

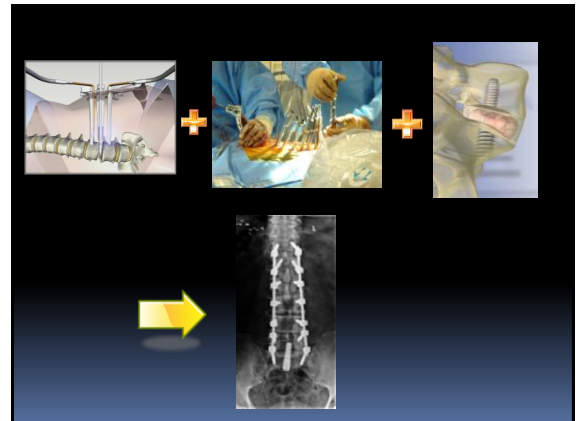
LATERAL ACCESS SURGERY EXPANDED APPLICATIONS

Kevin N. Ammar, MD

Neurological Institute of Savannah and Center for Spine
Savannah, GA

Disclosures

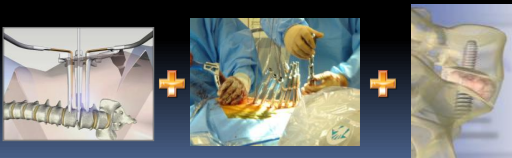
- Nuvasive consultant



SNS 2008

MINIMALLY INVASIVE PERCUTANEOUS MULTILEVEL 360 DEGREE FUSION FOR LUMBAR DEGENERATIVE SCOLIOSIS - A FEASIBILITY STUDY

Neel Anand, MD, Ty Thaiyananthan, MD, Kevin Khalsa, BS, Eli M. Baron,
MD, Kevin N. Ammar, MD



First Case '08

- 39 yo female
- Back / leg pain
- Progressive deformity



First Case '08



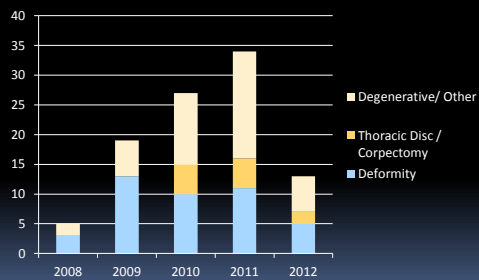
L2-3, 3-4, 4-5

L5-S1 TLIF

5 year review

Cases - 110

Levels - 201



Advantages

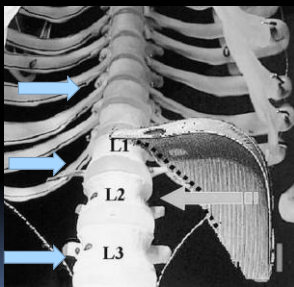
- No dissection of large vessels
- No dissection of dorsal spinal musculature
- Lateral annular release
- Possible ALL release
- Large graft footprint
- Indirect decompression
- Less invasive thoracic / thoracolumbar access
- Virgin corridor for revision

Access from T5-L5

Transthoracic
Retropleural
T5-11

Retropleural
T12-L2

Trans-Psoas
L1-5



Transdiaphragmatic
Retroperitoneal
T-L Junction

What's new?

- Retractor technology
 - Lighting
 - Strength
- Neuromonitoring sophistication
- Biologics / Implants
- No access surgeon

Potential Applications

Neural Compromise

- Foraminal narrowing
- Lateral recess stenosis
- Degenerative spondylolisthesis (Gr 1/2)
- Spondylolysis
- Thoracic disc herniations
- Adjacent segment issues

Instability

- Traumatic
- Tumor
 - Corpectomy
- Post-laminectomy deformity

Deformity

- Kyphosis
- Scoliosis

Axial Back Pain

- Degenerative disc disease

Ventral Intradural tumors

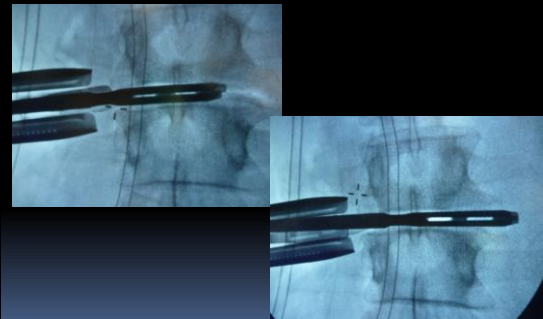
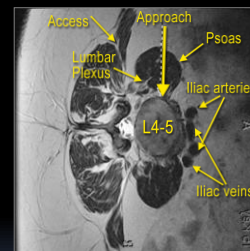
Arthroplasty

