Scoliosis

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Clinical application of 3D topographic device for monitoring scoliosis progression

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Background
Cumulative exposure to radiation from diagnostic radiographs increases patient risk of cancer development. Minimizing exposure to radiation is desired for the patient's health, so there is a need to develop alternative non-invasive tools to measure spine deformity.

Purpose
The aims of this study were to (1) determine the reproducibility of the newly developed 3-dimensional (3D) Milwaukee Topographic System (MTS) through inter- and intra-rater measurements and (2) calculate the correlation between the 3D angle obtained by the device and the Cobb angle measured with radiographs.

Methods
The study group consisted of twenty children with idiopathic scoliosis (IS), aged 6-18 years, with a range of Cobb angles. The MTS is composed of two wide-angle optical cameras, two electro-magnetic sensors, a light, a software package, a positioning frame, and a desktop computer. The device required four 5-second scan sweeps (three vertical and one horizontal) for each subject. Four measurements were performed by two investigators, alternately. Reliability for the device was measured with intra-class correlation coefficient (ICC) controlling subject effect in a stratified model. Pearson correlations were calculated as well as mean values and confidence intervals for each metric.

Results
A Pearson data analysis showed excellent intra-class correlation (ICC > 0.6) between investigators for 10 metrics, and moderate ICC (from 0.4 to 0.6) for four metrics ($p<0.05$). A Pearson analysis of intra-investigator ICC demonstrated moderate to excellent ICC in all 17 measured parameters ($p<0.05$). A Pearson correlation coefficient between the 3D angles obtained from the MTS and radiographs was remarkably higher for the Cobb angle in the sagittal plane ($r=0.91$, $p<0.001$).

Conclusions and discussion
The new MTS provides reproducible measures for the assessment of patients with scoliotic deformity.

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