

Minimally Invasive Lumbar Pedicle Screw Fixation Using Cortical Bone Trajectory – A Prospective Cohort

Study on Postoperative Pain and Functional Outcomes

Yi-Ren Chen MD MPH; Sayantan Deb BA; Harminder Singh MD

[Stanford Health Care]

Introduction

Over the past decade, a new technique called cortical screw fixation has been developed, which allows for medialized screw placement through stronger cortical bone. Several studies have shown biomechanical equivalence or superiority of cortical screws, but only one other study has looked at clinical outcomes.

Methods

We prospectively looked at the senior author's patients who underwent cortical versus pedicle lumbar screw fixation between 2013 and 2015 for lumbar degenerative disease. Eighteen patients underwent cortical screw fixation and 15 patients underwent pedicle screw fixation. We looked at pain and functional outcomes using a visual analog scale from 1 to 10 for pain and the Oswestry Disability Index (ODI) for function. Mann-Whitney and Fisher Exact tests were used to analyze the data.

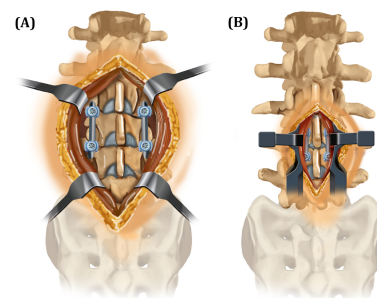
Results

The cortical screw cohort showed a trend towards having less peak postoperative pain ($p = 0.09$). The average postoperative pain was similar between the two cohorts ($p = 0.93$). There was also no difference in pain 6 to 12 weeks after surgery ($p = 0.8$). However, at 6 to 8 months, the cortical screw cohort showed a trend towards worsening pain compared to the pedicle screw cohort ($p = 0.02$). Both the cortical and pedicle screw groups had reductions in ODI compared to before surgery, with an 8.9 reduction in the cortical group ($P=0.04$) and 9.2 reduction in the pedicle group ($P=0.03$). There was no difference in ODI outcomes between the groups.

Conclusions

The cortical screw patients showed a trend towards less pain in the short term (1-3 days post-surgery) and more pain in the long term (4-8 months post-surgery) compared to pedicle screw patients. There was no difference in functional outcome between the groups, though both groups had statistically significant reductions in pain and ODI at follow-up.

Soft Tissue Exposure Required for One Level Lumbar Fixation



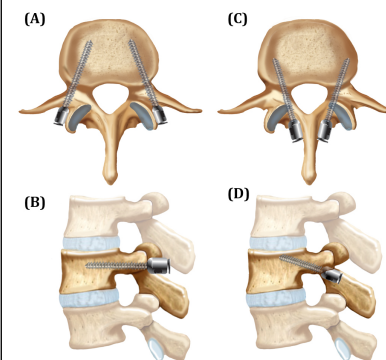
(A) Traditional pedicle fixation

(B) Cortical screw fixation

Learning Objectives

By the conclusion of this session, participants should be able to: 1) describe the differences in technique for traditional pedicle versus cortical screws; 2) describe the pain and functional outcomes between the two cohorts.

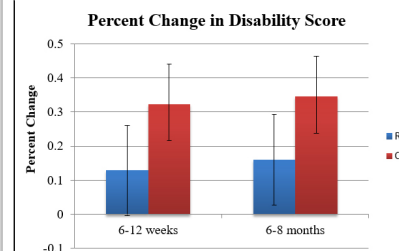
Cortical versus Pedicle Screw Fixation Trajectories



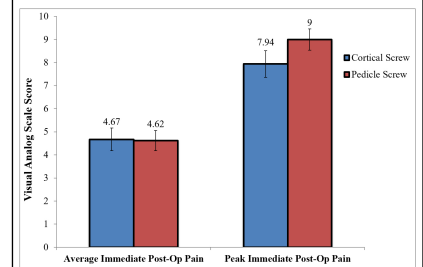
(A and B) Traditional pedicle screw trajectories in (A) axial and (B) sagittal views

(C and D) Cortical screw trajectories in (C) axial and (D) sagittal views

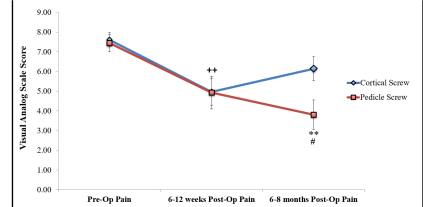
Functional Outcomes for Cortical vs Pedicle Screw Patients



Immediate Postoperative Pain in Cortical versus Pedicle Screw Patients



Long-Term Postoperative Pain in Cortical versus Pedicle Screw Patients



References

- Santoni BG, Hynes RA, McGilvray KC, Rodriguez-Canessa G, Lyons AS, Henson MAW, Womack WJ, Puttlitz CM: Cortical bone trajectory for lumbar pedicle screws. Spine J. 2009, 9:366-373. doi:10.1016/j.spinee.2008.07.008
- Wray S, Mimran R, Vadapalli S, Shetye SS, McGilvray KC, Puttlitz CM: Pedicle screw placement in the lumbar spine: effect of trajectory and screw design on acute biomechanical purchase. J Neurosurg Spine. 2015, 22:503-510. doi:10.3171/2014.10.spine14205
- Ueno M, Sakai R, Tanaka K, Inoue G, Uchida K, Imura T, Saito W, Nakazawa T, Takahira N, Mabuchi K, Takaso M: Should we use cortical bone screws for cortical bone trajectory? J Neurosurg Spine. 2015, 22:416-421. doi:10.3171/2014.9.spine1484