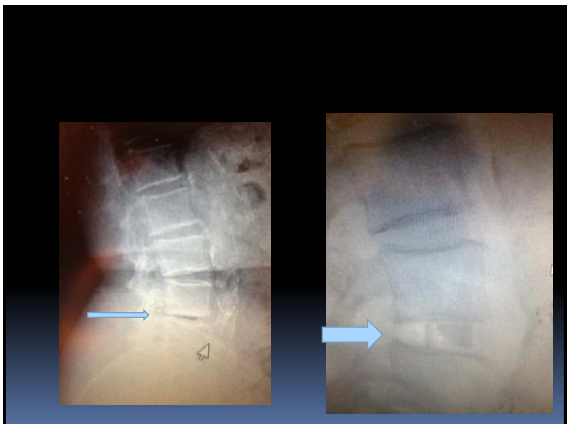
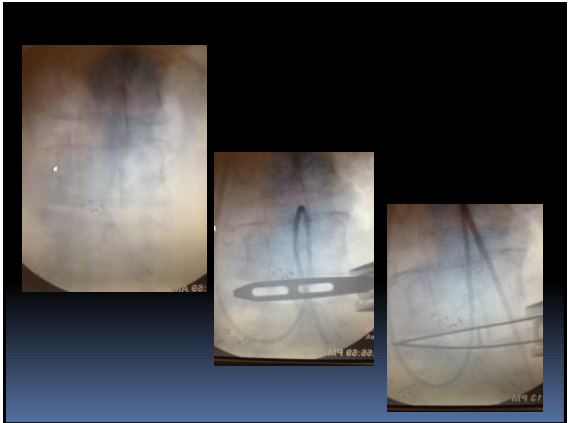
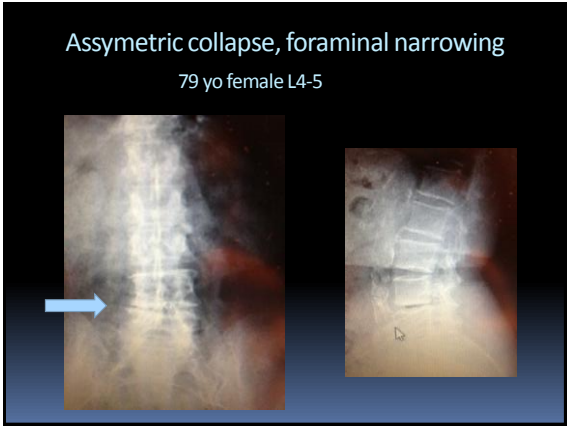
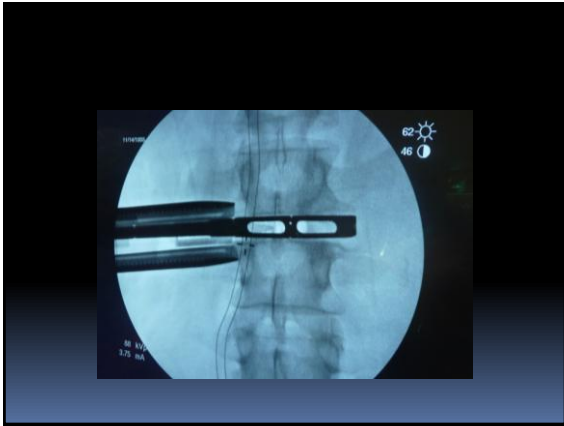
Case Examples

- Lumbar
- Revision
- Thoracic
- Thoracolumbar junction
- Deformity
- Arthroplasty
- Ventral intradural tumors

LUMBAR

Trans-psoas

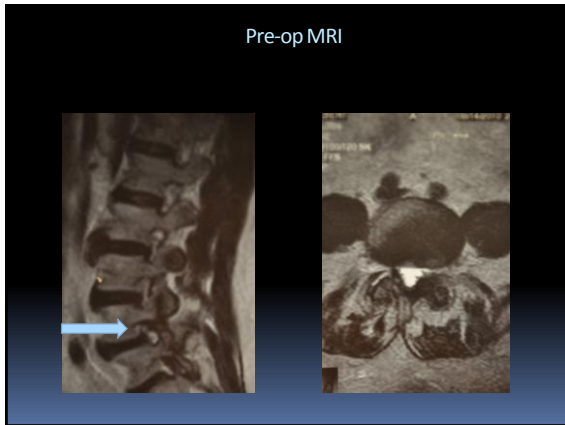






Degenerative Spondylolisthesis

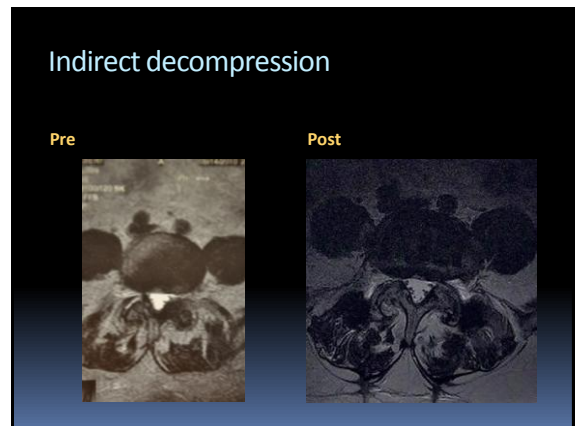
- 71 yo male
- Farmer
- Back and right leg pain
- Grade 1 slightly mobile spondy



Degenerative Spondylolisthesis

Hospital Course

- Minimal EBL
- Ambulatory day of surgery
- Home POD 1

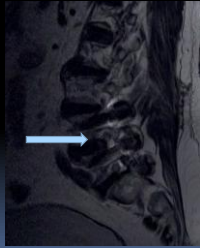


Indirect decompression

Pre



Post



Failed interspinous spacer

Post-infectious



REVISION

REVISION

Virgin corridor
Large surface area

TLIF revision

- 42 yo female
- Remote L5-S1 fusion
- L4-5 TLIF for HNP



10 weeks post-op



Revision – why lateral?

