#1495 - Posters

Placement Of Pedicle Screws In Adolescent Idiopathic Scoliosis Surgery: A Retrospective Comparative Study Between The Use Of Patient-Specific 3D-Printed Guides Versus The Freehand Technique.

Orthopaedics / Spine / Deformity Surgery

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Background
Adolescent idiopathic scoliosis (AIS) is the most common spinal deformity, affecting approximately 1-3% of adolescents. In most cases, orthopaedic treatment is sufficient, but up to 10-15% will require surgery to correct the deformity.
Scoliosis correction surgery is considered a major orthopaedic procedure, with a high percentage of complications. Some of the most prevalent complications are related to the long surgical time (bleeding, infection) and poor positioning of the screw in the pedicle (neurological injuries, vascular injuries).
The development of patient-specific 3D guides has led to major advances in spinal deformity surgery and prevents many of the complications described above.

Objectives
The objective of this study is to evaluate the advantages of using 3D guides in AIS correction surgery, compared to conventional freehand technique.

Study Design & Methods
This was a retrospective comparative cohort study evaluating different variables among patients undergoing surgery for adolescent idiopathic scoliosis.
The study sample was obtained from patients undergoing AIS surgery, at our centre, between January 2020 and June 2025, excluding those who did not meet the inclusion criteria.
Eighty-four patients (14.7 ± 1.9 years) were evaluated and divided into two groups according to the technique used to implant the screw in the pedicle.
Group I was treated using the conventional freehand technique (n: 55) and Group II using patient-specific 3D guides (n: 29).
We analysed the following variables: total surgical time, average time per screw placed, number of screws malpositioned in the operating theatre and removed (EMG-stimulated at thresholds < 5-7 mA), degrees of main curve correction and postoperative complications.

Results
The total surgical time for Group I was 304.8 ± 55.7 min, compared with 273.8 ± 47.6 min in Group II, showing statistically significant differences ($p = 0.01$). The time/screw ratio also showed differences, being 16.8 ± 3.5 min in Group I and 14.5 ± 2.8 min in Group II ($p< 0.01$).
The number of screws removed and repositioned during the procedure was significantly higher in Group I [2 (0–3)] compared to Group II [0 (0–1)] ($p = 0.0015$).
The percentage of transfusions was higher in conventional surgery (32.7% vs 24.1%), although the difference was not significant ($p= 0.63$).

Nine per cent of patients in Group I had postoperative complications, comparing to only three percent in Group II ($p = 0.64$).
The mean correction of the main curve was 45.6 ± 11.4 o in conventional surgery versus 43.2 ± 9.5o in surgery with 3D-printed guides ($p = 0.31$).

Conclusions
The use of patient-specific 3D-guides in the surgical treatment of spinal deformities allows us to perform a faster and safer procedure, significantly reducing surgical time and, consequently, the number of intraoperative and postoperative complications.
The drilling guide offers more precise and, therefore, more reliable placement of pedicle screws. The need to reposition or remove screws during surgery due to electromyographic alterations is significantly lower when using 3D-guides. Reducing surgical time decreases bleeding (fewer transfusions) and the percentage of post-operative complications (surgical site infection, need for rescue analgesia, etc.). Although these parameters do not reach statistical significance, the results show a consistent trend between the groups. This pattern could be confirmed with a larger sample or in subsequent studies with greater statistical power.

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