

Thymoma with Sacral Metastasis

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Thymomas are the most common type of mass found in adult anterior mediastinal masses. Thymomas typically metastasize to the ribcage because of their slow growth and affinity for local invasion. Far metastases are rare, with the brain as the most commonly metastasized area. Bone metastases of thymomas are usually observed in the calvarium. A 60-year-old patient, who presented with metastatic mass lesions that developed 18 months after undergoing a surgery for mediastinal thymomas in the sacrum and iliac bones detected by computed tomography, magnetic resonance imaging, and histopathology, is the first mediastinal thymoma case with metastasis to the sacrum in the literature.

Keywords: Thymoma, malignant thymoma, extrathoracic thymoma metastasis, sacrum metastasis

INTRODUCTION

Thymomas, which arise from the epithelial cells of the thymus, are usually localized in the anterior mediastinum. The frequent asymptomatic cases are diagnosed from bilateral lung X-rays as masses in the anterior mediastinum area. Computed tomography (CT) and magnetic resonance imaging (MRI) are important in the differential diagnosis. Ectopic thymomas can be found outside of the anterior mediastinum in the head-neck and thorax areas. The most commonly observed symptoms in patients are neurological paraneoplastic syndromes. In patients with thymomas, additional immune system diseases such as myasthenia gravis can be diagnosed. The prognosis of thymomas is dependent on capsule morphology. The treatment includes wide and complete surgical resection. Far organ metastases of thymomas are very rare (1-3). Metastases in the brain and calvarial bones have been reported in previous studies (4). However, no case report concerning sacral and iliac bone metastases of thymomas has been published previously. In our case report, we present such a case with CT, MRI, and histopathology results.

CASE PRESENTATION

A 60-year-old female patient presented to our hospital with pain in the lower back and pelvic area. After diagnosing a mass by chest X-rays, a biopsy was performed. The mass was diagnosed as thymoma by histopathology, and the patient was treated surgically. The surgically excised mass was 6 cm in diameter. The pathological diagnosis was Type B-3 epithelial thymoma with positive capsule invasion. Invasion into the visceral pleura was detected. No vascular or pericardial invasion was found. A lumbar CT was performed 18 months after surgery for the patient's lower back pain. Multi-detector CT (Toshiba 64-slice CT; Tokyo, Japan) directed to the lumbar vertebrae. No disc pathologies were detected. A lytic expansile lesion that caused cortical thinning in the anterior sacrum with accompanying sclerosis in the sacrum and iliac bones was diagnosed by CT. To define the morphology and direction of the mass, contrast MRI of the sacrum and iliac bones was planned. A routine contrast MRI for pelvic bones was performed. The scans were obtained using a 1.5-Tesla Signa MR unit (General Electric Medical Systems; Milwaukee, WI) in a neutral position (supine). Standard sequences were obtained for all the pelvic MRI scans, which included sagittal and axial fast-spin-echo T2-weighted images and sagittal fast-spin-echo T1-weighted images. Postcontrast sequences included sagittal and axial fat-suppressed fast-spin-echo T1-weighted MR images and axial fast-spin-echo T1-weighted images.

A primary sclerotic heterogeneous lesion in the right sacral bone was detected on axial CT images. Focal hypodense areas were observed in the lesion, and sclerotic areas were detected in the left iliac bone (Figure 1a). A soft tissue component was noted anterior to the right sacral bone lesion. The soft tissue component was hypodense on the soft tissue window axial CT image (Figure 1b).

A heterogeneous pathological signal was detected in the right sacral wing on T2-weighted MRI. Some sclerotic regions were observed in this bone as low signal intensity on both T1- and T2-weighted MRI (Figure 2a, b). A soft tissue compo-

