multi-Disciplinary Subspecialty for Appropriately Trained and Experienced Providers

Anthony T Yeung1,2*, Christopher A Yeung
Nima Salari, and Justin Field



Trend: “Moving away from Fusion”

- **Fusion is not needed if we can treat the cause of pain early**
- Natural healing over time will decrease the need for fusion to treat pain
- Fusion will be for deformity or instability
  - **Endoscopic MIS Fusion and dynamic stabilization is possible**



Journal of Spine

> 25 publications since 2015

Moving Away from Fusion by Treating the Pain Generator: The Secrets of an Endoscopic Master

Anthony T. Yeung*

Citation: Yeung AT (2015) Moving Away from Fusion by Treating the Pain Generator: The Secrets of an Endoscopic Master. J Spine 4: e121.doi:10.4172/2165- 7939.1000e121

Appropriate adoption and training will be critical



Recent Opinion Publication on the Role of Endoscopic Spine Surgery

YouTube lecture on website www.sciatica.com

Journal of Neurological Disorders

Yeung, J Neurol Disord 2016, 4:6
DOI: 10.4172/2329-6895.1000302

Opinion OMICS International

Transforaminal Endoscopic Surgery: Its Role in the Treatment of Painful Conditions of an Aging Spine

Anthony T Yeung*

Endoscopic Treatment of Cervical, Thoracic and Lumbar Spine

Treat the painful patho-anatomy in vivo for Endoscopic Surgical Treatment in the Lumbar Spine

Yeung, AT., Gore S., "In-vivo visualization of patho-anatomy in painful degenerative conditions of the lumbar spine II" Surgical Technology International XXI, 2012



Key Important Factors

- Appropriate Training
- Adopters must perform the procedures **really well**
- **Refrain from Hype and marketing of "hot" new concepts for the sake of short term gain**
  - (i.e. mild procedure, LDD, PALD, epiduroscopy, "discectomy")
- Transparent pricing (cash vs insurance reimbursement)
- Practice good EBM (Evidenced based Medicine)
- Many MIS "marketing" claims



Little Known Premise:

Disc Degeneration, even in asymptomatic patients has a high Risk of eventually developing low back pain and sciatica



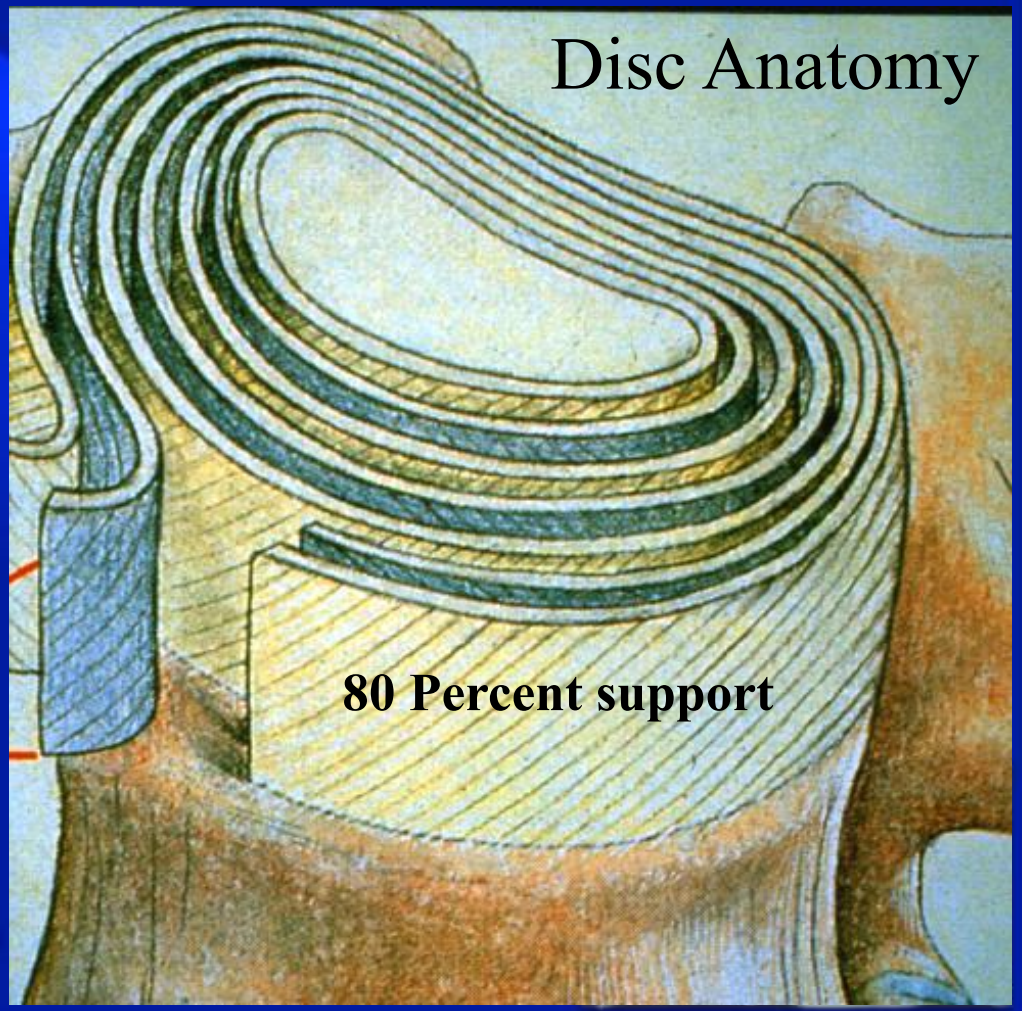
Common Low Back Pain begins in the disc

- Disc Degeneration in asymptomatic patients increases risk of low back pain
  - a prospectively assessment of Southern Chinese
  - Dino Samartzis, HK University faculty
- Nocimed (correlating acidic disc PH with pain)
- Aleeva's disc shunt



Primary Pain Source: The Disc

- **Current research and interest should be with intradiscal therapy**
  - **Validated by Chymopapain, ozone?**
- **New technologies for nucleus augmentation, biologics is still in its infancy, but promising**



The demise of chymopapain is a lesson that even level 1 EBM validated studies can fall victim to over regulation and risk vs profitability over efficacy



Evidence: Evocative Chromodiscography™

Specificity> 99% False Positive< 1% (Yeung)

Supported by review literature

Pain Physician 2008; 11:513-538 • ISSN 1533-315

Systematic Review

Systematic Review of Lumbar Provocation Discography in Asymptomatic Subjects with a Meta-analysis of False-positive Rates

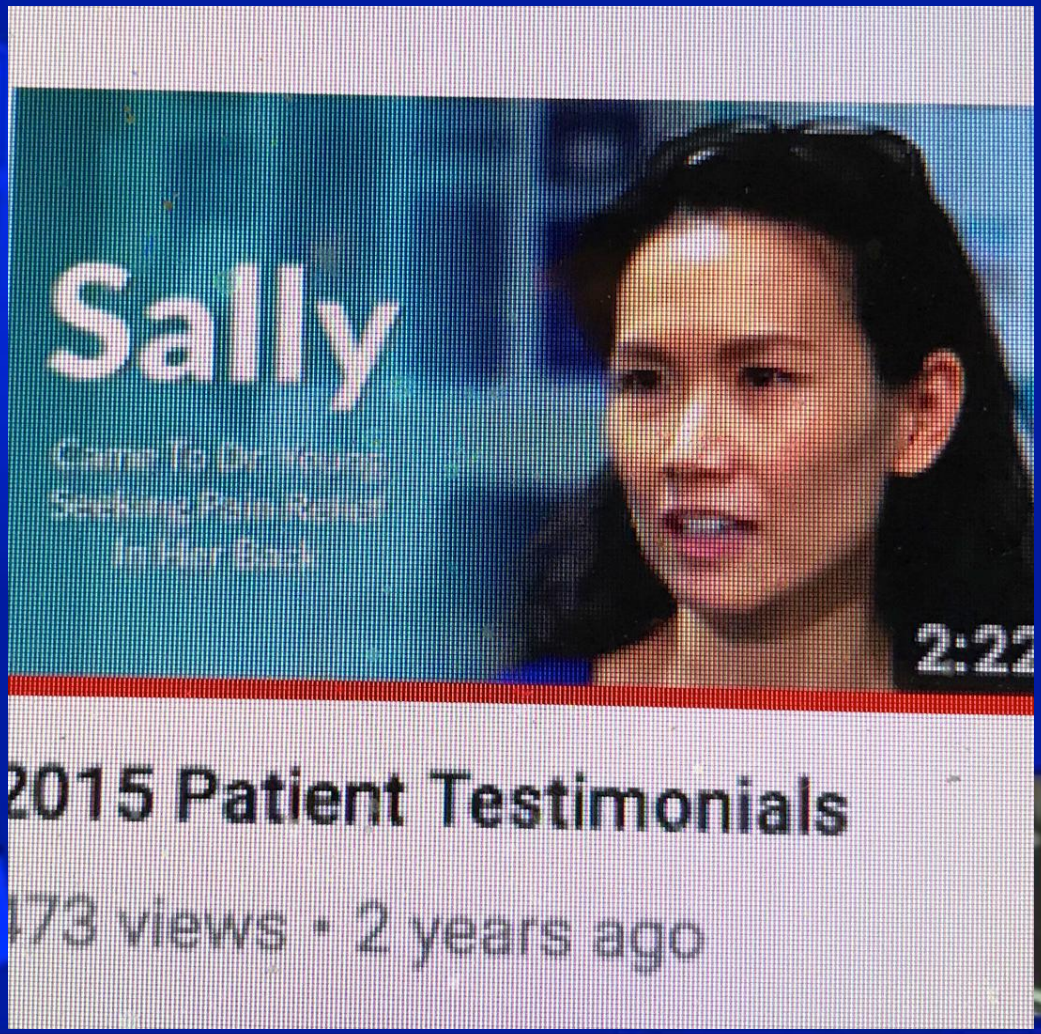
Lee R. Wolfer, MD, MS[1], Richard Derby, MD[1,2], Jeong-Eun Lee, PT[1,3], and Sang-Heon Lee, MD, PhD[1,3,4]

