

Spinal Cord Intramedullary Pressure in Main Thoracic Scoliotic Deformity: A Cadaveric Study

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Introduction

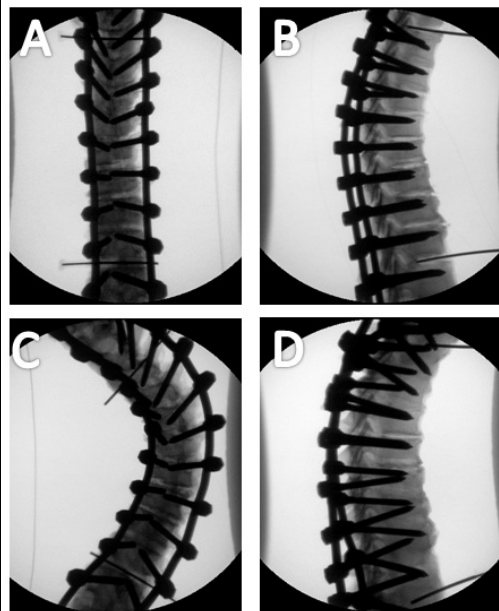
Previous studies have shown that kyphotic deformity significantly increases spinal cord intramedullary pressure (IMP). IMP changes in scoliotic deformity have not been studied to our knowledge. We used an in-vitro cadaveric model to study the relationship between main thoracic scoliotic deformity and spinal cord IMP.

procedures, pre-existing spinal deformity, canal stenosis, etc). A Full anatomic dissection was performed to expose the ventral and dorsal spine. Partial lateral discectomies and osteotomies were performed to allow spinal manipulation. Cadavers were then positioned sitting with physiologic thoracic coronal and sagittal alignment, with head stabilized in a skull clamp. Posterior segmental instrumentation was performed from occiput to L3. The T3/T4 ligamentum flavum was removed, dura opened, and 3 pressure sensors were advanced caudally to T4/T5, T7/T8 and T10/T11 within the cord parenchyma. A stepwise main thoracic T4-T11 scoliotic deformity with rostral and caudal compensatory curves was then induced by coronally bending thoracic rods and closing the lateral segmental osteotomies with compression on the concavity and distraction on convexity. At each step, fluoroscopic images and pressure measurements were obtained; the T4-T11 Cobb angle was measured. Sagittal alignment was maintained while inducing the scoliotic deformity.

Results

Creation of a main thoracic scoliotic deformity did not significantly increase IMP. The mean main thoracic maximal scoliotic deformity created was 77 ± 2 degrees (range: 71-84). At maximal deformity, the mean IMP change at T4/5, T7/8, T10/11 was 2 ± 2 mm Hg, 1 ± 1 mm Hg and 1 ± 1 mm Hg, respectively.

Model of Cadaveric Coronal Deformity



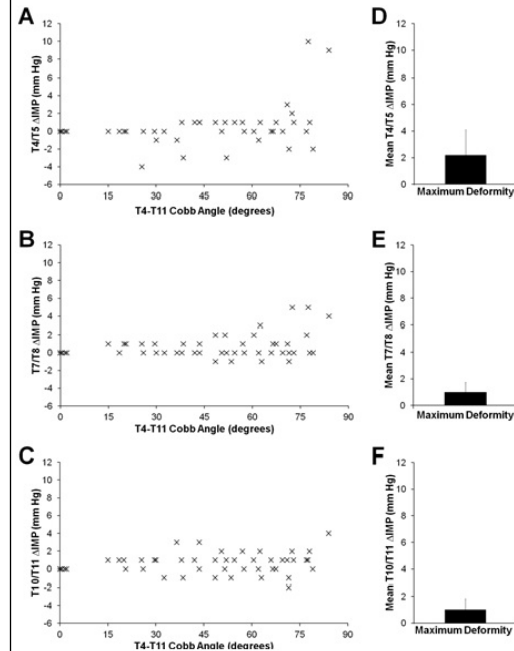
AP (A and C) and Lateral (B and D) views of cadaveric deformity in both neutral and maximally angled deformity

This differs significantly from previously published data demonstrating a significant marked increase in IMP for progressive thoracic kyphotic deformity. In one cadaver, a kyphotic deformity was created following coronal curve testing, confirming the previously reported impact of kyphosis on IMP.

Conclusions

In this cadaveric study, main thoracic scoliotic deformity did not significantly increase IMP. These findings are consistent with the presentation of isolated main thoracic scoliotic deformity patients with

Delta IMP Versus Scoliotic Cobb Angle



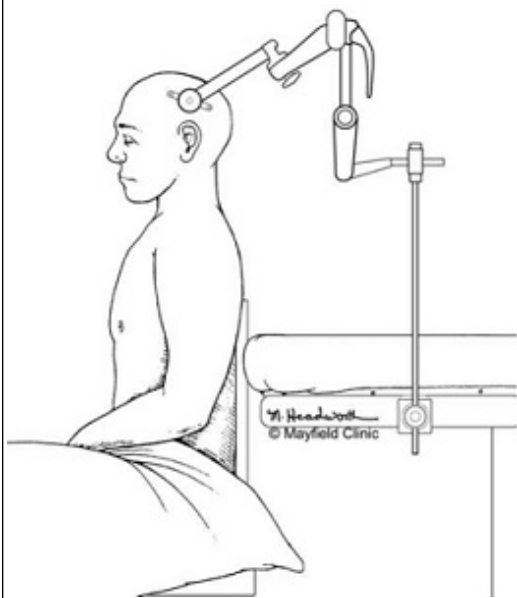
Change in IMP as a function of scoliotic cobb angle

cosmetic, pulmonary, and global alignment symptoms without myelopathy. This study helps explain the relative absence of myelopathy in isolated main thoracic coronal plane deformity.

References

1. Farley CW, Curt BA, Pettigrew DB, Holtz JR, Dollin N, Kuntz C 4th. Spinal cord intramedullary pressure in thoracic kyphotic deformity: a cadaveric study. Spine (Phila Pa 1976). 2012 Feb 15;37(4):E224-30.

Neutral Upright Spinal Alignment



Neutral upright spinal alignment in cadaveric testing beginning from a normal physiologic posture

Method

In six fresh-frozen cadavers, a progressive scoliotic deformity was created. Prior to testing the cadaveric specimens were assessed with CT imaging to rule out confounding pathology (neoplasm, prior spinal