TITLE: A comparison of direct pars interarticularis repairs for spondylolysis and low grade spondylolisthesis: a meta-analysis

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CATEGORY: SPINE
DISCLOSURES

• Disclosures: None
• No conflict of interest
INTRODUCTION

• Spondylosis with or without spondylolisthesis that does not respond to conservative management has an excellent outcome with direct pars interarticularis repair.

• Direct repair preserves the segmental spinal motion. A number of operative techniques for direct repair are practiced; however, the procedure of choice is not clearly defined.

• The present study aims to clarify the advantages and disadvantages of the different operative techniques and their outcomes.

• In Buck repair, the screw is passed from the lower edge of the lamina across the defect. The Scott repair involves a wire which is encircled around the transverse process and spinous process. The Morscher repair consists of inserting a Pedicle screw with laminar hooks. Pedicle screw based repairs use a pedicle screw that is attached to rod or hooks to approximate the pars defect.
METHODS

• A meta-analysis was conducted in accordance with the PRISMA (preferred reporting items for systematic reviews and meta-analyses) guidelines.

• The following databases were searched: PubMed, Cochrane library, web of science, and CINAHL.

• Studies of patients with spondylolysis with or without low-grade spondylolisthesis who underwent direct repair were included.

• The patients were divided into 4 groups based on the operative technique used: the Buck repair group, Scott repair group, Morscher repair group, and pedicle screw–based repair group.

• The pooled data were analyzed using the Der Simonian and Laird random-effects model.
RESULTS

- Forty-six studies consisting of 900 patients were included in the study. The Buck group included 19 studies with 305 patients; the Scott group had 8 studies with 162 patients. The Morscher method included 5 studies with 193 patients, and the pedicle group included 14 studies with 240 patients.

- The pooled rates for fusion for the Buck, Scott, Morscher, and pedicle screw groups were 83.53%, 81.57%, 77.72%, and 90.21%, respectively.

- The pooled complication rates for the Buck, Scott, Morscher, and pedicle screw groups were 13.41%, 22.35%, 27.42%, and 12.8%, respectively.

- The pooled positive outcome rates for the Buck, Scott, Morscher, and pedicle screw groups were 84.33%, 82.49%, 80.30%, and 80.1%, respectively.

- The pedicle group had the best fusion rate and lowest complication rate.
PRISMA PROTOCOL AND BIAS ASSESSMENT

**PRISMA PROTOCOL**

PubMed, CINAHL, Web of Science, Cochrane database

Web search 8069 articles screened after removing duplicates

124 full text articles screened

7945 articles excluded after going through titles and abstracts

78 articles excluded due to non-relevance with the study criteria

46 articles selected for analysis

**Bias assessment plot**

**FIG. 1. A:** PRISMA protocol showing the selection of cases. **B:** Funnel plot for the pedicle group showing asymmetrical distribution indicating presence of bias.
RESULTS

**Pooled fusion rate**  The pooled rates for fusion for the Buck, Scott, Morscher, and pedicle screw groups were 83.53%, 81.57%, 77.72%, and 90.21%, respectively.

**Pooled complication rate**  The pooled complication rates for the Buck, Scott, Morscher, and pedicle screw groups were 13.41%, 22.35%, 27.42%, and 12.8%, respectively.
# RESULTS

<table>
<thead>
<tr>
<th>Technique</th>
<th>No. of Pts</th>
<th>No. of Studies</th>
<th>Pooled Fusion Rate (95% CI)</th>
<th>Pooled Complication Rate (95% CI)</th>
<th>Pooled Positive Outcome Rate (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buck repair</td>
<td>305</td>
<td>19</td>
<td>83.53% (76–89%)</td>
<td>13.41% (8–18%)</td>
<td>84.33% (78–89%)</td>
</tr>
<tr>
<td>Scott repair</td>
<td>162</td>
<td>8</td>
<td>81.57% (65–93%)</td>
<td>22.35% (14–31%)</td>
<td>82.49% (73–89%)</td>
</tr>
<tr>
<td>Morscher repair</td>
<td>193</td>
<td>5</td>
<td>77.72% (66–86%)</td>
<td>27.42% (8–51%)</td>
<td>80.30% (80–88%)</td>
</tr>
<tr>
<td>PS-based repair</td>
<td>240</td>
<td>14</td>
<td>90.21% (82–96%)</td>
<td>12.8% (6–21%)</td>
<td>80.1% (74–85%)</td>
</tr>
</tbody>
</table>

PS-based: Pedicle screw based
DISCUSSION

• Sport activities carry a higher risk of spondylolysis with repetitive axial loading and hyperextension. The repeated stresses that fall on the pars in highly demanding sports, such as weight lifting, cricket, soccer, and gymnastics, result in stress fractures.

• In most cases, spondylolysis and low-grade spondylolisthesis remain asymptomatic.

• Conservative management is the gold standard as the initial treatment of spondylolysis. Surgical treatment is advised in patients who have disabling symptoms despite conservative management or when there is a progression to spondylolisthesis.

• Direct repair focuses on repair of the pars without causing motion restriction in the adjacent segments.
SUMMARY POINTS

• The pedicle screw–based direct pars repair for spondylolysis and low-grade spondylolisthesis is the best choice of procedure, with the highest fusion and lowest complication rates, followed by the Buck repair.

• The Morscher and Scott repairs were associated with a high rate of complication and lower rates of fusion.