

Castellvi Spine 2016
MIS L5-S1 TLIF

Terrence Julien, MD, FACS, FAANS
Associate Professor of Neurosurgery
System Director, Surgical Neuro-Oncology
System Co-Director, Minimally Invasive Spine Surgery
Department of Neurosurgery
Allegheny Health Network
Pittsburgh, PA

Disclosures

- Stryker Spine
- Exactech
- Camber Spine
- Amendia
- Corelink

L5-S1 Isthmic Spondylolisthesis

42 yo male, 5 yr history of progressive in pain
CC- Low Back Pain made worse with mechanical activities (bending and lifting)

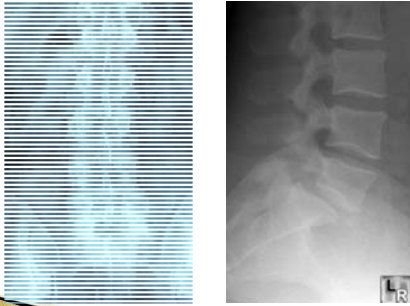
Left leg pain radiating from buttock to foot, numbness lateral Left calf

Rx- physical therapy, medication and epidural steroid injection

PE- . Motor 5/5, sens. Decreased left lateral calf, DTRs 2+, SLR- Neg.

Castellvi Spine 2016

Case L5-S1



Castellvi Spine 2016

Case L5-S1



Castellvi Spine 2016

Case L5-S1



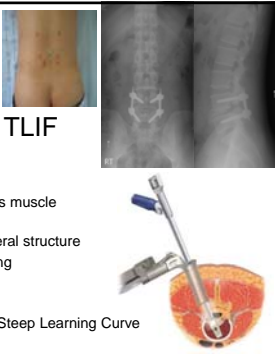
Castellvi Spine 2016

Minimally Invasive TLIF

- Advantages
 - Decreased soft tissue injury
 - Unilateral exposure & less muscle dissection
 - Preservation of contralateral structure
 - Decreased operative bleeding
- Disadvantages
 - Technically demanding
 - Increased operative time

Steep Learning Curve


Peng et al., Spine, 2009; Scheufler et al., Neurosurg, 2007; Schizas, Int Orthop, 2008



Materials

Shin, et al. - Prospective analysis of:


- Their first 41 cases of the MIS TLIF procedure
- Degenerative lumbar disease treated by:
 - Decompression through a tubular retractor
 - Obliquely inserted a PEEK cage
 - Percutaneous pedicle screw fixation and fusion
- F/U > Minimum of one year



Materials

Patients characteristics

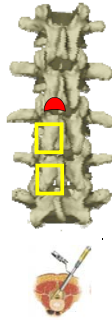
- Average age: 57 yrs. (36-76)
- Average F/U: 21 m
- Etiology
 - Spinal stenosis: 24 cases
 - Spondylolisthesis: 12 cases
 - HIVD: 3 cases
 - IDD: 1 case
 - Segmental Instability: 1 case



Materials

► Procedure (41 patients)

- No. of operated levels
 - 1 level TLIF: 31 cases
 - 1 level TLIF + 1 level decomp. 8 cases
 - 2 level TLIF: 2 cases
- Laminectomy
 - Unilateral: 37 cases
 - Bilateral: 4 cases
- Contralateral decompression
 - 16 cases



Methods

→ Assessing parameters of learning curve

- Length of operative time
- Amount of bleeding
 - Intra-operative bleeding
 - H-vac drain
 - Total peri-operative bleeding
- Starting day of ambulation
- Transfusion incidence
- Occurrence of complications



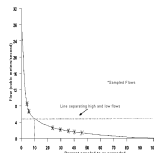
→ Clinical outcome

- Oswestry disability index
- Visual analogue scale
 - Low back pain
 - Radiating pain to legs

Statistical Analysis

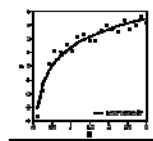
→ Regression analysis for learning curve

- Bivariate analysis
 - Case # vs. parameters (operative time, bleeding)
- Logarithmic curve-fit



