

Safety and Feasibility of Cervical Pedicle Screw Insertion in Paediatric Subaxial Cervical Spine Without Navigation: A Retrospective Cohort Study

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Introduction

- Pedicle screw fixation has supplanted other methods of fixation as the 'gold standard' for posterior arthrodesis of the spine.
- The small size of the pedicles, difficult technique and the proximity of vital neurovascular structures make most surgeons opt for lateral mass screw based fixation for posterior arthrodesis of cervical spine.
- No study so far which has reported on the insertion of CPS in paediatric subaxial cervical spine without the use of intraoperative navigation

Objective

- To assess the safety, efficacy and feasibility of cervical pedicle screw (CPS) fixation in paediatric subaxial cervical spine without intraoperative navigation



Methods

Study design: Retrospective cohort study

- Eight paediatric patients requiring rigid subaxial cervical spine fixation were operated at a single centre between 2014-2016.
- Pedicle morphometry on preoperative computed tomography (CT) scans (80 pedicles were studied).
- CPS were inserted in selected pedicles without navigation.
- Postoperative CT scans were studied to look for screw containment within pedicles.
- Complications were noted and clinicoradiological follow-up was done for a minimum of 36 months.

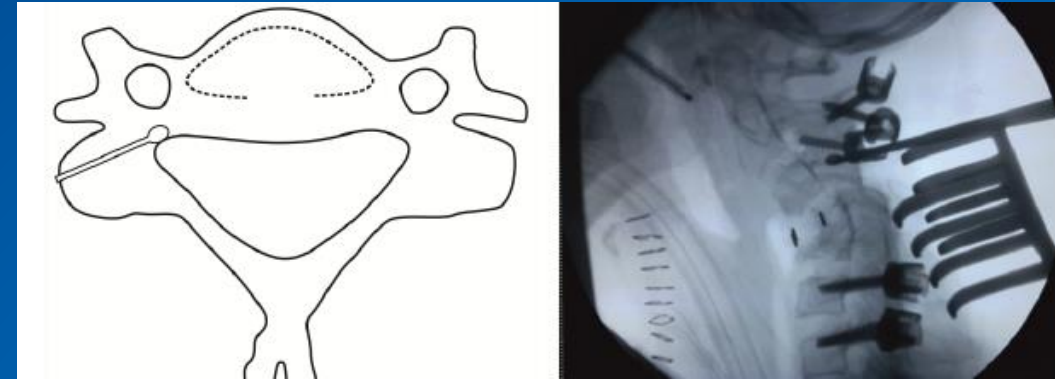


Illustration and intraoperative lateral fluoroscopic view of a small curette being used to scoop out cancellous bone of the pedicle by scraping it along the medial pedicle wall



Postoperative axial CT scan section showing a Grade-1 medial cortical breach on the right side at C5 level and a well contained cervical pedicle screw on left side at C5 level



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Results

- The mean age of the patients was 9.2 years (range: 5-13 years) and the mean follow-up period was 43.5 months (range: 36-52 months)
- 6/80 pedicles had a PW < 4mm, CPS insertion was not attempted at these levels, 46/80 were planned for insertion, 9/46 were excluded due to distorted anatomy.
- The level-wise distribution of the inserted CPS was: C3=4, C4=6, C5=10, C6=10 and C7=7.
- Post-operative CT scans revealed Grade-1 medial cortical breach in 5/37 screws and Grade-2 medial cortical breach in a single screw
- No perioperative complications were noted. At a mean follow-up of 43.5 months (range 36-52 months), no patient had implant failure or deformity progression

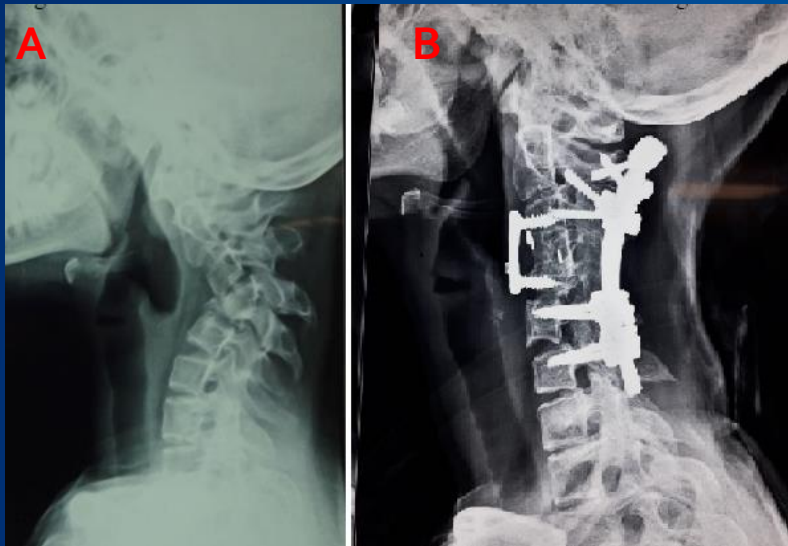
	Pedicle width (PW) in mm	Pedicle height (PH) in mm	Pedicle length (PL) in mm	Pedicle axis length (PAL) in mm	Transverse pedicle angulation (TPA) in degrees	Sagittal pedicle angulation (SPA) in degrees
C3	4.41 ± 0.43	5.76 ± 0.56	5.83 ± 0.24	27.13 ± 0.63	31.75 ± 1.58	14.18 ± 1.34
C4	4.55 ± 0.48	5.95 ± 0.48	6.02 ± 0.42	27.10 ± 0.78	30.42 ± 0.93	8.10 ± 0.90
C5	4.76 ± 0.38	5.91 ± 0.59	5.99 ± 0.37	28.04 ± 0.79	30.10 ± 0.83	1.19 ± 1.88
C6	4.86 ± 0.30	6.00 ± 0.50	6.30 ± 0.37	29.12 ± 1.17	29.10 ± 0.78	-5.21 ± 1.32
C7	5.12 ± 0.33	6.05 ± 0.54	6.32 ± 0.38	29.92 ± 1.31	23.60 ± 1.21	-6.87 ± 1.87

Table showing measurements with respect to each pedicle morphometric parameter for all the measured pedicles (All values denoting Mean ± standard deviation)



Conclusion

- Based on our findings we conclude that CPS insertion in paediatric subaxial cervical spine is feasible and safe
- Biomechanical advantages of CPS can be extended to the paediatric subaxial cervical spine



A) Preoperative radiograph of a 12 year old female with severe post-tubercular kyphosis
B) Postoperative radiograph of a 12 year old female with severe post-tubercular kyphosis with cervical pedicle screws used at C3, C5 and C6 levels