

Case Report

Total En Bloc Lumbar Spondylectomy of Follicular Thyroid Carcinoma

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The presence of distant metastases from differentiated thyroid carcinoma decreases the 10-year survival rates of patients by 50%. This is a report of a 61-year-old female with follicular thyroid carcinoma who presented initially with low back pain. 2-deoxy-2-[18F] fluoro-D-glucose whole-body positron emission tomography/computed tomography (PET/CT) demonstrated a hypointensity lesion in the left thyroid gland with malignant uptake in L1 vertebra and magnetic resonance images revealed paravertebral and epidural extension of mass in L1 vertebra. After thyroidectomy, histopathological study showed a follicular carcinoma. We performed L1 total en bloc spondylectomy with expandable cage for long-term local control. The technical details of total en bloc spondylectomy in follicular carcinoma are described herein.

KEY WORDS : Thyroid carcinoma · Total en bloc spondylectomy · Metastasis.

INTRODUCTION

Bone metastases represent a frequent complication especially of follicular thyroid cancer and severely reduce the quality of life causing pain, fracture, and spinal cord compression. Bone metastases are typically associated with elevated markers of bone turnover, but these markers have not been increased in differentiated thyroid cancer. 2-deoxy-2-[18F] fluoro-D-glucose whole-body positron emission tomography/computed tomography (PET/CT) are the best anatomic and functional imaging techniques.

Thyroid cancer is a unique tumor associated with excellent long-term survival, even in the presence of distant metastasis. Follicular thyroid carcinoma is a slow-growing tumor, nevertheless, early hematogenous spread occurs to the lung and bone⁶.

Metastatic vertebral tumors often require surgical removal, frequently in a piecemeal fashion. Conventional piecemeal removal has several disadvantages such as disastrous bleeding because bone bleeding cannot be easily controlled with

any hemostatic methods, residual tumor mass because intraoperative distinction of the margin of the tumor is difficult, and tumor cell contamination^{2,9,12}. This case illustrates the technical details of total en bloc spondylectomy for long-term local control.

CASE REPORT

A 61-year-old female presented with a 2-year history of moderate chronic low-back pain that had become significantly worsen 3 months prior to admission. In addition to the increasing pain, she also experienced the onset of numbness in both her legs. Plain X-ray films of the lumbar spine revealed a lytic lesion involving the L1 vertebral body. MR imaging showed a tumor in the L1 vertebra with paraspinal extension (Fig. 1A, B, C). No other metastatic lesions were found upon bone scan. However, a positron emission tomography (PET) scan revealed a suspicious lesions in the left thyroid gland. The patient underwent a fine needle aspiration biopsy, and the lesion was diagnosed as a follicular thyroid carcinoma. The vertebral metastatic tumor was classified as Tomita Stage 5, and the treatment goal was long-term local control. L1 total en bloc spondylectomy was successfully performed. The postoperative outcome was favorable. The patient showed a good clinical

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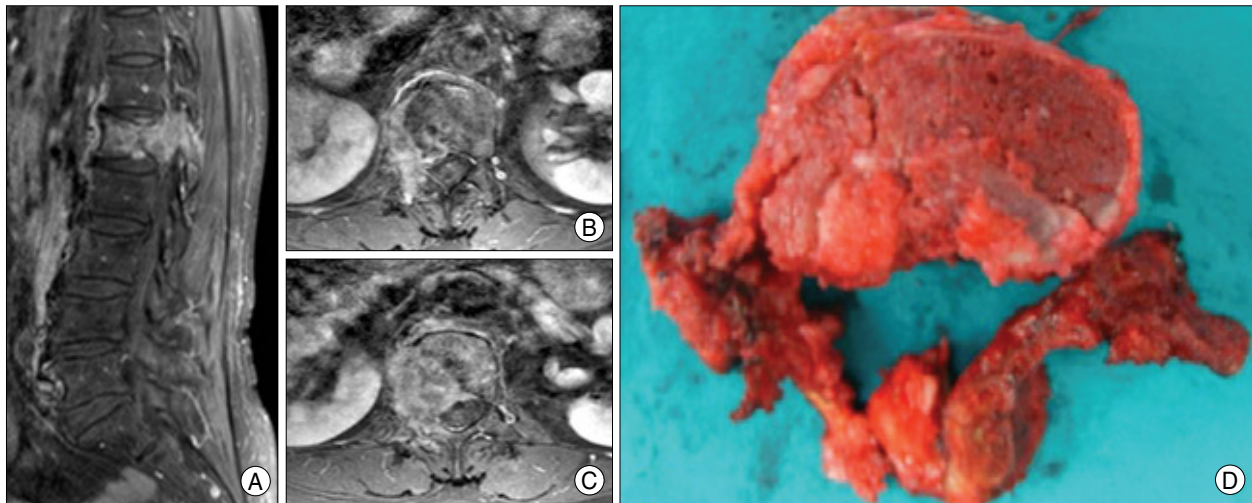