Endoscopic Evidence: Toxic Annular Tears

Testimony: Wife of Pain Physician on Disc website and YouTube videos

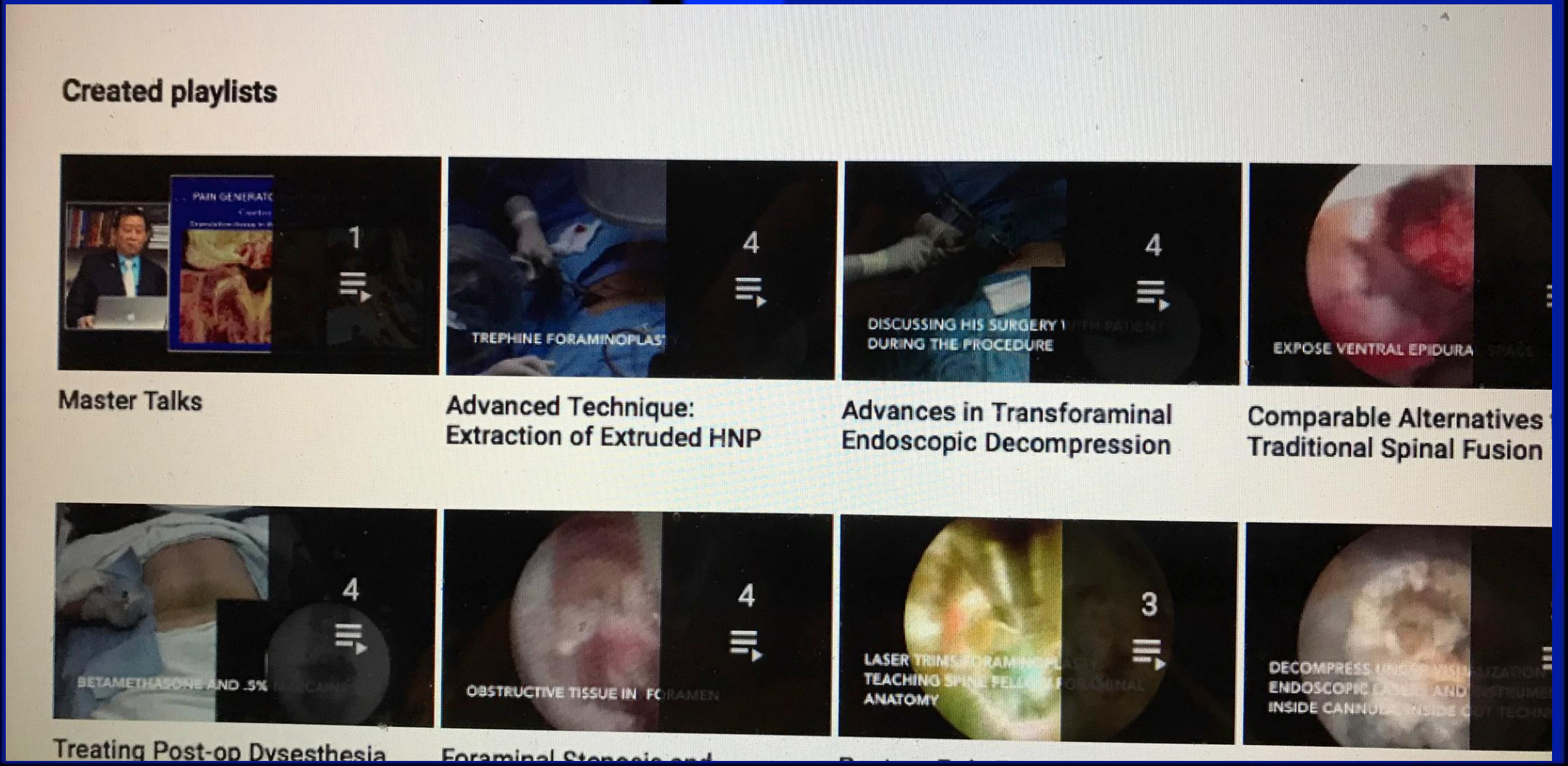
www.sciatica.com





Playlists www.sciatica.com

Documents case examples with video illustrations



Clinical Rationale of Endoscopic Treatment

- **Intradiscal Therapy (lumbar spine)**
  - **Validated by Level I studies (chymopapain)**
- Foraminal decompression
  - ENDOSCOPIC EXCISION
- Dorsal rhizotomy
- **Hybrid** Procedures incorporating all three Therapies



Current Focus of Pain Physicians are interventional Injections to temporarily decrease pain to allow the Natural healing process to "resolve" pain

Endoscopic Surgery is the least invasive Surgical Procedure to treat the patho-anatomy of chronic back pain and sciatica



Fusion

- **Save Fusion for last**, avoiding “burning bridges” for more invasive procedures as a staged procedure
- Fusion continues to flourish as well, with “new” surgical concepts changing every 10 years
- Many patients want to avoid fusion to avoid paradoxical effects and surgical morbidity



Clinical Research validates Both Clinical Rationale

- The research design focuses on Evidence Based Medicine: EBM allows us to rate clinical data into :
  - **Levels of Evidence, I-V**
  - **Grades of Recommendation**



The "E" in Endoscopic Evidence Based Medicine (a new concept)

- E= Evidenced based
- E=Endoscopically Visual Based
- E= Expedient and Efficient Based
- E= Economically Based
- E= Expertise Based



The Practice of Evidence Based Medicine is the integration of:

- Clinical Expertise
- Patient's personal Needs and Values
- Best Research Evidence



Evidence Based Medicine

Excerpted from presentation by W. Watters

- **Almost all physicians feel they are already practicing "Evidence –based Medicine"**
  - Medical Schools teach and use the scientific method
  - Many read medical journals appropriate to their practice



Surgical Concepts on Expertise and Education:

(excerpts from NASS President W. Watters)

- "What you think you may know may no longer be valid or become disproven over time with future research"
- "What you want to know is impossible to completely assimilate at one time"
- "What you need to know may be very hard to find"



Patient Values are also Important

- Each patient brings a set of **personal beliefs** and knowledge base to the patient-physician relationship
- Patients rely heavily upon the recommendations of their physician, family, and friends for personal choices
  - Different cultures may have beliefs based on their cultural biases that will affect their acceptance of treatment
- Physicians offer guidance to their patients for a joint decision on their choice



The Best Research Evidence

- **Reduces bias**, which is difficult to overcome, but should be acknowledged
- Promotes ethical clinical decision making and Minimizes outside influences



Practical Implications

- For the Practioner… Improve patient care
- For the Clinical Scientist… elevate studies to higher levels than level 4 or 5 case series
- For the Published peer reviewed Author… Disseminate Information (too often recognized after proponent's death)



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Journal of Spine

Endoscopic Surgery of the Spine as a Multi-Disciplinary Subspecialty for Appropriately Trained and Experienced Providers

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In Endoscopic Surgery: Cooperation is needed

Cross training, communication, shared responsibilities

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

Technical abilities are different, and disruptive for colleagues with a different surgical background



Decision making and surgical skills are both necessary and go together. Training and competency is critical.



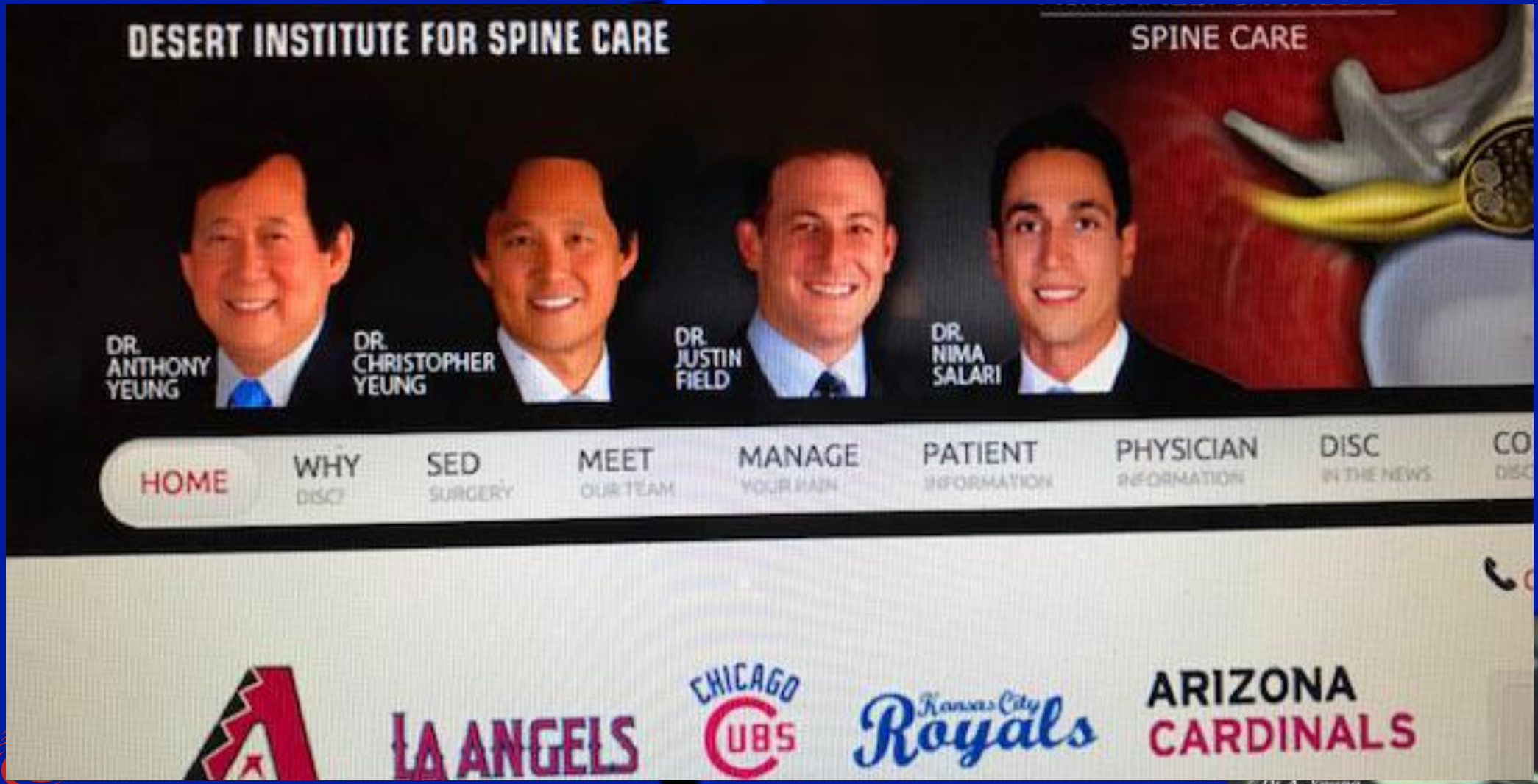
Endoscopic Surgery Advantages

- The endoscope makes it possible to correlate the patho-physiology of pain of with visualized patho-anatomy. (please refer to DISC website, and click on the top 10 playlists)

- Operating under local anesthesia allows the patient to communicate with the surgeon during surgery



DISC website www.sciatica.com



DISC Videos and Top 10 Playlists (YouTube)
My website www.sciatica.com

Simple - because what DISC offers is not available anywhere else.

Patients have come from all over the world to receive care at DISC. Medical tourists are increasingly seeking information on all options open to them through professional referrals and getting multiple opinions from all sources.

Desert Institute for Spine Care is pleased to offer medical travel options for your spine care needs. We will coordinate your care from start to finish.

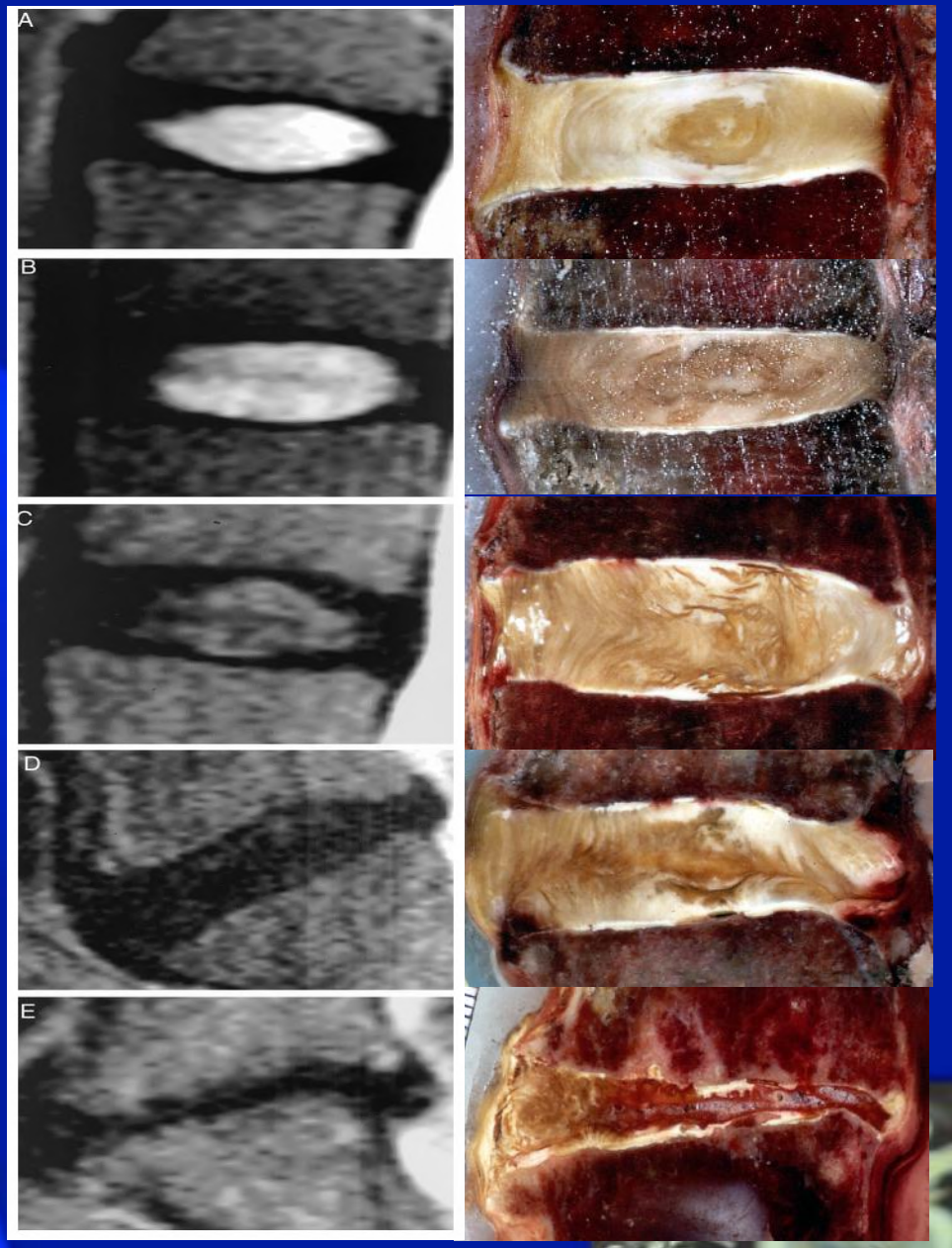
LEARN MORE ABOUT MEDICAL TOURISM »
GO TO DISC'S TOP 10 PLAYLISTS »
WATCH REAL PATIENT PROCEDURE VIDEOS »



