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Successful treatment of malignant thymoma with sacrum metastases

A case report and review of literature

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Abstract

Rationale: Malignant thymoma in the spine is a rare disease without standard curative managements so far. The objective of this article is to report a very rare case of recurrent malignant thymoma with sacrum metastases causing severe lumbosacral pain, which was presented with acute radiculopathy and treated with 2 operations combined with stabilization and cement augmentation. The management of these unique cases is not well-documented.

Patient concerns: A 75-year-old man presented with lumbosacral pain, radiating pain and numbness of the left extremity. The patient underwent thymectomy in 2008, and posterior spinal cord decompression, tumor resection and a stabilization procedure in 2011. Pathologic results confirmed malignant thymomas of the spine. Imaging studies revealed the density of soft tissues, obvious bony destruction in the sacrum, and significant spinal cord obstruction.

Diagnoses: We believe this is a less-documented case of metastatic thymoma of the sacral spine presenting with back pain and radiculopathy, and presenting as a giant solid tumor.

Interventions: The patient underwent osteoplasty via a posterior approach. Pathologic results confirmed malignant thymomas of the sacral spine.

Outcomes: The patient's neurological deficits improved significantly after the surgery, and the postoperative period was uneventful at the 6-month and 1-year follow-up visit. There were no other complications associated with the operation during the follow-up period.

Lessons: This article emphasizes metastatic thymoma of the spine, although rare, should be part of the differential when the patient presents with back pain and radiculopathy. We recommend the posterior approach for spinal decompression of the metastatic thymoma when the tumor has caused neurological deficits. Osteoplasty by cement augmentation is also a good choice for surgical treatment.

Abbreviations: MRI = magnetic resonance imaging, T1WI = T1-weighted image, T2WI = T2-weighted image, VAS = visual analogue scale.

Keywords: cement augmentation, metastatic spinal thymoma, sacrum, stabilization, surgical treatment

1. Introduction

Thymoma and thymic carcinoma are uncommon epithelial entities, which originate from the thymus gland. To date, the true incidence is not known, but it is estimated to be 0 to 15 cases per 100000 individuals and represents 0.2% to 1.5% of all malignancies.[1] According to the World Health Organization, there are "organotypic" (types A, AB, B1, B2, and B3) and "nonorganotypic" (type C, thymic carcinomas) thymomas.[1,2] Types A, AB, B1, and B2 thymomas are benign tumors, while type B3 thymomas are aggressive tumors of intermediate malignancy. Spinal metastases of malignant thymoma (type B3) are extremely rare in literature, only very few patients with spinal metastasis have been documented, thus there is still short of imaging proof. Herein, we are presenting a detailed analysis of a rare case of spinal metastases of thymoma treated with stabilization and cement augmentation.

To the best of our knowledge, this is a rare case of metastatic thymoma to the spine in a man presenting with back pain and radiculopathy. We performed osteoplasty through a posterior approach. In the short term, the patient's conditions improved significantly post-operatively. After reviewing pertinent literature, we discussed common perioperative considerations in patients with significant metastatic thymomas to the spine and management considerations for these cases.

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SZL, XZ, and AS contributed equally to this work.

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2. Case report

In May of 2017, a 75-year-old man presented to our hospital, with progressive back pain, radiating pain and numbness of his left lower limb. The patient, having been diagnosed of B3 thymoma for 9 years, received surgical treatments including thymectomy in 2008, and posterior spinal cord decompression, tumor resection and a stabilization procedure due to the spinal metastases of malignant thymoma followed by postoperative radiation in 2011. In the medical journal of his current illness, the patient stated he had been experiencing paroxysmal and severe back pain for approximately 3 months, and he had also experienced a worsening numbness and radiating pain of his left lower limb for approximately 3 months. The pain in his back can reach 6 to 7 points using visual analog scale (VAS) and cannot be alleviated with rest and hot compresses. The patient denied experiencing any other constitutional symptoms. Upon further questioning, he recalled a history of old myocardial infarction since 2003. No pertinent family history was identified, including hypertension and cancer.

On physical examination, the patient showed pressure pain and percussion pain in his sacral region decreased sensation to pin-prick and fine-touch of his left lower limb and exhibited 5-/5 strength in his bilateral lower limbs. Deep tendon reflexes revealed normal for knee-jerk and Achilles tendon reflexes bilaterally. Ataxia, cranial nerves, mini-mental, and the rest of the neurological examination showed no abnormalities. Preoperative hemodynamic and cardiovascular assessments included electrocardiogram, echocardiogram, and chest radiography. Preoperative laboratory assessment was conducted, including routine laboratory tests (electrolytes, liver, and kidney function tests, complete blood count), tumor markers, myocardial enzymogram, and screening for myasthenia gravis. The results of the laboratory studies were almost within normal range. X-rays revealed sacral lesions, with high suspicion of spinal soft tissue tumors (Fig. 1 A, B). Spinal magnetic resonance imaging (MRI) was ordered to visualize the metastatic lesions, assess the stability of the vertebral column, and to aid in the formulation of a surgical approach. MRI of the spine showed the density of soft tissue measuring 10 cm × 7.5 cm × 5.7 cm, obvious bony destruction in the sacrum, and spinal cord compression secondary to the giant mass, with increased metastatic marrow infiltration of the sacrum (Fig. 2 A–H). Tumor infiltrated through the sacrum body into the posterior elements, thus extraosseously spread into the bilateral aspects of the epidural space extending posteriorly, resulting in spinal cord compression (Fig. 3 A, B). The bone scanning revealed high intake in the sacral spine, with high suspicion of spinal metastases (Fig. 4).

