Thoracic or lumbar spinal surgery in patients with Parkinson’s disease -A two-center experience of 32 cases-

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Introduction

• Parkinson’s disease (PD) is a degenerative disorder of the central nervous system that occurs in an older population.

• Previous studies reported the high complication rate of spinal surgery in patients with PD because of their poor bone quality and severe neuromuscular disorders.

• Because the data concerning spinal surgery in PD patients are inadequate there is no consensus as to the guidelines for surgical treatment for them.

• We retrospectively performed radiological assessments of 32 PD patients who had underwent thoracic or lumbar spinal surgery in 2 institutions.
Objective

We performed radiological assessments of 32 PD patients who had underwent surgery for lumbar canal stenosis, skeletal deformity, or fracture-related disorders to show the complications which frequently occur in lumbar surgery in PD patients.
Patients and Methods

Patients:
• Patient number: 32 (10 men and 22 women)
• Age at the time of the surgery: 70 years old (56-78)
• The duration of PD treatment: 4.4 years
• Postoperative follow-up periods: 2.4 years (1-6)
• Diagnosis
  Lumbar spinal canal stenosis (LCS): 12 patients
  Spinal deformity (SD): 11 patients
  Fracture-related disorders (FD): 9 patients

Evaluation:
• Implant-related complications
  cage-related complications, pedicle screw (PS) pullout, rod fracture
• Postoperative vertebral fracture
• Sagittal balance using the sagittal vertical axis (SVA) and L1-S1 angle (LL)
<table>
<thead>
<tr>
<th>Operation</th>
<th>LCS(12)</th>
<th>SD(11)</th>
<th>FD(9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laminectomy</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>PLIF, TLIF</td>
<td>11</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Posterior fusion with PSO</td>
<td>-</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Posterior fusion without PSO</td>
<td>-</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Combined ant. and post. fusion</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Percutaneous vertebroplasty</td>
<td>-</td>
<td>-</td>
<td>2</td>
</tr>
</tbody>
</table>

PLIF, posterior lumbar inter body fusion; TLIF, transforaminal lumbar interbody fusion; PSO, pedicle subtraction osteotomy.
### Results

#### Postoperative complications

<table>
<thead>
<tr>
<th></th>
<th>LCS(12)</th>
<th>SD(11)</th>
<th>FD(9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implant-related</td>
<td>1 (8.3%)</td>
<td>5 (45.4%)</td>
<td>4 (44.4%)</td>
</tr>
<tr>
<td>complications</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cage sinking or</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>migration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PS pullout</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Rod fracture</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Postoperative</td>
<td>1 (8.3%)</td>
<td>3 (27.2%)</td>
<td>3 (33.3%)</td>
</tr>
<tr>
<td>Vertebral fracture</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PS pullout and cage-related complications occurred at the lower instrumented segments.
## Results

### Postoperative sagittal balance

<table>
<thead>
<tr>
<th></th>
<th>LCS(12)</th>
<th>SD(11)</th>
<th>FD(9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoperative LL &lt; 0° or SVA &gt; 100mm</td>
<td>0</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Progression of kyphosis</td>
<td>1 (8.3%)</td>
<td>6 (54.5%)</td>
<td>6 (66.7%)</td>
</tr>
<tr>
<td>ΔLL &gt; 20° or ΔSVA &gt; 100mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alignment maintained</td>
<td>6 (50%)</td>
<td>3 (27.3%)</td>
<td>3 (33.3%)</td>
</tr>
<tr>
<td>ΔLL &lt; 5° or ΔSVA &lt; 30mm</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ΔLL = LL immediately after surgery – LL at the recent follow-up  
ΔSVA = SVA at the recent follow-up – SVA immediately after surgery
Discussion

• Previous studies reported the high rate of complications and reoperation.

• Twelve of 14 patients required additional surgery, undergoing 31 reoperation. Patients who were treated with single-level fusion avoided reoperation, and all patients who underwent decompression surgery went on to failure.

  Babat et al. Spine 2004

• 52.2% and 33% of 23 PD patients with sagittal imbalance had surgical complications and revision surgery, respectively.

  Koller et al. Eur Spine J 2010

• Twelve PD patients with deformities were treated with posterior spinal fusion from T2-pelvis, although 6 patients underwent revision surgery.

In our series

- Four patients underwent reoperations.
  - 2 in LCS: cage migration and late infection,
  - 1 in SD: rod fractures
  - 1 in FS: the progression of kyphosis after vertebroplasty
- The rate of complications and postoperative progression of kyphosis were high in SD and FD.
- Rod fractures in 2 patients occurred at the PSO site.
- Implant failures and postoperative vertebral fracture which frequently occurred at the caudal site cause the progression of kyphosis.
- All 4 patients using iliac screw fixation maintained sagittal balance.
78 year-old men in FD underwent posterior corrective surgery with PSO. The vertebral fracture and PS pullout occurred within 6 months after surgery.

77 year-old men in FD underwent posterior corrective surgery with PSO. The rod fracture occurred at the PSO site 2 months after surgery.

69 year-old men in SD underwent posterior corrective surgery with PLIF and iliac screws. Sagittal balance maintained after a year after surgery.
Conclusions

• We retrospectively performed radiological assessments of 32 PD patients who had underwent surgery for lumbar canal stenosis, skeletal deformity, or fracture-related disorders.

• The rate of complications and postoperative progression of kyphosis were high in SD and FD.

• Implant failures and postoperative vertebral fracture which frequently occurred at the caudal site cause the progression of kyphosis.
Disclosure declaration

None of the authors has any potential conflict of interest