Journal of Surgical Oncology 2009;99:314–317

CASE REPORT

Multilevel Lateral Extra-Cavitary Corpectomy and Reconstruction for Non-Contiguous Metastatic Lesions to the Spine: Case Report and Literature Review

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In patients with metastatic disease to their spine and compromise of neurologic function, the challenge is to accomplish decompression of the neural elements and maintain mechanical stability but limit the risk and morbidity to the patient. In this case report the lateral extracavitary approach is employed to accomplish these tasks through a single approach in a patient with multiple non-contiguous sites of dorsal as well as ventral cord compression.
J. Surg. Oncol. 2009;99:314–317.

KEY WORDS: **lateral extra-cavitary corpectomy; spine; metastatic**

INTRODUCTION

Spinal tumors causing neurologic deficit is a common indication for spinal stabilization surgery. Tumors may arise primarily from the spinal cord or vertebral structures, or may be metastatic from a distant primary cancer [1,2]. Primary cancers are relatively rare [3]. In contrast, the spine is an extremely common site for metastasis, with 5–10% of all cancer patients diagnosed with metastatic spine disease, and nearly 40% of cancer patients have evidence of spinal metastases at autopsy [3–6]. Approximately 50% of metastatic spinal tumors are from primary breast, lung, and prostate cancer [3–5,7–9].

Surgeons attempting to resect spine tumors have a variety of options for their approach [3–5,10]. The choice of approach will be dictated by tumor location, the number of levels involved, the necessity of total excision, desired methods of resection and reconstruction, and the medical condition of the patient [3,4,11]. Anterior, posterior, anterolateral, posterolateral (including lateral extracavitary), combined anterior and posterior, staged anterior and posterior, and minimally invasive approaches have all been described [3,8,12,13].

Corpectomy (sometimes called vertebrectomy) is one popular technique to provide exposure of the anterior spinal column, treat disease spanning multiple levels or extending behind the posterior vertebral body, or treat vertebral body deformity [13–16]. Multilevel corpectomy can provide exposure of multiple levels of the spine to aid in resection of large tumors, but the morbidity of the anterior approaches traditionally employed to achieve corpectomy is a concern [10–12,14,17]. Alternatively, the lateral extracavitary approach with corpectomy allows exquisite spinal exposure while avoiding the morbidity of anterior approaches, but few cases employing multilevel lateral extracavitary corpectomy have been described [10,11,17].

The Patchell study [18] showed that patients with spinal metastasis presenting with neurologic deficit performed better (with respect to preservation of neurologic function) with surgery and radiation as opposed to radiation alone. Surgical techniques have markedly improved in the last couple of years, particularly with the introduction of expandable vertebral body cages, and have reduced morbidity associated with surgical resection and stabilization. For those patients in who prognosis from a systemic standpoint is greater than 6 months, with neurologic deficit (or impending neurologic deficit) due to spinal metastasis, and whose medical condition would tolerate surgery, surgical stabilization may offer the best chance at preserving neurologic function. The upper limit of what can be done, from a technical standpoint, has expanded. This poses the dilemma of not whether certain surgery can be done, but whether certain surgery should be done. This case represents a singular experience of such a dilemma.

CASE REPORT

A 54-year-old female with a history of metastatic renal cell carcinoma to the spine had previously undergone a radical nephrectomy and later an L2 corpectomy and T11-L4 posterior fusion at an outside facility 18 and 9 months, respectively, prior to presentation. She presented with thoracic back pain and rapid onset lower extremity paraparesis. MRI demonstrated multi-segment involvement of T2, T4, and T6–T8 (Fig. 1A). After consultation with medical oncology, her systemic disease was deemed to have a prognosis greater than

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Received 8 November 2008; Accepted 21 November 2008
DOI 10.1002/jso.21227
Published online 23 January 2009 in Wiley InterScience (www.interscience.wiley.com).