Subsequently, osteoplasty with cement augmentation was performed to destroy the functional tumor and stabilize the spine under local anesthesia. In brief, percutaneous vertebroplasty at sacrum was performed according to the original surgical plan. For the posterior approach, we used C-arm for perspective positioning, bilateral vertebral lesions of sacrum were identified as surgical targets, and the bilateral sacral pedicle puncture points were located. Then 2% lidocaine was used for local infiltration anesthesia, and the puncture needle was inserted through the cannula. Under the C-arm fluoroscopy, the vertebral lesion was penetrated through the left pedicle of the sacrum first, and bone cement for vertebroplasty was introduced. Under the perspective, the 10.0 mL cement of left side was slowly pushed through the putter, and the biopsy passage was closed. In the same way, the right S1 vertebral pedicle was then punctured to the right S1

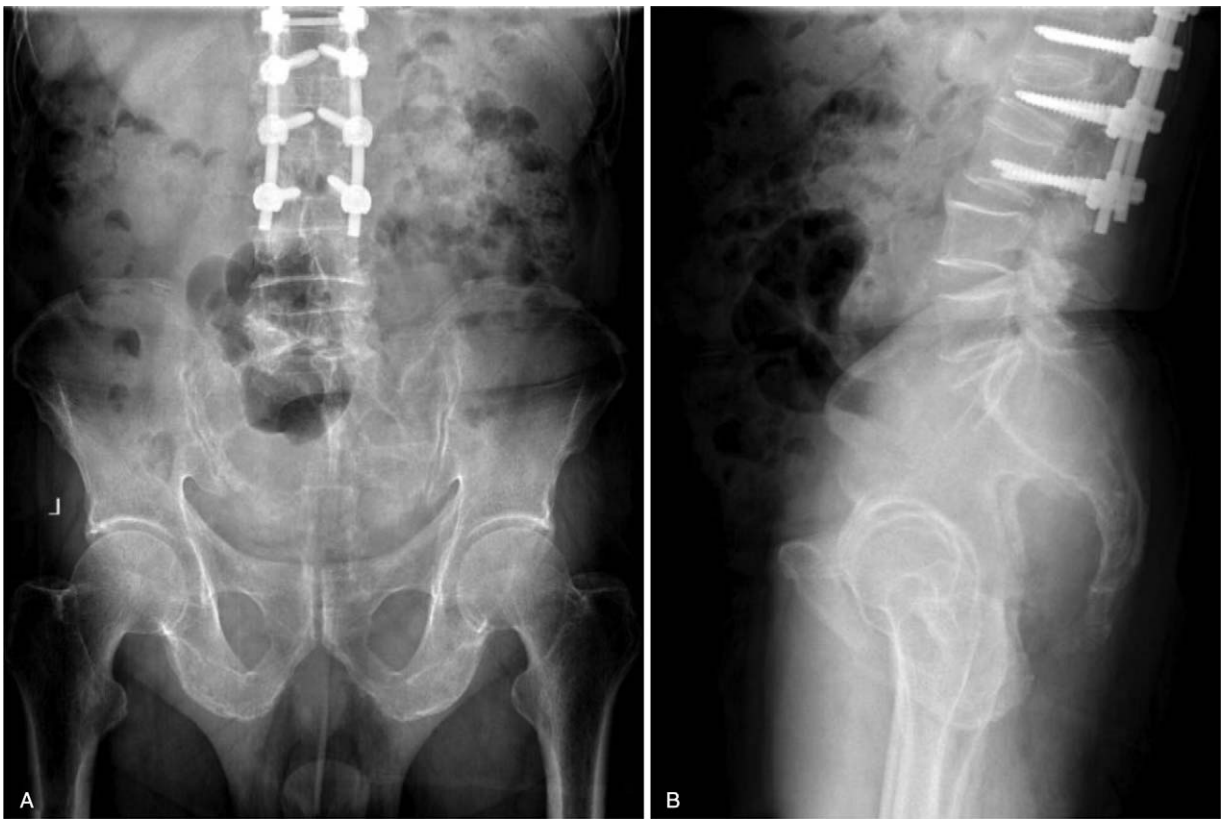

Figure 1. (A,B) Preoperative X-rays revealing sacral lesions with high suspicion of spinal metastatic soft tissue tumors.

