Biomechanical Evaluation of a Novel Posterior Integrated Clamp that Attaches to an Existing Posterior Instrumentation for Use in Thoracolumbar Revision

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OBJECTIVE: This study aimed to evaluate the biomechanics of the REVERE® ADDITION® posterior integrated clamp (IC) that extends on an already implanted construct in comparison to a single long continuous bilateral pedicle screw (BPS) and rod stabilization system.

METHOD: Six osteoligamentous T12-L5 calf spines were tested on a spine motion simulator by varying the ratio between the BPS and IC in the following configurations: intact, four-level constructs (T13-L4), three-level constructs (L1-L4), and two-level constructs (L2-L4). A load control protocol of 8Nm moments was applied at a rate of 1°/sec to establish the range of motion value for each construct in flexion-extension, lateral bending, and axial rotation. Statistical analysis was performed on raw data using repeated measures analysis of variance and significance was set at P < 0.05.
RESULTS:

- On average, the reduction in motion for the four-level continuous pedicle screw and rod construct (67%) was similar to that for constructs extended with the REVERE® ADDITION® integrated clamps (64%).
- Furthermore, for three-level and two-level constructs, no significant difference in range of motion was observed between continuous pedicle screw constructs and those revised with the REVERE® ADDITION® integrated clamps (regardless of the ratio between BPS and IC).

CONCLUSION:

In this study, the REVERE® ADDITION® posterior integrated clamps showed equivalent biomechanical rigidity to continuous pedicle screw rod constructs in revision scenarios.

### Four-Level Surgical Constructs

(A) Bilateral pedicle screw (BPS) T13-L4, (B) BPS L3-L4+IC T13-L3, (C) BPS L2-L4+IC T13-L2, and (D) BPS L1-L4+IC T13-L1.

<table>
<thead>
<tr>
<th>Loading Condition</th>
<th>Intact</th>
<th>BPS T13-L4</th>
<th>BPS L3-L4+IC T13-L3</th>
<th>BPS L2-L4+IC T13-L2</th>
<th>BPS L1-L4+IC T13-L1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexion-extension</td>
<td>100±17</td>
<td>18±9</td>
<td>19±7</td>
<td>27±8</td>
<td>24±4</td>
</tr>
<tr>
<td>Lateral bending</td>
<td>100±20</td>
<td>29±6</td>
<td>28±8</td>
<td>36±9</td>
<td>36±8</td>
</tr>
<tr>
<td>Axial rotation</td>
<td>100±9</td>
<td>53±6</td>
<td>49±11</td>
<td>58±3</td>
<td>52±7</td>
</tr>
</tbody>
</table>

Values are presented as mean±standard deviation.
ROM, range of motion; BPS, bilateral pedicle screw; IC, integrated clamp.

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