



Robotic Placement of Pedicle Screws is Safe and Associated with Low Revision Rate: A Single Institutional Analysis of 2092 Screws

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Introduction

- Pedicle screw placement can be associated with devastating neurovascular complications given the proximity of critical neurovascular structures.
- Robotic surgery platforms are currently being adopted into spinal surgery standard practice for the placement of pedicle screws, as a purported advantage is safer and more accurate pedicle screw placement.
- Despite their utilization, large scale studies reporting pedicle screw safety remain scarce for specific platforms.
- **We aimed to report the revision rate of all robotically placed pedicle screws utilizing the ExcelsiusGPS Robotic Platform (Globus Medical Incorporated, Audubon, PA) from its adoption at our institution to assess the revision rate for screw related complications at 3 months of follow up.**

Methods

- A retrospective review was performed of all robotically placed pedicle screws utilizing the ExcelsiusGPS Robotic Platform from February 2019 through April 2022.
- The search period allowed for a **three month follow up period to identify any pedicle screw related complications**. The search criteria included all primary and revision spine fusion procedures.
- The study was performed at a single institution, which is a high-volume tertiary center specializing in musculoskeletal care. The study was approved by the institutional review board.

Methods

- **The primary outcome was return to the operating room for a mal-positioned pedicle screw.**
- Secondary outcomes included mean operative time, estimated blood loss (EBL), and length of stay (LOS).
- Implant manufacturers were recorded to assess any effect on return to the operating room.
- Patient variables were collected to include age at the time of surgery, sex, and body mass index (BMI).

Results

- 398 patients underwent 401 spine fusion procedures.
- The cohort consisted of 202 males (50.8%) and 196 females.
- **2092** screws were placed robotically by 10 different surgeons during the study period.

Patient Demographic and Operative Characteristics	Mean \pm SD
Age (years)	61.1 \pm 12.8
BMI (kg/m ²)	28.7 \pm 6.1
Surgical Time (minutes)	207.9 \pm 117.1
Estimated Blood Loss (mL)	271.9 \pm 1213.0
Length of Stay (days)	2.9 \pm 2.9

Results

- **11 patients (2.7% of all cases)** underwent revision surgery at a mean time from the index procedure of 24.6 ± 25.5 days.
- There were a total of **8 (0.4%)** screws that required revision.
- One screw was found to be mal-positioned post-operatively in our series that resulted in immediate radiculopathy and muscular weakness. This screw was revised immediately on the same day without complication.

Case Number	Indication for Revision Surgery	Number of Screws Revised
1	Loose Screw	1
2	Robot Calibration Error	0
3	Post-Operative Wound Infection, Screw Loosening	2
4	Screw Pullout	1
5	Cage Subsidence, Screw Loosening	2
6	Epidural Hematoma	0
7	Wound Dehiscence	0
8	Screw Mal-placement	1
9	Screw Pullout	1
10	Cage Subsidence	0
11	Rod Failure	0

Conclusions

- This study represents the largest single institutional experience utilizing a single spine robotic platform for pedicle screw placement.
- Multiple methods are often used to assess screw position post-operatively. However, the most clinically significant metric is return to the operating room for a screw related complication, most common to be radiculopathy in the acute post-operative period on our series.
- One screw was revised for mal-position resulting in weakness and radiculopathy in the series. **We report a screw failure rate of 0.4%**, which includes all of the screws that were revised, establishing the safety of screw placement with the ExcelsiusGPS Robotic Platform.

Thank You

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