

Identifying patterns of coronal malalignment according to the Obeid coronal malalignment classification (O-CM) for Adolescent and Adult Idiopathic Scoliosis

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Introduction

Coronal alignment of spinal deformities has been investigated over the past decade, however no study looked into CM characteristics inside the idiopathic scoliosis population preoperatively. The aim of the current study was to identify patterns of coronal malalignment according to the O-CM classification for adolescent and adult idiopathic scoliosis patients that were categorized according to the Lenke classification with > 2cm CM.

Materials and Methods

Retrospective analysis of prospectively collected data. Patients were classified by 3 experienced spine surgeons according to the Lenke classification for idiopathic scoliosis and the O-CM classification, which was followed by a comprehensive analysis on all cases where complete agreement has been reached between the reviewers. Age and various radiographic variables in the coronal and sagittal planes were analysed. Descriptive statistical analysis included frequency distributions and cross-tabulations to examine relationships between Lenke and O-CM classifications. Decision tree models were created to predict O-CM subtypes based on radiographic parameters. Comparative Analysis of O-CM Classification Subtypes was performed (Figure 1).

Results

135 patients were included. The 3 main Lenke curve types that showed coronal malalignment were 5C (46.7%), 6C (25.9%) and 1AR (14.8%). CM was mainly toward the Convex side represented by O-CM type 2A1 (67.4%) followed by 2A2 (12.6%). The strongest predictors for CM were age where patients younger than 47 years were in the convex 2A1 type and patients older than 47 years were in the convex 2A2 type, Upper End Vertebra tilt with a cut-off angle of 34° where a higher angle lead mainly to a concave malalignment type 1A1 and a lower angle lead to a convex malalignment 2A2. L3/L4 tilt parameter was higher in types 2A1 and 2A2 when compared to 1A1 however the difference did not reach statistical significance (p=0.091). Major cobb angle was not observed as a predictor for CM.

Conclusion

This is the first study to identify patterns of CM in idiopathic scoliosis. Single structural curves showed higher tendency to CM. Driver of CM seems to be the vertebra with higher coronal tilt: concave if UEV higher, convex if LEV higher.

Variable	1A1	2A1	2A2	p-value
Age	60.2 ± 9.6	25.8 ± 12.6	61.6 ± 10.9	0,000
PI	55.1 ± 9.3	51.6 ± 14.8	58.3 ± 10.4	0,061
PT	27.1 ± 12.1	11.7 ± 9.7	26.4 ± 10.2	0,000
LL	34.4 ± 15.6	60 ± 17	43.3 ± 15.6	0,000
TK	29 ± 13	29.8 ± 16.2	29.7 ± 13.9	0,988
SVA	68.3 ± 45.5	-6.3 ± 32.9	25.3 ± 30.7	0,000
GT	34.8 ± 17.1	9.3 ± 12.1	28.4 ± 13.1	0,000
L3/L4 tilt	24.7 ± 9.8	26.1 ± 9	31.1 ± 9.5	0,091
CM	44.4 ± 25.2	31.5 ± 8.7	33.3 ± 10	0,287
Major Cobb	65.8 ± 19.3	61.4 ± 15.6	58.7 ± 25.5	0,127
UEV tilt	36.5 ± 14.9	26.1 ± 9.7	21.8 ± 12.5	0,004
LEV tilt	27.9 ± 9.3	32.9 ± 8.3	33.8 ± 13.4	0,201