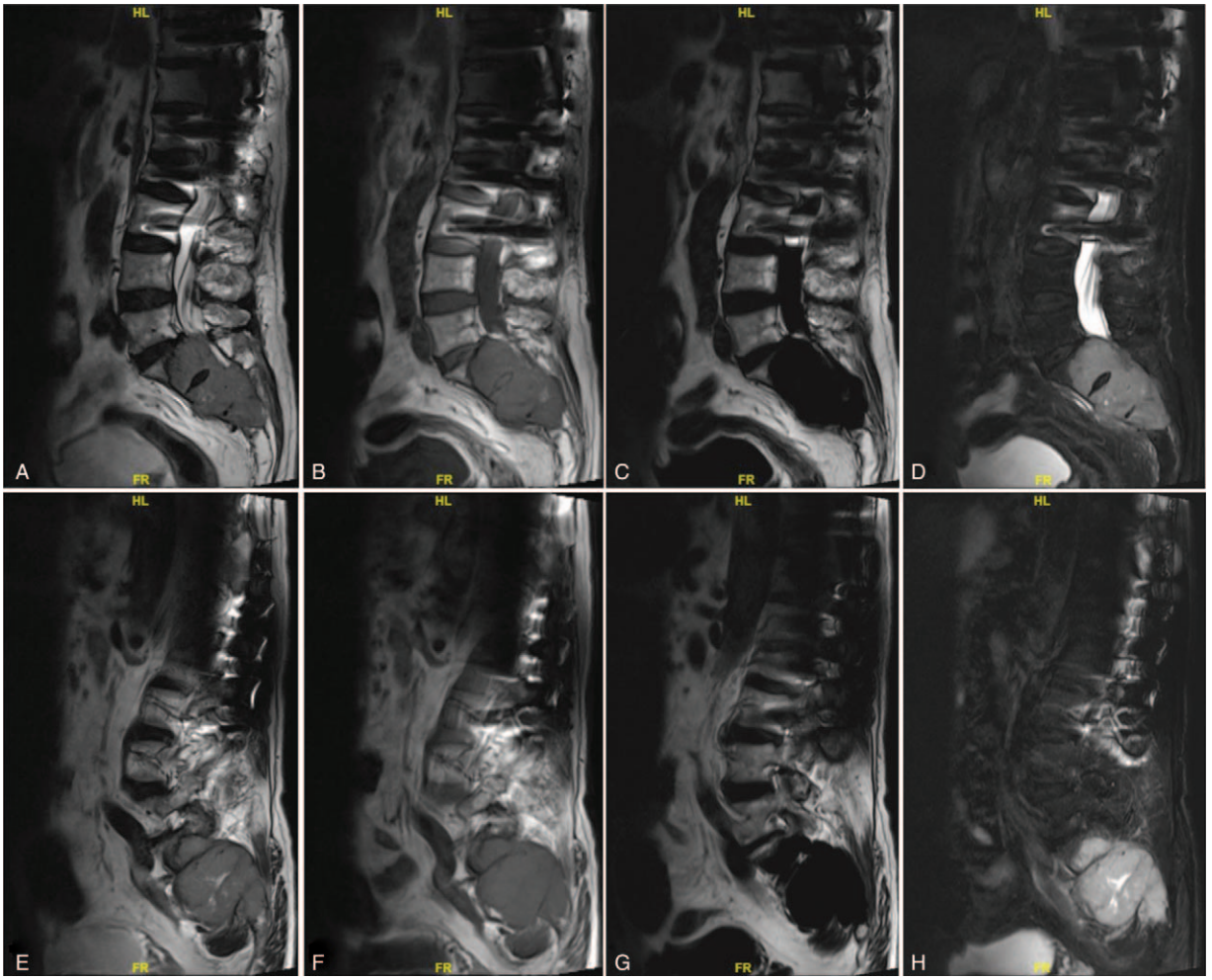

Figure 2. (A–H) Preoperative sagittal MRI scan revealing the density of soft tissue measuring 10 cm × 7.5 cm × 5.7 cm, obvious bony destruction in the sacrum, and spinal cord compression caused by metastatic malignant thymoma, with increased metastatic marrow infiltration of the sacrum. MRI = magnetic resonance imaging.

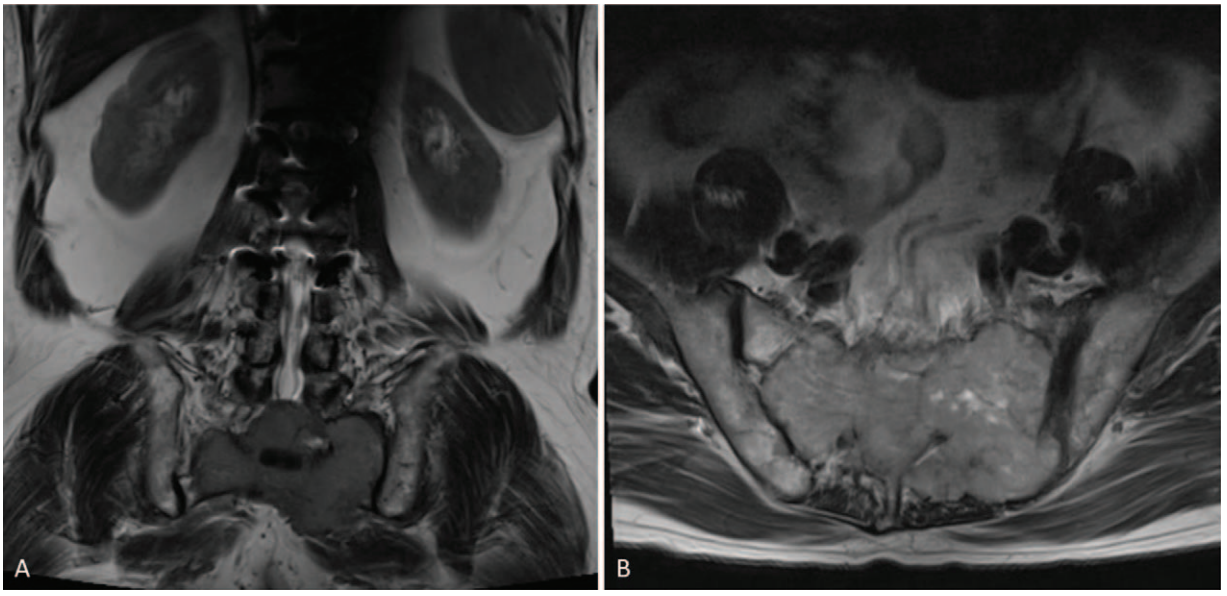

Figure 3. (A,B) Preoperative coronal and transverse MRI images showing sacral metastases of B3 thymoma. MRI = magnetic resonance imaging.

