

T2 (upper instrumented level) and maximum von Mises stresses on the rods were measured.

Results: SDS showed around 10% reduction in maximum Von Mises stresses during all motions, compared to TGR.

Conclusion: SDS provides equivalent maximum von Mises stresses compared to TGR. Research is currently pursued to investigate the spatial distribution of stresses, spinal range of motion due to unique design features in SDS and spring-force optimization for optimal growth potential while minimizing rod fractures, as compared to TGR.

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Paper #48

A Prospective, Multicenter Analysis of the Efficacy of Anterior Vertebral Body Tethering (AVBT) in the Treatment of Idiopathic Scoliosis



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Summary: Spinal fusion remains the gold standard surgical treatment for progressive IS, however concerns about the long-term effect of spinal fusion have led to the development of growth-modulation techniques. We present minimum 2-year results in a prospective cohort of 28 consecutive patients treated with AVBT at 2 independent centers and found the technique effective in preventing curve progression and obtaining curve correction with most curves reaching a clinical success of $\leq 30^\circ$.

Hypothesis: Anterior vertebral body tethering (AVBT) is limited in effectively preventing curve progression and maintaining curve correction to $\leq 30^\circ$ at 2 yr f/u.

Introduction: AVBT has sparked interest as a possible alternative in the management of progressive idiopathic scoliosis (IS). To date limited available data exists regarding the efficacy and complication rate with AVBT. The aim of our study was to evaluate the clinical, radiographic and perioperative outcomes and complication rates to determine the efficacy of AVBT in skeletally immature IS patients.

Methods: A retrospective review of all consecutive patients treated with AVBT at 2 centers with minimum 2 year f/u was conducted using a prospective multicenter database. Clinical success was set a priori as major coronal curve size $\leq 30^\circ$ at most recent f/u.

Results: 28 patients with 33 procedures were analyzed. Mean age at surgery was 12.7 (9.7-16.8) years with majority female (89%) and mean f/u of 28 (24-40) months. Mean pre-op major curve of 54° (35° - 81°) degrees improved to mean 34° (5° - 63°) at first erect x-ray with further correction to a mean 29° (4 - 46°) at 2 yr f/u (46%, $p < 0.01$). Significant spontaneous curve correction was also observed in the un-instrumented curves on average by 28% ($p < 0.01$) at 2 year f/u. Average number of instrumented levels was 6.2 (5-8) with a mean OR time of 214 (138-505) min. Average EBL was 253 (50-650) cc with no patient requiring allogeneic blood. Length of hospital stay was mean 5.0 (3.0-8.0) days. Clinical success was noted in 57% of patients at most recent f/u. There were 10 complications in 28 patients (36%) with 2 (7%) requiring conversion to fusion due to curve progression and 3 (11%) requiring revision due to adding on, overcorrection and tether breakage.

Conclusion: AVBT is effective in obtaining clinical success in skeletally immature IS patients with minimum 2 yr f/u. Although a reoperation rate of 18% demonstrates further need to refine indications and technique, the 2 yr major curve correction results are promising. Longer-term follow-up is needed to determine the true clinical benefits of this technique.

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Paper #49

Spine Pathology in Mucopolysaccharidoses

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Summary: Mucopolysaccharidoses (MPS) are rare inherited metabolic diseases, causing lysosomal storage of mucopolysaccharides; clinical presentation involves skeletal system and particularly the spine. Anomalies include developing kyphosis at thoracolumbar junction, that can cause nervous symptoms, and dens hypoplasia with associated atlantoaxial subluxation that can cause myelopathy. We present our experience in the treatment of spine pathology in MPS.

Hypothesis: Medical treatments of mucopolysaccharidoses seem to have little impact on spine disease: treatment of cervical instability often includes surgical decompression and stabilization, while thoracic lumbar kyphosis is treated by bracing and, in severe cases, with surgery. Bracing is more effective in kyphosis under 40° Cobb. Our surgical cases in thoracic lumbar Kyphosis treatment include the first ever described posterior approach only vertebrectomy in MPS and a case of lateral costo transverse approach instrumented correction.

Introduction: Mucopolysaccharidoses (MPS) are rare inherited metabolic diseases that impair catabolism of glycosaminoglycans or mucopolysaccharides, causing lysosomal storage; clinical presentation is multi-systemic, with of the spine. Vertebral anomalies include "beaked" vertebra at thoracolumbar junction, responsible for the typical developing kyphosis that can cause nervous impairment; the deposition of glycosaminoglycans in tissues at occipitocervical junction causes compression myelopathy.

Methods: From 2006 to 2018 we treated 22 MPS patients with spine diseases, mean age 4 years and 6 months All patients have been studied by spine plain radiographs and by MRI, integrated by CT scan in surgical patients. 18 patients with progressive thoracic lumbar kyphosis (mean 45° Cobb), without nervous symptoms, have been braced. 3 patients have been operated: a 4 years 6 months old girl, quadriplegic, affected by spinal cord compression at occipitocervical junction, treated by decompression and occipitocervical stabilization; a 6 years old boy with progressive thoracic lumbar kyphosis with neurologic symptoms, treated by posterior L2 vertebrectomy and instrumented arthrodesis T11-L4, with L1-L3 intersomatic cage; a 7 years and 7 months old boy with progressive thoracic lumbar kyphosis with neurologic symptoms, treated by T11-T12 and T12-L1 discectomy by posterior-lateral approach, T11-T12 and T12-L1 intersomatic arthrodesis and T10-L4 posterior instrumented arthrodesis.

Results: Surgical patients had no major complications after surgery and CT scan at follow up shown complete fusion without loss of correction, even if in a cervical case we used an adult rigid instrumentation in a 4 years 6 months old girl (10 years follow up) and in thoracic lumbar kyphosis case treated by vertebrectomy due to diminutive anatomy we positioned interbody cage in suboptimal position

Conclusion: Bracing is a viable treatment strategy in thoracic lumbar kyphosis and can obtain good clinical results at medium terms follow up even if kyphosis deformity remains in radiographs. Surgical treatment is effective in severe evolving cases both at cervical and thoracic lumbar level, main difficulties arose from unavailability of dedicated instrumentation in very young patient, as even smallest devices available are often too big.

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