Risk factors for development of adjacent segment disease after minimally invasive transforaminal interbody fusion

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Minimally invasive transforaminal interbody fusion using percutaneous pedicle screws (MIS-TLIF, PPS) is becoming popular in Japan.
As this is a relatively new procedure, there is little information about complications such as adjacent segment disease (ASD).

The purpose of this study was to identify the risk factors for ASD after MIS-TLIF, PPS.

Eurospine 2015 (Copenhagen)
Patients and Methods

74 patients

• L4/5 single-level MIS-TLIF, PPS
• 38 male, 36 female
• 62.4 y (range 25-80)
• 752.8 days (range 366-1824)

Radiographic ASD

• Development of spondylolisthesis > 3 mm
• Decrease in disc height > 3 mm
• Intervertebral angle at flexion of less than –5°

Okuda S, Spine, 2004

ASD 5 (7.2%), non-ASD 69 cases

Eurospine 2015 (Copenhagen)
## Results

<table>
<thead>
<tr>
<th></th>
<th>ASD (5)</th>
<th>non-ASD (69)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yr)</td>
<td>66.8 ± 11.2</td>
<td>60.6 ± 13.4</td>
<td>0.34</td>
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<tr>
<td>Follow-up (days)</td>
<td>1128.8 ± 519.2</td>
<td>745.2 ± 370.5</td>
<td>0.22</td>
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<tr>
<td>JOA score improvement</td>
<td>76.9 ± 20.5</td>
<td>85.6 ± 20.4</td>
<td>0.5</td>
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<tr>
<td>post-ope CPK elevation</td>
<td>578 ± 174</td>
<td>654 ± 523</td>
<td>0.45</td>
</tr>
<tr>
<td>Disc degeneration (+/-)</td>
<td>cranial 2/3</td>
<td>18/51</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>caudal 3/2</td>
<td>26/43</td>
<td>0.32</td>
</tr>
<tr>
<td>PS angle **</td>
<td>25.8 ± 5.1</td>
<td>23.9 ± 3.4</td>
<td>0.51</td>
</tr>
</tbody>
</table>

* Pfirrmann grade 3-5 were defined as disc degeneration plus.

** Average of 4 pedicle screw (PS) angle was compared.
Results

Lumbar lordosis (LL)

\[ \Delta LL = 0.3 \quad p = 0.048 \]

\[ \Delta LL = -5 \]

Segmental lordosis (SL)

\[ 14.2^\circ \]

Disc height

\[ (a+b+c)/3 \]

\[ (a+b+c)/3 \]

Eurospine 2015 (Copenhagen)
65y, M

MIS-TLIF, PPS

post-OP 2y
rt. lumbar pain

XLIF, PPS

LL 44 → 38°
SL 17 → 14°

Eurospine 2015 (Copenhagen)
Risk factors for ASD

- Gender
- Age
- Decreased lumbar lordosis
- Disc degeneration
- Excessive distraction of disc space

In this study, risk factors for ASD after MIS-TLIF, PPS were decreased lumbar lordosis and small post-OP segmental lordosis, indicating decent lordosis needs to be gained during MIS-TLIF, PPS.

Sears WR, Spine J, 2011
BL Chen, Eur Spine J, 2011
Kaito T, J Neurosurg Spine, 2010

Eurospine 2015 (Copenhagen)
Frequency of ASD increase over time

(years) | %  | Reference
-------|-----|-------------------------
10     | 61.4 % | Hayashi H, *Spine*, 2015
5.5    | 46.8 % | Hayashi T, *Fukuoka Acta Med*, 2008
3.6    | 33 %   | Okuda S, *Spine*, 2004
3.2    | 46.6 % | Kaito T, *Rinsho Seikeigeka*, 2008
2.0    | 7.2 %  | Ono K, *Eurospine 2015*
0      | Lumbar fusion surgery

Further follow up is needed to elucidate the true frequency of ASD after MIS-TLIF, PPS.

*Eurospine 2015 (Copenhagen)*
COI disclosure Information

None of the authors have any potential conflict of interest.