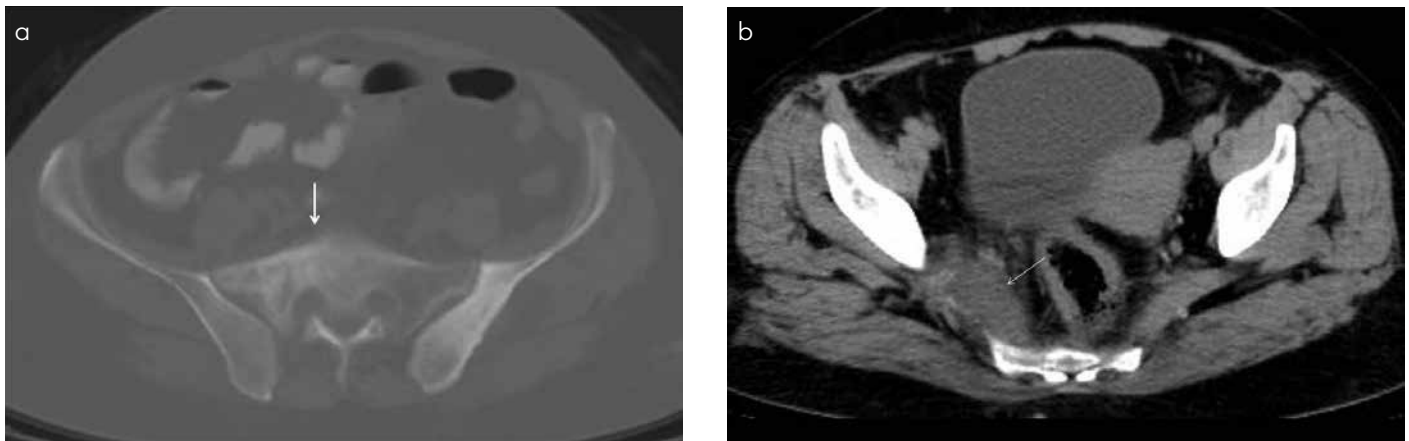


FIGURE 1. a, b. (a) Axial pelvic CT image mainly shows the sclerotic heterogeneous lesion (arrow) in the right sacral bone. Focal hypodense areas are seen in the lesion. Sclerotic areas are also seen in the left iliac bone. (b) Axial pelvic CT image shows the soft tissue component of the lesion (arrow).

TABLE I. Thymoma classifications

WHO	Levine ve Rassai	Müller et al. (8)
A	Benign thymoma	Medullary thymoma
AB		Mixed thymoma
B1	Malignant thymoma category 1	Predominantly cortical thymoma
B2		Cortical thymoma
B3		Well-differentiated thymic carcinoma
C	Malignant thymoma category 2	Carcinoma
WHO: The World Health Organization		

ment was observed at the anterior region of the sacral lesion. Postcontrast images revealed heterogeneous enhancement in the bone and soft tissue component (Figure 2c).

A bone biopsy of the sacral bone and surrounding solid area was performed at the Neurosurgery Department using CT. The procedure was performed without complications. Epithelial metastatic cells were observed in the biopsy results. Histopathology confirmed the origin of the lesion to be thymoma metastasis. In accordance with the oncological council, radiotherapy was performed on the patient. The informed consent was obtained from our patient. Radiotherapy ameliorated the pain experienced by the patient.

DISCUSSION

The thymus is derived embryologically from the endodermal epithelium of the third pharyngeal pouches, which migrate medially and downward into the anterior superior mediastinum (5). The normal thymus is rich in lymphocytes and epithelial cells. Hassall's corpuscles are characteristic for the thymus. Thymomas are composed of neoplastic thymic epithelial cells and are usually located in the anterior mediastinum. Thymomas are rare tumors that grow slowly and are defined as benign neoplasms. Thymomas can be observed with paraneoplastic and autoimmune syndromes (e.g., myasthenia gravis, polymyositis, systemic lupus erythematosus, and rheumatoid arthritis) (6). Thymomas are most frequently associated with myasthenia gravis, which is an autoimmune disease. The frequency of myasthenia gravis

occurrence has been reported to be 30%–60%, which is high (3). No family or ethnic factor has been associated with the etiology of thymomas (7). In some studies, the Epstein-Barr virus nuclear antigen was found in thymic carcinoma cells, warranting further research in that area (6).

Thymoma staging and prognostic factors are important for treatment planning. The World Health Organization (WHO) released a thymoma classification in 1999. Thymomas are classified as Type A, AB, B1-3, and C (Table I) (8). According to the WHO classification, pathologically capsular invasive thymomas are classified as malignant (9). Additionally, malignant thymomas are classified as Type C and are termed thymic carcinomas (9, 10). Levine and Rosai (11) classified thymomas as benign and malignant and malignant thymomas are classified as Category 1 or 2 (Table I).

In the Masaoka-Koga classification, thymomas are divided into four stages. Stage 1 thymoma has no transcapsular invasion, whereas stage 2 thymoma has transcapsular invasion. Limited microscopic invasion is classified as Stage 2a, and invasion into neighboring fatty tissues is classified as stage 2b. If there is suspicion concerning the tumor penetrating into the mediastinal pleura or pericardium, thymoma should be classified as stage 3. If the primary tumor has separate pleural or pericardial nodules, it is classified as stage 4a. The involvement of nodes to the thymus is stage 4b. Involved nodules can be mediastinal or distant nodules (12).

Malignant thymomas account for ~7%–35% of all thymomas (13, 14). Local invasion and recurrence can occur in cases of malignant thymomas. Very rarely, distant metastases can develop. The series of 1093 cases by Kondo et al. (15) is the largest thymoma series in the literature. In that study, less than 2% of thymomas exhibited lymph node metastasis, and distant metastases were reported in less than 1% of the cases. Kondo et al. (15) reported the lung and thorax as the most common sites of distant metastases.

