**Paper #9: Growth Patterns of the Neurocentral Synchondrosis (NCS) in Immature and Growing Vertebra**

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**Disclosures:**  **R.M. Schwend:** A; K2M. B; Advisory Board: Project Perfect World, Advisory Board: Miracle Feet, Chair: AAP Section on Orthopaedics. **L.C. Blakemore:** A; K2M. B; Medtronic, Stryker, Associate Editorial Board: Spinal Deformity, Member at large, board of directors: Scoliosis Research Society. **J.A. Schmidt:** A; K2M. **B. Akbarnia:** A; DePuy Spine (to institution). B; K Spine, K2M. D; K Spine, Ellipse. F; Depuy Spine, K2M.

**Introduction:** Understanding the development, growth and closure of the neurocentral synchondrosis (NCS) is essential for proper recognition and treatment of pediatric spinal disorders. Published information on normal growth of the NCS is limited to MRI evaluation of the thoracic and lumbar spine, showing differential closure based on age and vertebral level (Zheng et al 2009). The intent of our study was to evaluate the growth pattern of NCS in all three regions of the spine in actual pediatric specimens.

**Methods:** Measurements were taken from the cervical, thoracic and lumbar vertebral bodies (VB) of 32 pediatric specimens, ranging from 1 to 18 years of age (there are no 2 or 9 YO specimens in this data set) from the Hamann-Todd Osteological Collection at the Cleveland Museum of Natural History. 733 VBs were available for analysis. All available VBs from C1 to L5 were photographed in six orthogonal planes using high definition photography. All images were calibrated and quantitative measurements taken from the photographs of the cranial-caudal view using Scandium Image Analysis System. For each VB both the left and right sides of each NCS and the actual width of the pedicle (at the same level as the NCS) were measured. Dividing NCS by the pedicle width and multiplying by 100 provided the percent of the open growth plate.

**Results:** Age and the three regions of the spine were evaluated. The graph shows that in early childhood and in all three regions of the spine the NCS was active and open. By age 5 years, the cervical spine NCS had virtually closed with only 10% of the NCS remaining open. The lumbar spine, while closing rapidly was still nearly 50% open at age 5 years and closed by age 10 years. The thoracic spine was only 25% closed at age 5 years and remained open through age 17 years. There was no difference between the left and right NCS data (t test NS).

**Conclusion:** This data supports the theory that vertebral growth can still be ongoing in the thoracic spine when the NCS is already closed in both cervical and lumbar regions. This may coincide with adolescent peak growth velocity, the doubling of thoracic volume after age 10 years, a time period for development of idiopathic scoliosis.

**Reference**