OLIF: Applying the Approach for Degenerative Pathologies

Richard Hynes, MD

Disclosures

- Medtronic
- Depuy/Synthes
- Celling Technologies
- Spineguard

Thank You

Castellvi Spine

Foundation for Orthopaedic Research & Education

Dr. Joseph Wasselle and Dr. Jim Billys
First OLIF as BACK Center Partner

Publications

OLIF Publications

- Roussouly – Complications and Morbidities : Oblique Lumbar Interbody Fusion in 179 Patients (2012)
- Davis/Hynes - Retroperitoneal oblique corridor to the L2-S1 intervertebral discs in the lateral position: an anatomic study (2014)
- Fujibayashi/Hynes - Effect of indirect neural decompression through oblique lateral interbody fusion for degenerative lumbar disease (2015)
- Wakita - Less invasive corrective surgery using oblique lateral interbody fusion (OLIF) including L5-S1 fusion for severe lumbar kyphoscoliosis due to L4 compression fracture in a patient with Parkinson's disease: a case report (2015)
- Sato - Radiographic evaluation of indirect decompression of mini-open anterior retroperitoneal lumbar interbody fusion: oblique lateral interbody fusion for degenerated lumbar spondylolisthesis. (2015)
- Molinares- Retroperitoneal oblique corridor to the L2-S1 intervertebral discs: an MRI study. (2015)

OLIF Publications

- Abe/Orita - Perioperative Complications in 155 Patients Who Underwent Oblique Lateral Interbody Fusion Surgery: Perspectives and Indications From a Retrospective, Multicenter Survey.
- Orita/Ohtori - Lower Lumbar Segmental Arteries Can Intersect Over the Intervertebral Disc in the Oblique Lateral Interbody Fusion Approach With a Risk for Arterial Injury: Radiological Analysis of Lumbar Segmental Arteries by Using Magnetic Resonance Imaging.
- Zhang - Does right lateral decubitus position change retroperitoneal oblique corridor? A radiographic evaluation from L1 to L5.
- Orita - Lumbar foraminal stenosis, the hidden stenosis including at L5/S1.
- Phan - Review of early clinical results and complications associated with oblique lumbar interbody fusion (OLIF).

OLIF Publications

- Kim - Minimally Invasive Oblique Lateral Interbody Fusion for L4-5: Clinical Outcomes and Perioperative Complications
- Heo - Minimally Invasive Oblique Lumbar Interbody Fusion with Spinal Endoscope Assistance: Technical Note
- Mobbs - Lumbar interbody fusion: techniques, indications and comparison of interbody fusion options including PLIF, TLIF, MI-TLIF, OLIF/ATP, LLIF and ALIF
- Liu - Imaging Anatomical Research on the Operative Windows of Oblique Lumbar Interbody Fusion
- Li/Mobbs - Oblique lumbar interbody fusion: technical aspects, operative outcomes and complications
- Chang - Ventral Dural Injury After Oblique Lumbar Interbody Fusion

OLIF Publications

- Woods/Billys/Hynes - Technical Description of Oblique Lateral Interbody Fusion at L1-L5 (OLIF25) and at L5-S1 (OLIF51) and Evaluation of Complication and Fusion Rates
- Kim - Endoscope-assisted oblique lumbar interbody fusion for the treatment of cauda equina syndrome: a technical note
- Jin - Comparative Study of the Difference of Perioperative Complication and Radiologic Results: MIS-DLIF (Minimally Invasive Direct Lateral Lumbar Interbody Fusion) Versus MIS-OLIF (Minimally Invasive Oblique Lateral Lumbar Interbody Fusion)
- Zairi - Mini open oblique lumbar interbody fusion (OLIF) approach for multi-level discectomy and fusion involving L5-S1: Preliminary experience
- Fujibayashi - Preoperative assessment of the ureter with dual-phase contrast-enhanced computed tomography for lateral lumbar interbody fusion procedures

Varying Techniques

- Roussouly (2012) - Complications and Morbidities of Mini-open Anterior Retroperitoneal Lumbar Interbody Fusion: Oblique Lumbar Interbody Fusion in 179 Patients (France)
- Mayer (2015) - The Oblique Anterolateral Approach to the Lumbar Spine Provides Access to the Lumbar Spine With Few Early Complications (Germany)
- Molloy (2016) - A new extensile anterolateral retroperitoneal approach for lumbar interbody fusion from L1 to S1: a prospective series with clinical outcomes (UK)
- Woods/Billys/Hynes (2017) - Technical Description of Oblique Lateral Interbody Fusion at L1-L5 (OLIF25) and at L5-S1 (OLIF51) and Evaluation of Complication and Fusion Rates (USA)

