

Session 1 | Whitecloud Award Nominated Papers

7. Comprehensive Skeletal Maturity Index Can Obviate the Need for Hand Radiographs for Sanders Scoring §

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Hypothesis

The combination of Risser (R), triradiate cartilage (TRC), proximal femur maturity index (PFMI), and proximal humerus ossification system (PHOS) indicators into a comprehensive skeletal maturity index (RTFH) correlates well with the Sanders score from hand radiographs, providing an alternative method to assess peak height velocity (PHV) in scoliosis patients.

Design

Retrospective

Introduction

Scoliosis radiographs are commonly used to assess spinal curvature and skeletal maturity in pediatric patients. However, the Sanders score, derived from hand radiographs, remains the gold standard for determining skeletal maturity and peak height velocity (PHV). On scoliosis radiographs, growth indicators such as Risser staging, triradiate cartilage (TRC), proximal femur maturity index (PFMI), and proximal humerus ossification system (PHOS) are also assessed. This study explores whether a combination of these four indicators into a single skeletal maturity index (RTFH) can serve as a reliable alternative to the Sanders score for evaluating skeletal maturity and PHV in scoliosis patients.

Methods

We retrospectively analyzed 205 paired scoliosis and hand radiographs from pediatric scoliosis patients (2017-2024) who had both types of radiographs taken on the same day. Each scoliosis radiograph was graded using four growth indicators: Risser (0-5), TRC (0-2), PFMI (0-6), and PHOS (1-5). These scores were combined into the RTFH index, ranging from 2 to 18. The RTFH scores were compared with the Sanders scores from the hand radiographs. An RTFH score of <6 was considered pre-PHV, 6-10 indicated PHV, and >10 indicated post-PHV, corresponding to Sanders scores of <3, 3-4, and >4, respectively.

Results

Of the 205 radiographs analyzed, 96.10% of RTFH scores matched the Sanders scores. Specifically, 83% of RTFH scores <6 accurately predicted pre-PHV, 100% of scores between 6 and 10 matched Sanders scores indicating PHV, and 95.4% of scores >10 identified post-PHV. In 3.90% of cases that did not match, the RTFH overestimated skeletal maturity in 6 patients and underestimated it in 2 patients compared to the Sanders score.

Conclusion

There is a strong correlation between the RTFH skeletal maturity index and the Sanders score, suggesting that RTFH could be a viable alternative for evaluating skeletal maturity and PHV in scoliosis patients, potentially reducing the need for additional hand radiographs and associated radiation exposure.

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