Fig. 1. A : Sagittal T1-weighted enhanced magnetic resonance image (MRI), revealing a solitary mass lesion of L1 in which involve the pedicle. B and C : Axial T1-weighted enhanced MRI, showing epidural and paraspinal extension of the mass. D : Totally en bloc resected L1.

recovery without any further neurological deficit.

Surgical technique

Preoperative embolization was done to reduce blood loss during operation. The patient was placed in a prone position over the Jackson four-poster frame (OSI, CA, USA) to avoid compression of the vena cava and to neutralize lumbar lordotic curvature. Electrophysiological monitoring of a somatosensory-evoked potential and motor-evoked potential were done. A straight, vertical, midline skin incision was made over the spinous process and extended three vertebrae above and below the involved segment. A subperiosteal dissection was performed to expose the laminae and transverse process. By spreading the retractor and detaching the muscles around the facet joints, a wide exposure was obtained. The surgical field was created wide enough on both sides to allow dissection under the surface of the transverse processes. To expose the superior articular process of the uppermost vertebra, the spinous process and the inferior articular processes of the neighboring vertebra were resected by osteotome and removed with dissection of the attached soft tissues, including the ligamentum flavum. The polyethylene tube for the threadwire saw (T-saw) guidance was inserted along the medial cortex of the lamina and the pedicle so that the spinal cord and the nerve root are not injured. After the T-saw guide was passed, its tip at the exit of the nerve root canal was seen beneath the inferior border of the pars interarticularis. In the next procedure, a multi-filament, flexible, threadwire saw was passed through the hole in the T-saw guide, and then the T-saw guide was removed, and tension on the threadwire saw was being maintained. This procedure was also applied to the contralateral side. The threadwire saw was placed beneath the

superior articular and transverse processes of target vertebra. With a reciprocating movement of the threadwire saw, the pedicles were cut, and then the whole posterior element of the spine was removed in one piece. Cutting surface of pedicles were sealed by bone wax to reduce bleeding and to minimize contamination by tumor cells. To maintain stability after segmental resection of the anterior column, a temporary posterior instrumentation was performed^{8,9}.

After en bloc laminectomy, blunt dissection was performed around the vertebral body. At this time, the segmental arteries were identified and ligated bilaterally. Blunt dissection was done anteriorly on both sides through the plane between the iliopsoas muscle and the vertebral body. The lateral aspect of the body was then dissected easily with a curved vertebral spatula and the segmental artery was dissected from the vertebral body. By continuing dissection of both lateral sides of the vertebral body anteriorly, the aorta was carefully dissected from the anterior aspect of the vertebral body with a spatula and the surgeon's fingers. And then a series of spatulas, starting from the smallest size, was inserted sequentially to extend the dissection. A pair of the largest spatulas was kept in the dissection site to prevent the surrounding tissues and organs from iatrogenic injury and to make the surgical field wide enough for manipulating the anterior column. Threadwire saws were inserted at the proximal and distal cutting disc space levels of the vertebral bodies. The anterior column of the vertebra, the anterior and posterior longitudinal ligaments were cut by the threadwire saw. Then, the mobilized anterior column was rotated around the spinal cord and removed carefully to avoid injury to the spinal cord⁹. With this procedure, a complete anterior and posterior decompression