Roussouly

- Lateral Mini-Open Anterior to Psoas
- Access to L2/L5
- 179 Patients
- Up to 3 levels can be addressed through a 'sliding window'

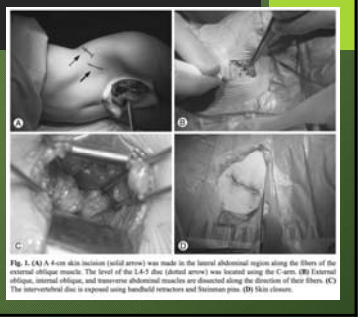


Fig. 1. (A) A 4-cm skin incision (solid arrow) was made in the lateral abdominal region along the fibers of the external oblique muscle. The level of the L4-5 disc (dotted arrow) was located using the C-arm. (B) External oblique, internal oblique, and transverse abdominal muscles are dissected along the direction of their fibers. (C) The intervertebral disc is exposed using handheld retractors and Steinman pins. (D) Skin closure.

Mayer

- Mini-Open in Semi-Lateral Position (30°)
- Access to L1/L5
- 812 Patients
- 3.7% Complication Rate (0.37% Neurologic & 0.37% Vascular)

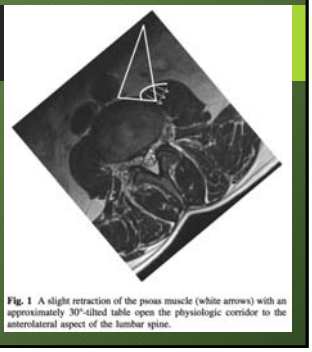


Fig. 1 A slight retraction of the psoas muscle (white arrows) with an approximately 30°-tilted table open the physiologic corridor to the anterolateral aspect of the lumbar spine.

Molloy

- Supine Anterior to Psoas –Mini-Open)
- Access to L1/S1
- 64 Patients
- No Permanent Neurologic, Vascular or Visceral Injuries

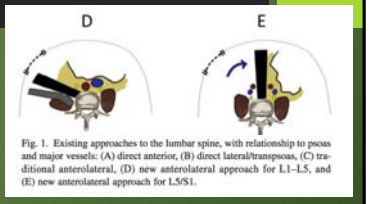
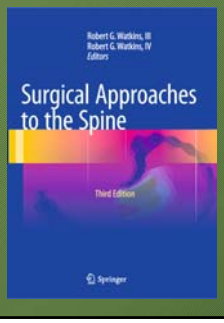


Fig. 1. Existing approaches to the lumbar spine, with relationship to psoas and major vessels: (A) direct anterior, (B) direct lateral/transpsoas, (C) traditional anterolateral, (D) new anterolateral approach for L1–L5, and (E) new anterolateral approach for L5/S1.

Woods/Billys/Hynes

- Tubular/Mini-Open True Lateral
- Access to L1/S1
- 137 Patients
- Complications – 11.7%
  - Subsidence – 4.4%
  - Ileus – 2.9%
  - Vascular – 2.9%

