PREOPERATIVE RETROLISTHESIS IS A RISK FACTOR OF LUMBAR DISC HERNIATION AFTER FENESTRATION WITHOUT DISCECTOMY

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Purpose

To identify risk factors of **Post-Decompression Lumbar Disc Herniation (PDLDH)**

Background

To treat lumbar canal spinal stenosis (LSS) without instability or anterolisthesis, fenestration is a widely accepted procedure, but some patients experience the recurrence of acute lower limb pain in the relatively early postoperative period. Revision surgery is sometimes required.
Reason for revision

In previous reports, disc herniation is the first or second reason for revision surgery, but the predictors have not been identified.

We hypothesized that identifying risk factors could avoid revision surgery at the same level, which are often complicated and even risky.

- Acute lower limb pain within 2 years after surgery
- New herniated discs
- MRI findings consistent with acute lower limb pain

Eule JM, Surg Neurol 1999
Yuzawa Y, Arch Orthop Trauma Surg 2011
Hopp E, Clin Orthop Relat Res 1988
Herno A, Spine 1993
Tuite GF, J Neurosurg 1994
Total 493 pts

2007 – 2012, 326 men & 167 women
69.7 years

112 pts excluded

381 pts

62 pts recurrent limb pain, other etiology

319 pts

301 pts Candidates for Control group (C group)

H group, N=18

C group, N=90
The control group was selected based on sex, decompression level, age, No. of decompression levels and operation day. This selection method was not arbitrary and reduced confounding factors as much as possible.

**Selection of C group**

Clinical parameter

- Body mass index (BMI)
- Diabetes mellitus (DM)
- Operating time per 1 level
- Blood loss per 1 level
- No. of decompression levels
- Preoperative Japanese Orthopaedic Association (JOA) score for evaluating neurological status (maximum score 29 points)
Radiographic Evaluation – Plain radiography

- Lateral slip (mm)
- Disc wedging angle (°)
- Percent slip (%)
- Intervertebral angle
- ROM (°)
- Lumbar lordosis (°)

Freedman B, Spine 2009
Blumenthal C, J Neurosurg Spine 2013
Dupuis P, Spine 1985
Disc height (mm)  Facet angle (°)  Facet degeneration  Extent of facet removal (%)

Disc degeneration - Pfirrmann classification

Grade III - V

Vertebral endplate degeneration - Modic change

Type I - III

Grade 0 - 3

Type I

T1 low

Grade V

14.0 mm

T2 high
The demographics, CT & MRI evaluation were compatible in both groups. Patients in the H group were more likely to have preoperative retrolisthesis and lower lumbar lordosis compared to those in the C group.

<table>
<thead>
<tr>
<th></th>
<th>Herniation group N=18</th>
<th>Control group N=90</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP lateral slip (mm)</td>
<td>0.6</td>
<td>0.5</td>
<td>0.336</td>
</tr>
<tr>
<td>AP disc wedging angle (°)</td>
<td>1.5</td>
<td>1.1</td>
<td>0.285</td>
</tr>
<tr>
<td>Percent slip (flex, %)</td>
<td>-2.8</td>
<td>1.0</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Percent slip (neutral, %)</td>
<td>-6.0</td>
<td>-1.2</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Percent slip (ext, %)</td>
<td>-8.0</td>
<td>-2.2</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Intervertebral angle (flex, °)</td>
<td>1.7</td>
<td>0.4</td>
<td>0.064</td>
</tr>
<tr>
<td>Intervertebral angle (neutral, °)</td>
<td>7.6</td>
<td>6.4</td>
<td>0.137</td>
</tr>
<tr>
<td>Intervertebral angle (ext, °)</td>
<td>10.1</td>
<td>8.4</td>
<td>0.060</td>
</tr>
<tr>
<td>Intervertebral ROM (°)</td>
<td>8.4</td>
<td>7.8</td>
<td>0.510</td>
</tr>
<tr>
<td>Lumbar lordosis at L1-S1 (°)</td>
<td>30.8</td>
<td>36.4</td>
<td>0.044</td>
</tr>
</tbody>
</table>
Results – Multivariate analysis

We selected 5 variables as potential predictors according to the univariate analyses. Percent slip at extension was the sole significant independent risk factor of PDLDH.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>P-value</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent slip at extension</td>
<td>0.0001</td>
<td>1.36 (1.17-1.58)</td>
</tr>
</tbody>
</table>

ROC curve

Retrolisthesis at extension

Cut-off value 7.2% ≈ 3mm
Discussion

Forward –

supraspinous & interspinous ligaments

Backward –

facet, disc, spinous process

Given that the intervertebral discs contribute to restricting backward bending, it may be suggested that the H group patients preoperatively had a weak disc that could not work as a restraint of backward bending anymore because they developed retrolisthesis.

Therefore, the spinous processes could compensate for resisting backward bending.

Heuer F, J Biomech 2007
Gillespie KA, Spine 2004
Hartmann F, Arch Orthop Trauma Surg 2012
Lee MJ, Spine 2010
Tai CL, BMC Musculoskel Disord 2008
Zander T, Eur Spine J 2003
Adams MA, Spine 1988
Hypothesis

Preexistence of a weak disc

+ 

Removal of the posterior elements

Disc herniation
Conclusions

PDLDH relatively common and undesirable

Preoperative retrolisthesis  the sole risk factor

The cut-off value  7.2% retrolisthesis

Removing the posterior elements  may not be suitable to prevent PDLDH

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COI Disclosure

Name of presenter: Shota Takenaka

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