SPONTANEOUS REDUCTION TECHNIQUE
OF MODERATE TO HIGH GRADE SPONDYLOLISTHESIS
VIA MINIMALLY INVASIVE, MINI-OPEN POSTERIOR LUMBAR INTERBODY FUSION

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The purpose of this study was to achieve the safe and easy technique for minimizing the neurologic deterioration and maximizing the reduction of spondylolisthesis using mini-open, posterior-lumbar interbody fusion under circumferential releasing technique.

**PURPOSE**

The purpose of this study was to achieve the safe and easy technique for minimizing the neurologic deterioration and maximizing the reduction of spondylolisthesis using mini-open, posterior-lumbar interbody fusion under circumferential releasing technique.

**MATERIALS AND METHODS**

<table>
<thead>
<tr>
<th>Materials</th>
<th>54 cases / Mean age (60.19 years) / Mean follow-up period (32.67 months)</th>
</tr>
</thead>
</table>

**Slippage Grade: Spondylolisthesis**

<table>
<thead>
<tr>
<th>Grade II</th>
<th>Grade III</th>
<th>Grade IV</th>
<th>The mean rate of slippage</th>
</tr>
</thead>
<tbody>
<tr>
<td>25~49%</td>
<td>50~74%</td>
<td>~75%</td>
<td>45.85%</td>
</tr>
<tr>
<td>37 cases</td>
<td>14 cases</td>
<td>3 cases</td>
<td></td>
</tr>
</tbody>
</table>
MATERIALS AND METHODS

Operation

- Mini-open, posterior-lumbar interbody fusion
- Epidural anesthesia
- Rimmed screw head type percutaneous screw system: Apollon System (Solco Medical)
  - Advantage of facilitating spontaneous reduction during rod insertion.

Circumferential Releasing Technique

1. Intraoperative Postural Reduction Position
2. Facet Joint Mobilization
3. Segmental Mobilization: Wide distraction of restricted disc space: Rimmer distractor
4. Increasing Lumbar Lordotic Angle
   - Pressure compression and rod compression during rod tightening
   - Rimmed head type screw with percutaneous rod system
5. Increasing Segmental Lordotic Angle: angled lumbar interbody fusion cage

Clinical Result

- visual analogue scale (VAS)
- Oswestry Disability Index
- Postoperative neurological complications

Radiological Result

- Degree of slippage reduction
- Degree of disc height restoration
CIRCUMFERENTIAL RELEASING TECHNIQUE

1. Postural Reduction Position

2. Facet Joint Mobilization

3. Segmental mobilization

4. Increasing Lumbar Lordotic Angle
   Rimmed Type Screw Head Percutaneous Transpedicular Screw Fixation System: Apollon System

5. Increasing Segmental Lordotic Angle
## RESULT

### Clinical Result

<table>
<thead>
<tr>
<th></th>
<th>Preoperative</th>
<th>Postoperative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VAS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Back</td>
<td>6.28</td>
<td>1.85</td>
</tr>
<tr>
<td>Leg</td>
<td>7.83</td>
<td>1.41</td>
</tr>
<tr>
<td>Oswestry Disability Index</td>
<td>68.38</td>
<td>16.46</td>
</tr>
</tbody>
</table>

### Radiological Result

<table>
<thead>
<tr>
<th></th>
<th>Preoperative</th>
<th>Postoperative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree of Slippage</td>
<td>45.85%</td>
<td>9.35%</td>
</tr>
<tr>
<td>Degree of Disc Space</td>
<td>5.37mm</td>
<td>12.15mm</td>
</tr>
</tbody>
</table>

### Postoperative Complications

- **Definitive Motor Weakness:** 0 case (0%)
- **Transient, Mild Motor Weakness:** 2 cases (3.70%)
- **Transient, Sensory Change:** 4 cases (7.41%)
- **Instrument failure or Fusion Failure:** 0 case (0%)
Relative stretching of the cauda equina over the posterosuperior border of the sacrum can be found in all patients who have Grade-III or IV spondylolisthesis at the lumbosacral junction.

- We identified twelve patients, all less than eighteen years old, who had cauda equina syndrome after in situ arthrodesis for Grade-III or IV lumbosacral spondylolisthesis.
- In addition, posterior insertion of instrumentation and reduction of the lumbosacral spondylolisthesis should be considered.

The loss of lordosis in the instrumented segments not only may affect the adjacent segments, but also the load on the posterior spinal implant may increase.

- With a loss of lumbar lordosis in the instrumented segments, the tension in the anterior soft tissue structures may be diminished, thus increasing the compressive load on the posterior implant and its interface with the vertebrae.
DISCUSSION

CIRCUMFERENTIAL RELEASING TECHNIQUE


- Slip reduction is based on circumferential release.
  - **Posterior Release:** Total resection of the scar around the pars interarticularis: liberated the nerve roots.
  - **Anterior Release**
    - The disc was thoroughly disc resection
    - the disc space was gradually distracted and thoroughly released with **sequential disc shavers**
      : until rupture of anulus conjunct with anterior longitudinal ligament.
  - **Circumferential release:** the slipped vertebrae; tend to obtain **spontaneous reduction**.
  - **Circumferential release:** contributes to achieving spontaneous slip reduction partially: **low-grade isthmic spondylolisthesis**.

- During the maneuver, due to circumferential release, it could be found that the slipped vertebrae tended to obtain partial spontaneous reduction, and furthermore, with the following pedicle screw fixation, **additional reduction** would be achieved without any application of posterior translation force.
- Spontaneous reduction: There were no compressed neural elements.

A. **Isthmic spondylolisthesis** of grade II
B. expand and release the disc space with sequential disc shavers
C. anulus conjuncted with ALL is ruptured and the vertebral body tends to obtain partial reduction Spontaneously.
Reduction of Spondylolisthesis: Meyerding Grade II: L4-5
CASES

Reduction of Spondylolisthesis: Meyerding Grade II: L5-S1
Reduction of Spondylolisthesis: Mayerding Grade III
Reduction of Spondylolisthesis: Mayerding Grade IV
According to the results, we could obtain maximal reduction of spondylolisthesis under minimal neurologic deterioration in the cases of a moderate to high grade of spondylolisthesis using the circumferential segmental releasing technique.