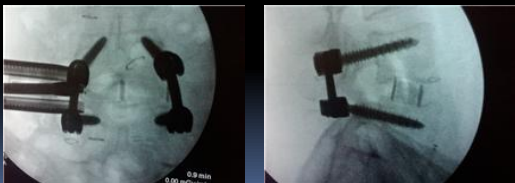
- Avoid hazards of posterior revision
- Substantial interbody graft
- Minimize blood loss, tissue retraction
- Quicker recovery

Revision Intra-op



Revision

- 30 minute procedure
- <25 ml EBL
- Home on POD1
- Resolved LE pain



TDR Revision

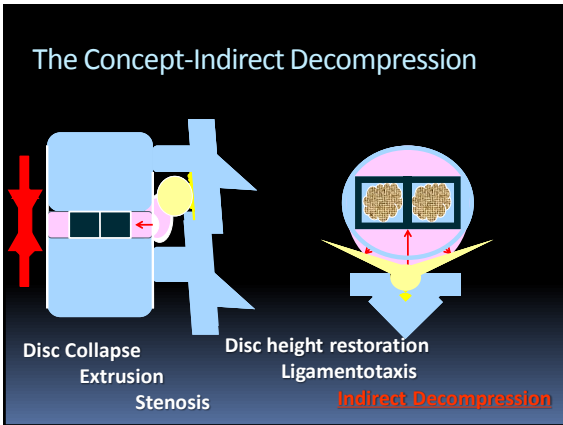


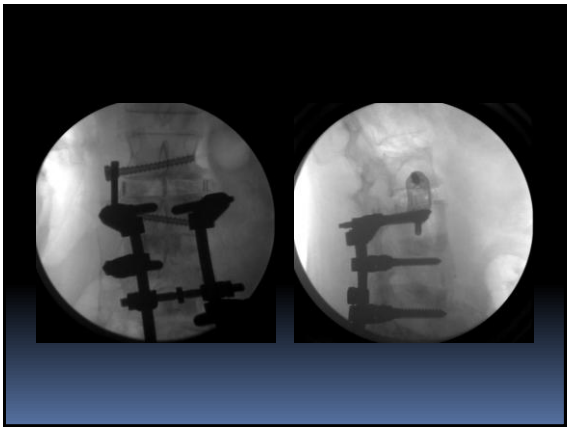
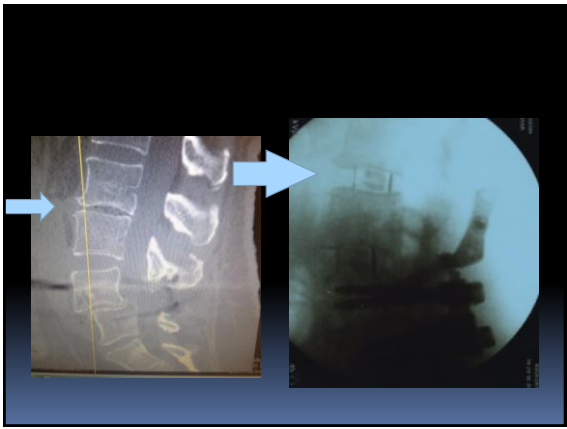
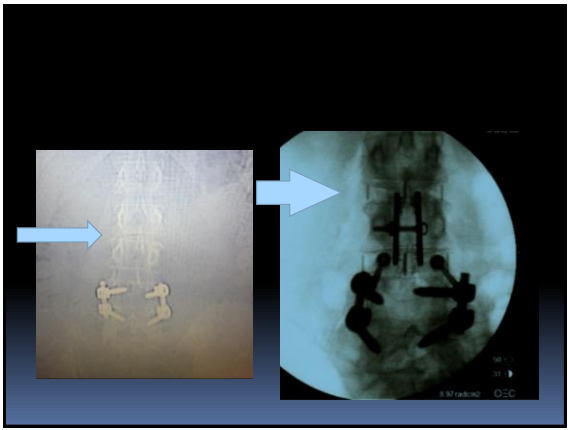
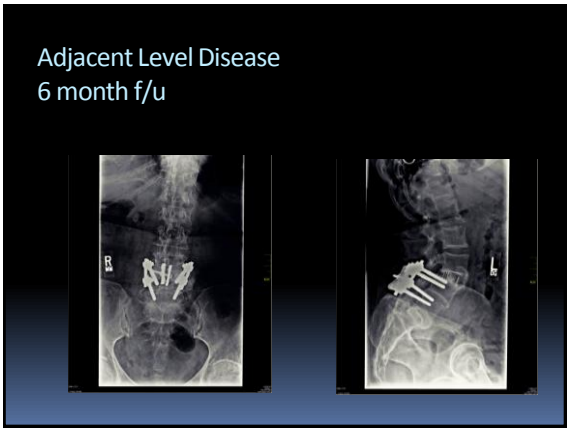
TDR Revision

Preop.

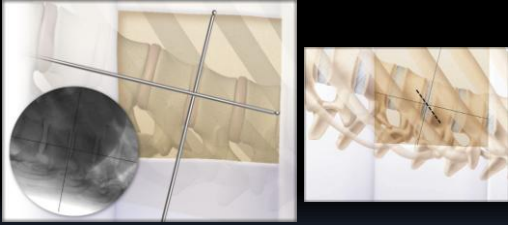
Adjacent Level Disease

- 74 yo female
- L4-5 fusion 90's
- 7 month h/o progressive back pain
 - Pain into hips, no LE pain
 - Wheelchair bound
- L3-4 mobile Grade 1 spondy
- CAD, HTN, + Coumadin
- Claudication / moderate stenosis
 - Amenable to indirect decompression



