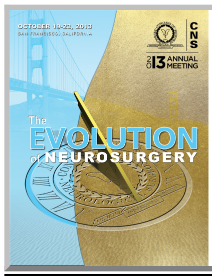

Safety and Efficacy of Pedicle Screw Placement Using Intraoperative Computed Tomography: Consecutive Series of 1148 Pedicle Screws

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Introduction

A number of imaging techniques have been introduced to minimize the risk of pedicle screw placement. Intraoperative CT has been recently introduced to assist in spinal instrumentation. In this study, we examine the effectiveness of intraoperative CT in enhancing the safety and accuracy of pedicle screw placement.

Methods

We included all cases from December 2009 to July 2012 in which an intraoperative CT scan was used to confirm pedicle screw placement.

Results

A total of 203 patients met our inclusion criteria. Out of 1148 screws, 103 (8.97%) screws were revised intraoperatively in 72 (35.5%) patients: 14 (18.42%) were revised in the cervical spine (C2 or C7), 25 (7.25%) in the thoracic spine, and 64 (8.80%) in the lumbar spine. Compared to screws in the thoracic and lumbar regions, pedicle screws placed in the cervical region were statistically more likely to be revised (p=0.0061). Two (0.99%) patients required re-operations due to undetected misplacement of pedicle screws.

Table 1

	ioCT	post-op CT
Thoracic Revision rate	7.25	2.5
Lumbar Revision Rate	8.80	0.9

Table 1. Comparison of thoracic revision rates and lumbar revision rates of pedicle screws in patients utilizing intraoperative CT vs post-operative CT.

Table 2

	Lateral	Medial	Superior	Inferior	Anterior	Short Screws
ioCT	39.81%	28.16%	6.8%	12.62%	11.65%	7.77%
Post-op CT	0.178%	0.6453%	0.0925%	N/A	N/A	N/A

Table 2. Comparison of direction of pedicle screw breeches in patients utilizing intraoperative CT vs post-operative CT.

Figure 3

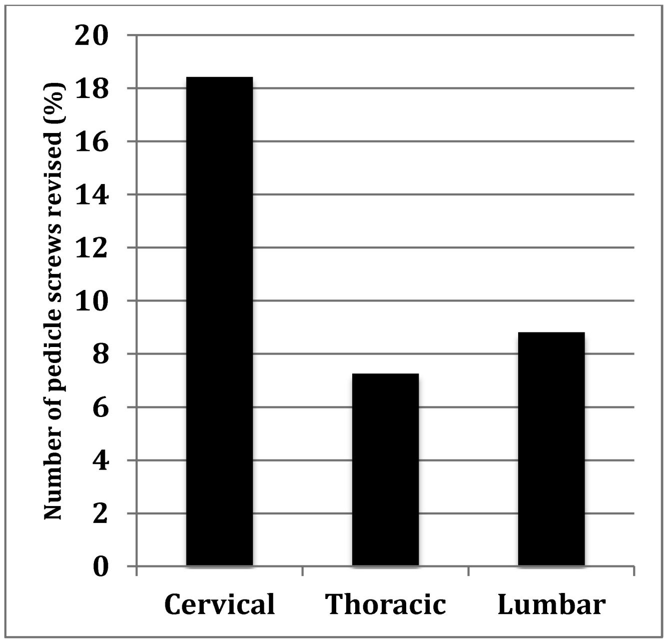

Figure 3. (a) Number of pedicle screws revised, expressed as a percentage of the total number of pedicle screws placed at each spinal level. (b) Number of pedicle screws revised, expressed as a percentage of total pedicle screws placed with the cervical, thoracic, or lumbar spinal regions. Compared to screws in the thoracic and lumbar regions, pedicle screws placed in the cervical region were statistically more likely to be revised (p=0.0061).

Conclusions

We describe one of the first North American experiences with the intraoperative CT used to confirm the placement of pedicle screws. Compared to a similar cohort of patients from our institution that had pedicle screws inserted via the free-hand technique with post-operative CT, we found that the intraoperative CT lowers the threshold for pedicle screw revision, resulting in a statistically higher rate of screw revision in the thoracic and lumbar spine (p<0.0001). During our 2.5-year experience with the intraoperative CT, we did not find a reduction in rates of reoperation for misplaced pedicle screws.

Learning Objectives

By the conclusion of this session, participants should be able to: 1) Discuss the role and effectiveness of the intra-operative CT; 2) Identify several modalities related to the safety of pedicle screw placement.

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