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.**

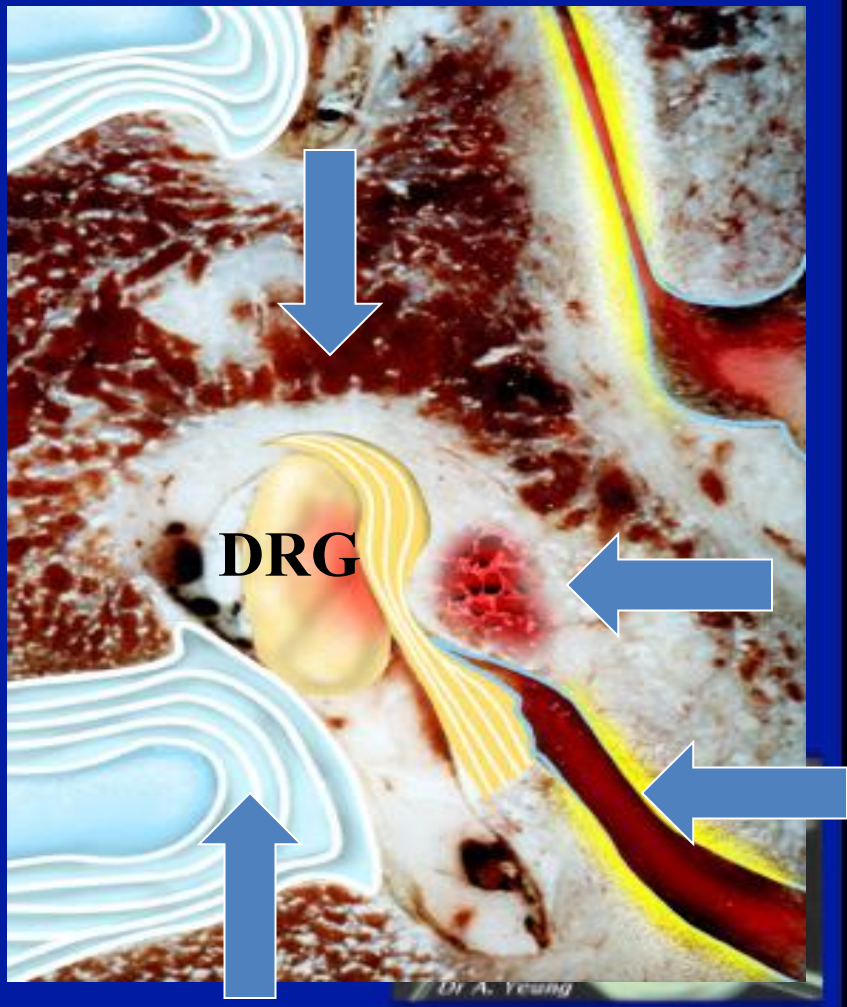


PAIN GENERATORS IN DDD affect the DRG

Courtesy of Wolfgang Rauschning

Granulation tissue in the annulus





The Future of Endoscopic Spine Surgery

Includes Intradiscal Therapy Validated by 2 large Level I studies using chymopapain as the common basis of chronic back pain

Support and focus on endoscopic validation of Intradiscal Therapy



The Future of Endoscopic Surgery

- Utilized by qualified, adequately trained surgeons and non-surgeons (both need training)
- Acceptance will depend on the politics, physician acceptance, and the business of spine in various parts of the world
- 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 Management under local anesthesia



Video demonstrations of Endoscopic Procedures providing video evidence based validation appropriate for adequately trained surgeons and non-surgeons to be showcased (www.sciatica.com)



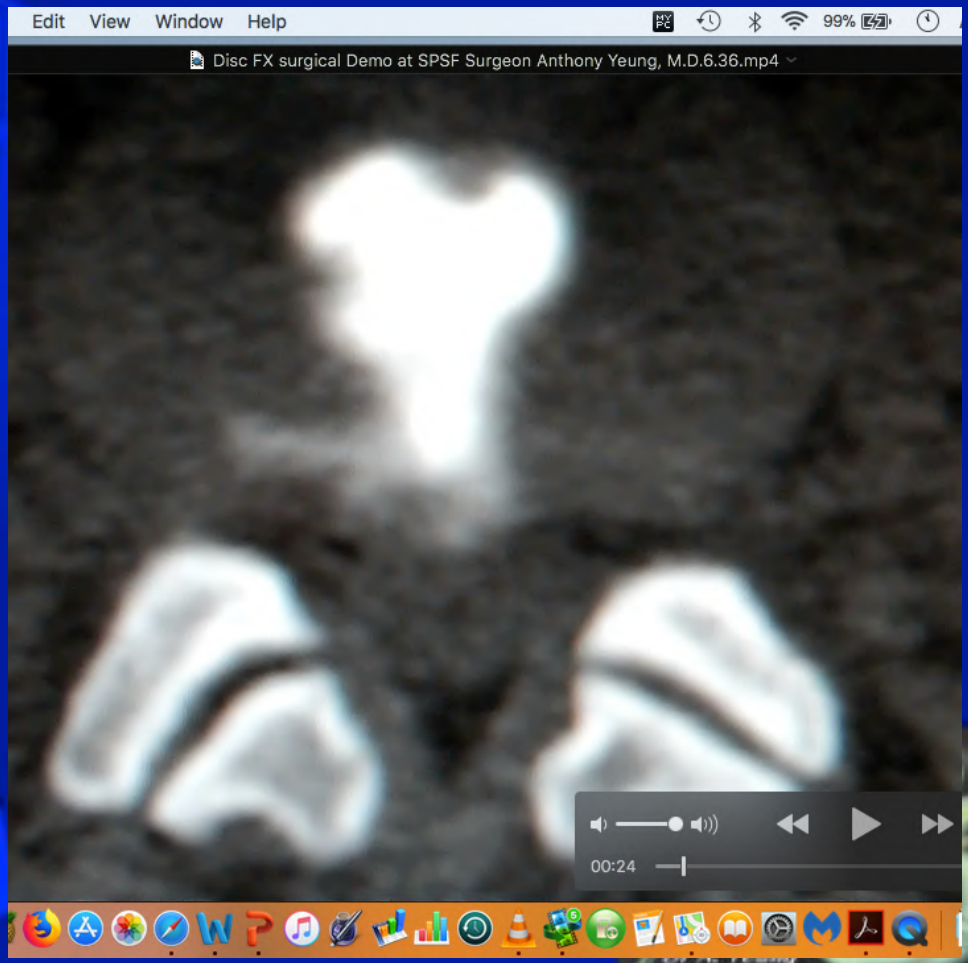
Clinical Illustration

Disc Fx for Disc protrusion + annular tear

Axila Mri



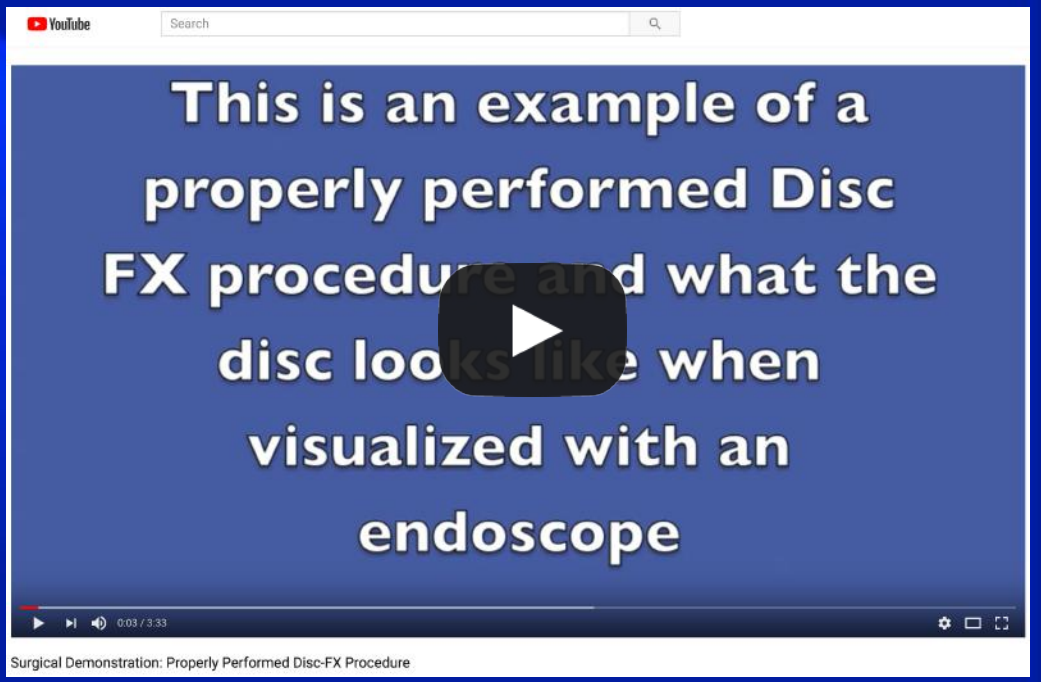
Positive CT discogram



Disc Fx: First line of treatment for Surgical Pain Management

The video can be found on DISC's YouTube channel.

Click to Watch Video





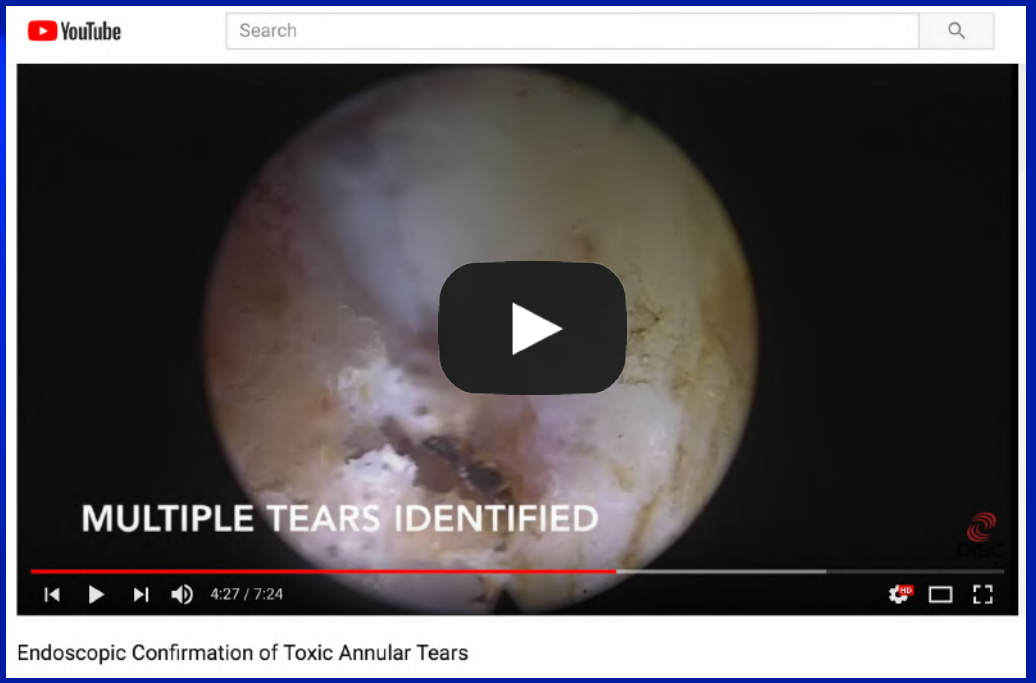
Specimen evidence of a perfectly performed Disc fx (3 grams)



Endoscopic SED™ for toxic annular tears 1.39

These videos can be found on DISC's YouTube channel.

