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Clinical Evaluation of Spinal Coronal and Sagittal Balance in 584 Healthy Individuals: Normal Plumb Line Values and Their Correlation With Radiographic Measurements.

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Abstract

BACKGROUND: Plumb line distances (PDs) are widely used in conservative clinical practice to evaluate the sagittal shape of the spine.

OBJECTIVE: The objective was to assess the normative values of PDs in a large, healthy population in an age range representative of the adolescent population with spinal deformities, and to correlate it with x-ray measurements.

DESIGN: This was a cross-sectional study.

METHODS: Participants were 584 healthy individuals (341 females) with x-rays showing no spine deformities. The whole sample (OVERALL) was divided into 5 groups: 6-9 years old (n = 106); >10 years, Risser 0 with triradiate cartilage open (n = 129) or closed (n = 104); Risser 1-2 (n = 126); and Risser 3-5 (n = 119). PDs were taken by maintaining a tangent to the thoracic kyphosis apex at C7, T12, L3, and S2. Sagittal index (C7 + L3), and sagittal and coronal balances (C7 related to S2) were calculated.

RESULTS: In OVERALL, PDs at C7, T12, L3, and S2 were 39.9 ± 16.7, 21.4 ± 15.3, 39.9 ± 15, 20.6 ± 17.0 mm, respectively. Sagittal index was 79.8 ± 26.8, sagittal balance was 19.3 ± 17 mm anterior to S2 plumb line; 13.5% had a coronal imbalance of 11.4 ± 5.4 mm to the right and 24.7% of 13.2 ± 6.0 mm to the left. C7 and L3 PDs, sagittal index, and sagittal balance were significantly lower in ages 6-9 compared to older patients in Risser 1-2 group. C7 and S2 PDs and sagittal index were significantly larger in males. Sagittal index correlated with thoracic kyphosis Cobb degrees (r = 0.47).

LIMITATIONS: The participants were not randomly chosen from the general population; and, they had an x-ray because of spine pathology suspicion.

CONCLUSIONS: This study shows normative data to be used in clinical practice.

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