

Case Report

Assessment of long-term kyphosis following transthoracic corpectomy with single adjacent level posterior instrumentation

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Abstract

Anterior thoracic spinal instrumentation has traditionally been supported by a posterior thoracic construct spanning from at least two levels above to two levels below; however, instrumentation at a single-level above and below may be adequate to support such a construct. We report two cases of transthoracic corpectomy with short-segment posterior fixation with success in long-term stabilization. Two patients with thoracic vertebral malignancy resulting in spinal deformity and spinal cord compression underwent transthoracic corpectomy with placement of an expandable cage proceeded by posterior fixation one level above and one level below. Using the Cobb angle, the degree of kyphosis was measured at 3, 6, and 12 months postoperatively. Long-term spinal stabilization was achieved in both patients. There was no significant increase in kyphosis and no evidence of hardware failure in either patient during the follow-up period. Transthoracic corpectomy with supplementary posterior fixation one level above and below may be adequate to stabilize the spine.

Key words: Anterior expandable cage, corpectomy, kyphosis, spinal cord compression/surgery, spinal epidural malignancy, thoracic, transthoracic

INTRODUCTION

As spinal epidural malignancy becomes increasingly common, techniques to decompress and stabilize the spine become increasingly relevant. Surgical goals include decompression of the spinal cord and nerve roots, restoration of spinal alignment, and stabilization of the weight-bearing column. A common

approach to address these goals in the thoracic spine is transthoracic corpectomy with posterior fixation.^[1-3]

Traditionally, anterior thoracic spinal instrumentation has been supported by posterior fixation spanning from at least two levels above to two levels below the anterior construct. The longer the length of the posterior construct, the longer the incision, the greater the need for muscle dissection, and the greater the probability of suboptimal screw placement. We postulate that short-segment posterior stabilization (one level above, one level below the anterior construct) may minimize these morbidities and provide adequate stabilization in cases of thoracic corpectomy for spinal malignancy. We present two cases of successful stabilization with short-segment posterior instrumentation, resulting in resolution of neurologic deficits and stabilization of spinal curvature at long-term follow-up.

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MATERIALS AND METHODS

Thoracic spinal alignment was evaluated on the basis of computed tomographic (CT) imaging preoperatively, in the immediate postoperative period, and throughout follow-up. The degree of thoracic kyphosis was measured using the Cobb angle tool in the picture archiving and communication system at our institution (Horizon Rad Station, McKesson Corporation, San Francisco, CA, USA) based on the methods described by Park *et al.*^[4] Patients were evaluated at regular intervals and assessed for neurologic function and postoperative pain in addition to radiographic stability.

CASE REPORTS

Case 1

An 81-year-old man with a history of multiple myeloma 10 years prior presented with 1 week of back pain and 3 days of bilateral lower-extremity weakness. Physical examination was significant for mild paraparesis and myelopathy with hyperreflexia. A CT scan revealed a burst fracture at T3 with kyphosis and spinal cord compression. He underwent transthoracic corpectomy at T3 with placement of an expandable titanium cage (VLIFT, Stryker, Kalamazoo, MI) packed with rib autograft. The anterior construct was supplemented by posterior instrumentation with placement of pedicle screws and rods (VERTEX, Medtronic, Minneapolis, MN) at T2 and T4 through an open approach. The pathology findings were consistent with myeloma. The postoperative CT scan revealed adequate decompression and stable alignment. The operative and postoperative courses were uneventful and the patient was discharged to home. One month postoperatively, he had resolution of hyperreflexia, intact power, and normal gait. At 3, 6, and 17 months postoperatively, his pain remained well-controlled and his neurologic function was preserved; concurrent follow-up CT evaluations revealed stable alignment without evidence of hardware failure. Pre- and post-operative Cobb angle measurements are provided in Table 1.

Case 2

A 51-year-old woman with a known history of breast cancer presented with 4 days of progressive bilateral lower-extremity numbness, difficulty ambulating, and thoracic radicular pain. Physical examination demonstrated a band-like distribution of hyperesthesia and a T6 sensory level. She had intact power in her legs, but myelopathy with hyperreflexia. Imaging demonstrated a destructive lesion of the T6 vertebral body that was circumferentially compressing the spinal cord [Figure 1, left]. She underwent transthoracic T6 corpectomy with anterior cage placement (VLIFT). The anterior construct was supplemented

with posterior instrumentation with pedicle screw and rod (VERTEX) fixation at T5 and T7 through an open approach. The pathologic diagnosis was consistent with her primary breast cancer. Postoperative CT scan demonstrated adequate spinal decompression and stable alignment. The operative and postoperative courses were uneventful and the patient was discharged to home. At 1 month follow-up, the patient noted improved sensation and gait; CT scan demonstrated stable alignment. Three months postoperatively, reflexes and gait had normalized, with stable spinal alignment on CT [Figure 1, center]. At 6 and 20 months postoperatively, her pain remained well-controlled off medications; neurologic function was preserved; and imaging demonstrated continued stability with no evidence of hardware failure [Figure 1, right]. See Table 1 for pre- and post-operative Cobb angle measurements.