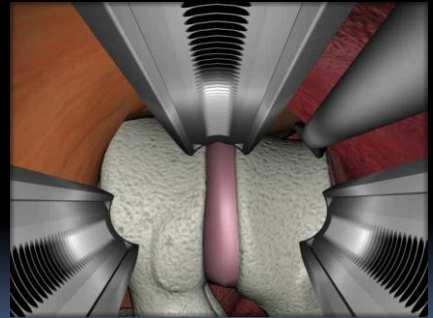
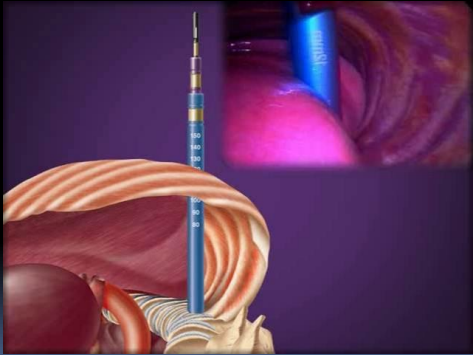
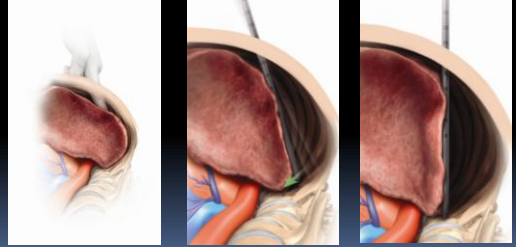


Localization for Transthoracic Discectomy



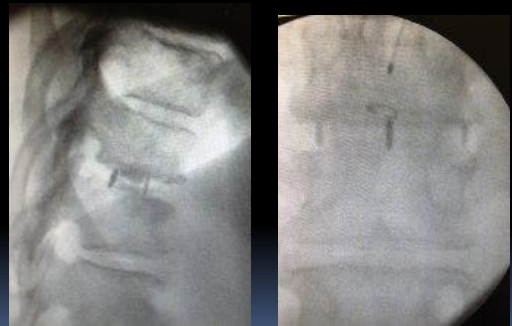
Transthoracic

Retropleural possible



Thoracic disc

T10-11



Tumor/Pathologic Fracture

- 47 yo female
- Progressive paraparesis
- Progressive upper thoracic pain
- Exam:
 - Large uterine mass
 - LE weakness
- W/u otherwise negative for primary malignancy
- W/u negative for infection



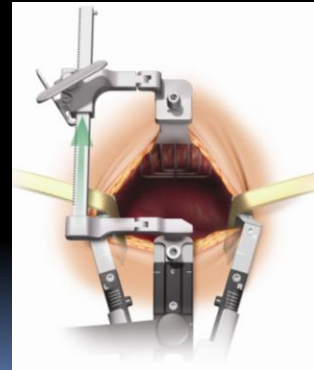
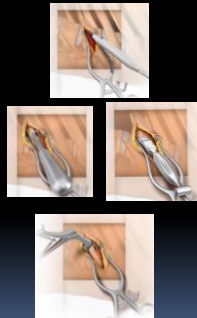
Pre-op CT

Evaluate endplates



Transthoracic Approach

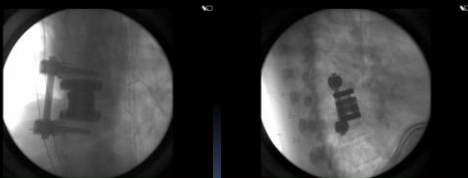
- Incise along rib – ALL to PLL
VB outline
- Rib dissection
Preserve neurovascular
bundle
- Rib resection
- Pleural cavity entry using blunt
dissection



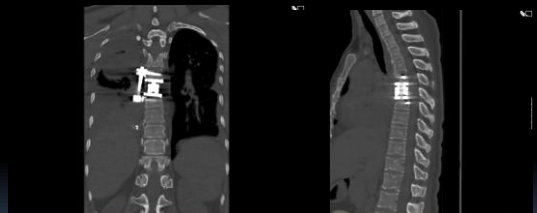
Intra-op

AP

Lateral



Post-op CT



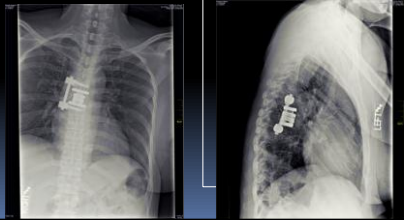
Tumor/Path Fx

- Pathology:
 - Endometrial adenocarcinoma
- Inpatient rehab
- Chemo and XRT
- Removal of uterine mass

