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Comment to “The pathogenesis of idiopathic scoliosis: uncoupled neuro-osseous growth?” by R. W. Porter

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This review article has many interesting aspects, not only with regard to the topic discussed, but also the manner in which it was built from an extensive bibliography that was checked with a perfectly open mind.

The hypothesis for the pathogenesis of idiopathic scoliosis is related to uncoupled growth between the nervous component (spinal cord) and the bony component (disc and vertebrae) of the spine.

This concept, even if it is controversial, is attractive because it re-emphasizes the close relationship between the spine and nervous system throughout the normal growth of the human being.

The study of the neural bony tube

The author presents some very well-established knowledge, according to which, the spinal cord follows the shortest route in a spinal deformity. We can add to the author's remarks that, in any kind of scoliosis (for example post radiation or post laminectomy or even in kyphosis), the cord is always located (at the apex of the deformity) along the shortest pathway (i.e. the concavity for scoliosis, the anterior part for kyphosis, etc).

There is greater controversy when the absence of torsion of the cord related to twisted vertebrae is presented. In fact, for patients treated for progressive paraplegia in scoli-

otic curves by cord transposition, we have, on occasion, observed a twist of the cord, which is suspended on the convex apical root, which is obstructing the pathway prepared for transposition. The cord can be moved only when the root is cut, resulting in untwisting of the cord.

Nevertheless I am completely in agreement with the author's point that the center of rotation in a scoliotic curve at the level of a vertebra is located in the spinal canal and not in the spinous processes.

However, I do not agree with the hypothesis, as proposed in the section on Morphology, that the majority of scoliotic deformities are located in the lower thoracic area. There are, indeed, curves that are purely thoracic, thoracolumbar or lumbar.

Mention is also made, elsewhere in this section, of an age-related frequency for scoliosis onset at the moment of the pubertal growth spurt. This is certainly true; however, we should not forget infantile scoliosis, which appears before the age of 3 years, and juvenile curves, which appear between 3 years and puberty – both of which are true scolioses.

Finally, to add some comments about anthropometry, we must also remember that thoracic volume and rib growth increase for 2 years after the end of spinal growth in height.

All these comments may refute some aspect of the hypothesis, but not the basic one.

This comment refers to the article which can be found at
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Neural hypothesis

As for the study of the spinal cord itself, and the neural hypothesis, it is true that the spinal cord may interfere with the size of the spinal canal. It is well known that spinal cord tumors with or without syringomyelia increase the size of the spinal canal with very thin pedicles, while, on the other hand, congenital agenesis of the T12 vertebra is very often associated with a very thin and narrow neural tube and a very thin and atrophic spinal cord at the level of the congenital anomaly. We can also say that the spinal cord can spontaneously extend beyond a very wide canal with big dural ectasia and bone defect in some dystrophic spines, such as cases of neurofibromatosis type I kyphoscoliosis. It seems there that the *primum movens* is not the cord, but really the spine; however,

this is a long way from idiopathic scoliosis.

In fact, in the very severe curves, with a Cobb angle of more than 160° , neurological troubles are very exceptional unless the spine is stretched suddenly, creating nervous tissue anoxia. On the other hand, when the spine is progressively stretched using a very-low-distraction cast, neurological problems are absent, and in cases of existing neurological problems, this procedure has even been shown to lead to a recovery.

I also agree completely with the remarks concerning the relationship between syringomyelia, Chiari anomalies, and the development of scoliosis, and I would emphasize the fact that the removal of a purely thoracic neuroblastoma or even a section of two or three consecutive intercostal nerves close to the foramen leads to scoliotic deformity, where

convexity of the curve is on the same side as the surgical damage (exactly the opposite of what we can see in post radiation Wilms tumor patients, where the convexity of the curve is located on the opposite side of the surgical approach).

However, the most interesting aspect of this review article is the study of relationship between relative growth of spinal tissue and neural tissue under the influence of the melatonin, calmodulin hormonal complex.

The hypothesis presented on the interaction of pineal gland products upon modulation of spinal growth on the base of increased bone growth and conversely with the same products with reduced melatonin with impaired spinal cord growth cannot be rejected. Nothing in the research that my colleagues and I are doing in this field can refute this hypothesis.