DISCUSSION

The traditional approach to stabilization of anterior thoracic decompression with cage placement involves posterior instrumentation at least two levels above and two levels below the affected level.^[3,5] Here, we present two patients who underwent transthoracic corpectomy for malignancy with short-segment posterior stabilization; in both cases, neurologic deficits resolved and imaging demonstrated long-term stability of spinal curvature.

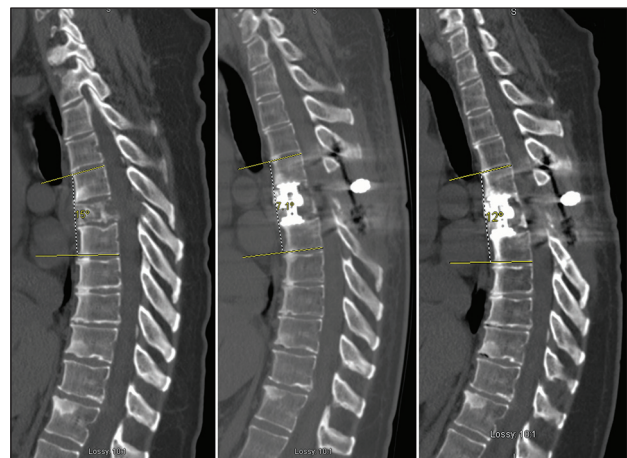


Figure 1: Representative thoracic spine computed tomographic (CT) images of a 51-year-old woman with breast carcinoma at the T6 level (Case 2). The patient underwent a transthoracic corpectomy, anterior cage placement, and posterior supplementation from T5 to T7. Sagittal spine Cobb angle measurements were assessed by drawing lines along the superior edge of the adjacent vertebral body cephalad to the level of the corpectomy and along the inferior edge of the adjacent vertebral body caudal to the level of the corpectomy. Kyphosis is assessed preoperatively (left), immediately postoperatively (center), and at 20 months postoperatively (right)

Table 1: Degree of spinal kyphosis measured by Cobb angle on sagittal thoracic computed tomographic scan

Case	Preoperative	<1 week	3 months	6 months	>12 months
Patient 1 (T3)	30°	16°	28°	26°	25°
Patient 2 (T6)	15°	10°	7°	10°	12°

The cases presented involve single-level corpectomies in the thoracic spine. Previous reports exist of successful posterior fixation one level above and one level below a corpectomy in the lumbar and cervical spine following vertebral body fracture; to the best of our knowledge, no previous reports exist of this technique in the thoracic spine.^[6-8] In this location, the ribcage provides additional semi-rigid support and likely contributes to the overall long-term stable spinal alignment observed, suggesting that conclusions drawn from the cervical and lumbar spine may apply to the thoracic spine as well. Multilevel corpectomies with longer anterior column defects result in greater torque on posterior instrumentation; thus, in our clinical practice, we have limited a one-above one-below posterior supplementation to single-level corpectomy operations.

Advances in spinal instrumentation may be responsible for the construct success in these patients. With a rigid titanium expandable cage providing solid anterior and middle column fixation, less stress is allocated to pedicle screw fixation in the posterior construct. With an aggressive corpectomy, wider cage end caps can be used to distribute forces over a greater surface area of the endplates. This force dispersion may allow for a shorter-segment posterior supplementation. In theory, shorter-segment posterior instrumentation allows for a smaller incision, less muscle dissection, decreased operative time, and perhaps overall decreased surgical morbidity associated with this portion of the procedure. Even in a percutaneous approach, fewer levels would theoretically involve lower risk. Given that most constructs fail early in the postoperative period,^[9,10] the follow-up results in these patients appear promising for stability.

These data suggests that short-segment posterior instrumentation to stabilize an anterior transthoracic corpectomy for malignancy may be an acceptable option for decompression with preservation of alignment. Further study of a larger patient population would yield more definitive conclusions, but anecdotal evidence of these successes is promising.

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