Tumor/Path Fx


6 Month f/u

- Minimal pain
- Ambulatory

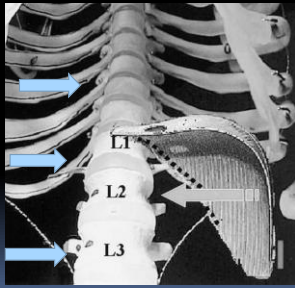


THORACOLUMBAR

L1 Burst Fx



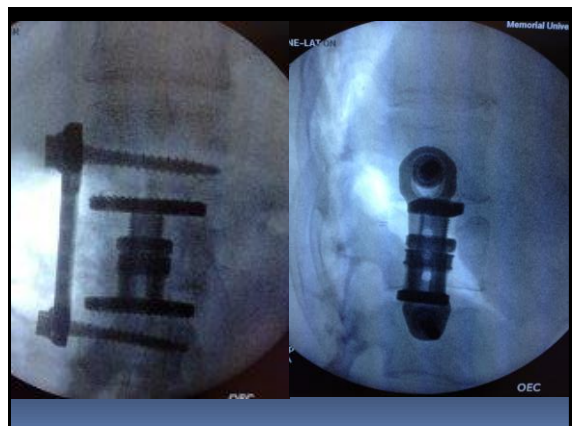
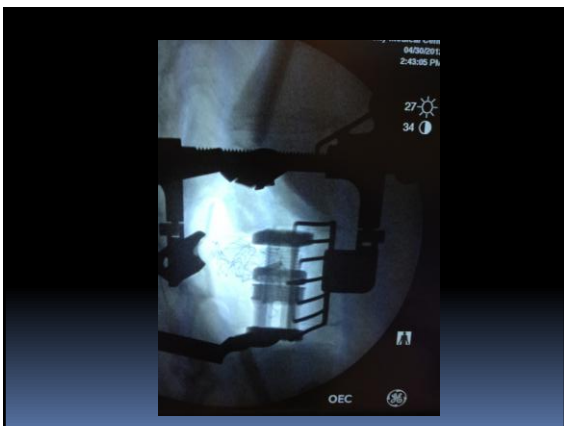
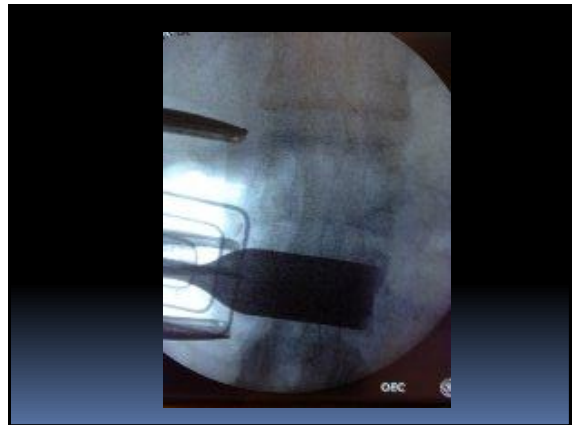
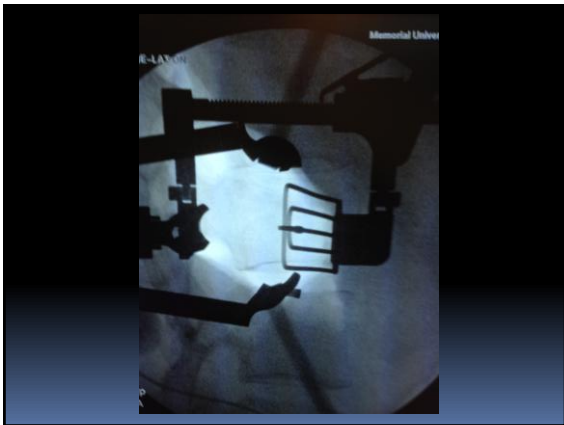
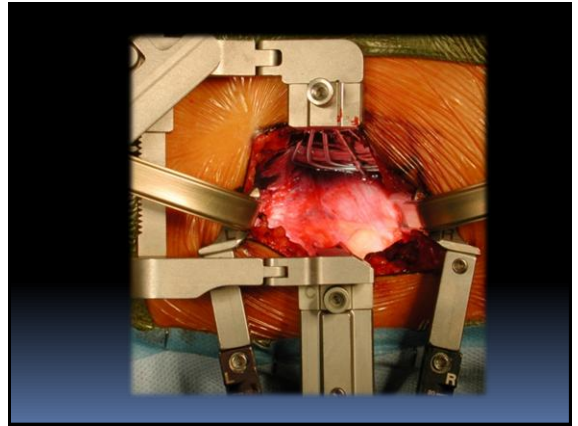
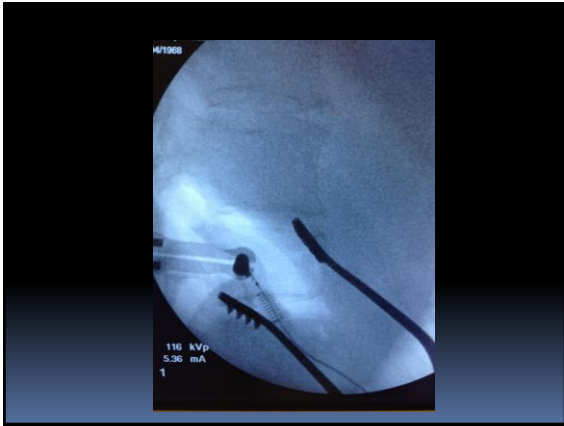
Access from T5-L5




- Transsthoracic Retropleural T5-11
- Retropleural T12-L2
- Trans-Psoas L1-5
- Transdiaphragmatic Retroperitoneal T-L Junction

Retropleural Access - L1 Burst Fracture





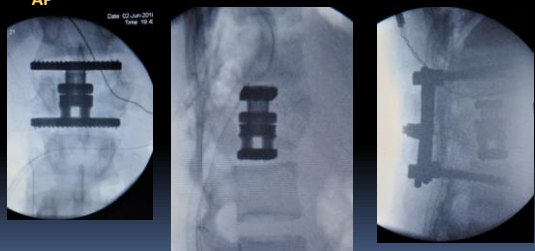
- 24 yo male
- MVA
- T12-L1 fracture / dislocation
- Complete SCI



Intra-op

AP

Lateral



DEFORMITY

Adult Scoliosis



- **Type 1:** Primary degenerative scoliosis (de novo scoliosis)
 - Engendered by deterioration of spinal discs and/or facet joint degeneration.
- **Type 2:** Idiopathic adolescent scoliosis of the thoracic/lumbar spine which has progressed into adulthood.
- **Type 3:** Secondary degenerative scoliosis
 - (a) Scoliosis following idiopathic or other forms of scoliosis, or has occurred due to a leg length discrepancy that has created pelvic obliquity, hip pathology, or lumbosacral transitional anomaly.
 - (b) Scoliosis secondary to a metabolic bone disease, along with asymmetric arthritis disease and vertebral fractures

