Spinal Navigation in Complex Cervical Cases

Rienmüller et al. (2017), in The Bone & Joint Journal

Products
Spine & Trauma 3D Navigation (Surface Matching Registration)

Hospital / Authors
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Clinical Background
While transpedicular screw placement has been established with a low risk profile in the lumbar spine, 21-40% of cortical injuries have been reported using conventional fluoroscopy for such procedures in the cervical spine and 11.1-16% in the upper thoracic spine. Consequently, image guidance has been successfully introduced in order to control and reduce complications in these regions, particularly in complex cases, while at the same time increasing the accuracy of screw placement. However, in combined anterior and posterior procedures navigation has not been widely used because of concerns about metal artifacts from anterior implants inhibiting registration for the posterior implant procedure.

Aim of Study
Evaluate and compare accuracy and safety of surface matching based Brainlab spine navigation in cervical and upper thoracic spine with (COMB) and without (POST) prior anterior surgery using drill guide and k-wires.

Cohort study incl. 107 consecutive patients / 592 transpedicular screws

Results
- **High accuracy* of 88.5% in cervical and upper thoracic spine** (524/592 screws) achieved according to Gertzbein-Robbins (GRS) classification*
- **Combined instrumentation revealed to be an independent risk factor for screw misplacement**, as high accuracy* was noted in 91.6% of cases after POST versus in 83% of cases after COMB
- **4.7% of 5 patients had to undergo revision surgery**: 3 due to misplacement, 2 because of wound infection. No neurological, vascular or visceral injury occurred

*GRS high accuracy equals class 1 and 2 screws meaning screw perforation ≤ 2mm

Summary
- There are clear biomechanical advantages to using transpedicular vs. lateral mass screws in cervical spine surgeries
- Navigated **transpedicular screw insertion in the cervical region is safer and more accurate** compared to fluoroscopy guided insertion. K-wires did not lead to any perforation in either direction
- In COMB cases, there is a 2.4-fold increased risk of misplacement due to limited mobility and metal artifacts during registration. Therefore, despite low complications in this study, extra caution must be taken
- **CT surface matching** based on single vertebra registration seems to be **particularly beneficial** for the accuracy of screw placement

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