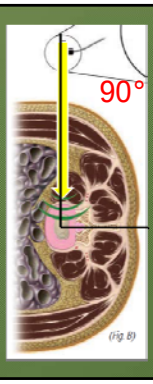
2015

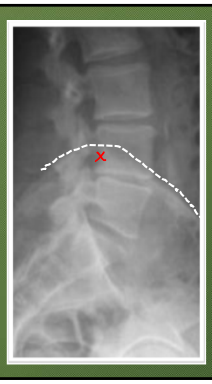


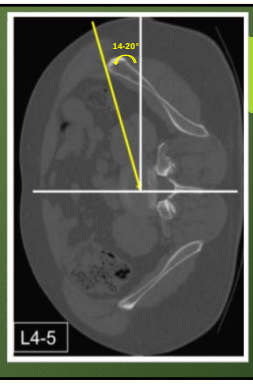
OLIF Rationale

Rationale

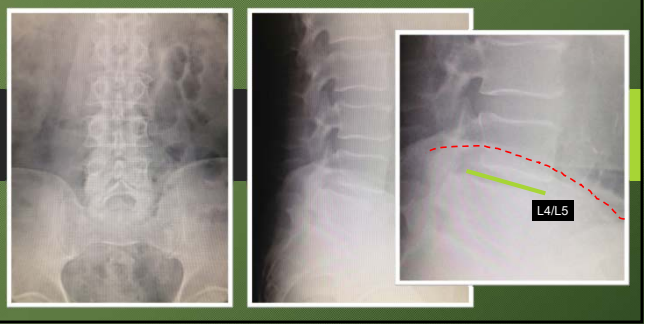
- Iliac Crest Avoidance
- Muscle Sparing (Corridor)
- Femoral Nerve Avoidance
- All Disc Levels in One Position
- Ergonomics
- Neuromonitoring

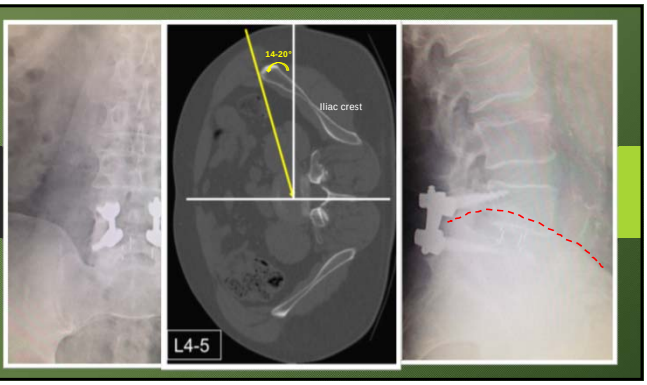






Spondy – L4/L5 (High Crest)





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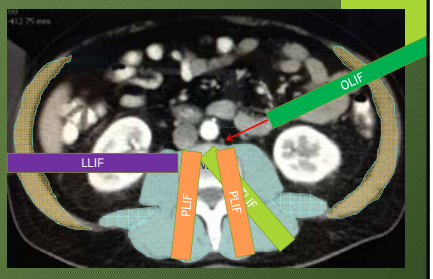
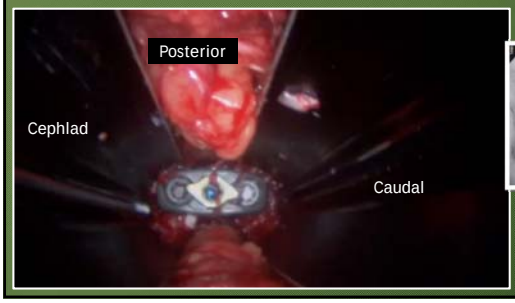
OLIF Corridor – NO MUSCLE



Psoas View During Retractor Removal



OLIF L3/L4 with Lateral Pivox Plate

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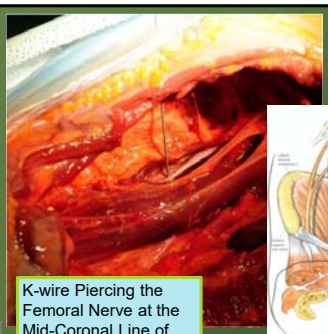
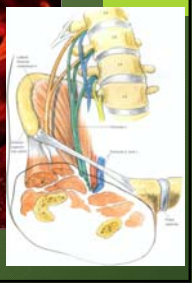
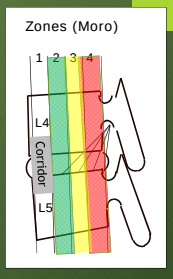


