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Topic Evaluation (Scoliosis & Kyphosis)

Title Arms positioning and postural sagittal variation: is x-rays kyphosis and lordosis measurement reliable?

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Abstract **Objectives:** verifying how changing the posture of the arms, as must be done during standard radiographs to allow visualization of the spine, can change the spinal sagittal angles.
Background: x-rays are the gold standard evaluation of scoliosis, and this is considered true also for sagittal plane deformities. While it is very well known that posture drive to changes of scoliosis curves, this has never been verified for sagittal plane; in this case it is even more important because, to see the spine, there is the need to move the arms from the resting physiological position, so changing spinal posture. Today it does not exist a universally accepted standard for arm positioning during radiographs, nor it is known how it influences measurements. Surface devices on one side give possibly more reliable instruments because they allow to maintain the physiological position, on another side consent to verify how changing arms position influences spine configuration. Such a study could not be made with x-rays for safety and technical reasons.

Methods. Study Design: transversal study. Population: 85 subjects (50 hyperkyphosis, 33 scoliosis, 2 normals). Hardware: 4-D Formetric. Methods: each subject has been consecutively evaluated in normal standing, then with progressive extension of the shoulders with extended arms (45°, 90°, 135°, 180°), then with arm crossing on the chest (CROSS) and with flexion of the shoulders and elbow to let the hands rest on the shoulders (REST). All sagittal parameters given by Formetric have been considered. Statistics: ANOVA for total and sub-groups.

Results: The absolute differences from the standing position of kyphosis angles ranged 4.8-13.3° and were statistically significantly different with rare exceptions. For lordosis the differences were always statistically significant and ranged 4.6-10.4°. The biggest differences have been found with REST and 180°, the lowest with 45°, and CROSS in some cases. Variation of angles depended on changes of spinal configuration, with displacements of the spine both in the sagittal and horizontal axis.

Conclusion: According to these results, x-rays are determinant to see bone deformities and for diagnosis, while monitoring outcome can be more reliably and safely done using non-invasive, surface measurements.

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