Original Research Article

Features of neurohumoral regulation in flat back posture and initial stage scoliosis

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Abstract

Introduction

The appearance and progression of idiopathic scoliosis (IS) are considered to be the result of an inequality of the spinal column and spinal cord longitudinal growths. Consequently, normal afferent input from spinal cord elements to the highest parts of the central nervous system (CNS) is altered even by a minor hyperextension of spinal cord structures. Deafferentiation leads to forming a hyperactive deterministic structure and inadequacy of neurohumoral processes of regulation in thalamus–hypothalamus–hypophysis. The resulting neurohumoral abnormalities could be defined in experimental models via patients' blood serum testings.

Aim

The aim of this study was to define prognostically valuable biotest indexes in the early stages of scoliotic deformity progression.

Materials and methods

Results of blood serum testing of 15 children with flat back posture and 15 children with first and second grade IS, subjects 9–12 year old, are presented in this paper. Biotest results of 12 healthy children of the same age served as the control. Method of biotesting: rats spinalized at the thoracic level (Wistar male rats weighing 200 g) were injected with 0.1 mL of blood serum of investigated children at the L3–L5 levels. Features of the rearrangement at the spinal cord level were judged by changes in the spontaneous and evoked electromyographic (EMG) activity of the hind extremities. The EMG rate is the quantity of EMG discharges in a time unit. Initial EMG activity of a rat before blood serum administration is considered to be 100%. The total coefficient of disorders was calculated according to 24 factors of antagonistic muscles EMG reactions. All patients were examined employing the following methods: computer evaluation of surface topography, surface EMG of paravertebral muscles, four-field weighting, and blood samples for biotesting.

Results and discussion

The most informative biotest indexes pointing to IS progression in children were chosen. Reliable differences in the groups with respect to the model were identified by tonic reaction changes and irradiation of excitation to muscles of an opposite extremity after electrical stimulation \((p \leq 0.05)\). Reflex responses in IS were changed on one of the sides (right in right-sided and left in left-sided scoliosis), but in postural fault EMG activity increased in extensors on both sides.

Conclusions
Biotesting findings allow for the progression of scoliotic deformity to be prognosticated. This is important for the selection of the proper treatment strategy.

Keywords

Scoliosis; Flat back posture; Blood serum biotesting