K-wire Piercing the Femoral Nerve at the Mid-Coronal Line of L4-5 Disc

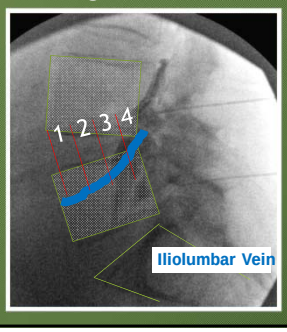


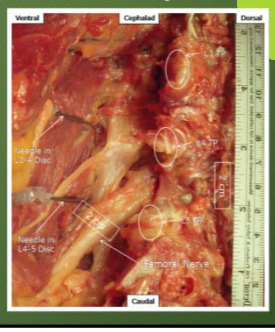
Cadaveric: Femoral Nerve Distribution

Distribution by Zone

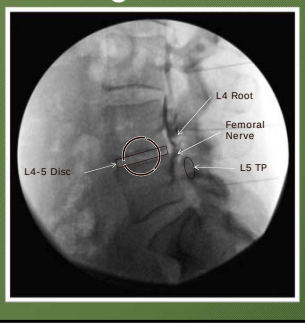


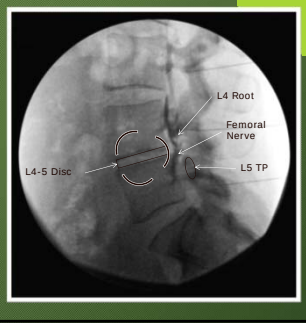
Neurogram and Gross Anatomy





Neurogram with Retractor





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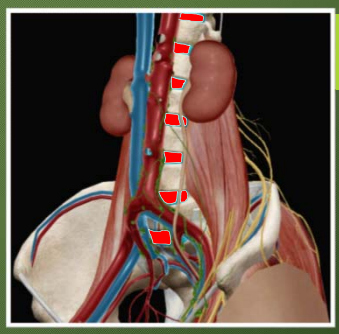
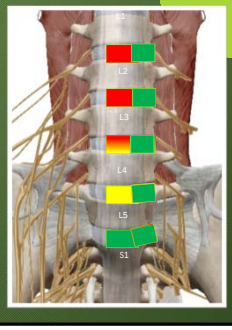


OLIF

- Access to above L3/L4?
- Mobilization of Great Vessels (SHP)
- Extensive Retroperitoneal Dissection
- All Levels Possible in One Position
- OLIF25 is a Different Procedure than OLIF51
- OLIF51 is Recommended with an Access Surgeon

LLIF

- Access to L4/L5 – Iliac Crest
- Neurological Risk – Femoral Nerve
- Muscular Pain – Psoas
- Access – L5/S1



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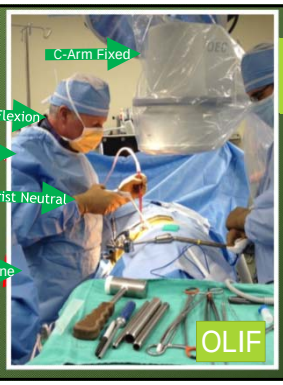


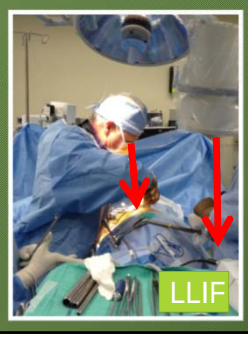
Surgeon in Positive Sagittal Balance x 30 Year Career?

Surgeon in Neutral Sagittal Balance x 30 Year Career?

Ergonomics / Working View

- Fluoroscopy remains stationary
- Surgeon and Fluoro work at same time

Surgeon & Fluoro See Disc Space Simultaneously



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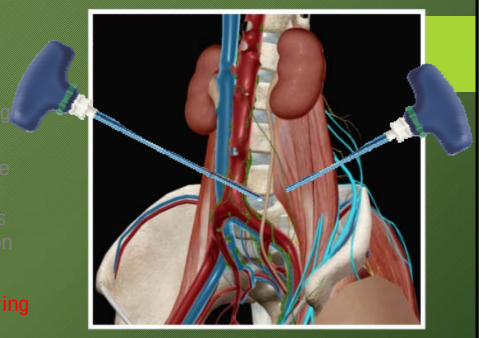


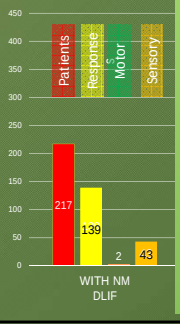
Personal Experience

OLIF Current Overview

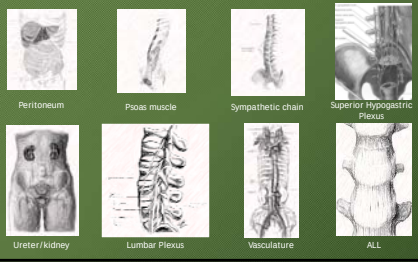
	Total	O25+ O51	O25 Only	O51 Only
Patients M (466) / F (504)	970	547	322	101
Levels	2134 2.2 / Patient	1488	545	101
Mean EBL (cc)	53.0	53.4	36.4	60.4
Fusion	95%	94%	95%	98%