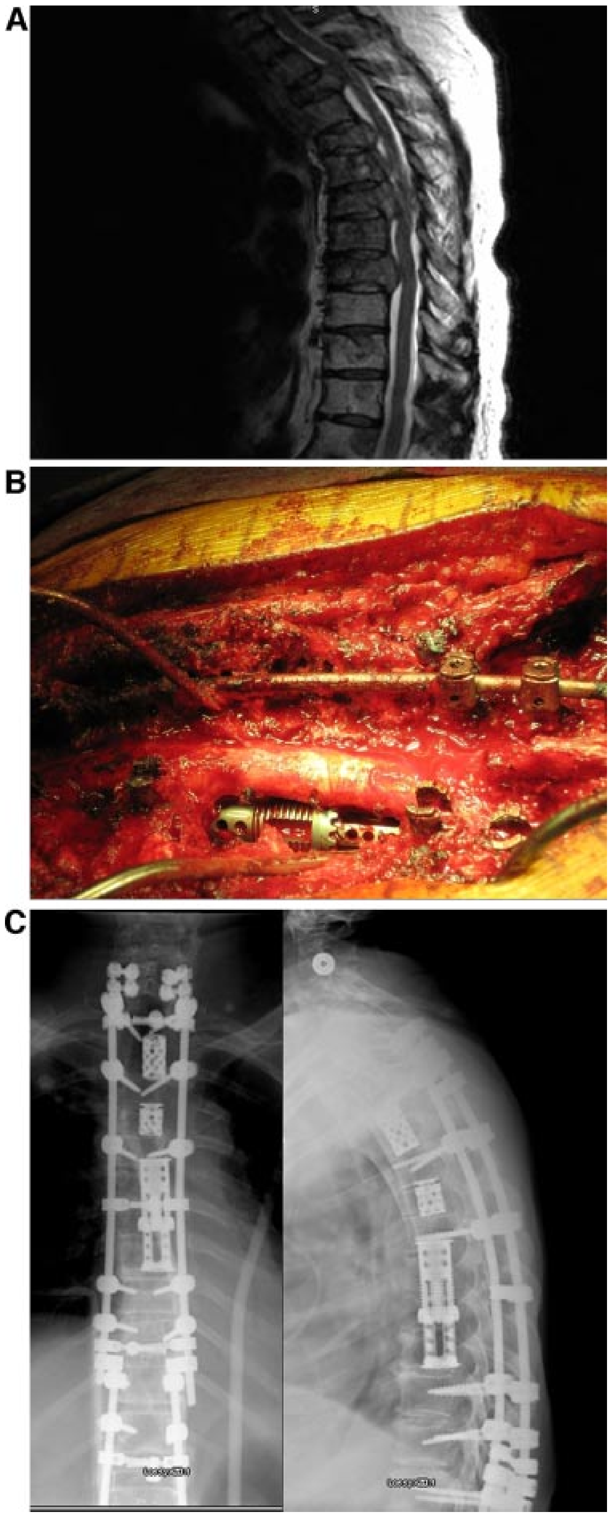

Fig. 1. **A**: Preoperative MRI demonstrated metastatic disease of the spine with kyphosis and canal compromise. **B**: Multi-segmental lateral extracavitary corpectomy of levels T2, T4, and T6–T8 was performed. Expandable cage was placed in multisegment defect and expanded to appropriate height. **C**: Follow-up X-ray at 3 months demonstrated maintenance of correction. [Color figure can be viewed in the online issue, available at www.interscience.wiley.com.]

6 months. She was otherwise quite healthy. Radiation oncology felt her lesions were too large for radiosurgery. Furthermore, they felt external beam radiation would be unlikely to improve her neurologic status. She underwent a T2, T4, and T6–T8 lateral extracavitary corpectomy and posterior fusion (Fig. 1B) by the senior author. Operative time was 5 hr with an estimated blood loss of 2 L. The patient remained intubated overnight and was extubated the following morning. Immediately post-operatively the patient had improvement in her neurologic function. By the 4th post-operative day she had regained useful strength in her lower extremities and was ambulatory with assistance of a walker. She was ultimately discharged home. Imaging at her 3 months follow-up visit showed maintenance of sagittal correction (Fig. 1C).

