

SUBSPECIALTY PROCEDURES

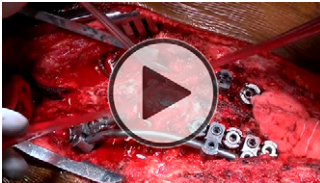
THE TECHNIQUE FOR PERFORMING POSTERIOR VERTEBRAL COLUMN RESECTION WITH EN-BLOC FIXATION/REDUCTION IN ADULT SPINE DEFORMITY SURGERY

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Published outcomes of this procedure can be found at: *Spine J.* 2019;19(12):1926-33, *Spine (Phila Pa 1976)*. 2005;30(23):E703-10, and *Spine (Phila Pa 1976)*. 2005;30(14):1682-7.

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Abstract

Background: Posterior vertebral column resection (pVCR) is a powerful tool for correcting rigid spinal deformity; however, it is a technically demanding procedure and may be associated with a substantial rate of complications¹. pVCR is often reserved for appropriately selected patients with severe focal deformity, in whom soft-tissue releases and posterior column osteotomies alone are unlikely to achieve satisfactory correction. Surgeon experience has also been shown to be correlated with outcomes², placing further emphasis on appropriate training and practice before performing pVCR.

Description: All surgeries are performed with the patient in the prone position under continuous neuromonitoring. The posterior approach to the spine and spinal instrumentation are performed in a standard fashion³. The S2-alar-iliac technique is utilized for sacropelvic fixation when indicated⁴. A minimum of 6 fixation points above and 6 below the level of resection are obtained, resulting in 2 instrumented blocs proximally and distally. A wide decompressive laminectomy with foraminotomies is then performed at the resection level, allowing for visualization of the spinal cord and exiting nerve roots. In the thoracic spine, disarticulating 3 to 4 cm of the medial rib at the resection level allows for better visualization and accessibility. Temporary fixation is then obtained by a unilateral rod spanning the osteotomy site. Focus is then directed toward the inferior and superior articular facets and pedicle, which are resected in a piecemeal manner from lateral to medial. Care must be taken to avoid damaging nearby nerve roots, especially at the inferomedial aspect of the pedicle. Cancellous bone removal from the vertebral body is then performed in a piecemeal manner through a lateral extra-cavitary approach from each side. This step necessitates transferring temporary fixation to the contralateral side in order to ensure adequate resection bilaterally. Posterior cortex is then resected. The anterior dura is carefully freed of any ligament or bone. Resection of the discs above and below the resection level is then performed, and the end plates are prepared for arthrodesis. The next step is to measure the defect. The sizing of the cages must be kept in line with the desired degree of correction,

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preventing overlengthening of the spinal column and subsequent stretching of the spinal cord. An en-bloc reduction-fixation across the osteotomy site is performed with use of intercalary connecting rods in order to achieve the desired correction. In situ benders at this stage may be utilized to manipulate the intercalary rods in order to widen the resection space anteriorly. The rods will subsequently be replaced. This technique minimizes stress on the junctional segments through load distribution across the various fixation points in the proximal and distal blocs. Finally, after decortication of the posterior elements, the bone graft is placed prior to layered closure in the standard manner.

Alternatives: Alternative treatments to the pVCR include a standard pedicle-subtraction osteotomy.

Rationale: A standard pedicle-subtraction osteotomy offers a substantial amount of correction; however, correction is limited to the sagittal plane because the wedge osteotomy is hinged on the anterior cortex. This limitation makes the pVCR a better candidate for patients with severe biplanar deformities.

Expected Outcomes: pVCR is a complicated and technically challenging procedure that offers substantial correction in the coronal and sagittal planes for patients with rigid spinal deformities. It has also been shown to significantly improve patient quality of life⁵. Complication rates, however, are reportedly as high as 25% among older patients with poor physiologic reserve, with postoperative risks including medical complications, neurological deficiencies, surgery-related complications and others⁶. Previous studies have demonstrated improved outcomes with increasing surgeon experience².

Important Tips:

- Medial rib resection in the thoracic spine allows easy access to the lateral vertebral column.
- En-bloc fixation-reduction minimizes fixation failure above and below the level of resection and provides a rigid foundation during the correction maneuver.
- Ensure that the anterior column is disconnected all the way across in order to avoid excessive shortening of the spinal cord and the potential neurologic sequelae.
- Complete resection of the posterior cortex and scar tissue anterior to the dural sac is required prior to the correction maneuver.
- Ensure an adequate number of fixation points above and below the resection level.

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