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Research Article

Sagittal Profile and Flexion Restriction of the Thoracic Spine are Essential Elements in the Pathogenesis of Thoracic AIS

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1. Introduction and Objective

The comprehensive pathomechanism of AIS remains obscure. Abundant anterior growth of the apical vertebrae has been reported to be decisive for the development of the thoracic curve. Based on our studies with pantography and inclinometer on healthy growing children and scoliosis patients we demonstrate that hypokyphosis and flexion rigidity of the thoracic spine are the basic elements in the development and progression of thoracic AIS.

2. Materials and Methods

- Longitudinal study of 1000 healthy children where the sagittal configuration of the spine was measured by pantography annually from 11 to 14 yrs and finally at 21 yrs [1].
- Cross-sectional study of healthy 294 children divided in 5 groups (8, 10, 12, 14 and 16 yrs). Inclinometric methods were used to measure posture and mobility in the sagittal and coronal planes [2].
- Cross-sectional study on 71 girls with progressive AIS, divided in three groups according to the curve size. Inclinometric methods were used to measure posture and mobility in coronal and sagittal planes [3].

3. Results

3.1 Healthy children

In both studies [1, 2] thoracic kyphosis increased during growth but boys were more kyphotic at all stages of the growth. In forward bending of the thoracic spine boys in all stages of growth had larger curve than girls, the difference was statistically significant at 14 yrs ($p < 0.05$). In thoracic extension girls at all stages of the growth had large curves than boys, the difference was statistically significant at 16 yrs ($p< 0.05$).

3.2 Scoliosis patients

Thoracic kyphosis was in mild curves (17˚) 28.4˚, in moderate curves (32˚) 21.8˚ and in severe curves (46˚) 19.5˚.

Thoracic flexioncurves in the same groups were 58.6˚/ 59.9˚/ 50.9˚ respectively.

Thoracic extensioncurves were 18.2˚/ 15.9˚/ 16.5˚ respectively.

Correlation of the thoracic flexion with growth velocity in healthy girls:

Negative correlation (0.05) meaning that rapid growth was associated with stiffer thoracic spine in flexion.

4. Summary and Conclusions

Certain amount of thoracic kyphosis may protect against idiopathic thoracic scoliosis, because in thoracic Scheuermanns`progressive scoliosis is not detected. In this study healthy girls had smaller thoracic kyphosis as well as they were stiffer in forward bending, which had negative correlation with growth speed year before the measurements. In scoliosis patients this same phenomenon was observed: the bigger the curve the smaller the kyphosis and smaller the flexion curve. This reminds the crankshaft phenomenon through creating functional extension contracture and rotational instability. In attempts to halt the progression of thoracic curve enlarging the kyphosis and flexion curve through aggressive mobillization may might be rewarding.

References

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