The Learning Curve in Robotic-Assisted Pediatric Spine Deformity Surgery

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INTRODUCTION

- Pedicle screw malposition is a leading cause of morbidity in pediatric spine deformity surgery.
- Robotics paired with navigation has increased the accuracy of pedicle screw placement (90% free-hand technique to 98.8% robotics paired with navigation)

OBJECTIVE

Characterize surgeon experience required to achieve the increased pedicle screw placement accuracy to:

- Quantify a typical learning curve when implementing robotics in pediatric spine deformity surgery
- Identify experience-related changes in surgical outcome measures.

METHODS & DEMOGRAPHICS

- Retrospectively reviewed the first 300 patients who underwent robotic-assisted posterior spine fusion by a single surgeon at a single institution
- Cases split into three surgeon experience groups:
  - Early (cases 1-50)
  - Middle (cases 51-100)
  - Late (cases 101-300)
- Measures collected: Demographics, Risk designation, Curve parameters, Operative data & Outcome measures
- Preliminary results includes first 150 patients
  - 61.3% females
  - Average age 14.5 years
  - Average primary curve of 53.22 degrees
  - High-risk designation: 46%
  - Most common diagnosis: Adolescent Idiopathic Scoliosis

PRELIMINARY RESULTS

- No significant difference in the incidence of post-operative complications (p=0.98), average length of stay (p=0.69), average percent correction (p=0.40), or neuromonitoring changes (p=0.43) across the three experience groups
- Need for perioperative allogenic transfusion decreased significantly in the late group relative to the early group (p=0.04)

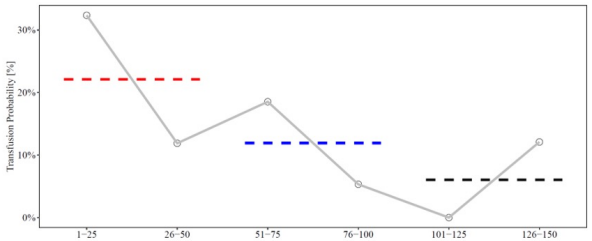

Figure 1. Change in the incidence of perioperative allogenic blood transfusion by surgical experience (x-axis = patient number).

- Significant improvement in overall operative time in the early group relative to the late group (p=0.007) and the early group relative to the middle group (p=0.02)

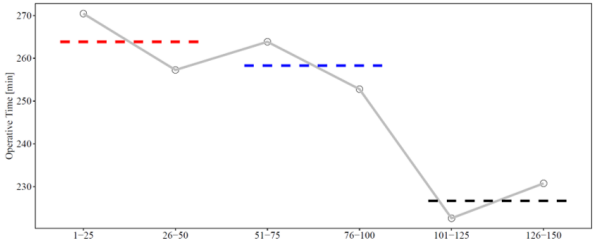

Figure 2. Change in mean operative time by surgical experience (x-axis = patient number).

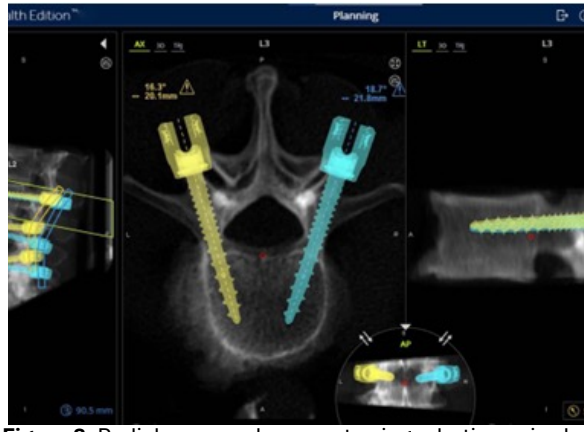

Figure 3. Pedicle screw placement using robotics paired with navigation

DISCUSSION

- Initial learning curve resulting in significant improvements in blood loss and operative time
- No decrease in safety or increase in post-operative complications when implementing robotics in pediatric spine deformity surgery

TAKEAWAYS & NEXT STEPS

- Preliminary data supports safe implementation of robotics in a pediatric population
- As surgeon proficiency improves, the adoption of robotics may offer long-term benefits for surgeons and patients alike.
- Complete analyses to further characterize typical learning curve of implementation of robotics paired with navigation in pediatric spine deformity surgery.