

Clinical Study

Early outcomes and complications of posterior vertebral column resection

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Abstract

**BACKGROUND CONTEXT:** Hyperkyphosis confers a significant risk for neurologic deterioration as well as compromised cardiopulmonary function. Posterior vertebral column resection (PVCR) is a challenging but effective technique for spinal cord decompression and deformity correction that even under the setting of limited resources can be performed to reduce the technical difficulties, the operating time, and possibly the complications of the traditional two-staged vertebral column resection (VCR). **PURPOSE:** To report on the results of VCR performed through a single posterior approach (PVCR) in the treatment of severe rigid kyphosis in a series of patients treated and followed at a Scoliosis Research Society Global Outreach Program site in West Africa. **STUDY DESIGN:** Retrospective case series.

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**PATIENT SAMPLE:** Forty-five consecutive patients treated with PVCR for correction of severe rigid kyphosis.

**OUTCOME MEASURES:** Clinical and radiographic outcomes and complications; Scoliosis Research Society outcome instrument (SRS-22).

**METHODS:** From 2002 to 2009, 45 patients (20 male and 25 female) underwent PVCR for kyphosis from congenital deformity (nine) or secondary to tuberculosis of the spine (36). Preoperative demographics, preop and postop neurologic status, SRS-22 scores and complications were recorded; upright full spine X-rays were available in all patients. Mean age was 14 years (6–47 years); mean follow-up 27 months (2–79 months). Mean preoperative kyphosis measured 108°. The deformity apex was resected via a costotransverse (thoracic) or posterolateral (lumbar) approach; neurosurveillance with sensory (somatosensory-evoked potentials) and motor (motor-evoked potentials) potential was used in all cases. Posterior instrumentation was used in all patients, and anterior structural cage was used in 32 patients.

**RESULTS:** Intraoperative monitoring changes occurred in 10 patients (22%), and one patient progressed to complete spinal cord injury. Average preoperative local kyphosis was 108° and corrected to 600 postoperatively. Postoperatively, no additional patient showed neurologic deterioration; of the 11 patients with preoperative gait disturbances, 4 improved to normal gait, 5 remained the same, and 2 showed deterioration of their walking ability to nonambulating level. Total SRS-22 scores improved from 3.18 to 3.54 ( $p=.01$ ), primarily self-image domain.

**CONCLUSIONS:** Posterior vertebral column resection was successfully undertaken for the management of thoracic and thoracolumbar hyperkyphosis, demonstrating improvements in overall kyphosis and clinical outcome. Neuromonitoring provided the required safety to perform these challenging complex spine deformity procedures. © 2015 Elsevier Inc. All rights reserved.

*Keywords:*

Kyphosis; Postinfectious; Congenital; Posterior vertebral column resection; PVCR

## Introduction

Complications of untreated severe kyphosis are numerous and include compromised cardiopulmonary function, spinal cord compression, neurologic deficits, painful costopelvic impingement, and various psychosocial disturbances [1,2]. Several spinal osteotomies have been used for the treatment of severe deformity and in particular correction of severe kyphotic deformity [3]. Vertebral column resection (VCR) is an osteotomy of all three columns of the spine normally reserved for severe rigid spinal deformities that enables translation and shortening necessary to correct multiplanar deformities. Vertebral column resection was first described by MacLennan [4] in 1922 as excision of the apex in scoliosis through a posterior only approach that was combined with postoperative casting. In 1987, Bradford [5] presented the anterior column resection in patients with fixed multiplanar deformities, which was a modification of the technique described by Luque [6] that combined spinal shortening and posterior instrumentation.

Despite the satisfactory outcomes of the two-stage anterior-posterior technique [7,8], several series of patients have been treated with posterior only vertebral column resection (PVCR) in recent years [9–14]. The development of this technique has aimed at the reduction of technical difficulties, operating time, and complications of the traditional anterior-posterior VCR whether performed as a single procedure or in a staged fashion [10]. In cases of severe kyphosis, PVCR is an excellent procedure for safely decompressing the anterior aspect of the spinal

cord, which is draped over the apex of severe kyphotic deformities.

In this article, the authors report the outcomes obtained since 2002 with PVCR in properly selected patients with severe postinfectious or congenital kyphosis despite the lack of availability of resources at a Scoliosis Research Society Global Outreach Site (SRS GOP) in developing nations.

## Materials and methods

Between 2002 and 2009, 45 patients were treated with PVCR and followed at one SRS GOP in West Africa. Patients were selected based on the severity and rigidity of the deformity. A retrospective review using the clinical records and the radiographic materials was performed. The clinical records were reviewed for demographic data, etiology of the lesion, operation time, average blood loss, functional improvement, and complications (Table 1). Radiographs were reviewed for curve magnitude, deformity correction, spinal balance in the sagittal plane, complications related to the instrumentation, and stabilization. Deformity measurements were based on the Cobb's method; the angle of the kyphosis is measured by drawing a line on the upper surface of the first normal vertebra above the lesion and one through the lower surface of the first normal vertebra below the lesion. The sagittal spinal balance was determined by the standing lateral films measuring the C7 plumb line (or sagittal vertical axis [SVA]) horizontal distance from the posterior superior

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