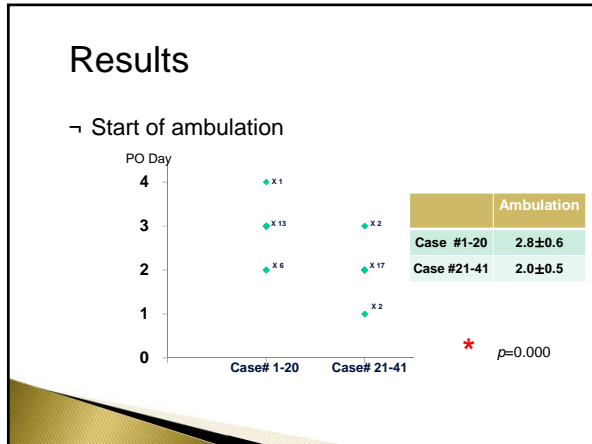
→ Former 20 vs. Latter 21 cases

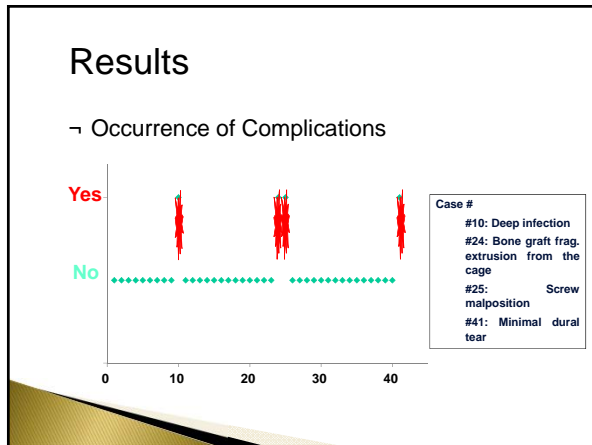
- Student T-test
 - Operative time, Blood loss, Start of ambulation
- Chi-square test
 - Transfusion need, Occurrence of complications

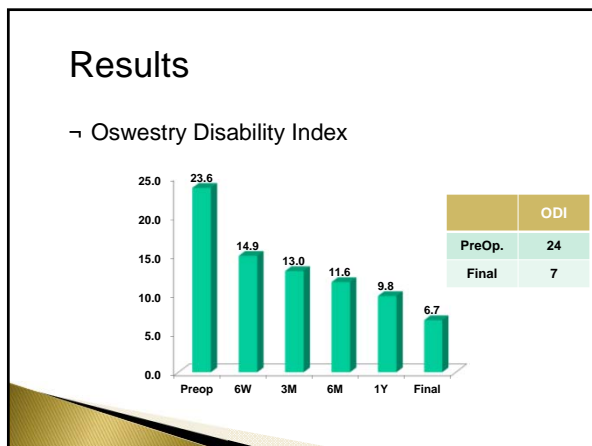


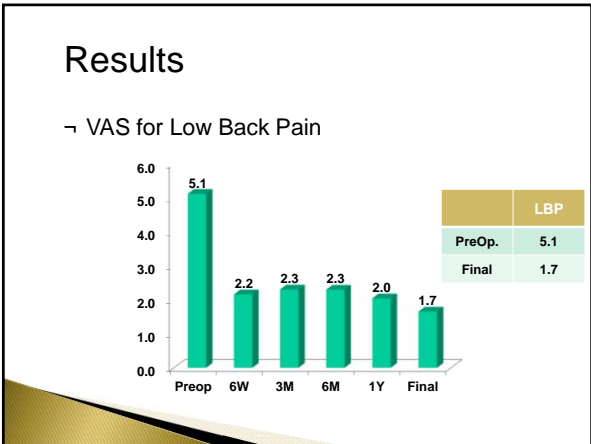
→ SPSS (ver.13.0)

