Scoliosis

Oral presentation

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The biomechanics of conservative treatment of idiopathic scoliosis

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Objective
To evaluate the mechanical action of braces and the biological response to their action.

Study design
Two studies were carried out. The goal of the first was to analyse the actions induced by the brace, in order to modify the pattern of load distribution on the vertebrae included in the curve. The optimization of the actions results in an inversion of the stress concentration through the spinal curve. The second derives from the observation that the mechanical features cannot completely define the biomechanics of orthotic treatment.

Results
The biomechanical analysis demonstrates that the response of the scoliotic spine to the action induced by the brace are determined by two main factors: (1) the residual potential of remodelling of the vertebrae (due to the residual potential of growth); and (2) the capacity of the visco-elastic structures to react properly to the forces. The study defined the G modulus of torque-rigidity in relation to the age of the individual, the level of the intervertebral disk and the magnitude of the vertebral rotation.

Conclusion
The effectiveness of the corrective action is linked to the geometry of the brace. However, mechanical action cannot produce any corrective effect on biological structures unless actions determine a vertebral remodelling. Vertebral remodelling is possible if there is a sufficient residual potential of growth and if the visco-elastic structures are capable to react adequately to the action imposed. It is, therefore, necessary that the inter-vertebral disks, included in the scoliotic curve, should work within the limits of linear elasticity.