Optimizing pedicle subtraction osteotomy techniques: a new reduction instrument to increase technical safety and angular reduction efficiency

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Background

- Sagittal balance analysis has changed our strategic approach to degenerative spine pathologies

- Corrective surgeries such as Pedicle Subtraction Osteotomy (PSO) are performed more frequently
Introduction

- PSO can be performed by emptying the vertebral body (eggshell) or by resecting a chevron through pedicles and vertebral body (VB)
- The main technical issue is closure of osteotomy line without losing correction
- Other technical issues: listhesis, VB collapse
Usual PSO closure technique
Study purpose

• Present a new reduction instrument optimizing PSO closure technique in a series of patients treated for major sagittal imbalance
Materials and Methods

- 3 European University Hospitals
- 17 consecutive patients with major sagittal imbalance needing a PSO + long fusion
- Correction angle measured at PSO level after reduction with the new plier
- Global balance parameters measured for each patient
New reduction plier
Kinetics of the reduction plier

- The new reduction plier has 3 articulations that allow to control the closure angle through rotation of the pedicle screws around the anterior vertebral wall hinge.
Results

- Mean vertebral correction angle at PSO: **31 degrees** (range 25°-45°)
- No intra-operative loss of correction or listhesis
- Global pelvic & balance values were all improved:

<table>
<thead>
<tr>
<th></th>
<th>Pre-op (mean, degrees)</th>
<th>Post-op (mean, degrees)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pelvic Tilt (PT)</td>
<td>31.4</td>
<td>23.8</td>
<td>&lt;0.0009</td>
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<tr>
<td>Sacral Slope (SS)</td>
<td>25</td>
<td>32.6</td>
<td>&lt;0.0009</td>
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<tr>
<td>L1-S1 Lordosis (LL)</td>
<td>19.4</td>
<td>54.8</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Spino-Sacral Angle (SSA)</td>
<td>122.8</td>
<td>128.5</td>
<td>0.0547</td>
</tr>
</tbody>
</table>
Example

37° correction angle at L4

Preop

Postop
Conclusion

• The new reduction plier efficiently and safely closes PSO

• Average correction of 31° (25-45), more than reported in the literature

• No vertebral collapse, no loss of correction, no listhesis
Relevant references