[Click to Watch Videos]





Endoscopic visualization serves as “endoscopic based evidenced”

When correlated with clinical results:

ADDING AUDIO FEEDBACK by patient USING LOCAL ANESTHESIA RE-INFORCES EVIDENCE



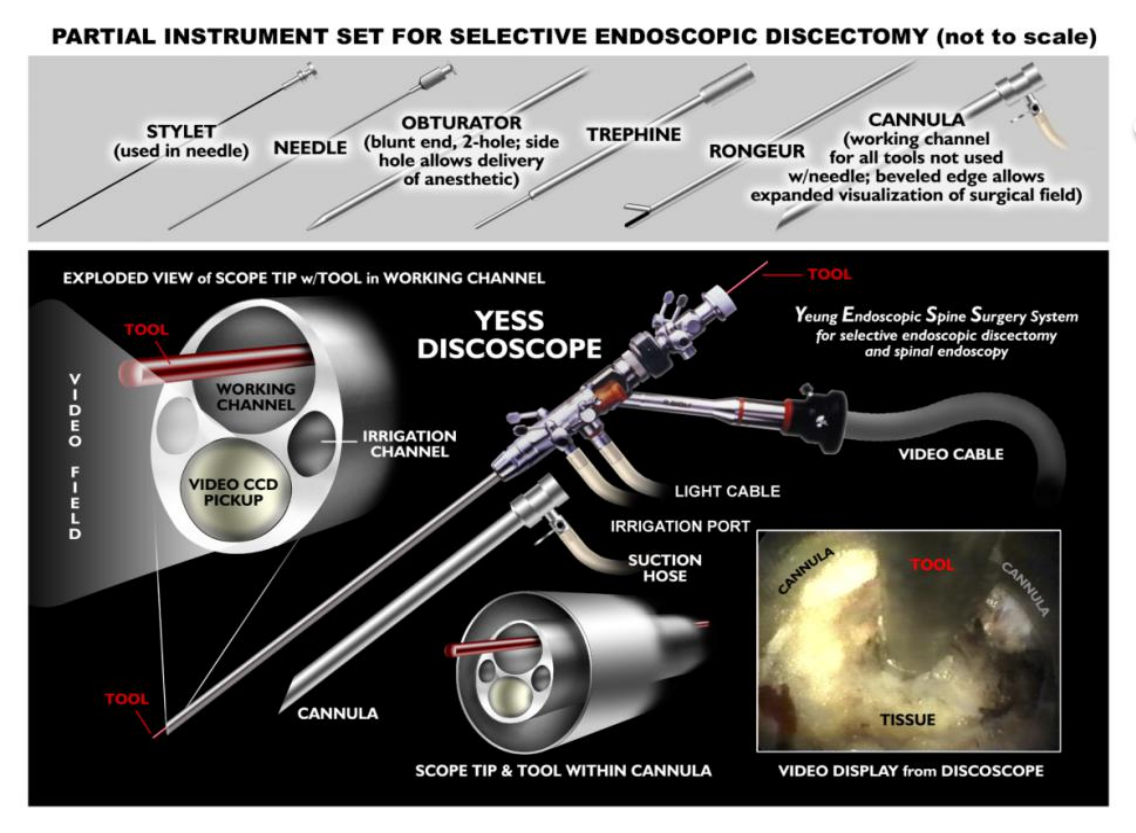
The “E” in Endoscopic Evidence Based Medicine

- E= Evidenced based
- E= Endoscopically Based, reinforced by patient response to decompression, ablation, irrigation



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**

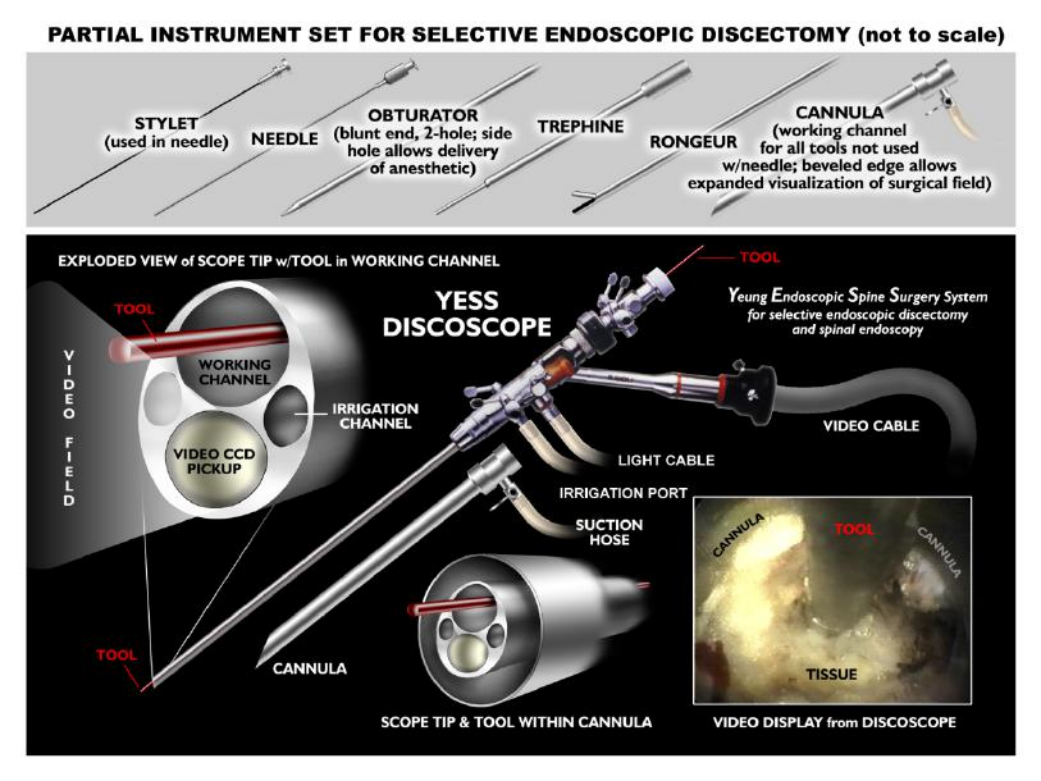


Y.E.S.S™. Multi-Channel flow integrated Spine Scope

Wolf's YESS Endoscope Design

Provides Endoscopic Documentation in lieu of Level 1 evidence based medicine

For Diagnosis and Treatment: Identify Painful Patho-anatomy



Ergonomically Designed and configured

Designed for Intradiscal Visualization and Therapy

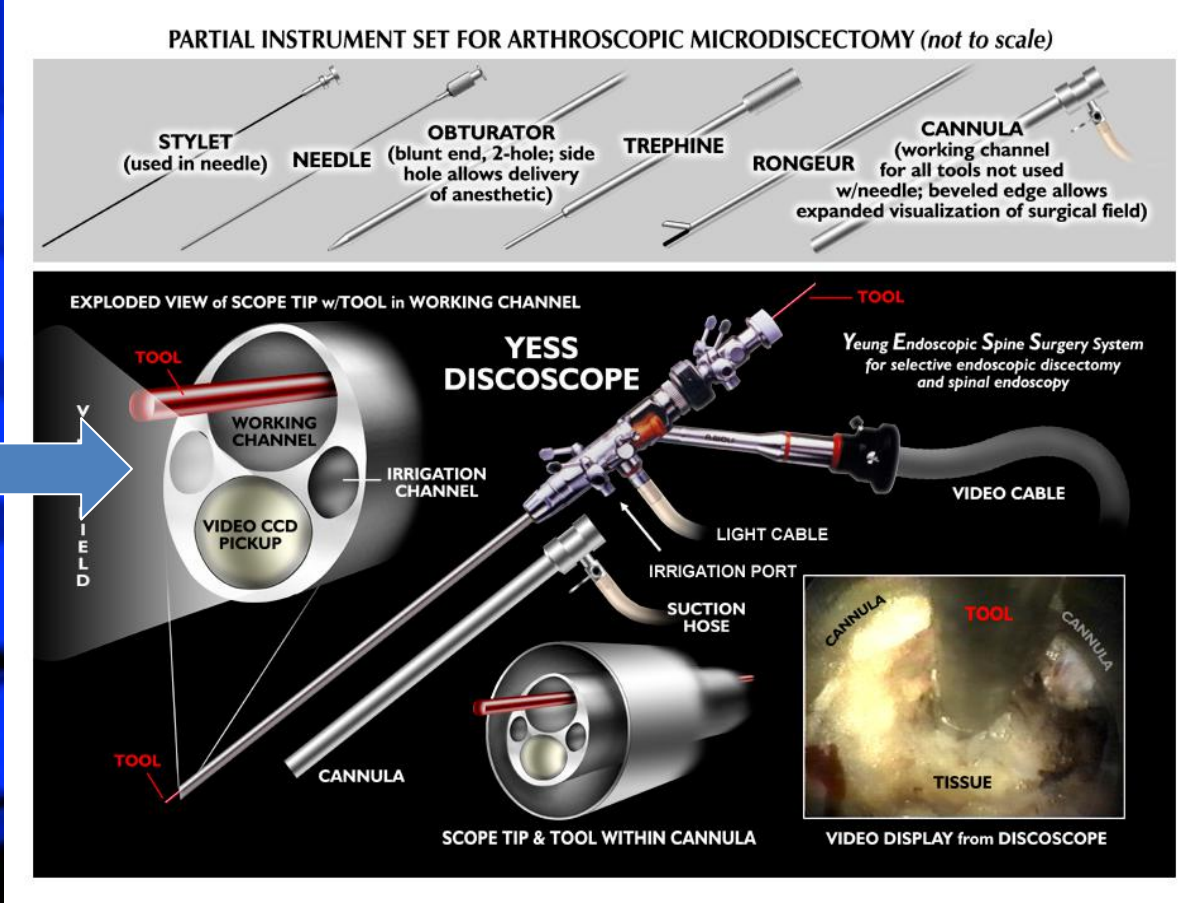
90% of Back pain originates in the disc



The YESS scope

- Endoscopes have integrated channels that is flow and pressure controlled to provide maximal visualization
- It has irrigation channels that a laser fiber can be inserted down one channel for laser ablation
- 2 mm - 4.2 mm working channel for surgical instruments

Oval (4.5mm) shape for narrow discs



Multiple Endoscope Systems are being marketed

- The YESS system by Richard Wolf GmBh
- Wolf not marketing the advantages of the Original YESS design, but favors promoting Vertebris design shared with Reutten
- Other systems are readily Available, with a focus on training and marketing