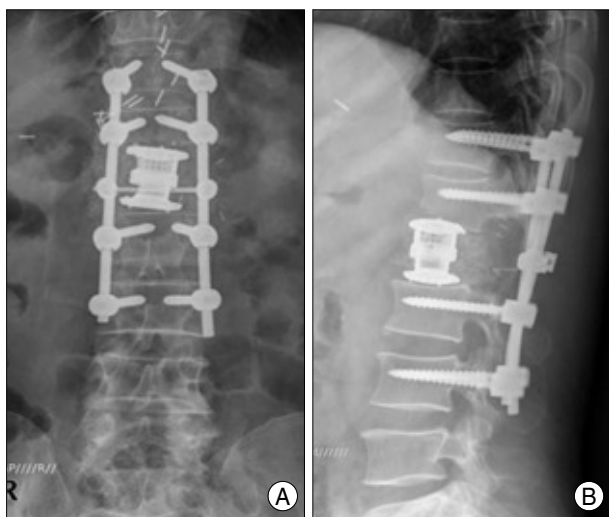


Fig. 2. Postoperative AP (A) and lateral (B) X-ray showing L1 body replacement with an expandable cage after total en bloc spondylectomy.

of the spinal cord and total en bloc resection of the L1 vertebra was achieved (Fig. 1D). Anterior support was accomplished by using an expandable cage (Synex, Synthes, PA, USA) (Fig. 2).

DISCUSSION

In case of differentiated thyroid carcinoma, as compared with other solid cancers, distant metastasis is not a common event occurring in about 9 percent of patients⁶. Interestingly, thyroid cancer is the most common primary neoplasm with vertebral metastasis as its initial manifestation³. It is probably due to indolence of differentiated thyroid cancer without subjective symptoms. This would mean that differentiated thyroid cancer is probably the most indolent tumor with a benign clinical course. Thyroid cancer is a unique tumor associated with excellent long-term survival, even in the presence of distant metastasis.

Weinstein et al. have stressed long-term survival in patients with primary spinal malignancy may be significantly correlated with the extent of the initial surgical procedure and tumor type. It may be assumed that a wider surgical margin will result in a better prognosis¹³. In our case, we chose total en bloc spondylectomy, according to Tomita's proposed surgical strategy for long-term local control. The advantages of total en bloc resections for establishing a cure are well recognized by surgical oncologists. Total spondylectomy is indicated for patients with primary spinal tumors or with isolated, solitary metastatic spinal disease when the primary tumor has been completely resected. The tumor must not invade adjacent visceral organs and must not be adherent to vena cava or the aorta for the surgery to be feasible⁹. Relative contraindications to total en bloc

spondylectomy include life expectancy of fewer than 6 months and more than two levels of contiguous disease. Tomita et al. have established a new surgical classification of vertebral tumors, modified from the staging system of Enneking et al.¹¹, in which the anatomical location of tumor involvement (vertebral body, pedicle, lamina and spinous process, epidural space, and paravertebral area) is used to determine whether a patient will benefit from a total en bloc spondylectomy⁹. The biological rationale for en bloc spondylectomy is supported by a recent study in which the authors examined the local extension of metastatic vertebral tumors; the authors demonstrated that each vertebra acts as a separate compartment surrounded by anatomical barriers to neoplastic cells². Lubicky et al.⁴ and Savini et al.⁷ have reported using a combined anterior-posterior approach for piecemeal total spondylectomy in patients with giant cell tumors. In 1988, Magerl and Coscia⁵ reported performing nine total spondylectomy via a posterior approach, but in their technique piecemeal resection of the VB was also required, which clearly increases the risk of tumor cell contamination of the surrounding surgical field. Tomita et al.^{9,12} modified with refined the total en bloc spondylectomy technique and performed it via a posterior approach in 24 patients with metastatic tumors and in seven patients with primary malignant vertebral tumors. Their technique involved the en bloc, as opposed to piecemeal, resection of the tumor, which they safely accomplished aided by a specially designed, flexible, smooth, threadwire narrow-diameter saw, used to divide sharply the pedicles without damaging the surrounding soft tissues¹⁰.

The major potential complications of total en bloc spondylectomies, as reported by Tomita et al.⁹ include injury to adjacent neural structures, injury to major blood vessels, excessive bleeding from the epidural venous plexus, disturbance of the spinal cord circulation at the level of surgery, and possible contamination by tumor cells during the pediculotomies. Of the patients reported by Tomita et al.^{9,12} one died on the third postoperative day due to disseminated intravascular coagulation, and one required a second operation because of instrumentation failure. The technique used by Tomita for total en bloc spondylectomy is a one-stage procedure performed via a posterior incision only.

CONCLUSION

This case illustrates that total en bloc spondylectomy can be performed safely and should be recognized as an important approach in the treatment of selected cases of spinal tumors.

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