



Posterior-Only Vertebral Column Resection for Fused Spondyloptosis

Jeffrey L. Gum, MD^{a,b}, Lawrence G. Lenke, MD^{c,*}, Anand Mohapatra, MD^d, Sam Q. Sun, MD^c,
Michael P. Kelly, MD^b

^aNorton Leatherman Spine Center, Louisville, KY 40202, USA

^bDepartment of Orthopaedic Surgery, Washington University School of Medicine, St. Louis, MO 63110, USA

^cThe Spine Hospital, Department of Orthopedics, Columbia University Medical Center, New York City, NY USA

^dWashington University School of Medicine, St. Louis, MO 63110, USA

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Abstract

Study Design: Retrospective review.

Objectives: To describe 3 cases of a posterior-only vertebral column resection (pVCR) for the treatment of spondyloptosis in the setting of prior spinal fusions.

Summary of Background Data: Lumbosacral spondyloptosis is a rare spinal deformity with a number of surgical options, none of which demonstrate clear superiority. The use of an L5 vertebral column resection, via combined anterior and posterior approaches, to restore lumbosacral alignment has been described though is accompanied by high rates of neurological deficit.

Methods: Review of 3 cases of spondyloptosis with prior spinal fusions in which a staged pVCR was used for deformity reconstruction.

Results: Three females, ages 39, 54, and 28, developed spondyloptosis with progressive lumbosacral kyphosis and sagittal malalignment after prior in-situ posterolateral spinal fusions. All were treated with staged pVCRs. At ultimate follow-up, imaging revealed improvement in sagittal balance of 6.1 cm (56%) in the 39-year-old and 12 cm (67%) in the 54-year-old, 21.1 cm (92%) in the 28-year-old. All patients had improvement in outcome scores with perfect satisfaction scores despite the 54-year-old having a persistent right foot drop.

Conclusion: Posterior-only VCR for spondyloptosis is a technically demanding surgical option offering significant radiographic and clinical improvement, but carries a risk for L5 nerve root deficit as in any spondyloptosis treatment.

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Keywords: Spondyloptosis; Vertebral column resection

Introduction

Lumbosacral spondyloptosis is a rare spinal deformity that can be associated with pain, progressive deformity, and

neurologic deficit [1-4]. A number of surgical options have been described, including anterior and posterior approaches or all-posterior procedures, with no clearly superior technique [5-12]. The goal of surgery is safe and effective

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*Corresponding author. The Spine Hospital, Department of Orthopedics, Columbia University Medical Center, New York City, NY USA. Tel.: (212) 932-4333; fax: (212) 932-5097

E-mail address: ll2989@columbia.edu (L.G. Lenke).

correction of the spinal deformity with decompression of the lumbosacral nerve roots. The amount of reduction one should attempt is the most debated technical portion of the procedure [8,13,14]. With increasing amounts of translational reduction come higher rates of neurologic deficit, most occurring with corrections exceeding 50% [15,16]. A reasonable aim of surgery is elimination of lumbosacral kyphosis and minimization of the translational element of the spondylolisthesis. The use of an L5 vertebral column resection (VCR), via combined anterior and posterior approaches, to restore lumbosacral alignment has been described but is accompanied by high rates of neurologic deficit [17,18]. The purpose of the study is to identify a series of patients undergoing posterior-only VCR (pVCR) for the treatment of spondyloptosis in the setting of prior spinal fusions.

Materials and Methods

Using a prospectively collected adult spinal deformity database, we retrospectively identified a consecutive series of 3 patients who underwent pVCR for lumbosacral spondyloptosis with previous arthrodesis from 2008 to 2012.

Patient 1

A 39-year-old female professor presented with worsening lumbosacral pain, bilateral lower extremity radiculopathies, and progressive deformity. At age 14, the patient had a traumatic spondylolisthesis at L6–S1. She progressed to complete spondyloptosis and underwent an L5–S1 in situ fusion at age 14 followed by a revision L4–S1 in situ fusion at age 16. Her neurologic examination was normal except for left extensor hallucis longus (EHL) weakness (4/5). Standing posteroanterior (PA) and lateral radiographs revealed six non-rib-bearing vertebral bodies and a spondyloptosis of L6 on S1 (Fig. 1A). A lumbar computed tomographic (CT) scan confirmed an arthrodesis from L5 to S1, including an anterior spinal fusion at L6–S1 (Fig. 1B). The patient stood with a crouched stance in positive sagittal alignment (Fig. 1C).

Patient 2

A 54-year-old female school teacher presented with symptoms of lumbosacral pain, bilateral lower extremity radiculopathies, and progressive deformity. The patient had undergone 5 prior spinal surgeries, including Harrington instrumentation from T11 to the sacrum, for progressive spondylolisthesis with the first at age 13. Her neurologic examination was normal. Standing PA and lateral radiographs as well as her preoperative magnetic resonance imaging and CT scan revealed an arthrodesis from T11 to the sacrum (Fig. 2A and B). On examination, the patient stood with a crouched stance and forward sagittal alignment (Fig. 2C).

Patient 3

A 28-year-old woman presented with progressive deformity and bilateral lower extremity weakness and numbness. At age 16 she had a posterior fusion for grade IV spondylolisthesis that worsened following a car accident 5 years later. She underwent three subsequent revisions with dural leak, instrumentation failure, and progression of her deformity despite a solid posterior spinal fusion from L1 to the sacrum. Standing PA and lateral radiographs and CT scan with 3D reconstruction revealed an arthrodesis from L4 to the sacrum (Fig. 3A and B). On examination, the patient stood with a crouched stance and extreme forward sagittal alignment (Fig. 3C). The neurologic examination revealed grade 3/5 EHL, 4/5 tibialis anterior, and 4/5 quadriceps on the left and grade 4/5 EHL and tibialis anterior on the right but was otherwise normal.

Results

Patient 1

The patient underwent a staged, pVCR of L6. During the first stage, fusion exploration confirmed a fusion at L5–L6, L6–S1, and a pseudarthrosis at L4–L5. A decompression was performed via laminectomies at L5, L4, and the inferior aspect of L3, with revision laminectomies at S1–S2. Exiting nerve roots were identified and any dorsal scar tissue removed to avoid buckling of the dura. Sacropelvic fixation was achieved with six (three pairs) iliac screws followed by placement of pedicle screws from L2 to S1. A sacral dome osteotomy was performed to allow access to the L6 vertebral body and to create a smooth plane for docking of the proximal fusion mass with correction of the translational deformity. Temporary rods were placed and the wound closed. Neurologic monitoring via somatosensory evoked potentials and electromyography pedicle screw stimulation was without alerts. Total operative time was 482 minutes and estimated blood loss (EBL) was 3,000 mL (50% estimated blood volume [EBV]).

The second-stage procedure was performed two days later. With one temporary rod still in place, a posterior column osteotomy was performed at L5–L6. The resection of L6 was then performed below this osteotomy, by resecting the L5–L6 disc and exposing the lateral portion of the L6 body at the level of the pedicle on the left side, similar to a PSO. Once the lateral body was exposed, the pedicle was decancellated and the cortical bone was removed. The anterior and lateral cortical bone of L6 was thinned or “egg-shelled” with the combination of curettes and a high-speed burr. The goal of the thinning process is to leave just enough of a boney rim to avoid getting into any extracavitary structures such as the segmental artery, but thin enough to crumble or fracture the body under a gentle compressive force. The temporary rods were switched and the same resections were performed on the contralateral side. The final lordotic rods were then engaged at the iliac

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