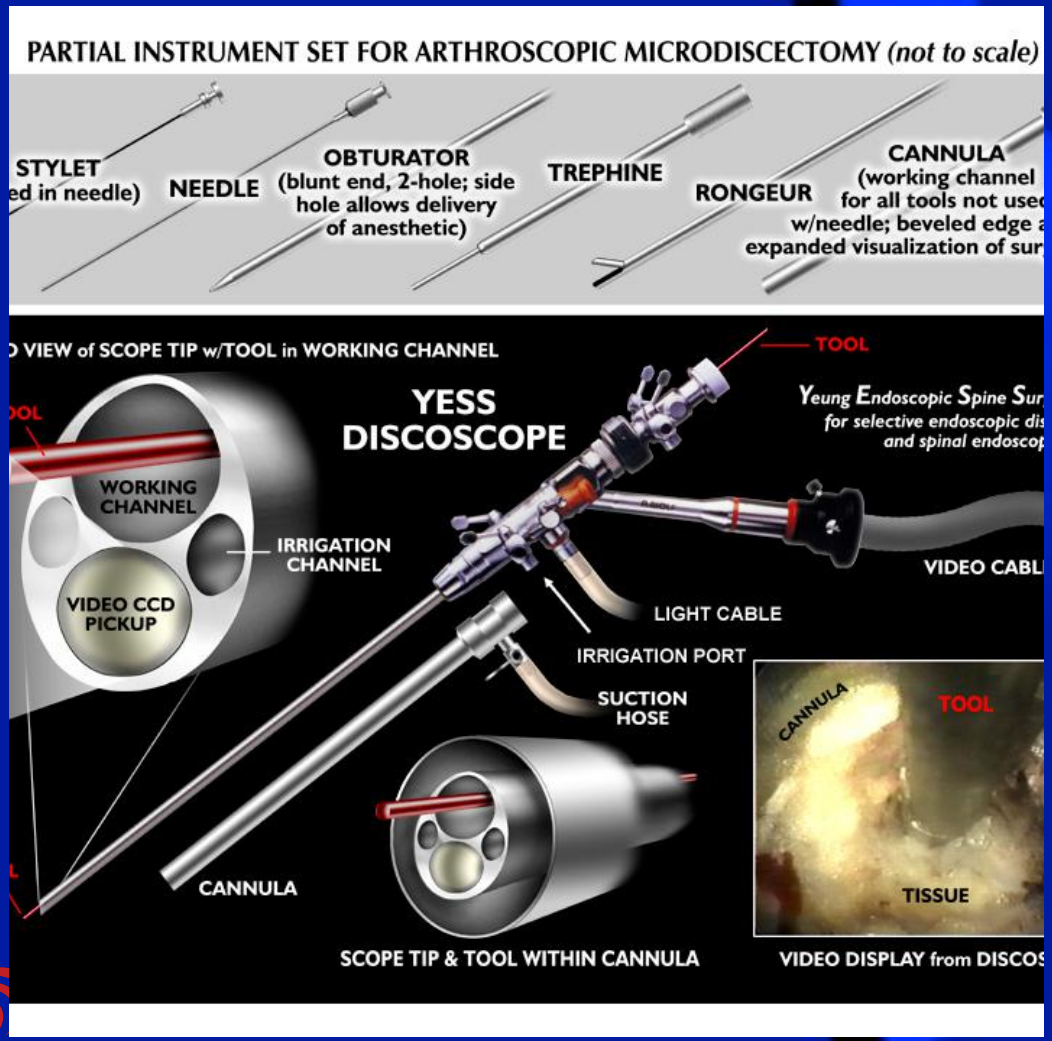
There are different systems and Techniques by other Masters and KOL's

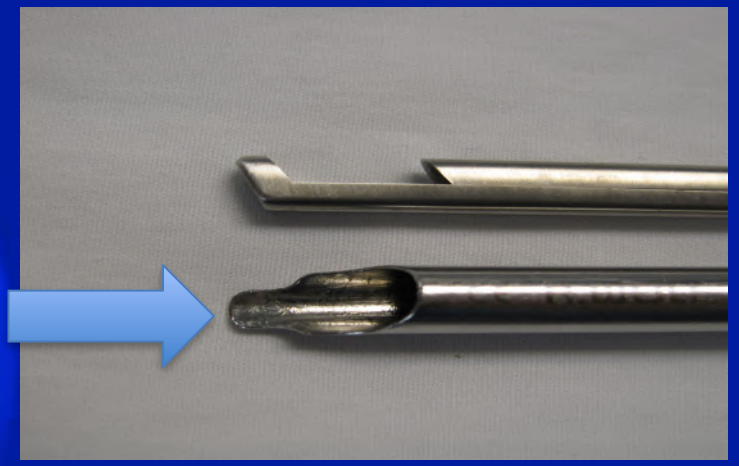
- Adopt the philosophy and technique of the "chosen" master.
- Results differ with each individual surgeon and their experience.
- Pick the procedures and technique that works best in your own hands and your surgical ability: "The Surgeon Factor"



The YESS System

Specialized cannulas Trephines and Kerrisons



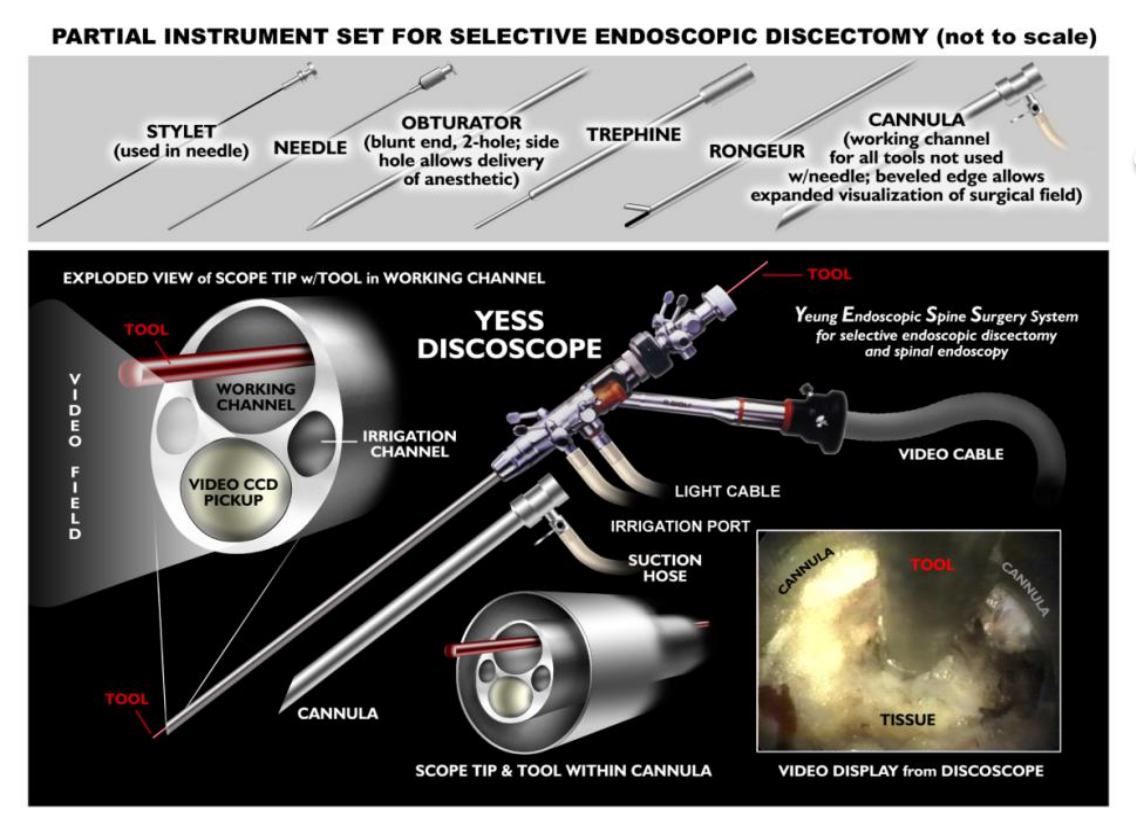


Flexible Riwo Carbide Burr



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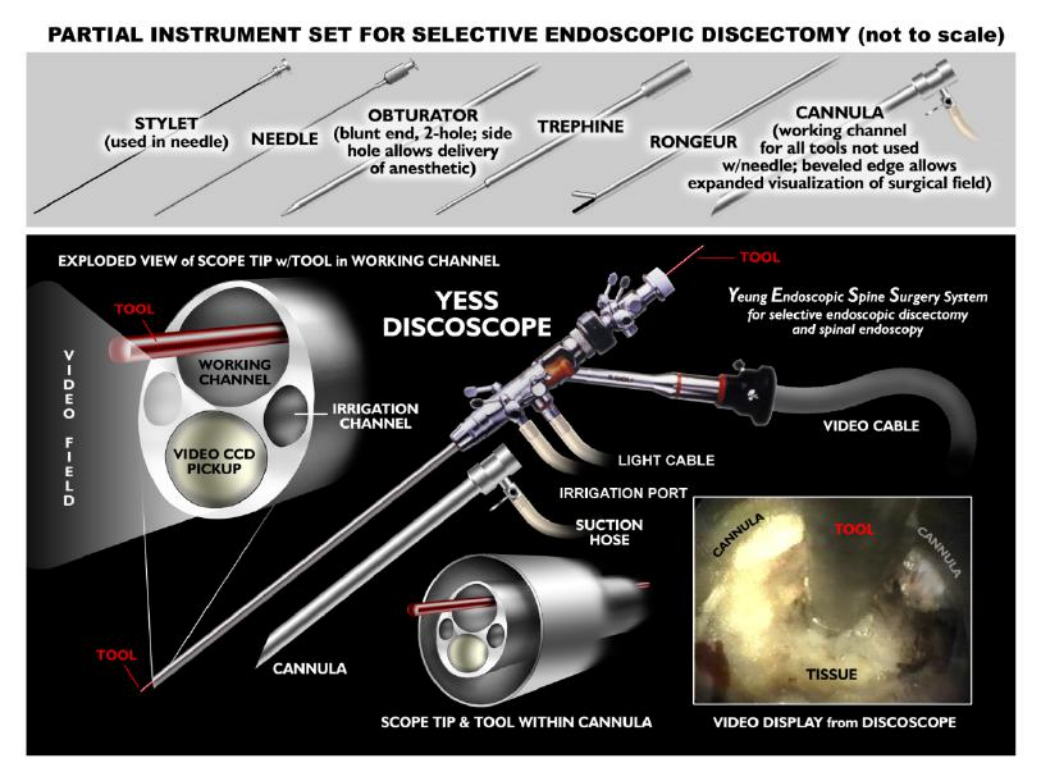


