Does an electronic conductivity device contribute to the accuracy of pedicle screw insertion in scoliosis surgery?

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Introduction

The implantation of pedicle screws in spinal deformity correction surgery has become the most common technique for thoracic and lumbar fixation.

Classic methodologies for verification of optimal placement of pedicle screws include intraoperative fluoroscopy, triggered electromyography, intraoperative image-based navigation, and most recently, the use of a handheld electric conductivity device PediGuard®. The goal of the current clinical study is to evaluate the contribution of the PediGuard® device to the accurate placement of thoracic and lumbar pedicle screws.

Materials and methods

Retrospective analysis of 213 scoliosis patients (Idiopathic/Congenital/Neuromuscular) was performed comparing 121 patients (Group I) who were operated without the use of PediGuard® 2003-2007 and 92 patients (Group II) in whom the device was used (2008-2009). Data pertaining to pedicle screws were compared including screw position relative to spinal apices and concomitant neuromonitoring alarm. The two groups were matched by age, gender, etiology and surgical criteria. Hybrid instrumentation was mainly used in group I, while in group II pedicle screws alone were used.

Both groups were operated on by a single surgeon (DO) and continuously monitored with intraoperative muiltimodal evoked potentials (SSEPs, MEPs, EMG) by a single neurophysiologic team (AK). Clinically relevant misplacement of pedicle screws was established by monitoring alarms concomitant with pedicle insertion.

Results

1270 pedicle screws were analyzed in group I compared with 1400 in group II. Neuromonitoring events concomitant with screw placement were recorded in 10 patients from group I (8.9%) compared with 3 in group II (3.2%).

The contribution of the electronic device to accuracy of pedicle screw was found to be statistically significant by Fisher's exact test ($p=0.048$). 69% of the monitoring alarms were associated with implantation adjacent to the apex of the spinal curve.

Conclusion

The use of PediGuard® significantly reduces the incidence of clinically-relevant misplaced pedicle screws in all variety of scoliosis surgery.