	OLIF
Vascular (L5/S1)	19 (1.9%)
Ileus	21 (2.2%)
Sympathetic Chain (Ipsilateral Warm Leg)	16 (1.6%)
Retrograde (SHP)	1 (0.1%)
Infection	0 (0.0%)
Neurological Injury (Permanent)	0 (0.0%)

Neuromonitoring



Key Structures



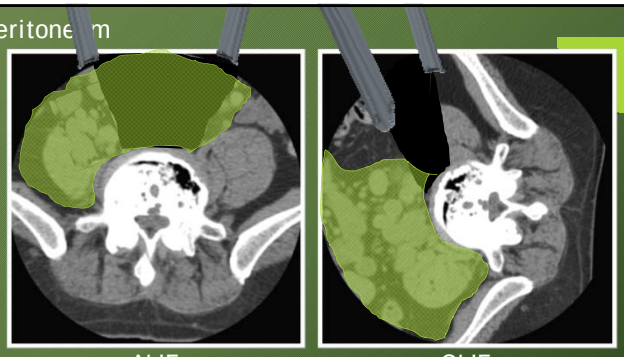
Peritoneum

- Contents Fall Anteriorly
- Posteriorly Directed Finger Will Skive Off Peritoneum.

Supine CT

Lateral CT

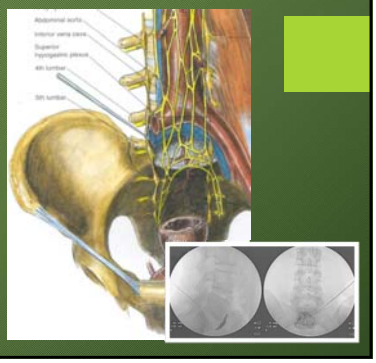
Peritoneum



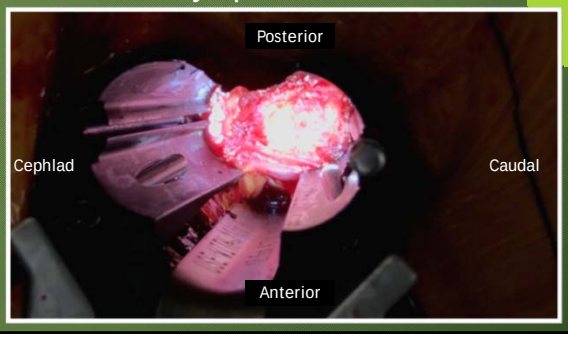
ALIF OLIF

Sympathetic Chain/SHP

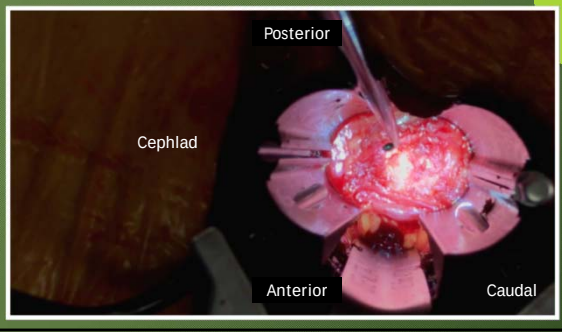
- Chain can be visualized and moved
- A blunt dilator or kittner may be used to move soft tissues
- A small percentage of patients may experience leg warmth and swelling