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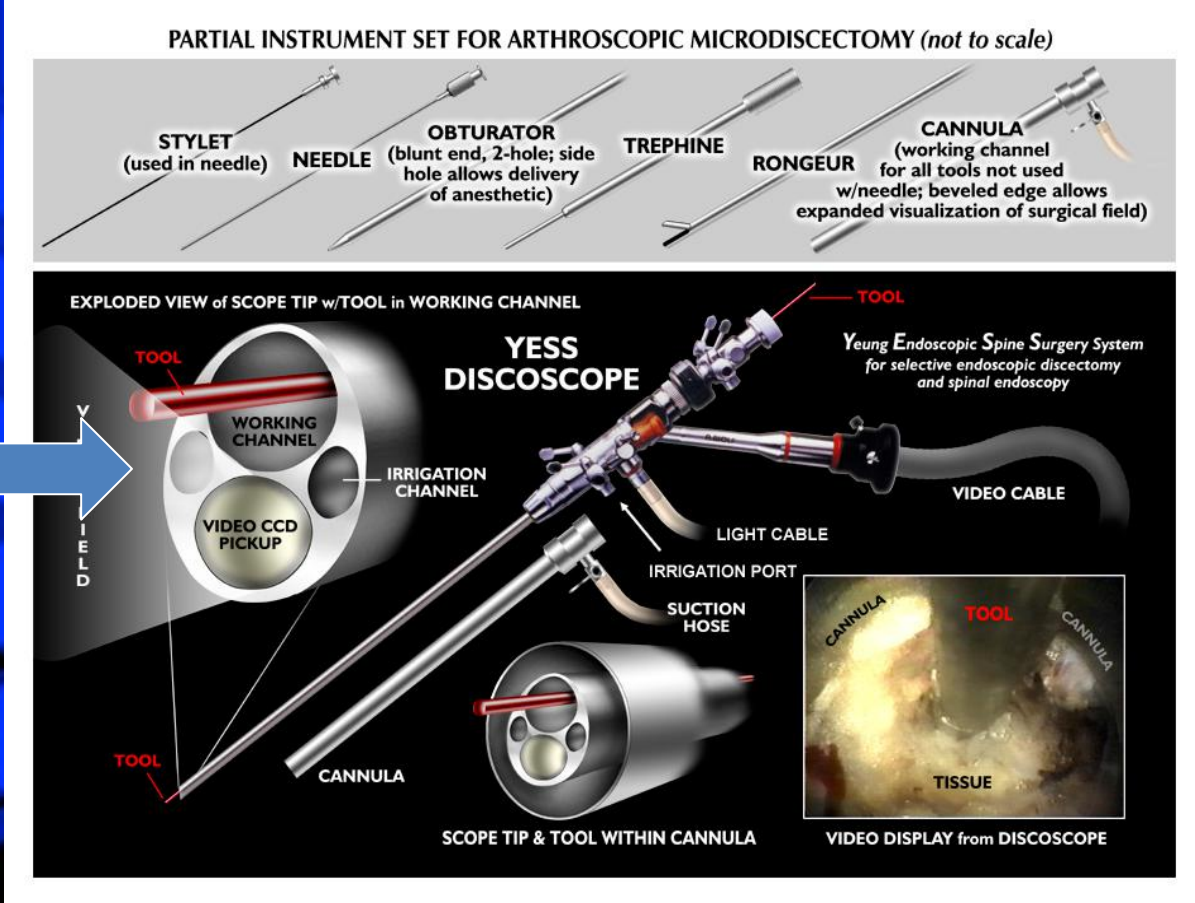
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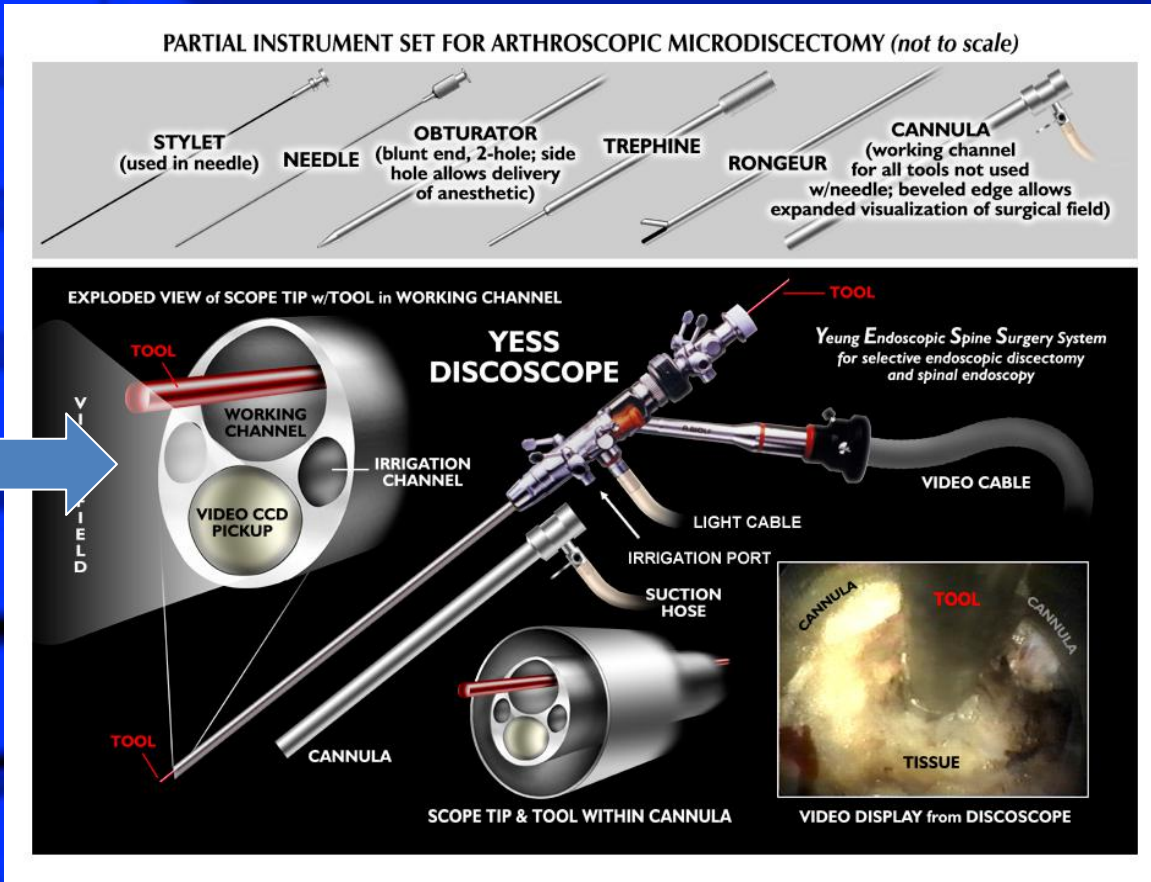
Oval (4.5mm) shape for narrow discs



The YESS scope 1997

- Endoscopes have integrated working channels that are pressure and flow controlled irrigation to provide visualization
  - Below systolic above diastolic
- 2 mm- 4.2mm working channels

Oval (4.5mm) shape for narrow discs



Dr A. Yeung

镜子规格：20°
工作通道：2.7mm
总长度：205mm





The only endoscope with a Multichannel “flow integrated” system. With a laser channel **Pressure and flow control fluid pump facilitates visualization**.

2 Different Techniques (courtesy Luke Kim)

"Gospel according to Yeung"

YESS

Inside Out Technique
SAFEST Due to
INTRADISCAL THERAPY

DIRECT VISUALIZATION

Outside In Technique
SERIAL DILATION
Hoogland design change

MaxMore
Joimax



The Best Designed
Endoscope= YESS Scope



The YESS Scope : controlled Multi-channel Irrigation

Wolf Award commemorating 20 years of innovation



Valuable Essential Tools

Accur-e-tech

Laser is a valuable surgical Tool that facilitates endoscopic surgery

Trimedyne®

80 watt Laser
Double Pulse



Dr A. Yeung

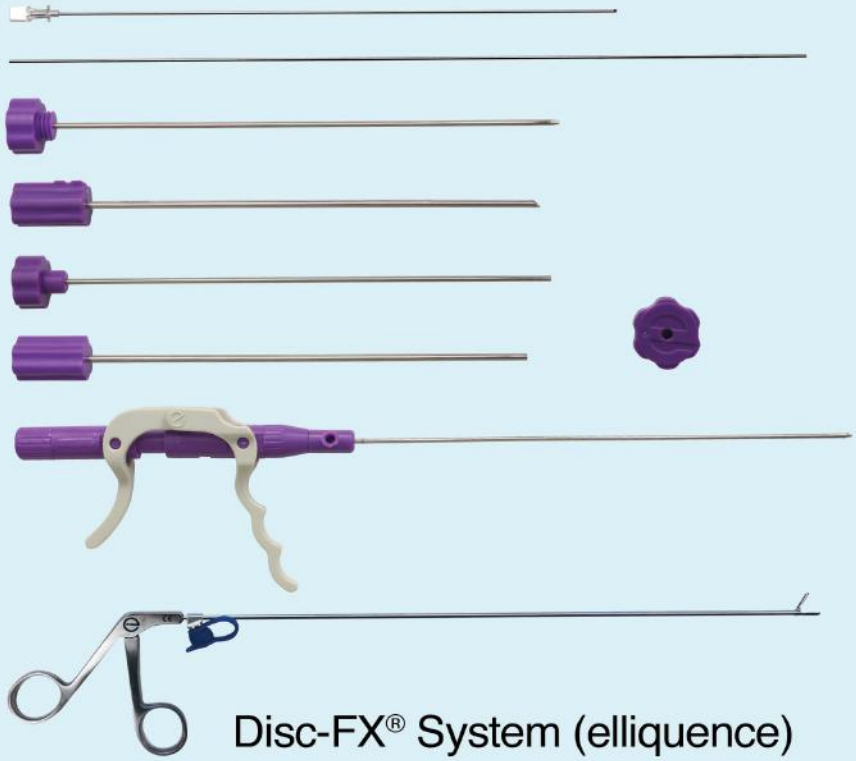
Elliquence Bipolar Radiofrequency
Disc Fx System for Surgical Pain Management

Surgimax Console



Surgi-Max® Plus (elliquence)

Disc FX System

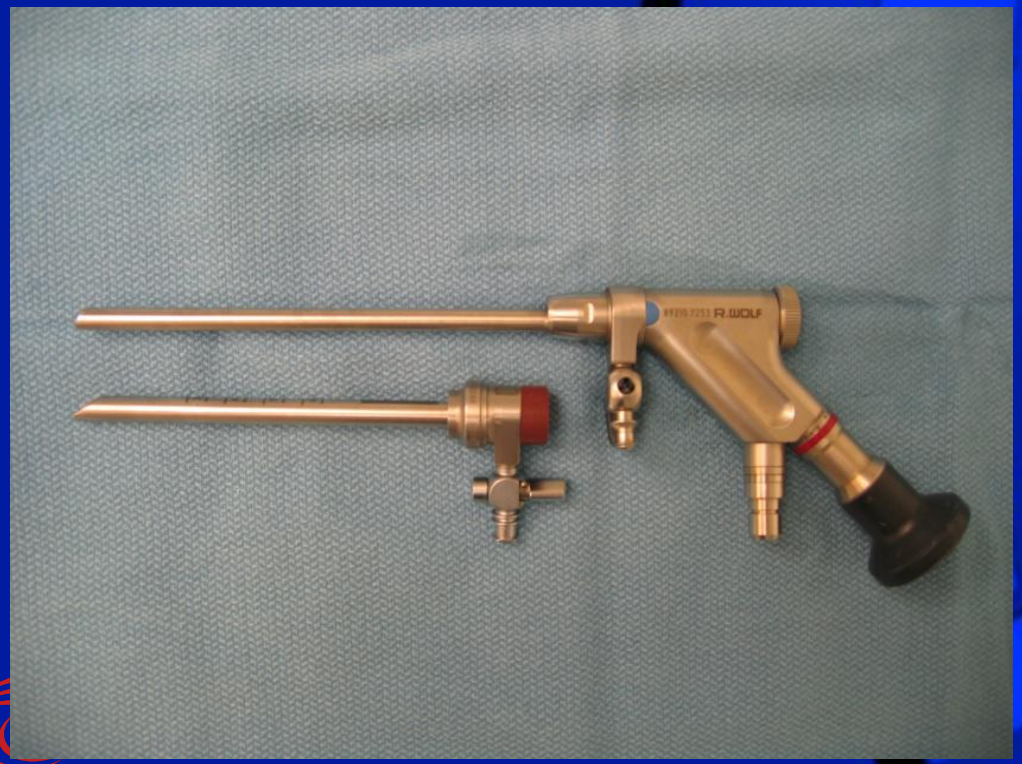


Disc-FX® System (elliquence)

