Temporary Pedicle Screw Fixation Without Augmentation For Thoracolumbar Burst Fractures

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Short-segment pedicle screw instrumentation for thoracolumbar burst fractures

Merit

• Reduce the fracture(alignment) over a short segment
• Restore canal dimension and vertebral body height

Demerit

• Early failure
• Posterior instrumentation alone : insufficient structural support ?
Patients and Methods

Thoracolumbar Burst Fractures
24 consecutive patients
September 2006 ~ August 2011
Male: 18 Female: 6
Mean age at operation 43 y.o. (20-66)

Time to surgery
0~9 days (mean 3.3)

Level of Injury
T11: 1
T12: 5
L1: 7
L2: 8
L3: 3
Radiographic measurement

**Superior-inferior endplate angle (SIEA)**
Angle between lines A and D

**Vertebral body angle (VBA)**
Angle between lines B and C

Cobb technique
**Surgical technique**

Indirect reduction by ligamentotaxis and pedicle screw fixation

**Shanz screws**
(AO Universal Spine System)

No anterior augmentation! No bone Graft!

**Postoperative management**

Immobilization in a custom-molded thoracolumbosacral brace at least 3 months

**Implant removal:**
around 1 year (11 ~ 16 months) after operation

Temporary pedicle screw fixation
Operation

Mean operating time : 100min (70-158)
Mean blood loss : 131ml (10-420)

Complications

Postoperative infection : 0
Iatrogenic neurologic deficit : 0
Breakage of pedicle screw : 1 (Φ 5mm screw)

All patients had union of fractured vertebra
No additional surgery
Load sharing classification

- 5point : 2
- 6point : 6
- 7point : 6
- 8point : 8
- 9point : 2

7 and over: 16 cases (67%)
Mean score: 7.2 points

McCormack T et al. The road sharing classification of spine fractures. Spine 1994

Neurological recovery

<table>
<thead>
<tr>
<th>Pre</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
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<td>B</td>
<td>2</td>
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<td>E</td>
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<td>13</td>
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</table>

All patients with neurologic deficit had at least one grade recovery

ASIA grade (n=24)
### Superior-inferior endplate angle (SIEA)

<table>
<thead>
<tr>
<th></th>
<th>Pre-op</th>
<th>Post-op</th>
<th>Pre removal</th>
<th>Final F/U</th>
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</thead>
<tbody>
<tr>
<td>13°</td>
<td>1°</td>
<td>3.2°</td>
<td>10.8°</td>
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</table>

Total correction loss **9.8°**

### Vertebral body angle (VBA)

<table>
<thead>
<tr>
<th></th>
<th>Pre-op</th>
<th>Post-op</th>
<th>Pre removal</th>
<th>Final F/U</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.3°</td>
<td>6.5°</td>
<td>7.0°</td>
<td>7.2°</td>
<td></td>
</tr>
</tbody>
</table>

Total correction loss **0.7°**
Case: 56 y.o. Male

Preop

Postop

1 year after removal

Load sharing classification

9 points

Comminution: 3
Apposition: 3
Deformity: 3 (Kyphotic correction 17°)
Factors contributed to the success of this surgical procedure

**Materials** *(Stainless Steel vs Titanium)*

<table>
<thead>
<tr>
<th>Material</th>
<th>Ultimate tensile strength (MPa)</th>
<th>Young's(tensile) modulus of elasticity (GPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stainless Steel 696</td>
<td>696</td>
<td>207</td>
</tr>
<tr>
<td>Titanium 10% vanadium</td>
<td>1193</td>
<td>109.6</td>
</tr>
</tbody>
</table>

**Diameter of screws**

7mm or 6mm even when **pedicle expansion** is necessary

**Preservation of posterior column**

No laminectomy, No laminotomy! Even with neurologic deficit
Correction loss including adjacent discs: Large
Correction loss fractured vertebra only: Little

Postoperative kyphotic change (correction loss)
⇐ Loss of disc height
⇐ (Overcorrection?)

Injury of adjacent discs

Inevitable!

Limitation of this surgical procedure?
Conclusion

• Surgical results of temporary short-segment pedicle screw fixation for thoracolumbar burst fractures were satisfactory.

• Reduction and maintenance of the fracture was successful but kyphotic change occurred due to loss of disc height.

• As injury of adjacent discs is inevitable, minor kyphotic deformity may be unavoidable.

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