Artificial Disc Replacement Combined With Fusion versus Two-Level Fusion in Cervical Two-Level Disc Disease with 5 Years Follow-up

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Disclosure declaration

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In 2-level cervical disc disease with insufficient cervical motion at one level, hybrid surgery (HS) consisting of cervical artificial disc replacement (C-ADR) at the mobile level, combined with anterior cervical discectomy and fusion (ACDF) at the spondylotic level, may be a reasonable alternative to 2-level ACDF.
Purpose

• In the previous study* with 2 years f/up, HS is superior to 2-ACDF in terms of better neck disability index recovery, less postoperative neck pain, faster C2–C7 range of motion recovery, and less adjacent ROM increase.

• The purpose of this study was to compare the long-term (5 years) clinical and radiologic outcomes of hybrid surgery and 2-level ACDF in patients with 2-level cervical disc disease.

Materials & Methods

• 40 patients undergoing 2-level cervical disc surgery
  – between 2004 and 2006
  – 2 consecutive level disc disease between C3/4 and C6/7
  – either a radiculopathy or myelopathy
  – no response to conservative treatment for >6 weeks.
  – 20 patients of the HS group
  – 20 patients of the 2-ACDF group
  – follow-up for 5 years

• Neck disability index (NDI) and grade their pain intensity before surgery and at routine postop intervals of 1, 2, 3, 4, and 5 years.
• Dynamic flexion and extension lateral cervical radiographs
• The angular ROM for C2-C7 and adjacent segments were measured using the Cobb method.
### Demographic data

<table>
<thead>
<tr>
<th></th>
<th>2-ACDF</th>
<th>HS</th>
<th>P-value *</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cases</strong></td>
<td>Preop</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td>(male %)</td>
<td>60.0%</td>
<td>50.0%</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td>(mean ± SD, YO)</td>
<td>48.0 ± 9.9</td>
<td>45.7 ± 7.1</td>
</tr>
<tr>
<td><strong>Operation time</strong></td>
<td>(minutes)</td>
<td>127 ± 15</td>
<td>105 ± 23</td>
</tr>
<tr>
<td><strong>Blood loss</strong></td>
<td>(mL)</td>
<td>180 ± 30</td>
<td>134 ± 23</td>
</tr>
<tr>
<td><strong>Level</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C3/4/5</td>
<td>4</td>
<td>3</td>
<td>0.786</td>
</tr>
<tr>
<td>C4/5/6</td>
<td>6</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>C5/6/7</td>
<td>10</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td><strong>Follow-up</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 year</td>
<td>20</td>
<td>20</td>
<td>-</td>
</tr>
<tr>
<td>2 years</td>
<td>20</td>
<td>20</td>
<td>-</td>
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<tr>
<td>3 years</td>
<td>20</td>
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</tr>
<tr>
<td>4 years</td>
<td>19</td>
<td>18</td>
<td>0.548</td>
</tr>
<tr>
<td>5 years</td>
<td>18</td>
<td>17</td>
<td>0.633</td>
</tr>
</tbody>
</table>

2-ACDF; 2-level anterior cervical discectomy and fusion; HS, hybrid surgery (artificial disc replacement with 1-level ACDF; YO, years-old; *: Student t-test or chi-square test

Postoperative cervical dynamic radiographs show preserved motion at the C-ADR level without excessive motion at the adjacent segments. The angular ROM is defined as the difference in the Cobb angle between the full flexion and extension as shown in lateral radiographs.
Results

The mean NDI scores decrease significantly in late follow-up in both groups. The HS group shows better NDI recovery at 1, 2 and 3 years after surgery.
The mean VAS scores of neck pain showed exponential decrease in both groups. The HS group shows less neck pain at 1 and 3 years after surgery.

The mean VAS scores of arm pain. There was no difference in arm pain relief between the groups.
The C2–C7 ROM. The HS group shows more ROM at 2 and 3 years after surgery.
The superior adjacent segment ROM for the 2-ACDF group shows hypermobility at all follow-up period. The HS group shows hypomobility at all follow-up period without statistical significance.

The inferior adjacent segment ROM. The inferior adjacent segment ROM showed significant differences between the groups at 1 and 2 years after surgery.
Conclusion

• HS is superior to 2-ACDF (better NDI recovery, less postoperative neck pain, faster C2-C7 ROM recovery, and less adjacent ROM increase) in 2 years follow-up, but these benefits of HS becomes similar to 2-ACDF with 5 years follow-up.