Cephalic stabilization and idiopathic scoliosis


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Keywords: Idiopathic scoliosis; Cephalic repositioning; Cervical Proprioception

Introduction.— In idiopathic scoliosis (IS), increase of osteopontin tissue expression [1] due to a defect of melatonin signaling could explain the various oculomotor, vestibular and proprioceptive anomalies. These anomalies can disturb postural control including cephalic stabilization control. Cephalic stabilization is influenced by vestibular, visual, oculomotor, proprioceptive and cervical information and used as a reference to vertical gravity.

Objective.— To evaluate the cephalic stabilization in IS, with a validated test: Cephalic Repositioning Test (CRT).

Methods and materials.— In this prospective study, we evaluate, in an IS population with an angle Cobb ≥ 15°, cephalic repositioning ability with CRT on a target, eyes closed, after ten right rotation and ten left rotations. Quantitative and qualitative statistical analysis is performed.

Results.— Thirteen IS subjects (age 13.5 ± 2.36) were evaluated. Forty percent have a pathological right and left CRT (> 6°), 76.9% have at least one pathological CRT and 61.1% have a pathological left CRT. Higher right lateralization was found significantly after repositioning. Abnormal left CRT is associated with a high angle Cobb lumbar (P < 0.05), and more significant with left convexity lumbar scoliosis (P < 0.05).

Discussion and conclusion.— These preliminary results show a disturbance of CRT and indirectly proprioceptive cervical control in IS. Requires further evaluation with a larger number of IS and matched a control group. In this disease, the test standardization is the detection and guidance to a specific rehabilitation: oculo-cervical reprogramming according to Revel’s [2] protocol.

References

http://dx.doi.org/10.1016/j.rehab.2012.07.703

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Introduction.— Several authors found a significant relation between handedness and asymmetry of trunk. The laterality is partially in relation with interhemispheric interaction. It is permitted by interhemispheric commisura, particularly the corpus callosum. Arguments evoke relation between abnormalities of the interhemispheric interaction and scoliosis: 1) the HGPPS, rare human syndrome, associates scoliosis with dysfunction of commissural neurons; 2) significant decrease of the volume of the corpus callosum in the idiopathic scoliosis (IS).

Objective.— Evaluate the interhemispheric interaction in IS, by studying eyes-foot laterality.

Methods and materials.— Prospective case-control study, estimating by eye-hand-foot laterality with specific tests, to SI ≥ 15°. The score allows classifying each laterality in right or left dominance. When the three dominances are isilateral, the laterality is homogeneous; in the opposite, it’s a cross-dominance.

Results.— Two groups were estimated: 38 AIS, and 26 controls. AIS present more cross-dominance than controls: 69% vs 30% (P = 0.003). Cross-dominance eye-hand is most frequent (eye-hand 65.4%; foot-hand 11.5%; mixed dominance 23.1%). These observations show disturbance of the interhemispheric interaction.

Discussion and conclusion.— Results are independent from the scoliotic deformation, because dominance install before seven years. The cross-dominance eye-hand favors direct retina-geniculo-cortical pathway, to save time of interhemispheric transfer during eyes-hand activities. This preferential use of some visual pathways can be secondary of the defect of melatonin signal transduction in ISA. This defect induces increase of osteopontin’s tissular expression. Osteopontin, coupled with the CD44 receptor, which can inhibit, in the optic chiasm, the growth of visual axons in some directions. The sub-use of the crossed retina-tecto-cortical pathway, which contributes to the cervico- cephalic visual stabilization, could perturb the postural downward control. The incapacity of proprioceptive compensation, especially cervical, could explain the abnormal muscular adaptation of trunk, and consequently spine deformity. These results can generate new therapeutic orientations.

Further reading

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Intradiscal pressure change induced by a lumbar orthosis


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Keywords: Lumbar orthosis; Intradiscal pressure; Finite element; Low back pain

http://dx.doi.org/10.1016/j.rehab.2012.07.704