Reduction in Fluoroscopy Time and Radiation Dosage Using an Innovative Guide Wire for Percutaneous Pedicle Screws

Cook B, Briski D, Zavatsky J
Ochsner Medical Center
Introduction

• Minimally invasive spine surgery has many potential benefits:
  • Shorter hospital stay
  • Less blood loss
  • Faster return to function

• There are, however, inherent risks to the patient and surgeon

• Numerous studies demonstrate increased radiation exposure with MIS secondary to the need for increased fluoroscopic surveillance, thereby increasing the risk of cataracts and malignancy

• Inadvertent advancement of standard straight guide wires through the anterior vertebral body can also occur.
  • Performing bi-cortical S1 fixation
  • Osteoporotic bone

• This advancement can injure the organs ventral to the spinal column
Introduction

• Recently, a split-tip guide wire was introduced which can prevent inadvertent advancement of the wire
  • May decrease the need for excessive fluoroscopic guidance and radiation exposure to patient and surgeon
  • May decrease the risk of injury to ventral structures
• Our study evaluates the benefit of utilizing a novel split-tip guide wire for percutaneous pedicle screw placement
Methods

• Thirty consecutive cases of MIS transforaminal interbody fusion (TLIF) at L5-S1 were retrospectively evaluated
  • Group 1: Standard straight guide wire, 15 patients
  • Group 2: Split-tip guide wire, 15 patients

• Except for the type of guide wire used, the same operative technique was used in each case

• Bi-cortical S1 screw fixation was performed in each case, with tapping of anterior cortex over the guide wire before screw insertion
Imaging
Methods

- Outcome measures:
  - Total fluoroscopy time
  - Radiation dosage
  - Operative time
  - Complications

<table>
<thead>
<tr>
<th>Generator Mode</th>
<th>Time</th>
<th>Cumulative Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluoro/Roadmap</td>
<td>195.5 s</td>
<td>100.0 %</td>
</tr>
<tr>
<td>HLF/Dig. Spot/Subtr</td>
<td>0.0 s</td>
<td>0.0 %</td>
</tr>
<tr>
<td>Film</td>
<td>0.0 s</td>
<td>0.0 %</td>
</tr>
<tr>
<td>Totals</td>
<td>195.5 s</td>
<td>138.69 mGy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Field of View</th>
<th>Time</th>
<th>Cumulative Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>195.5 s</td>
<td>100.0 %</td>
</tr>
<tr>
<td>Mag 1</td>
<td>0.0 s</td>
<td>0.0 %</td>
</tr>
<tr>
<td>Mag 2</td>
<td>0.0 s</td>
<td>0.0 %</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mode</th>
<th>Time</th>
<th>Cumulative Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous</td>
<td>195.5 s</td>
<td>100.0 %</td>
</tr>
<tr>
<td>Pulsed</td>
<td>0.0 s</td>
<td>0.0 %</td>
</tr>
</tbody>
</table>

Dose Summary
Results

• Total fluoroscopy time per case for Group 1 averaged 231.1 seconds vs. 154.2 seconds for Group 2 (P=0.017)

• Radiation dosage for Group 1 averaged 16.22 rads vs. 8.69 rads in Group 2 (P<0.001)

• There was no significant difference in operative time (P=0.18)

• Inadvertent advancement of two S1 guide wires occurred in two different patients in Group 1
  • Postoperative abdominal CT scans with contrast were negative in each case

• There were no other complications
Conclusion

• Utilizing a split-tip guide wire for percutaneous pedicle screw placement significantly decreased fluoroscopy time by 33% and radiation dosage by 46%.

• The split-tip of the guide wire can prevent the wire from advancing, thereby decreasing the need for increased radiographic surveillance.

• Tapping the anterior S1 cortex allows for bi-cortical screw purchase which is biomechanically stronger, but removes the mechanical stop that can prevent inadvertent guide wire advancement.
Conclusion

• The split-tip guide wire may prevent inadvertent guide wire advancement and decreases the need for fluoroscopic surveillance
  • In two cases using the standard, straight guide wires, we had inadvertent advancement while threading the instruments over the guide wire.
  • To ensure the safety of the patient, each underwent an abdominal CT scan with contrast to ensure there was no bowel or vascular injury.
  • This advancement can injure these structures and necessitate a CT scan.
Disclosures

• Consultant – DePuy Synthes Spine, Biomet, Amendia, Innovative Surgical Solutions, Safe Wire
• Royalties – Biomet
THANK YOU