YESS Rhizotomy Set by Wolf for axial back pain

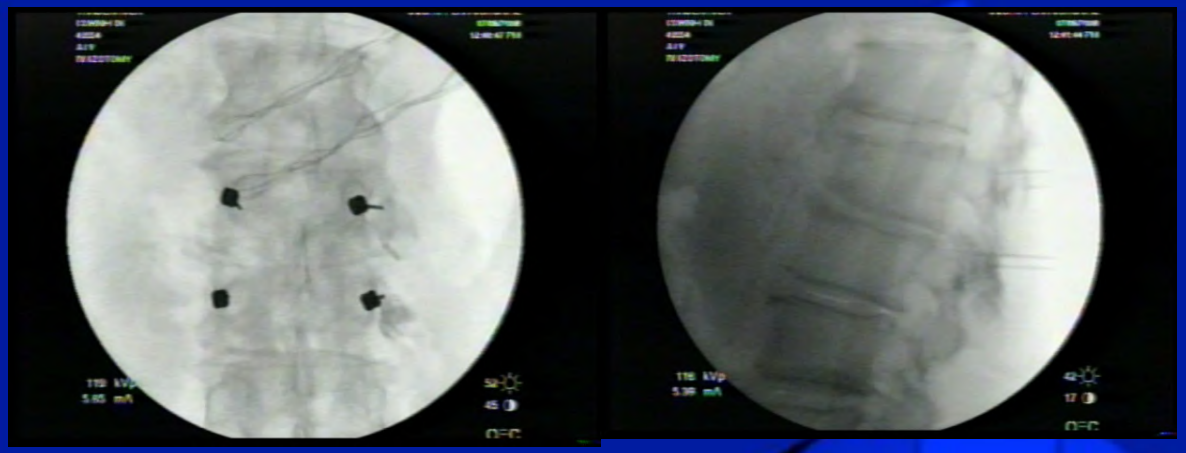
Rhizotomy Scope

Beveled cannula design
Provides surgical portals

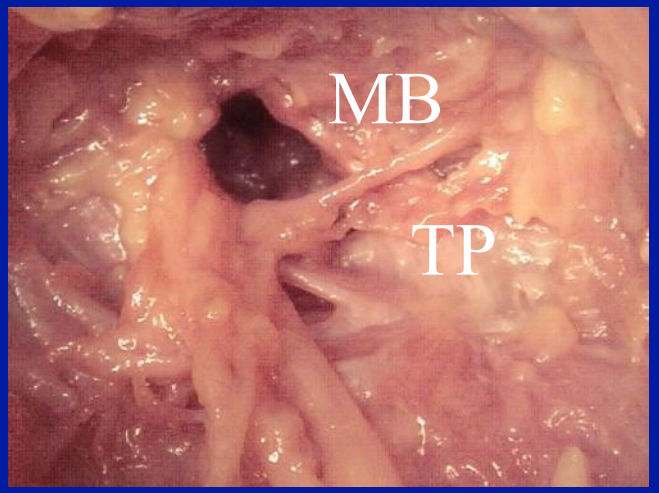




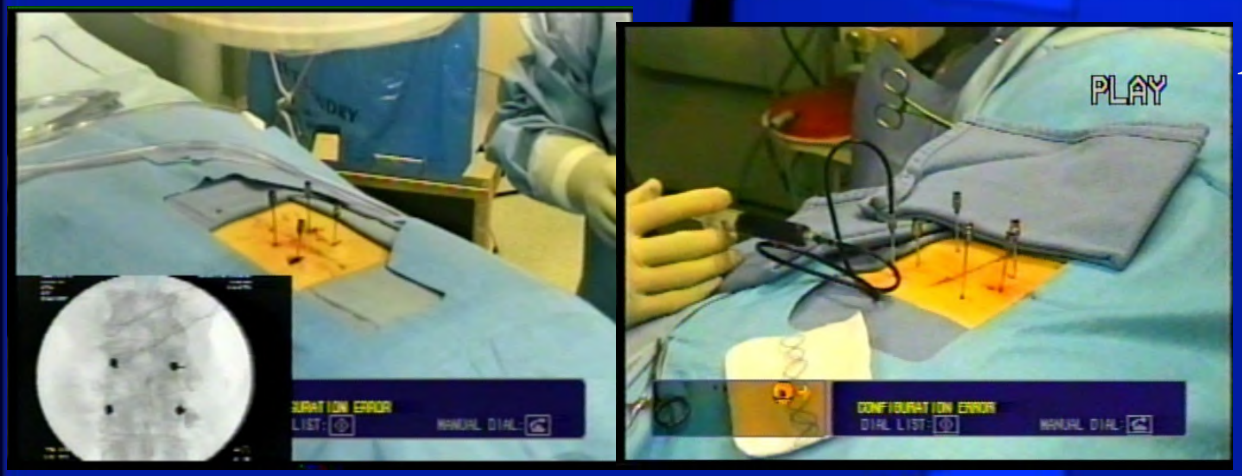
RhizotomyTechnique

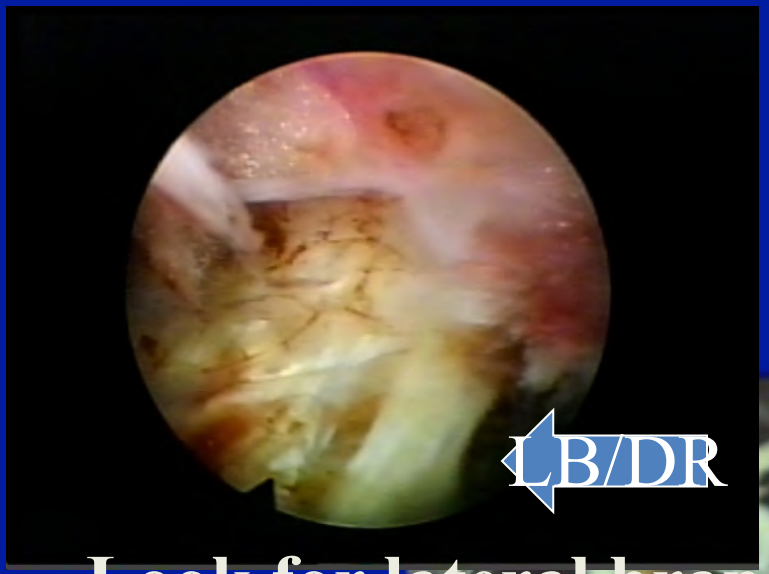


Needle Placement Wiltse Plane



Ablate MB at transverse proces





Isovue 300 + 10% indigocarmine

Look for lateral branch

An endoscope is needed



Cadaver Dissection:
Branches of the Dorsal Ramus may vary in location

(Dissection Yinggang Zheng, M.D.)

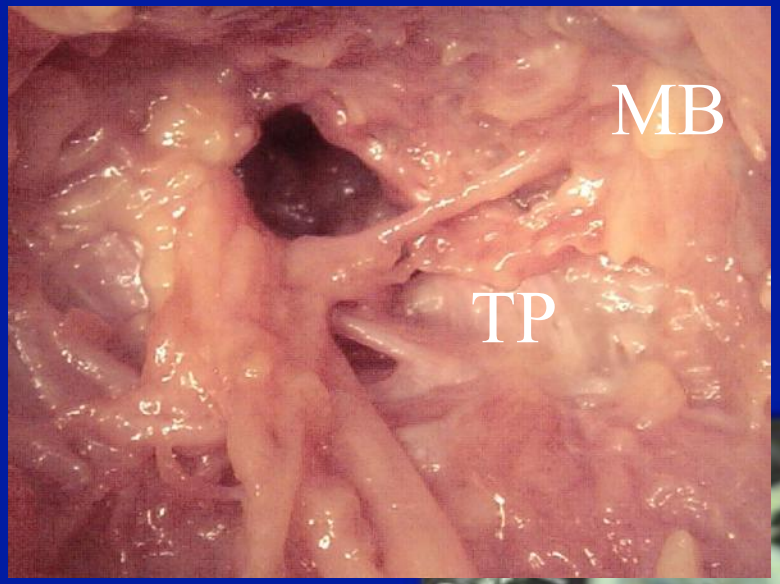
MB protected by osseous tunnel



L2



L3



L4

The Endoscope is designed to Identify painful patho-anatomy intradiscally and trans-foraminally in vivo for Endoscopic Treatment in the Lumbar Spine

Yeung, AT., Gore S., "In-vivo visualization of patho-anatomy in painful degenerative conditions of the lumbar spine II"

Surgical Technology International XXI, 2012

Validated by surgery with the patient under local anesthesia
With or Without sedation



Meticulous Cadaver Dissections have aided the understanding and development of Endoscopic surgery



Applied anatomy of the intervertebral foramen and extraforaminal ligaments and vessels



Assoc. Prof. Ayhan Cömert

Ankara University School of Medicine,
Department of Anatomy, Ankara Turkey

> 25 Publications Since 2015

- **Moving Away from Fusion by Treating the Pain Generator: The Secrets of an Endoscopic Master**

Anthony T. Yeung

Journal of Spine Dec 2015



Concept Papers in Open Access Journals 2016

Journal of Neurological Disorders

Yeung, J Neurol Disord 2016, 4:6
DOI: 10.4172/2329-6895.1000302

Opinion OMICS International

Transforaminal Endoscopic Surgery: Its Role in the Treatment of Painful Conditions of an Aging Spine

Anthony T Yeung*

University of New Mexico, School of Medicine, Albuquerque, New Mexico, USA

Journal of Neurological Disorders

Yeung, J Neurol Disord 2016, 4:6
DOI: 10.4172/2329-6895.1000303

Perspective OMICS International

Intradiscal Therapy and Transforaminal Endoscopic Decompression: Opportunities and Challenges for the Future

Anthony T Yeung*

University of New Mexico, School of Medicine, Albuquerque, New Mexico, USA

My Technique Publications 2016:

Journal of Neurological Disorders

Yeung, J Neurol Disord 2016, 4:8
DOI: 10.4172/2329-6895.1000322

Review Article OMICS International

Endoscopic Decompression, Foraminalplasty and Dorsal Rhizotomy for Foraminal Stenosis and Lumbar Spondylosis: A Hybrid Procedure in Lieu of Fusion

Anthony T Yeung[1,2*]

Yeung, J Spine Neurosurg 2016, 5:6
DOI: 10.4172/2325-9701.1000266

Intradiscal Therapy and Nucleus Augmentation as a Surgical Technique for the Treatment of Common and Chronic Low Back Pain

Yeung AT[1,2*]



Journal of Spine & Neurosurgery

A SCITECHNOL JOURNAL

Multiple Publications In 2017-2018

- Robotics for endoscopic Spine
- SED™ in Athletes
- Treating the Pain Generator
- 25 year experience in endoscopic surgery
- State of the Art in Endoscopic surgery
- Failed back Surgery
- PELD in China

A rapidly growing number of U.S. Asian Korean, Japanese Chinese, Taiwanese, and Indian Spine Surgeons are adding to the published literature



Yeung's contribution

Editor-in-Chief and Editorial Boards

Journal of Spine & Neurosurgery

Journal of Neuropathology

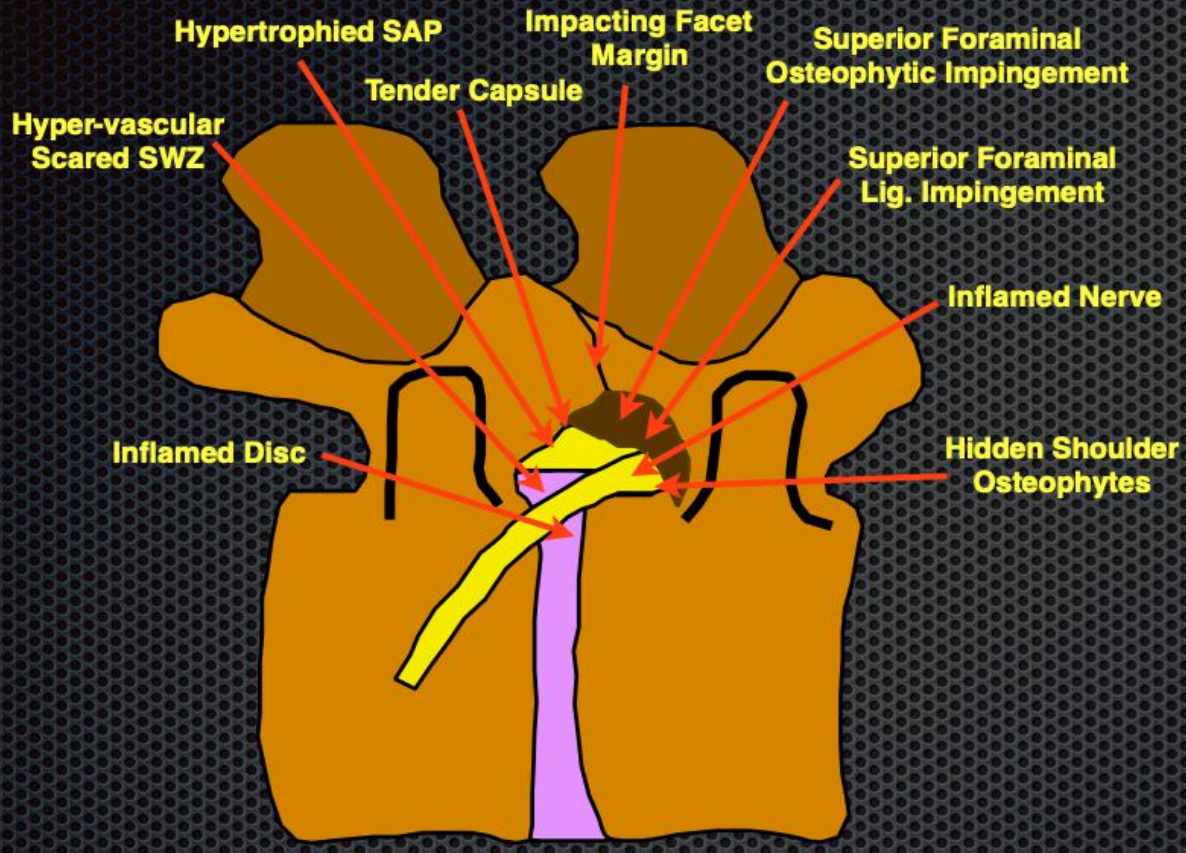
ConTROL Journal

- **My 25 years experience with Endoscopic Transforaminal Spine Surgery: It's Evolution, The Painful Conditions Treated, Results, Personal Thoughts, and a Review of the Evolving Literature**



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 i.e. compressed scar tissue previously asymptomatic

Transforaminal and Translaminar Endoscopic MIS vs Pain Management

- Formal training rare / mentorship desired
- Not universally taught in Spine or Pain Programs
- Pain specialists are trained and think differently



The future will not be for everyone !

