Minimally Invasive Scoliosis Surgery With Oblique Lateral Lumbar Interbody Fusion: Single Surgeon Feasibility Study

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Introduction
Spinal Fusion Approaches

The OLLIF Procedure
- OLLIF combines advantages of MIS lateral
- Fusion through 10mm incision
- Approach without direct visualization: Fluoroscopy & Electrophysiology
- Access disk via Kambin’s triangle

Study Objective: Can we achieve Minimally Invasive Scoliosis correction using OLLIF?

Surgical Technique

Left: Locating the incision point Right: (L to R) Probe, K wire, dilator, working tube, disk drill, rotating curette, ring curette, rongeur, cage insertion device.

Methods

<table>
<thead>
<tr>
<th>Levels</th>
<th>Count</th>
<th># Male</th>
<th>BMI</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
<td>3</td>
<td>26±7</td>
<td>68±13</td>
</tr>
<tr>
<td>2</td>
<td>13</td>
<td>10</td>
<td>30±5</td>
<td>72±11</td>
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<tr>
<td>3</td>
<td>12</td>
<td>10</td>
<td>29±9</td>
<td>66±12</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>3</td>
<td>30±13</td>
<td>72±7</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>1</td>
<td>34±0</td>
<td>72±0</td>
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<tr>
<td>6</td>
<td>2</td>
<td>2</td>
<td>27±5</td>
<td>73±19</td>
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</table>

- Retrospective Cohort Study
- Inclusion: Cobb angle >7°
- Indications: lumbar/lumbosacral scoliosis, spondyloarthropathy, degenerative disc disease, foraminal stenosis
- Exclusion: osteogenic spinal stenosis, bony obstruction, large facet hypertrophy, Grade II listhesis,
- 6 month follow-up for imaging, Oswestry, pain scale

1. Approach aided by A/P and Lat Fluoro + Electrophysiology
- Enter a 8mm blunt canulated probe through an incision on posterior axillary line.
- Walk probe along the rib inside the pleural space and position on disk of interest
- Insert K-wire into disk space and working tube over K-wire, creating sealed access to disk space

2. Discectomy performed through working tube
- Remove disk material with drill, rotating curette, ring curette, and rongeur
- Prepare endplates by dilating rotating curette
- Pack disk space with Tricalcium Phosphate soaked in autologous bone marrow aspirate

3. Cage entry
- Insert cage over K-wire under bidplanar Fluoroscopic monitoring
- Enter space into disk space
- Remove insertion devices, suture pleural space

4. Perform MI Posterior Pedicle Screw Fixation

Perioperative Results

<table>
<thead>
<tr>
<th># Levels</th>
<th># Patients</th>
<th>Blood Loss (ml)</th>
<th>OR Time (min)</th>
<th>Fluoro Time (s)</th>
<th>Hospital Stay (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
<td>116±215</td>
<td>62±40</td>
<td>133±107</td>
<td>3±1.7</td>
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<tr>
<td>2</td>
<td>13</td>
<td>83±73</td>
<td>74±23</td>
<td>374±92</td>
<td>2.6±0.5</td>
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<tr>
<td>3</td>
<td>12</td>
<td>178±103</td>
<td>158±128</td>
<td>599±250</td>
<td>3.3±0.9</td>
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<tr>
<td>4</td>
<td>4</td>
<td>210±152</td>
<td>154±25</td>
<td>594±462</td>
<td>3±0.5</td>
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<tr>
<td>5</td>
<td>1</td>
<td>256±60</td>
<td>157±10</td>
<td>810±40</td>
<td>7±0</td>
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<tr>
<td>6</td>
<td>2</td>
<td>760±622</td>
<td>177±30</td>
<td>330±324</td>
<td>4±0</td>
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</tbody>
</table>

Ambulation
12h Post op: 25% 24h Post op: 96%

Cobb Angle
(49/49 patients) (Pre) 13.1±7.3°

Oswestry
(33/49 patients) (Pre) 54±11%

10 Point Pain
(33/49 patients) (Pre) 8.1 ± 1.7

(6mo)7.6±6.0° (p<0.001)

(6mo) 32±22% (p<0.001)

(6mo) 3.7±2.8 (p<0.001)

Complications

Infections 0 cases
Nerve irritation [mild] 3 cases improved within months
Nerve irritation [moderate] 2 cases continuing weakness 4/5

Radiographic Outcomes
(N= 19/49 patients)

- Interbody Fusion 100%
- Postlateral Fusion Right 70.8%
- Postlateral Fusion Left 75%
- Screw Loosening 9.8%
- Screw Breach 4.9%

Conclusion: MIS Scoliosis correction using OLLIF is safe, efficient, and efficacious