Degenerative scoliosis

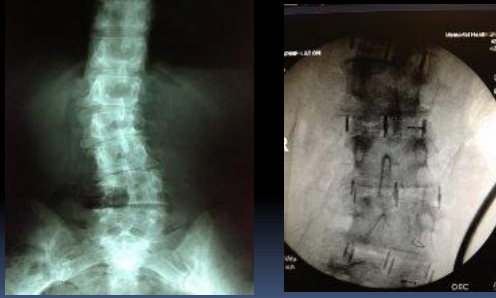
Type 1

'04

'07

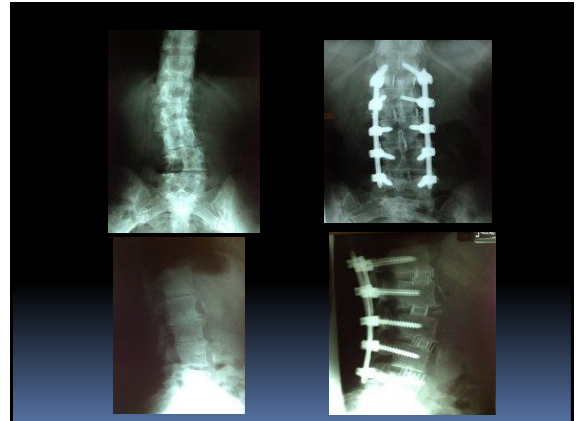
▪ Intra-op



Intra-op



360° Percutaneous Fusion

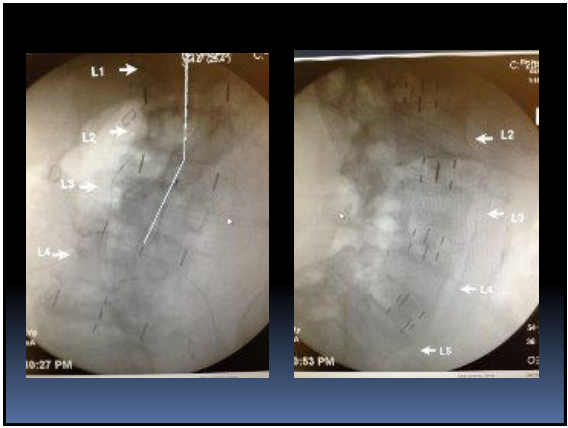
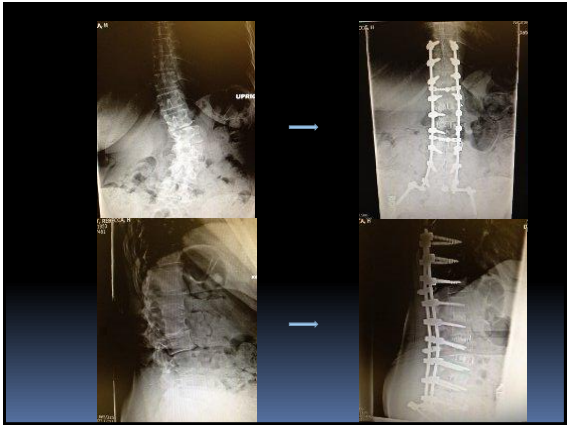
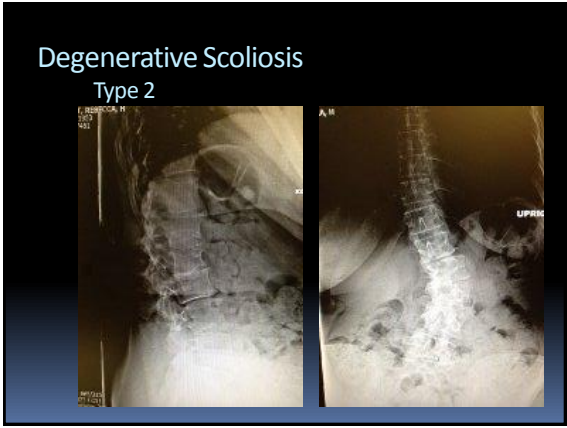


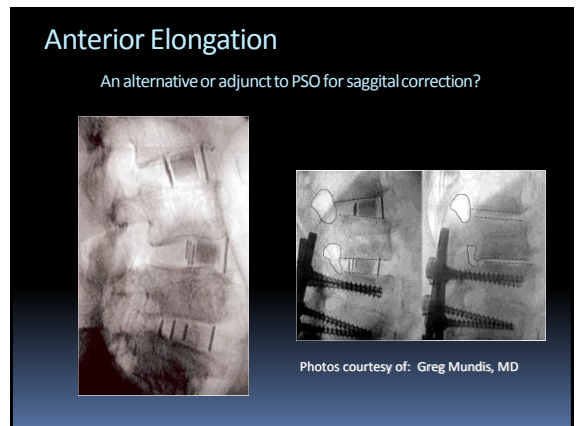
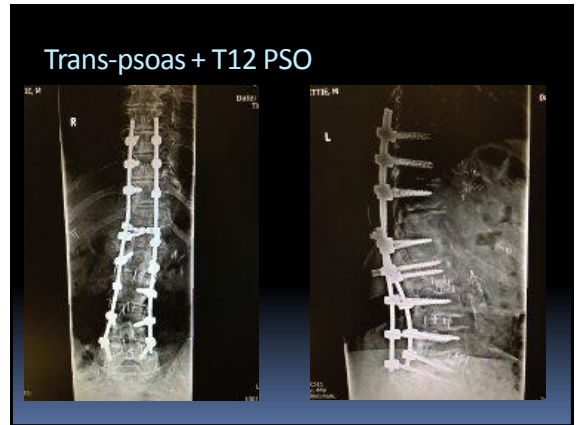
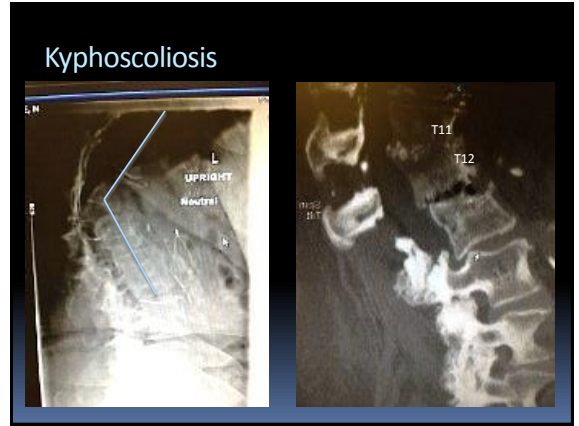
Subsequent L5-S1 degeneration

