
Chukwudi K. Chukwunyerenwa, MD, MCh,FRCSC; Charles Johnston, MD; Anna M. McClung, BSN, RN; Luke Gauthier, MD; Alan J. Spurway, MASc; Ron El-Hawary, MD, MSc, FRCSC


Introduction: When measured on coronal radiographs, spine-based distraction surgeries have followed a law of diminishing returns which has been proposed to be related to auto-fusion. As lengthening surgeries are kyphogenic, our hypothesis was that spine length continues to increase with each lengthening procedure; however, these gains occur in the sagittal plane. Our purpose was to evaluate the effect of lengthening procedures on coronal, sagittal, and true spine length in children with idiopathic scoliosis.

Methods: Retrospective, multi-center, review of 18 patients with minimum 5 yr follow-up after growth friendly surgery. Radiographs were analyzed at implantation and at each lengthening procedure. Primary outcomes were changes in coronal, sagittal, and true (along the sagittal arc of vertebrae) T1-T12 length per lengthening.

Results: With minimum 5 year follow up, 18 patients with a mean age of 4.1 years were treated with rib-based(n=9) or spine-based(n=9) distraction. Three groups were compared: First lengthening (L1), 2nd through 5th lengthening (L2-L5), and 6th through 10th lengthenings (L6-L10). Cobb angle stayed constant (45.0o, 44.7o, 48.6o), maximum kyphosis increased (32.1o, 45.3o, 47.5)*, coronal thoracic height increased (16.4cm, 17.6cm, 17.8cm), true thoracic length increased (18.4cm, 19.5cm, 20.8cm)*, change in coronal T1-T12/lengthening decreased (5.7mm, 4.0mm, 1.7mm), change in sagittal T1-T12/lengthening decreased (4.0mm, 3.3mm, 3.1mm), and change in true T1-T12 / lengthening remained constant (2.8mm, 4.4mm, 4.4mm).(*p<0.05).

Conclusion: Although there is the appearance of a law of diminishing returns when measured in the coronal plane, these changes were not as apparent when measured in the sagittal plane and were nullified with measurement of true spine length. These findings support the hypothesis that, when measured in the plane of distraction, a law of diminishing returns may not be apparent.