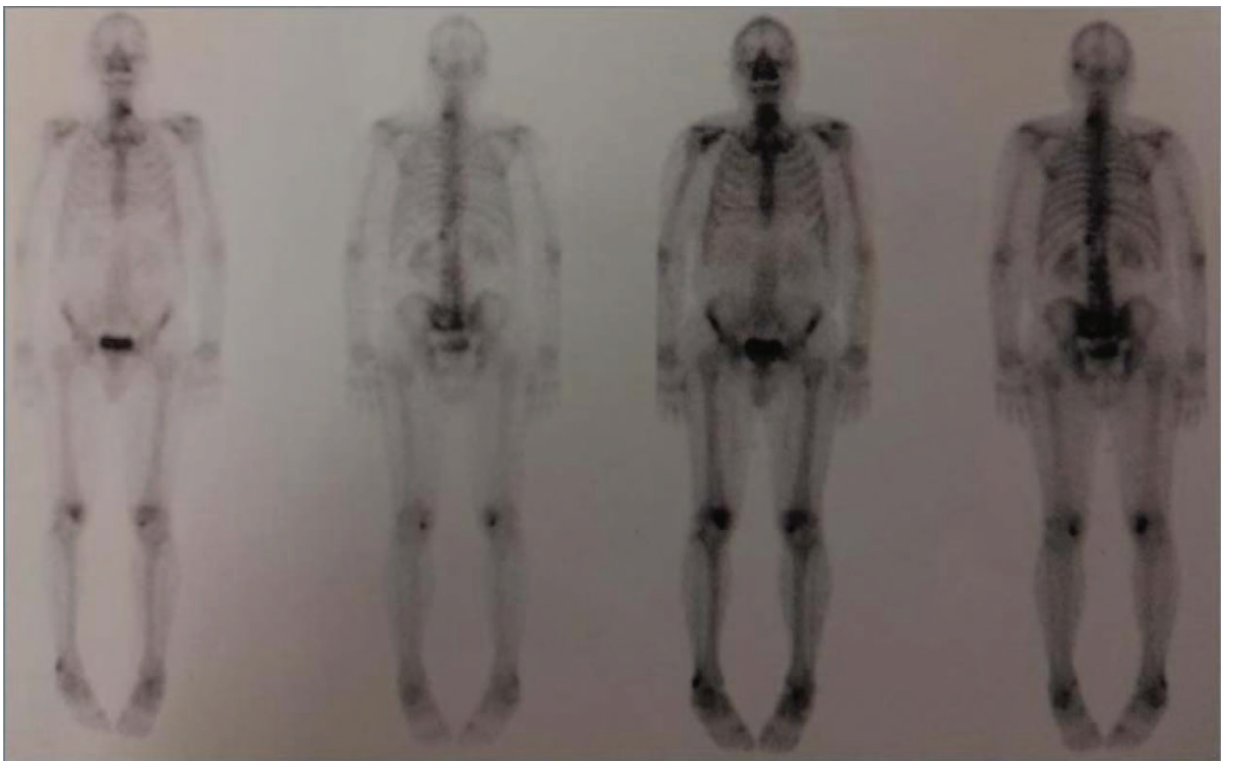

Figure 4. Bone scan revealed high intake in the sacral spine, with high suspicion of sacral metastases.

vertebral body lesion, and 9.6 mL bone cement was slowly pushed into the right S1 vertebral body lesion through a push rod under fluoroscopy, and the biopsy pathway was closed. Fluoroscopy confirmed the good dispersion of bone cement. The operation was successful and intraoperative bleeding was about 60 mL. Postoperative posteroanterior and lateral radiographs of the spine showed cement augmentation was satisfactory (Fig. 5 A and B). The patient was unwilling to undertake any further treatments and was discharged and monitored on an outpatient basis. The postoperative pathology report confirmed a malignant B3 type thymoma, which was consistent with the primary tumor (Fig. 6 A–D). Pathological analysis was positive for AE1/AE3 indicating epithelial origin from thymus gland. Biopsy samples were negative for chromogranin A, synaptophysin, CD56 (NK-1), TTF-1, CD5, with 30% Ki-67 positive nuclei (Fig. 7 A–F). Consequently, malignant thymoma with sacrum metastases was diagnosed via history taking, laboratory values, imaging results, and pathological studies.

One week after the operation, the patient's muscle strength of lower extremities improved to grade V compared to the preoperative status, and the symptoms were relieved significantly. Moreover, VAS score of his back pain improved to 0 to 1 points compared to the preoperative status, 6 to 7 points. Postoperatively, the patient underwent rehabilitation therapy and was discharged and monitored as an outpatient. The postoperative 6-month and 1-year follow-up visit showed no tumor progression and no new symptoms. There were no other complications associated with the operation during the follow-up period.

3. Discussion

Malignant thymomas are rare tumors that were usually determined by the invasiveness into nearby tissues or distant metastasis. On the basis of the appearance of epithelial cells, the World Health Organization unified classification proposed 3 histological types of thymomas (types A, AB, B1, B2, B3, and C). The incidence of thymomas has been estimated at 0.13 case per 100,000 individuals per year.[3,4] Malignant thymomas (type B3) are rare tumors which show pathological features of malignancy and highly aggressive biological behavior with extrathoracic metastases to the liver, kidney, and lymph nodes.[4] However, it is extremely rare for type B3 thymomas to metastasize to the spine. Back pain and radiculopathy can often mimic the most common cause of spinal diseases, making timely diagnosis of spinal metastatic thymomas difficult without a high level of suspicion.[5,6]

In literature, this is a rarity of recurrent metastatic thymomas of the sacrum presenting with back pain and radiculopathy. Clinical studies looking at metastatic thymomas and thymic carcinomas to the spine are lacking due to the extremely low incidence rate. Based on our review of the 33 case reports on PubMed (Table 1),[1–28] metastatic thymomas of the spine is slightly more common in the thoracic region and are more commonly diagnosed during the fourth and the fifth decades of life for the sporadic form (mean age: 51.5 years; range: 29–79 years).[1–28]

The location of the spinal lesion determines the neurological deficits, and there is a great deal of variability.[29] Compression of the cervical vertebra often exhibit symptoms of paresthesia and weakness in the upper extremities, while those located in the thoracic and lumbar regions usually show symptoms of low back pain, lower extremity paresthesia, weakness, and dysuria. In our case, the patient sought medical attention after experiencing serious back pain, lower extremity weakness, and numbness. To the best of our knowledge, this is the first reported case of recurrent malignant thymoma with sacrum metastases. Imaging