DISCUSSION

Tumors to the spine may result in spine destabilization, neurologic injury, and pain. Surgery is increasingly being performed in such circumstances. Most primary tumors of the spine arise from the bony elements including osteoma and osteoblastoma, vascular tumors such as hemangioma, giant cell tumors, multiple myeloma and plasmacytoma, lymphoma, chordoma, osteosarcoma, chondrosarcoma, and Ewing's sarcoma [19,20]. However, metastatic spinal tumors are far more common [3,21]. In a series of 832 autopsies on patients who died of cancer presented by Wong et al. [22] 36% had some evidence of spine metastases. Today 5–10% of cancer patients and 40% of patients with previous non-spinal bone metastases present with spinal cord compression from epidural metastases [4,22–26]. Of the patients with metastatic disease to the bone spine, 10–20% become symptomatic from spinal cord compression [25,27,28]. Metastases from prostate, breast, and lung make up 50% of all metastases to the spine [24] and commonly cause spinal metastases in 90.5%, 74.3%, and 44.9%, respectively [22]. With advances in modern medicine more of these cases will stop presenting at autopsy and more as patients with a long-term prognosis.

In selecting treatment strategy, life expectancy is a significant factor but other considerations include: tumor radiosensitivity, previous radiation failure, stabilization, deformity, intractable pain, and status of systemic disease. Surgical planning is multi factorial and catered to each patient individually. Some use the Tokuhashi score to determine patient survival [29] and in an effort to standardize their management strategy. This is a scoring system that takes into consideration Karnofsky score, number of extraspinal bone metastases, number of metastases in the spine, metastases to major internal organs, primary site of cancer and myelopathy. Those who score less than or equal to 5 generally die within 3 months and those who score greater than or equal to 9 on average live 12 months or more.

Although many factors influence our surgical planning, the management strategy for metastatic disease has three components: chemotherapy, surgery, and radiation. How we employ and combine these modalities has significantly changed over the past two decades. In the past a number of studies proposed that a laminectomy with adjuvant radiation was no more effective than radiation alone in restoring or maintaining neurologic function [30–37]. Instead they were associated with infection and worsening of pre-existing spinal instability. Based on this data radiation was the initial treatment strategy employed by most physicians. However spine surgery has come a long way in the past two decade and this approach certainly no longer holds, especially in radioresistant tumors. Surgical intervention is directed at local disease control, decompression of neural elements, mechanical stabilization and pain control. Common sites of metastases to the spine are the vertebral column (85%), the paravertebral region (10–15%), and, rarely, the epidural or subarachnoid/intramedullary space (<5%) [24,25,35]. With 70% of spine metastasis the metastatic emboli seed the vertebral body, causing ventral spinal cord compression, making a significant decompression with laminectomy alone very unlikely. Laminectomies and posterior decompression without fusion cause further destabilization in a patient with an anterior column prone to instability and compression fractures. It comes as no surprise that a surgical intervention if limited to a laminectomy does not make a significant contribution to patient outcome.

In this report the authors demonstrate that in patients with multilevel non-contiguous metastatic disease, especially those with lesions high in the thoracic spine, an aggressive resection/reconstruction is possible. Clearly, a single case with a favorable outcome is not enough to advocate aggressive surgery. However, it does provide food for thought. What is the upper limit of what can be done and when should it be done? A single posterior approach, lateral extracavitary, would allow a decompression at multiple levels and save the patient the morbidity of having to undergo multiple anterior approaches such a transthoracic and retroperitoneal. In these patients a long lateral construct, plate and screws, from an anterior approach is simply not possible and these patients will need a second approach (posterior) for instrumentation. An advantage of the lateral extracavitary approach is its utility as a single approach for the corpectomy/reconstruction as well posterior instrumentation/fusion. Combined instrumentation with vertebroplasty is also an option for certain vertebral segments.

CONCLUSION

At this point in the evolution of spine instrumentation and surgical technique, the upper limit as to our ability to resect and reconstruct is becoming increasingly distant, a point illustrated well by this case report. However, the more challenging and appropriate task is in defining the patient population who would benefit from such an aggressive surgical reconstruction. Clearly these techniques are technically demanding and may be associated with significant morbidity. The authors present a patient with a relatively radioresistant tumor, with acute neurologic decompensation, a Tokuhashi score of 7 and a prognosis greater than 6 month. However, these are not accepted nor advocated by the author as criteria for such an aggressive surgical strategy. This case report is not meant to advocate for such an aggressive strategy to become routine in managing such patients. This case simply presents a viable option for the surgical management of such patients in the event that the surgeon, medical and radiation oncologist agree to its necessity. The authors do advocate a lateral extracavitary approach for multi-level non-contiguous metastatic spine disease as this approach allows adequate visualization, circumferential and multi-level decompression, reconstruction/fusion and deformity correction all through a single approach.

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