Clinical and Radiologic Outcomes of Thoracolumbar Fusions Using Intraoperative CT Guidance (O-Arm) and Stereotactic Navigation (StealthStation): Subgroup Analysis in Spinal Trauma and Ankylosing Spondylitis Populations

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Disclosures

• The presenting author does not have any disclosures.
Introduction

• Placement of pedicle screws has become commonplace for thoracolumbar fusions. Suboptimal placement may lead to neurovascular complications and postoperative pain.

• In the advent of outcomes-based payment, precision and accuracy of pedicle screws is important. Image-guided spinal surgery is commonly used to improve accuracy, particularly for complex anatomy such as ankylosing conditions.

• We sought to analyze:
  • Clinical and radiographic outcomes of posterior thoracolumbar fusions
  • Using intraoperative CT-guidance (O-Arm®, Medtronic) and stereotactic navigation (SteathStation®, Medtronic)
  • Specifically in thoracolumbar spinal trauma
  • By retrospectively analyzing longitudinal data from our single institution
Methods

• We retrospectively identified 59 patients undergoing posterior thoracolumbar fusions using intraoperative CT and stereotactic navigation for trauma from 2010 to 2017 at a single institution.

• Specifically, analysis of pedicle screw accuracy, realignment in setting of trauma, and clinical outcomes were queried.

• Accuracy was judged in comparison to expected placement.
  • Breach grades included: Grade 1 (<2mm), Grade 2 (2-4mm), Grade 3 (>4mm)
Results

• 59 patients were identified having undergone 59 operations (595 pedicle screws).

• Various degree of injury included chance fracture, burst fracture, and fracture-dislocation. Levels of injury varied throughout the thoracic and lumbar spine.
Results

• Accurate pedicle screw placement, without cortical breach or anterior breach, was found in 97.6% (581/595).
  • Breach included: Grade 1 in 10 screws (1.7%); Grade 2 in 4 screws (0.7%).
  • No neurovascular complications were noted.
  • No revision surgery was performed for misplacement.

• Alignment was restored in all patients (n=59; 100%).
Results

- Eight **ankylosing spondylitis** patients were identified having undergone 8 operations (85 pedicle screws). There were various degree of injury including chance fracture and fracture-dislocation.
  - Accurate pedicle screw placement was found in 94.1% (80/85 pedicle screws).
- Overall, patient outcomes were significantly improved at follow-up.
Discussion

• Intraoperative CT-guidance and stereotactic navigation can overcome the difficulty associated with complex anatomy, such as thoracolumbar trauma with malalignment and unpredictable trajectories, and can improve the accuracy of instrumentation.

• Intraoperative CT can be used with stereotactic guidance or for intraoperative verification of free-hand screw placement with repositioning as needed.

• CT-guidance maintains the benefit of reduced fluoroscopic exposure and reduced reoperation for screw malalignment.