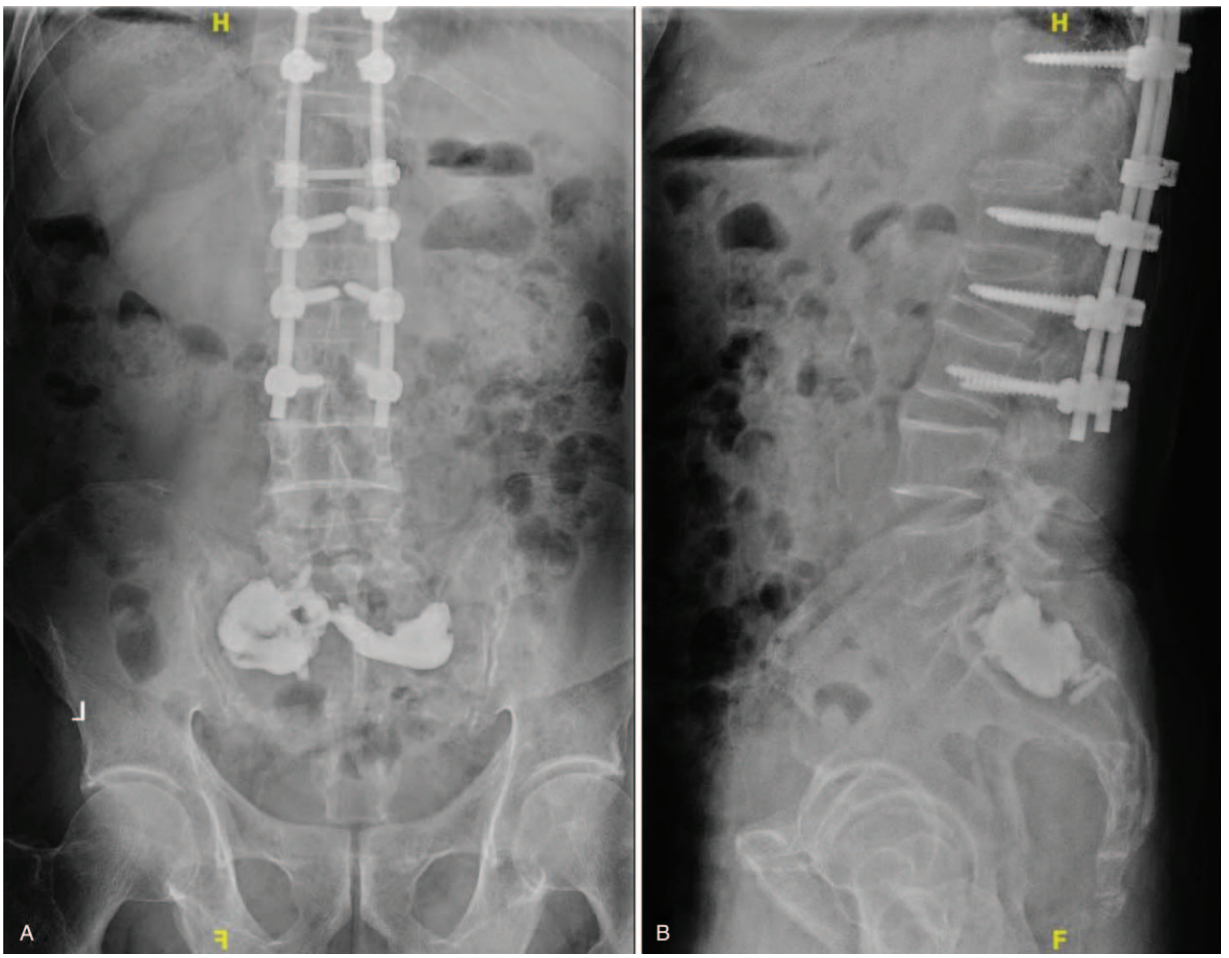

Figure 5. (A,B) PA and lateral x-ray image of the lumbosacral spine obtained postoperatively. PA = posteroanterior.

studies including X-ray, computed tomography (CT), MRI, and bone scan are non-specific, making it difficult to differentiate metastatic spinal thymoma from other common spinal lesions. However, imaging studies play a crucial role in the surgical intervention decision making. Imaging studies can demonstrate consecutive spinal stenosis, spinal cord compression, and pathological vertebrae fractures. MRI images from previous case reports demonstrate inhomogenous lesion of spine, isointense on T1-weighted image (T1WI) and hyperintense on T2-weighted image (T2WI), indistinguishable from other metastatic spinal lesions.[2,7–9] Heterogeneous enhancement, calcification, and cystic changes are rarely observed.[1,2,10,11] Our patient's MRI showed isointense on T1WI and hyperintense lesion on T2WI, which is consistent with previous case reports.

Thymomas (type B3) may become malignant via their metastatic tendency, and the metastases can help us diagnose a malignant type B3 thymoma. Although local spreading occurs rapidly, distant spinal metastasis may occur within a long period, up to 24 years after the diagnosis of thymomas.[2] The "gold-standard" diagnosis of thymoma relies on pathological findings. Histopathologically, metastatic spinal thymomas are characterized by an architecture of nests of tumor cells separated by vascular septa with the cells showing significant nuclear pleomorphism with prominent nucleoli, and large amount of lymphocytes.[4,12–16] Generally, metastatic thymomas are commonly immunoreactive for AE1/AE3. A histological examination of our case was positive for AE1/AE3 indicating thymoma from epithelial cells of the thymic gland. Biopsy samples were negative for chromogranin A, synaptophysin, CD56 (NK-1), TTF-1, CD5, with 30% Ki-67 positive nuclei, which confirmed the diagnosis of metastatic type B3 thymoma.

Currently, no treatment guidelines exist because of the variability in treatment modalities and reported outcomes.[1–28] Surgical resection is the mainstay of treatment for thymic tumors and spinal metastatic lesions. We recommend surgical management of the spinal metastatic tumor when the tumor has caused neurological deficits, spinal cord compression, or destruction of spinal stability. The best treatment for metastatic spinal thymomas causing acute partial paralysis and lower back pain is posterior decompression, tumor resection, and internal fixation.[17–20] This protocol accomplishes 2 objections: it alleviates the neurological deficits by decompressing the stenosis and at the same time provides histopathological specimens for diagnosis, which is valuable in cases where the patient presents with atypical clinical and radiological findings.[30] The highly vascular nature of the tumor and its potential for infiltration makes total resection difficult, thus recurrence is likely. The survival benefit of resection of spinal metastases is still unproven. However, such a procedure does have the benefit aiming at controlling residual tumor and is recommended for most patients.[17–24] This survival benefit of reducing the tumor burden, decompressing the spinal stenosis to alleviate radicul-