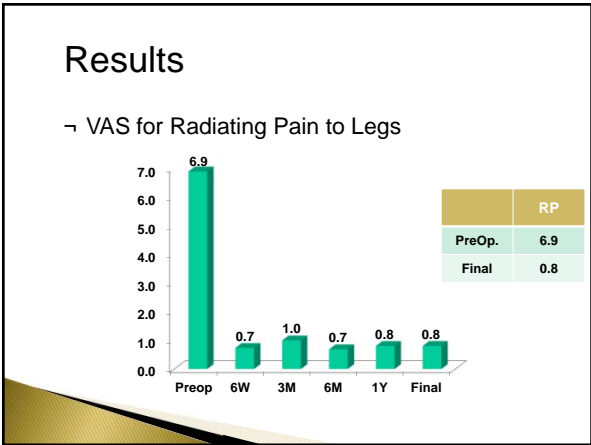
- $p < 0.05$

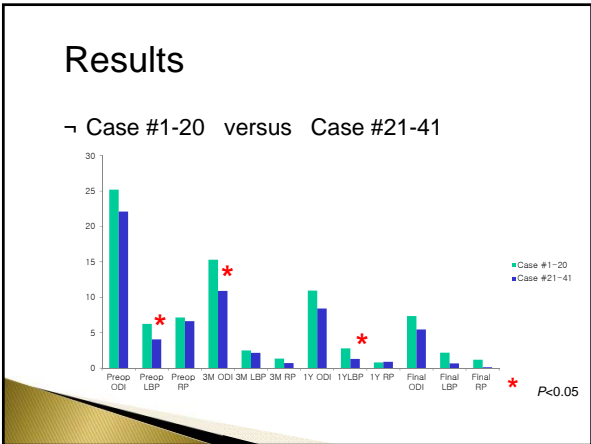












Summary and Conclusions

- Learning curve for minimally invasive TLIF was steep, but acceptable. Asymptote of the curve was approximately 35-40 cases.
- Operative time was significantly decreased with a surgeon's experience.

	Mean Operative time
Case #1-20	249 min
Case #21-41	198 min

Summary and Conclusions

- Amount of bleeding and needs for transfusion also significantly decreased with a learning curve.

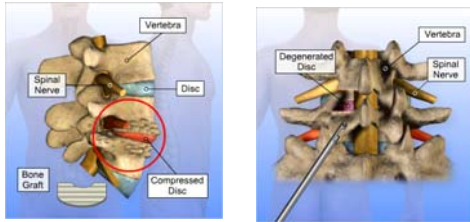
	Intraop. Bleeding	Perioperative Bleeding
Case #1-20	506 ml	689 ml
Case #21-41	272 ml	382 ml

- Minimally invasive TLIF can be an effective method treating degenerative lumbar diseases.

TLIF- Advantages

- ▶ TLIF obviates the morbidity from the retroperitoneal dissection and subsequent posterior fixation required for anterior lumbar interbody fusion (ALIF).
- ▶ Unlike PLIF, TLIF requires minimal to no retraction on the thecal sac and nerve roots while still providing 360 degrees of support.
- ▶ Because TLIF utilizes a more lateral trajectory, it can be performed in the setting of previous surgery with identifiable landmarks and a cleaner plane of dissection.
- ▶ The average length of stay for both minimally invasive and open TLIF ranged between 3 and 6 days

Lumbar – Transforaminal Lumbar Interbody Fusion (TLIF)

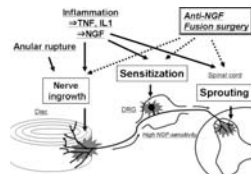


Decompression Removing the facet joint and disc relieves pressure on the compressed spinal nerve, allowing it to return to the proper position.

Fusion for DDD

Posterolateral fusion

Patients with some level of residual discogenic pain due to micromotion



Eur Spine J. 2008 December; 17(Suppl 4): 428–431

Fusion for DDD

Interbody techniques

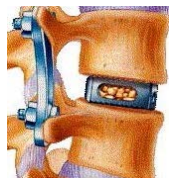
Remove pain generator

Large surface area for fusion where majority of spinal load bearing occurs

90% of the surface area
80% of the load

Compressive force through graft


Correction coronal and sagittal alignment



Anterior Approaches - Contraindications

ALIF
 Contraindications
 Calcified aorta
 Prior vascular reconstructive surgery
 Prior intra-abdominal or retroperitoneal surgery
 History of severe pelvic inflammatory disease
 Prior anterior spinal surgery

Transposas
 Contraindications
 At L5/S1 and sometimes at L4/5 because of obstruction from iliac crest
 Prior retroperitoneal surgery or scarring



ALIF – Complications

Retrograde ejaculation

Most series < 1% to 7%

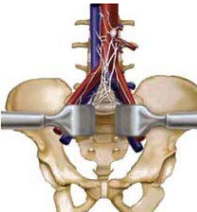
Much higher with transperitoneal approaches and with laparoscopic approaches

Blunt dissection versus electrocautery

Large majority of patients recover within 6 - 12 months

Bowel Injury

Ureter Injury



ALIF Complications

Rates variable - highly surgeon dependent


- Vascular complications of exposure for anterior lumbar interbody fusion.
J Vasc Surg. 2010 Apr;51(4):946-50;

212 ALIF exposures

2% rate of "serious" vascular complication

- 1 arterial injury required thrombectomy and stent
- 4 venous injuries required multi-suture repair

No mortalities



Conclusions

- MIS TLIF is an effective method for treating degenerative lumbar diseases.
- It provides an adequate surface area for fusion where majority of spinal load bearing occurs.
- It can also provide correction of coronal and sagittal alignment.
- No access surgeon is necessary.
- The rate of "serious" vascular complications does not approach that of the ALIF procedure.