- Go slow and Decide to specialize in Endoscopic spine surgery
- Learning curve is long and steep
- The future will require competency and specialization for endoscopic surgery to prosper

French Montparnasse station
(courtesy Boyle Cheng)



Current and Future Developments:
Payers should accept and reimburse validated endoscopic procedures performed as a hybrid procedure as cost effective



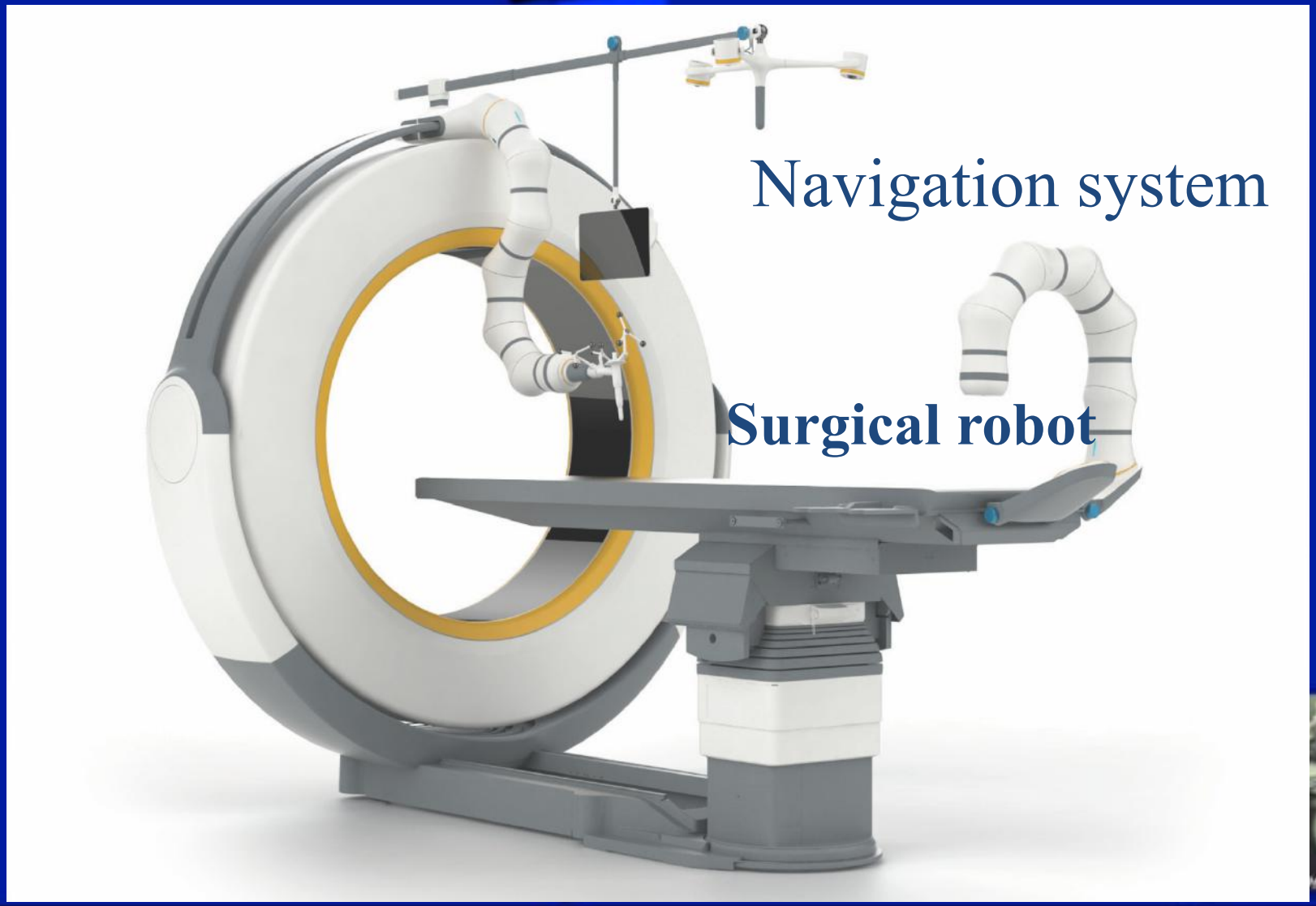
HJY/YESS Centers in China with with new Innovations

- New automated tools (surgifile)
- Third generation Endoscope Under Development utilizing a 3D chip
- Artificial Intelligence incorporated in Robotic Systems



Robotic A.I. for endoscopic spine under development

ORION Surgical Suite Intra-operative CT Scan Cardan Robot





Treatment Options

Bridging the Gap

Threshold

Fusion

Prosthetic Surgery

Endoscopic spine surgery:

Interventional Pain Management, Disc Fx, SCS, Drg neuromodulation

Conservative



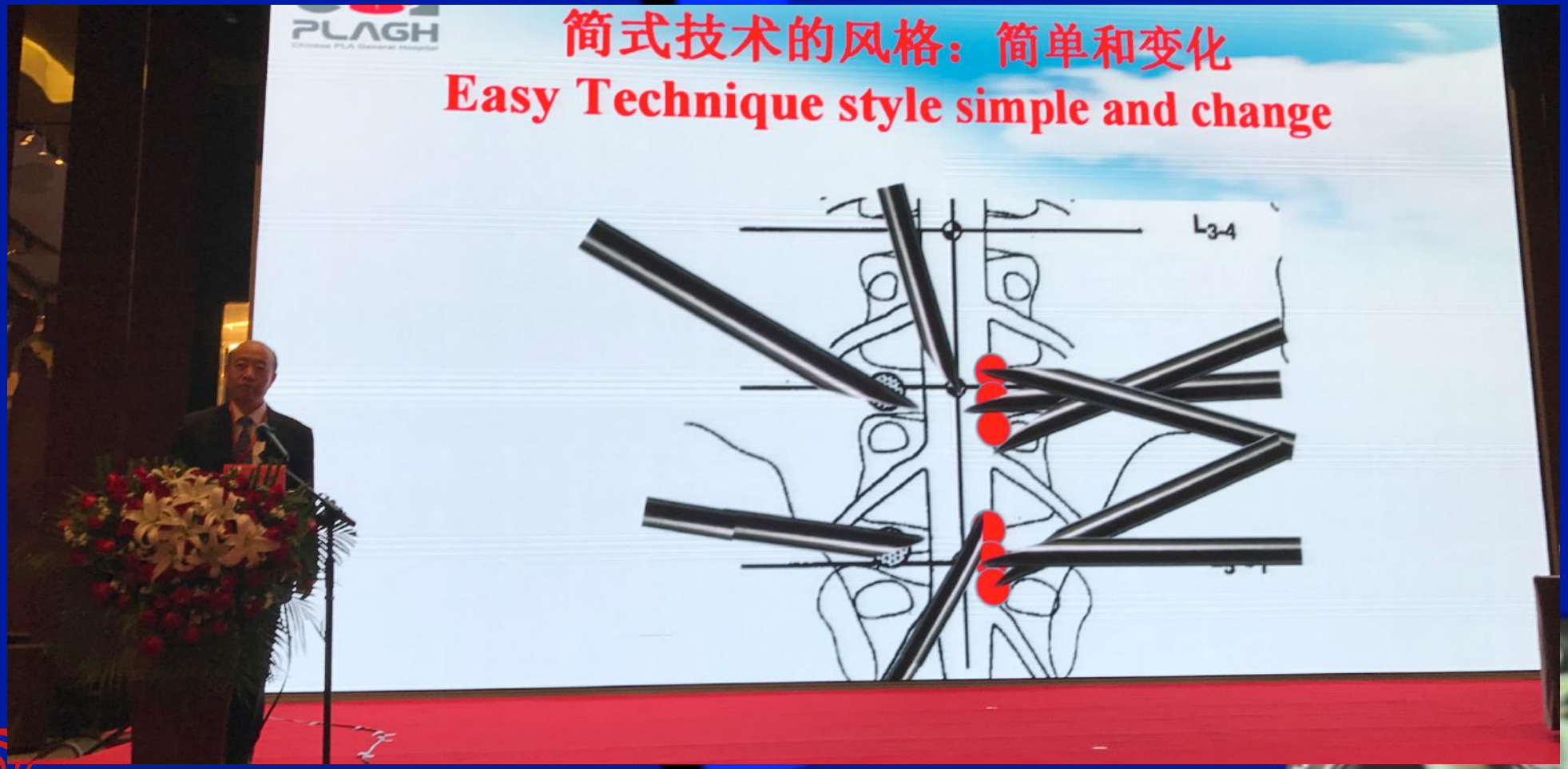


I support Rational Open Techniques

Endoscopic Techniques requires training



YESS Technique = “Easy” Technique
Xifeng Zheng, spine fellow



HJY / YESS Taiwan Surgeons 2017-18



Clive Chen

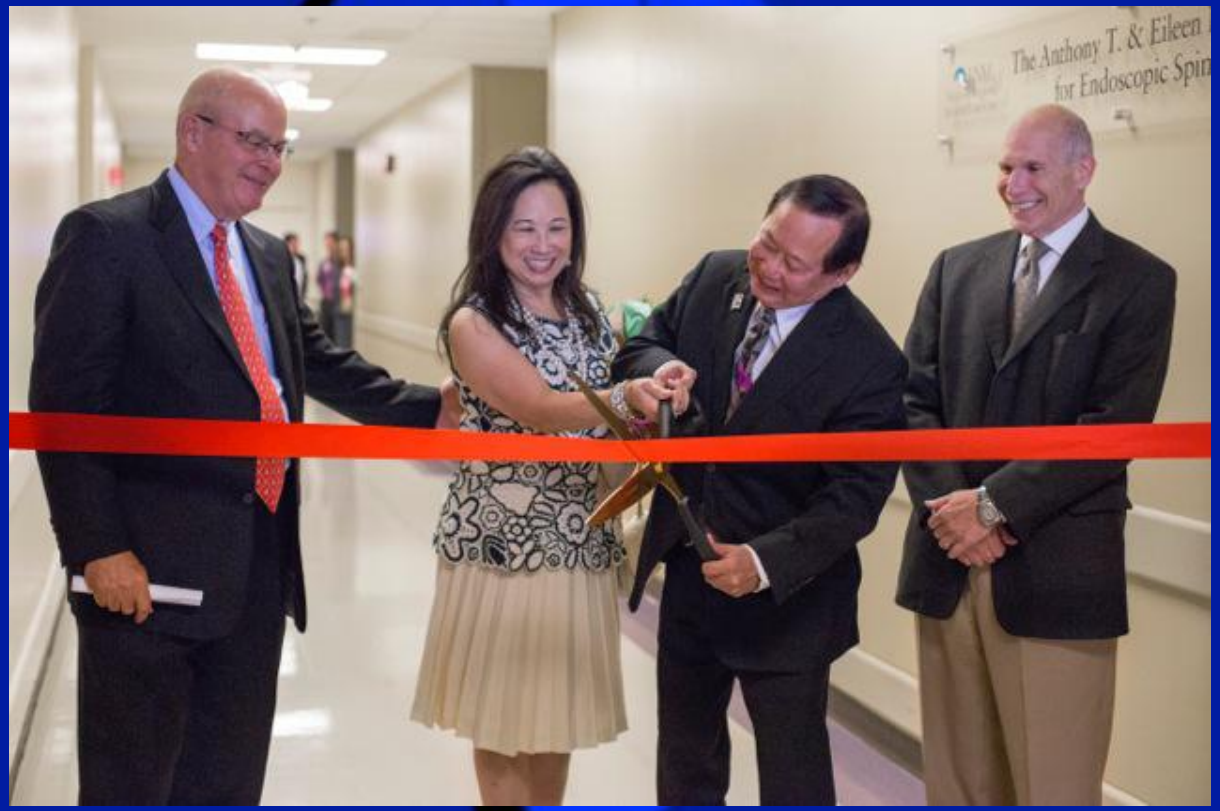
Jean Chen

Jeffrey Hsieh

Meng-ting Wu



Anthony and Eileen Yeung Endoscopic Spine Center at UNM





Thank You
谢谢!

www.sciatica.com
dryeung@sciatica.com


First YESS fellows


Xifeng Zhang


Zhengzhou Li

Dr Zhou Yue @ 3rd Chinese MISS Congress Chongging




Dr Gun Choi




Fellows conference


Yinggang Zheng