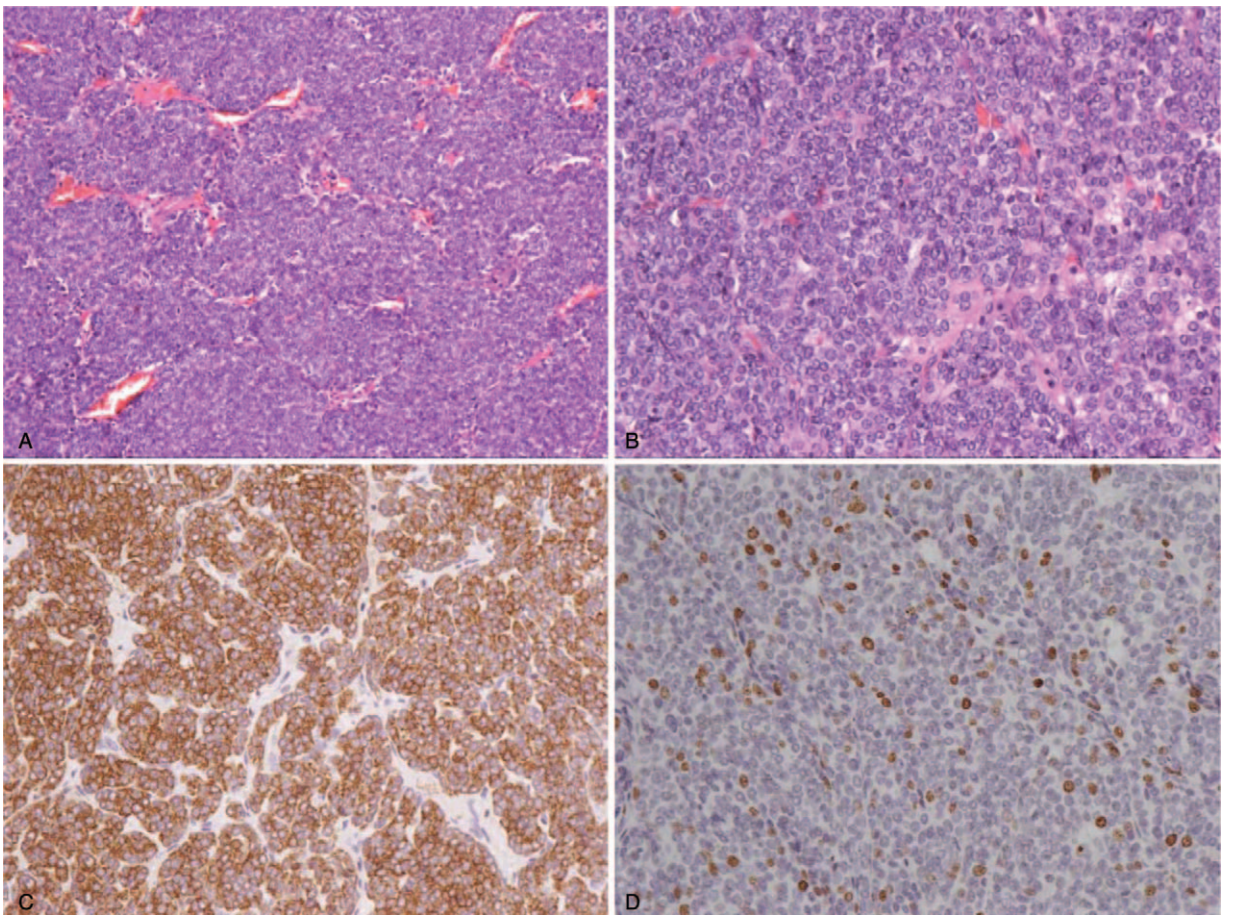

Figure 6. Pathologic histology of primary type B3 thymoma. (A,B) Microphotography showing significant nuclear pleomorphism with prominent nucleoli (H&E, original magnification 100× and 200×). (C) CK19 immunostaining is strongly positive in the epithelial cells. (D) Ki-67 immunostaining shows 15% Ki-67 positive cells. Ki-67 staining is localized in the tumor nuclei.

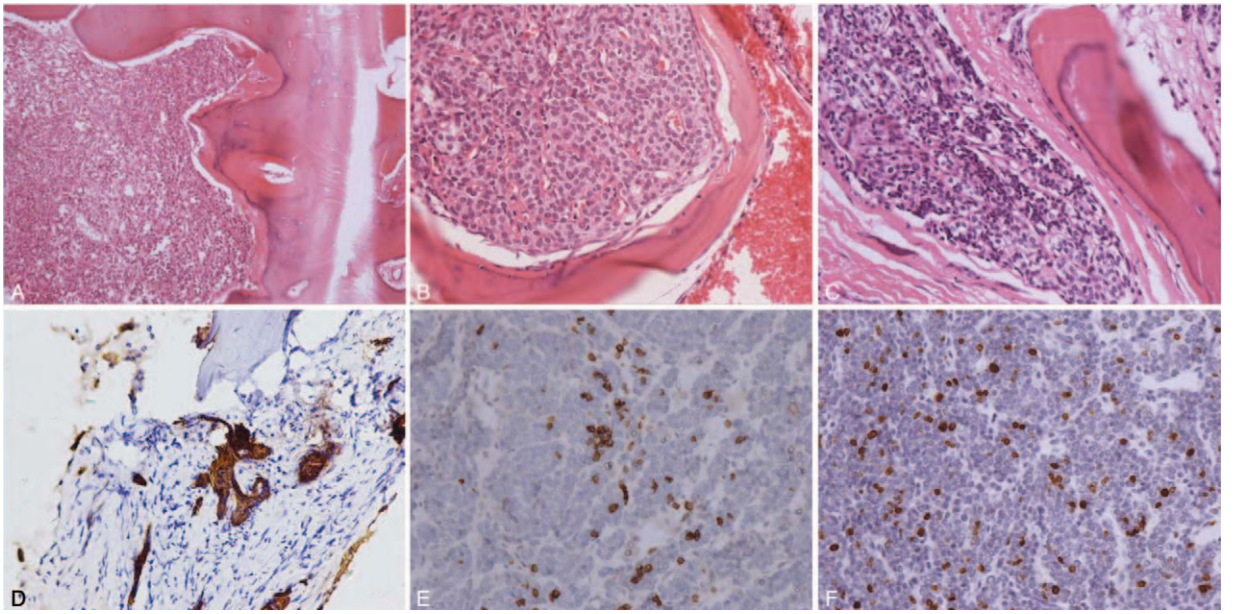

Figure 7. Pathologic histology of spinal metastases. (A–C) Microphotography showing characteristic nests of tumor cells separated by vascular septa (Zellballen) with cells showing significant nuclear pleomorphism with prominent nucleoli (H&E, original magnification 100×, 200×, and 200×). (D) AE1/AE3 immunostaining is strongly positive in the epithelial cells. (E) CD5 immunostaining shows positive staining in the tumor cells. (F) Ki-67 immunostaining shows 30% Ki-67 positive cells. Ki-67 staining is localized in the tumor nuclei.

Table 1

Clinical review of 33 previously published metastatic thymomas and thymic carcinomas of spine.