Visualization of Sympathetic Chain



Dissection of Sympathetic Chain



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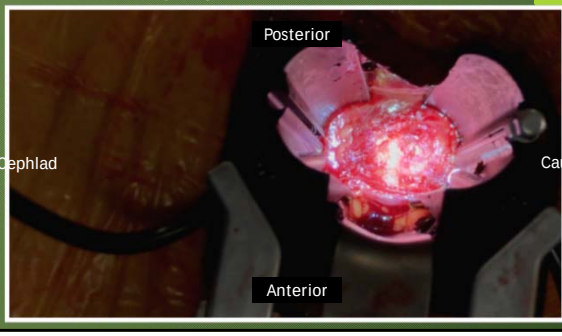
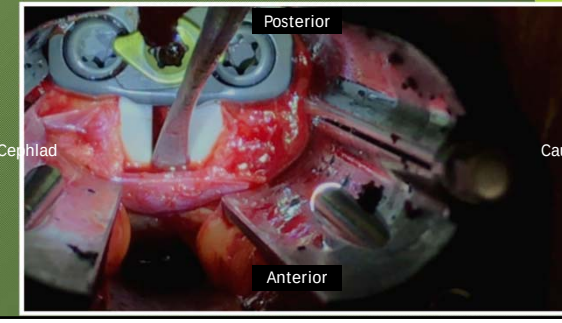
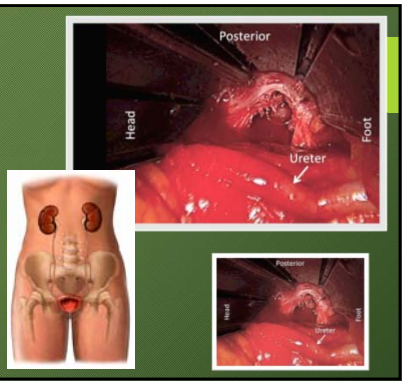


Visualization Post Cage/Plate Placement



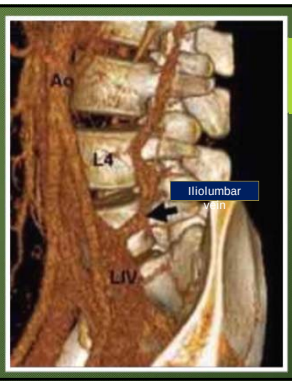
Ureter

- Kidney Should Be Evaluated Pre-op
- The Ureter Is Usually Attached To The Peritoneum
- Use Retractors To Directly Visualize Ureter



Vasculature – Iliolumbar Vein

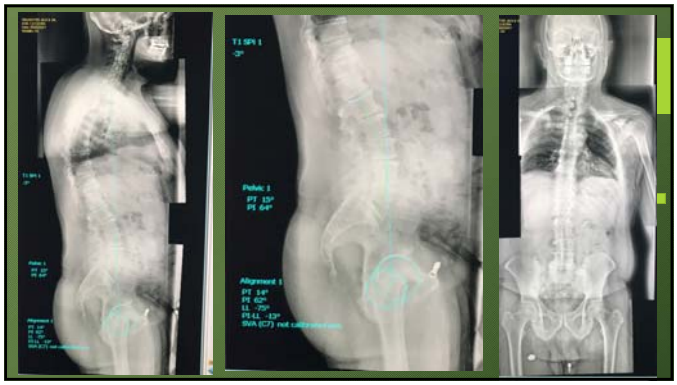
- Segmental Vessel - L5 VB
- Transitional Anatomy
- Direct Visualization

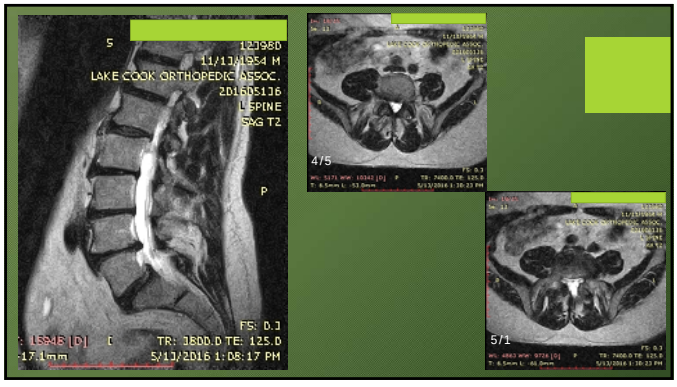


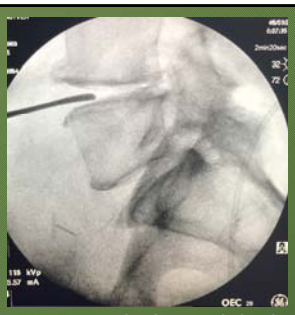
SELECTED CASES

L4/S1 Stenosis

- 63 y/o male – Retired Spinal Surgeon
- Bilateral Leg Radiculopathy
- Patient Wanted – L4/S1 Stand Alone OLIF with Anterior Decompression





