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 B.A.C.K. Center Partner
The BACK Center
Melbourne, FL

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.
- **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’

Mayer

- Mini-Open in Semi-Lateral Position (30°)
- Access to L1/L5
- 812 Patients
- 3.7% Complication Rate (0.37% Neurologic & 0.37% Vascular)
Molloy
- Supine Anterior to Psoas -Mini-Open
- Access to L1/S1
- 64 Patients
- No Permanent Neurologic, Vascular or Visceral Injuries

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
Surgical Approaches to the Spine
34
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)

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

Rationale

OLIF Corridor – NO MUSCLE
Psoas View During Retractor Removal

Cephal

Caudal

OLIF L3/L4 with Lateral Pivox Plate

Rationale

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

Cadaveric: Femoral Nerve Distribution

Distribution by Zone

Zones (Moro)
Neurogram and Gross Anatomy

Neurogram with Retractor

Rationale
- Iliac Crest Avoidance
- Muscle Sparing (Corridor)
- Femoral Nerve Avoidance
- All Disc Levels in One Position
- Ergonomics
- Neuromonitoring
**OLIF**
- Access to above L3/L4?
- Mobilization of Great Vessels (SHP)
- Extensive Retroperitoneal Dissection

**LLIF**
- Access to L4/L5
- Neuronal Risk – Femoral Nerve
- Muscular Pain – Psoas
- No Access – L5/S1

**OLIF25** is a Different Procedure than OLIF51
- OLIF51 is Recommended with an Access Surgeon

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

Surgeon in Positive Sagittal Balance x 30 Year Career?
- Surgeon in Neutral Sagittal Balance x 30 Year Career?
Fluoroscopy remains stationary

Surgeon and Fluoro work at same time

Ergonomics / Working View

Surgeon & Fluoro See Disc Space Simultaneously

LLIF

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

Personal Experience

OLIF Current Overview

<table>
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<tr>
<th></th>
<th>Total</th>
<th>O25+</th>
<th>O25 Only</th>
<th>O51 Only</th>
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<tr>
<td>Patients</td>
<td>970</td>
<td>547</td>
<td>322</td>
<td>101</td>
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<tr>
<td>Levels</td>
<td>2134</td>
<td>1488</td>
<td>545</td>
<td>101</td>
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<td>Mean EBL</td>
<td>53.0</td>
<td>53.4</td>
<td>36.4</td>
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<tr>
<td>Fusion</td>
<td>95%</td>
<td>94%</td>
<td>95%</td>
<td>98%</td>
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<tr>
<td>Vascular (L5/S1)</td>
<td>19 (1.9%)</td>
<td></td>
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<tr>
<td>Ileus</td>
<td>21 (2.2%)</td>
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<tr>
<td>Sympathetic Chain (Ipsilateral Warm Leg)</td>
<td>16 (1.6%)</td>
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<tr>
<td>Retrograde (SHP)</td>
<td>1 (0.1%)</td>
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<tr>
<td>Infection</td>
<td>0 (0.0%)</td>
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<tr>
<td>Neurological Injury (Permanent)</td>
<td>0 (0.0%)</td>
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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 kitter may be used to move soft tissues
- A small percentage of patients may experience leg warmth and swelling

Visualization of Sympathetic Chain

Cephalad

Posterior

Anterior

Caudal
Dissection of Sympathetic Chain

Visualization Post Cage/Plate Placement

Cephalad

Posterior

Anterior

Caudal
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
L4/S1 – Stenosis (Obese Patient)

-30 cm

L4/S1 – Stenosis (Obese Patient)

-17 cm

L4/S1 – Stenosis (Obese Patient)
Utilized Anterior Cage at L4/L5 Due to Narrow Corridor

Thank You!