Authors	Year	Age (y), sex	Symptoms and Signs	Thymoma Type (WHO)	Spinal Metastases Location	Intradural or Extradural	Incomplete Paralysis or Paralysis	Myasthenia Gravis	Years since Initial Diagnosis	Resection of Primary Lesion	Surgical Treatments	Adjuvant Treatment	Postop Complications and Outcome
Posner et al[13]	1977	32,M	Midback pain and radiated down legs and into toes; constipation; mild paraparesis	Lymphoid and epithelial thymoma	T8 to T12	Extradural	Mild paraparesis	No	1	Thymectomy	None	Radiation and chemotherapy	Not reported
Akamatsu et al[26]	1993	-	BLE paralysis	Stage IVb	Thoracic	Extradural	Paralysis of bilateral lower limbs	No	/	Not reported	Exploratory thoracotomy	Radiation and chemotherapy	Patient died of pancreatitis postoperatively
Selvaraj et al[22]	1999	73,M	Neck pain; BUE paresthesias; gait unsteadiness	Mixed cell thymoma	C3	Extradural	No	Yes	10	Thymectomy	Excisional biopsy at C3	Radiation	Initial resolution of symptoms; ocular myesthenia gravis developed
Alafaci et al[25]	1999	33,F	BLE weakness; BLE paresthesias; BLE hyperreflexia	Mixed invasive thymoma, epithelial predominance, low differentiation, clusters of lymphocytes	T4	Extradural	No	No	1	Not reported	T4 laminectomy with tumor decompression	None	Mild improvement of symptoms; died of respiratory failure shortly afterward
Hentschel et al[21]	2004	60,F	Axial thoracic spinal pain with a severe radicular component	C	T7	Extradural	No	No	2	Thymectomy	Percutaneous vertebroplasty with cement augmentation	Radiation and chemotherapy	In the postoperative period, the patient had near complete relief of her axial and radicular pain
MacLennan et al[23]	2004	33,F	Back pain; RLE pain	Predominantly lymphocytic malignant thymoma	T11-T12, L5	Extradural	No	No	8	Not reported	None	Radiation and chemotherapy	Patient died 6 years after presenting with back pain
Oguri et al[20]	2004	64,F	Hoarseness; dysphagia	C, squamous cell	C3-C4	Extradural	No	No	0	CT-guided biopsy	No surgical intervention for spinal involvement	Chemotherapy	Multiple recurrences with rapid enlargement of tumor
Farin et al[19]	2005	45,M	Progressive back pain; diminished sensation in bilateral toes	Dense, fibrous, cellular epithelium with mature lymphocytes	T11-T12	Extradural	No	Yes	12	Thymectomy	T11-T12 laminectomy and partial corpectomy, GTR, pedicle screw fixation	Radiation and chemotherapy	Initial improvement with ability to ambulate; disease free 9 months postoperatively
Toba et al[17]	2009	29,F	Back pain	B3	T10-T11	Intradural	No	Yes	4	Thymectomy	T10-T11 costotransversectomy with GTR	Radiation	No sign of further recurrence for 15 months
Nagel et al[18]	2011	67,M	Monoparesis of leg	Carcinoid tumor of the thymus	T3, T9, L5	Extradural	Yes	No	16	Not reported	Tuomr resection via laminectomies T2–3, T8–9, and L4–5	None	Died 1 year later
Liu et al[1]	2011	57,M	Progressive cervicodorsal pain and decreased sensation in both hands; decreased grip strength	C, poorly differentiated squamous TC	C4–T1	Extradural	No	No	0	Not reported	C5-C7 laminectomies, tumor resection, and C3–C7 posterior internal fixation and fusion	Radiation and chemotherapy	Symptoms resolved; initially recovered well; died from respiratory failure 5 months after surgery
Vladislav et al[28]	2012	66,M	Chest symptoms	B3	L1	Extradural	No	No	2	Not reported	Not reported	Not reported	Not reported
	2012	45,M	Ostealgia; chest symptoms; systemic symptoms	B1/B2	L1-L3	Extradural	No	No	0	Not reported	Not reported	Not reported	Not reported
	2012	31,M	Chest symptoms	B3	T10	Extradural	No	No	0	Not reported	Not reported	Not reported	Not reported
Hong et al[4]	2013	42,F	Back pain	B2	L4-S1	Extradural	No	No	8	Gross-total resection of a type B2 thymoma	Nearly total resection preserving the nerve roots was performed via a partial L4 and L5 hemilaminectomy	Radiation and chemotherapy	Minimal residual back pain
	2013	62,F	Segmental thoracic pain	C, well-differentiated thymic carcinoma	T9-T10	Extradural	No	No	13	6 surgical procedures for resection of a thymic carcinoma during a period of 13 years	A gross-total tumor resection was performed via a costotransversectomy and facetectomy T9–T10	Radiation and chemotherapy	No neurological deficits. The patient died 2 years later because of disease progression
Jee et al[10]	2014	61,M	Paraparesis	C	T4-T5	Extradural	No	No	0	Not reported	Decompression, tumor resection, and pedicle screw fixation	Radiation or chemotherapy	Died 3 years after surgery
	2014	42,M	Paraplegia	C	T3-T5	Extradural	Yes	No	2	Not reported	Decompression, tumor resection, and pedicle screw fixation	Radiation or chemotherapy	Recurrence of paraplegia; died <1 year postoperatively

(*continued*)

Table 1

(continued).