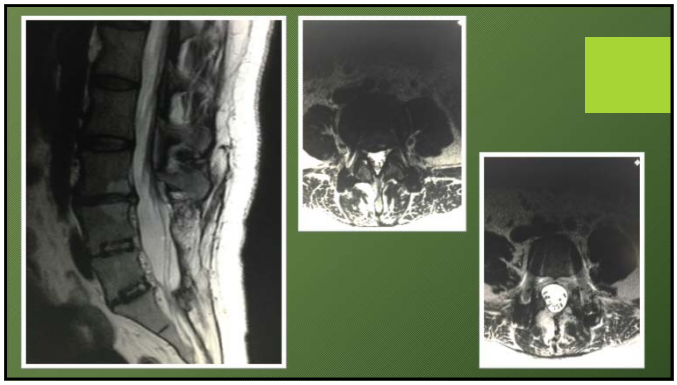


Increased Disc Height by 6mm at L4/L5 and 4mm at L5/S1

Post-Op

L3/L4 ASD

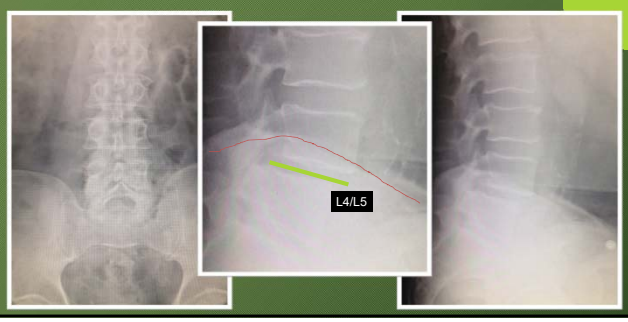
- 41 y/o Female with prior history of TLIF L4/S1
- Adjacent Level Degeneration L3/L4
- Surgical Plan – L3/L4 OLIF Using Pivox and Posterior Fusion with Decompression and Cortical Screw Fixation



L
L

RSN
LSN

DDD W/Spondy – L4/L5 (High Crest)



DDD W/Spondy – L4/L5 (High Crest)

DDD W/Spondy – L4/L5 (High Crest)

L4/S1 – Stenosis (Obese Patient)

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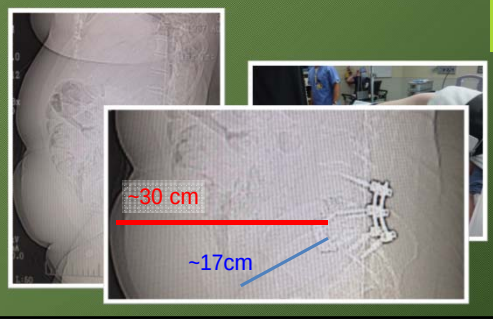
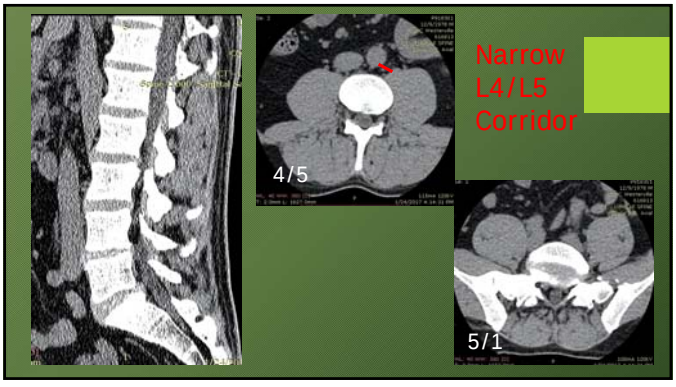


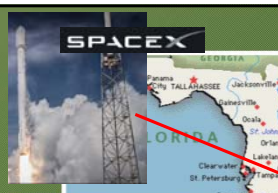
L4/S1 – Stenosis (Obese Patient)

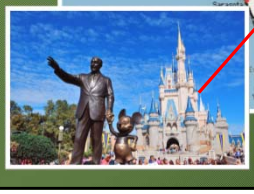
Anterior Access to L4/L5

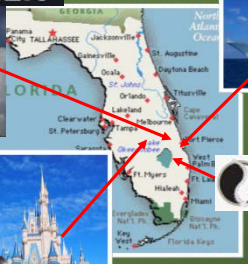


Narrow L4/L5 Corridor

Utilized Anterior Cage at L4/L5 Due to Narrow Corridor







Thank You!