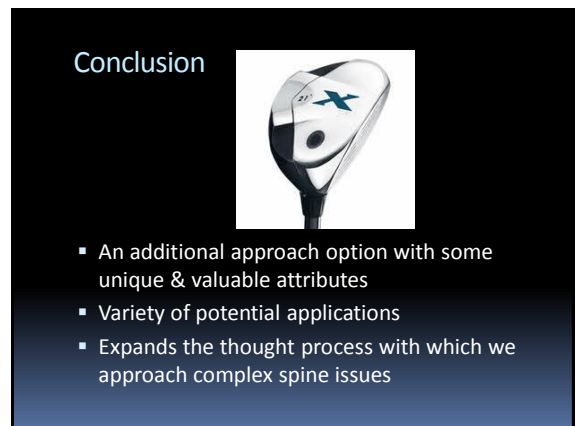
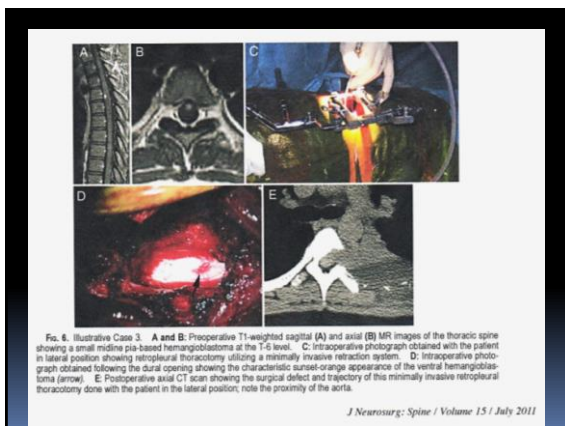
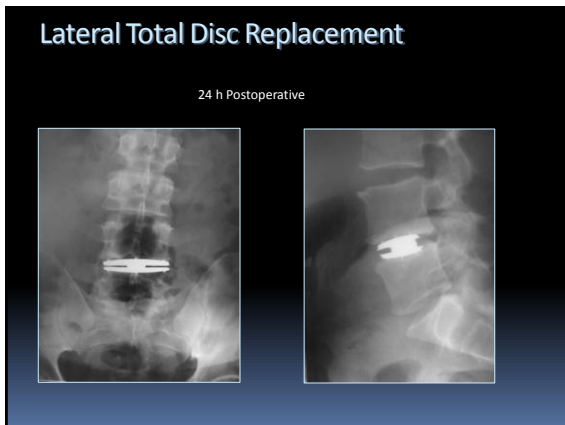
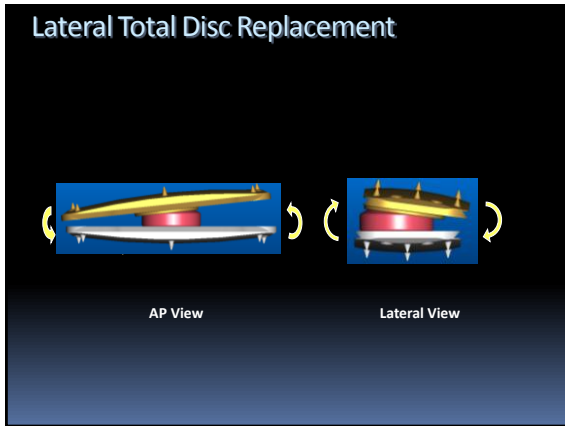
Pre-op

2 yrs post-op

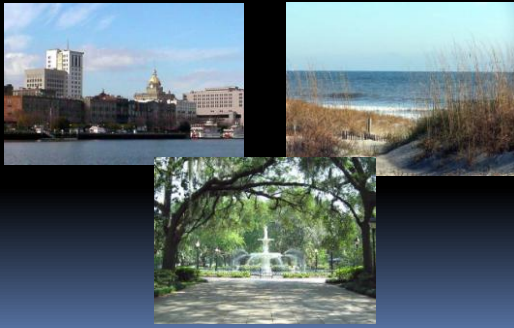








Thank You



Clinical Literature

Spine Journal December, 2010 MIS FOCUS

INDEX OF TOPICS COVERED:

- MIS Definition
- Anesthesia Considerations
- Anatomical Considerations
- MIS Decompression
- MIS TLIF
- Economics of MIS
- MIS Lateral Review (XLIF)
- XLIF Indirect Decompression
- XLIF Adult Scoliosis Study
- MIS Adult Deformity (XLIF)
- MIS Tumor Resection (XLIF)
- MIS Trauma (XLIF)
- Neuromonitoring
- Octogenarians (XLIF v PLIF)
- Biomechanics