Authors	Year	Age (y), sex	Symptoms and Signs	Thymoma Type (WHO)	Spinal Metastases Location	Intradural or Extradural	Incomplete Paralysis or Paralysis	Myasthenia Gravis	Years since Initial Diagnosis	Resection of Primary Lesion	Surgical Treatments	Adjuvant Treatment	Postop Complications and Outcome
	2014	36,M	Paraparesis	C	T2-T4	Extradural	No	No	5	Not reported	Decompression, tumor resection, and pedicle screw fixation	Radiation or chemotherapy	Died 2 weeks after surgery
	2014	68,M	Back pain	C	L1-L2	Extra-intradural	No	No	5	Not reported	STR of extradural component	Radiation or chemotherapy	Died 4 months after surgery
	2014	57,M	Paraplegia	C	T4-T6	Extradural	Yes	No	5	Not reported	Decompression, tumor resection, and pedicle screw fixation	Radiation or chemotherapy	Died 3.5 months after surgery
	2014	59,F	Back pain	C	T5	Extradural	No	No	0	Not reported	Pedicle screw fixation	Radiation or chemotherapy	Died 7 months after surgery
	2014	54,F	Back pain	C	T11	Extra-intradural	No	No	14	Not reported	STR of extradural component	Radiation and chemotherapy	Died 9 months after surgery
Marotta et al[2]	2015	46,M	Left cervicobrachialgia and a reduction of strength of the left arm	B3	C5-C7	Intradural	No	No	24	Thymectomy	Resection of the lesion and C5-T1 stabilization; STR of intradural, extramedullary C5-C7 lesion	Radiation	Symptom free
Sasaki et al[16]	2015	50,F	Back pain; LLE weakness and numbness	C, squamous cell	T3	Extradural	Yes	No	0	Thymectomy	T3 laminectomy with tumor resection	Radiation and chemotherapy	Improvement of symptoms
Zhao et al[24]	2016	47,F	Back pain and lower extremity weakness; hypesthesia; urine incontinence	AB, type B2, locally B3	T9-T11	Extradural	Yes	Yes	8	Thymectomy	Posterior decompression, tumor resection with bone cement reconstruction and internal fixation	Radiation and chemotherapy	Muscle strength and urinary function recovered gradually
Low et al[6]	2016	79,M	Back pain; truncal radiculopathy	Low-grade mucoepidermoid tumor	T8-T9	Extradural	No	No	12	Not reported	Biopsy	Radiation	Patient well at 1-year follow-up
Shivapathasundram et al[9]	2016	44,M	Back pain; gait abnormality; bowel/bladder symptoms; neurogenic claudication; BLE sensory changes	B2	L4-L5	Extradural	No		5	Not reported	L3-L4 laminectomy with GTR of epidural disease	Radiation	Returned to normal 2 years postoperatively
Jazi et al[7]	2017	44,M	Double vision and cervical paraspinal weakness; unable to lift his head; extremity weakness and dyspnea	B3	C7	Not reported	No	Yes	10	Mediastinotomy	None	Steroids, pyridostigmine, and five sessions of plasmapheresis; Radiation and chemotherapy	Symptoms controlled at 3-year follow-up
Kim et al[3]	2017	78,F	Weakness of the left wrist and grasp	C	C6-T1, intervertebral foramen	Extradural	No	No	7	Surgical resection	A nearly total resection preserving nerve roots was performed via a total C6-T1 laminectomy	None	Disease free at 6-month follow-up
Achey et al[5]	2018	63,M	Acute urinary incontinence; low back pain; right lower extremity radiculopathy	C	T8, L5-S1	Extradural	No	No	8	Not reported	L5-S1 decompression and GTR of the metastatic lesion at L5, along with stabilization	Radiation	Remained neurologically stable, symptoms of lower back pain and radiculopathy improved
	2018	38,F	Left flank pain radiating to the lower abdomen and groin and rapidly progressive myelopathy	B3 with cytologic atypia, mitoses and infiltrative growth concerning for type C thymic carcinoma	T12-L1	Extradural	No	No	2	Thymectomy	T12-L1 decompression with facetectomy; T11-L2 posterior instrumented fusion; GTR of T12-L1 tumor	Chemotherapy	Neurologically stable
	2018	44,F	Rapidly progressive myelopathy; neck pain	C	C7	Extradural	No	No	4	Mediastinotomy	Anterior C7 vertebrectomy for decompression and tumor resection, with the placement of a cage graft and plating from C5 to C7	None	Remained neurologically stable. Died 4 months after surgery

BUE = bilateral upper extremity; LLE = left lower extremity; BLE = bilateral lower extremities; RLE = right lower extremity; GTR = gross total resection; STR = subtotal resection.

opathy, and facilitating subsequent chemotherapy and radiation therapy.

To date, surgical management of malignant thymoma of spine has remained under evaluation, with no standard criteria. Vertebroplasty might be a useful strategy to achieve rapid and sustained neurological improvements for patients with metastatic thymomas involving the spine and the pelvis.[13,31] Although there were no complications associated with osteoplasty in our case, the safety of this approach still needs to be confirmed in further studies with larger sample sizes and longer follow-up periods. One postoperative complication was cement leakage into the canal and subsequent spinal cord compression.[31] Surgical extent, cement volume, and postoperative complications are critical factors that need further investigation. Surgery is also performed to stabilize and reconstruct affected regions of the skeleton once the disease appears to be unstable or neurological deficits occur, especially in the lower spinal region. Vertebroplasty by cement augmentation may be a proper treatment option for patients with spinal metastatic thymoma who cannot undergo appropriate surgery or decline open surgery.

Systemic chemotherapy and radiotherapy should be considered in a multimodality protocol if tumor recurrence is expected.[1–3,25–27] Thymomas are generally radiosensitive and chemosensitive tumors, with high response rates.[1,25–27] Thus, higher-staged tumors are often treated by surgery combined with adjuvant chemoradiotherapy, although such adjuvant therapy is not standardized due to its rarity. Moreover, little is known about the natural history and prognosis of metastatic thymoma to the spine. To date, studies have revealed that the most important determinants of long-term survival in thymoma are completeness of resection, Masaoka stage, and Mueller–Hermelink histologic classification.[1,4,5] The 5-year survival rate of patients with distant metastasis of thymoma varied widely between 13.3% and 81% after multimodality treatment, including surgical resection of primary tumor, pleurectomy, chemotherapy, and radiotherapy.[3] A multidisciplinary approach is required to improve patients' long-term outcomes. In conclusion, we present an extremely unusual occurrence of spinal metastasis of malignant thymoma that successfully managed by surgical procedure, percutaneous vertebroplasty with cement, which has not been previously well reported. Our focus is to emphasize the importance of considering spinal metastasis of malignant thymomas as a diagnosis and guiding the proper management strategy upon treatment.

4. Conclusion

Although uncommon, metastatic malignant thymoma of the spine should be part of the differential when the patient presents with neurological deficits and has a medical history of thymoma. We recommend the posterior approach for spinal decompression of the metastatic tumor when the tumor has caused neurological deficits. Vertebroplasty by cement augmentation may be a treatment option for patients with metastatic thymoma in the spine who cannot undergo appropriate surgery or decline open surgery. This represents a safe and minimally invasive approach to sustainably relieve pain and stabilize vertebral bodies for metastatic thymoma in the spine. With a multidisciplinary team approach, proper planning, and adequate perioperative medical management, metastatic thymoma in the spine can be managed effectively.

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