XLIF® Fusion Rates

Literature Results

Youssef & McAfee, et al. *Spine* 2010

- Fusion rates in peer-reviewed literature range from **80% to 100%**

- **Average: 94.9%**

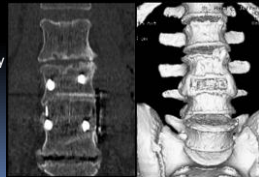
• Rodgers et al, SAS J 2010

- 66 patients treated with 1-3 level XLIF
 - Local autograft + DBM + cancellous allograft, and iliac crest BMA
- Prospective, computed tomography study at 12 months
- **97% fusion rate**

Minimally Invasive Surgery: Lateral Approach Interbody Fusion

Results and Review

Youssef & McAfee, et al. *Spine* 2010



XLIF® Complications

Literature Results

Youssef & McAfee, et al. *Spine* 2010

- Review of lateral approach literature (14 peer-reviewed articles)
 - Included Degenerative (8) and Deformity (6) papers
 - Minor complications: **6.7% - 20%**
 - Major complications: **0% - 8.6%**
 - Transient thigh symptoms: **8.6% - 30.4%**
 - Two outliers reporting 60.1% and 75%
 - Small samples (8 and 28 cases)
 - Early experience
 - Not all XLIF, technique considerations
 - Reoperations: **0% - 4.3%**

Minimally Invasive Surgery: Lateral Approach Interbody Fusion

Results and Review

Youssef & McAfee, et al. *Spine* 2010

Postoperative Period

What to Expect

- Patients typically walk same day, discharged next day
- Expected side effects:
 - 8-10% psoas weakness (resolves within 1-2 weeks)
 - 3-5% anterior thigh numbness (resolves within 1-2 weeks)
 - 0.5% thigh pain / dysesthesia (takes longer to resolve: 2-3 mos)

- To mitigate side effects, avoid
 - Wandering too much
 - Poor patient positioning
 - Bleeding in psoas
 - Use of monopolar cautery

- Recommended treatment
 - Post-op exercises
 - Neurontin (~)
 - Imipramine or other anti-depressant

Available online at www.sciencedirect.com

ELSEVIER ScienceDirect SAS Journal 4 (2010) 37-40

Editorial

SAS Journal www.sasjournal.com

Value and cost in less invasive spinal fusion surgery: lessons from a community hospital

- K.J. Deluzio et al. – *Value and cost in less invasive spinal fusion surgery: lessons from a community hospital*
 - Background
 - Mid-sized community hospital, Jefferson City, MO
 - Minimally invasive vs. Open
 - XLIF® for L1-2 through L4-5; MIS TLIF at L4-5 – 109 patients
 - PLIF – 102 patients
 - Outcome summary
 - 49% shorter stay
 - 6% lower initial cost
 - 76% decrease in residential events
 - Total perioperative savings of 9.6%, \$2,563/patient

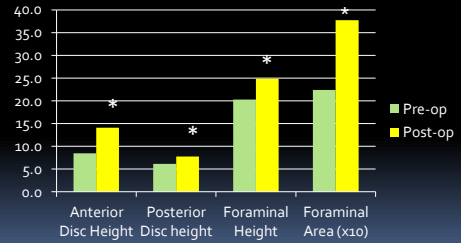
XLIF® Outcomes
Indirect Decompression

- Oliveira, et al. *Spine* 2010
- Prospective Study
- Consecutive Series of 20 Patients
- Inclusion Criteria: DDD with Central and/or Lateral Stenosis
- Clinical Outcomes: VAS, ODI, ZCQ, Treatment Intensity Score
- Images: X-Ray (AP, Lateral, Flexion, Extension) and MRI
- Follow-up: Preop, POP Early, and 3 months

A Radiographic Assessment of the Ability of the Extreme Lateral Interbody Fusion Procedure to Indirectly Decompress the Neural Elements
Ismael Oliveira, MD,* Luis March, MD,* Jacobo Gonzalez, MD,* and Leo Schwab, MD, PhD

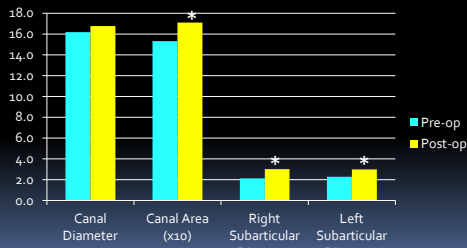
Statistical Analysis

Lateral X-ray Measurements



Statistical Analysis

Axial MRI Measurements

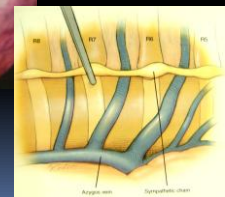
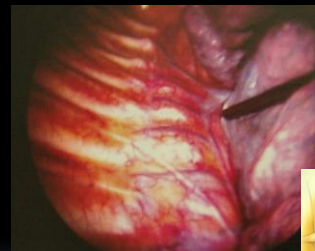


Editorial

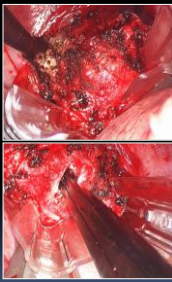
▪ “Minimally invasive or mini-open approaches are likely to have the greatest potential benefit when the approach is the main source of morbidity.”

- Peter Angevine, MD, MPH, and Paul McCormick, MD, MPH
- JNS: Spine editorial, March 2012

Aorta




- Rib head removal
- Standard discectomy performed before PLL resection



Anterior elongation Junctional Kyphosis

'99



'09