In thymoma treatment, the anterior mediastinal mass should be completely surgically removed. Studies of thymoma report complete surgical resection and stage as the most important prognostic factors (16). The Masaoka-Koga classification suggests surgical treatment for stages 1 and 2 and chemotherapy for stages 3 and 4 (15). Main artery invasion is also reported to be an important prognostic factor. Mediastinal radiotherapy is not

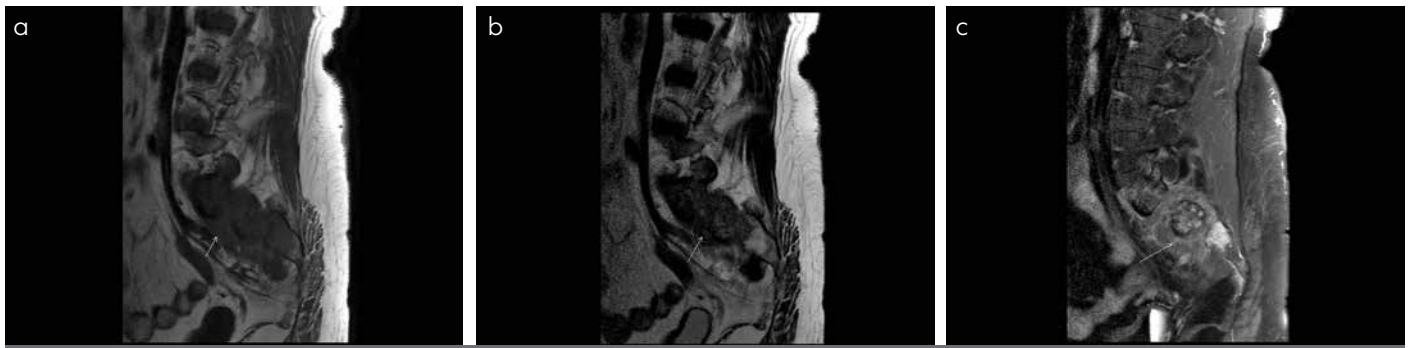


FIGURE 2. a-c. Sagittal FSE T1-weighted (a), FSE T2 sagittal (b), and postcontrast fat-suppressed FSE T1 sagittal (c) images show the soft tissue component of the lesion just anterior to the sacral vertebrae (arrows). This tissue enhances heterogeneously (c). The metastatic lesion in the sacral bone is seen as low signal intensity on the T1-weighted image and heterogenic signal intensity on the T2-weighted image (b).

employed before or after surgery because of its cardiac complications; chemotherapy is preferred in such patients. In extrathoracic thymoma metastases, radiotherapy is used because thymomas respond to radiotherapy fairly rapidly (1, 17, 18). Local recurrence can occur after surgery. In some cases, however, the mass cannot be completely surgically removed (2). In such cases, cisplatin chemotherapy protocols are used (2, 12).

Thymomas rarely metastasize (2%), and they most commonly metastasize to the lungs and brain (1, 2, 16). Extrathoracic metastases of thymomas are extremely rare; in such cases, cranial metastases are observed most frequently. In the literature, a few cases of metastases outside of the cranium have been reported. In diagnosed metastatic cases, masses with heterogeneous hemorrhagic areas were defined. Additionally, in some cases, thymomas metastasized into the vertebral extraspinal area (3), peritoneal cavity (13), and pelvic and genital organs (14).

Bone metastases of thymomas are very rare. In those few cases, the metastasized area is usually the cranium bones. No published report exists concerning thymomas metastasizing into the sacrum and iliac bones. Our case is the first of thymoma metastasis to the sacrum and iliac bones 18 months after the surgical resection of mediastinal thymomas. Our patient had poor prognosis, and she died 2 years after the diagnosis of sacrum metastasis because of multiple organ failure. In the literature, thymoma bone metastases are reported as lytic expansile bone lesions (14). In our case, the lesion observed in the sacrum had a lytic area and a component that caused deformation of the bone cortex as well as growth towards anterior soft tissues (Figure 1, 2). Additionally, CT showed that part of the lesion was sclerotic in nature, which has not been reported previously in bone metastases of thymomas.

Informed Consent: Written informed consent was obtained from patient who participated in this study.

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REFERENCES

1. Cowen D, Richaud P, Mornex F, Bachelot T, Jung GM, Mirabel X, et al. Thymoma: results of a multicentric retrospective series of 149 non-metastatic irradiated patients and review of the literature. *Radiotherapy and Oncology* 1995; 34: 9-16. [\[CrossRef\]](#)
2. Regnard JF, Magdeleinat P, Dromer C, Dulmet E, de Montpreville V, Levi JF, et al. Prognostic factors and long-term results after thymoma resection: a series of 307 patients. *J Thorac Cardiovasc Surg* 1996; 112: 376-84. [\[CrossRef\]](#)
3. Bott-Kothari T, Aron BS, Bejarano P. Malignant thymoma with metastases to the gastrointestinal tract and ovary: a case report and literature review. *Am J Clin Oncol* 2000; 23: 140-2. [\[CrossRef\]](#)
4. Al-Barbarawi M, Smith SF, Sekhon LH. Haemorrhagic brain metastasis from a thymic carcinoma. *J Clin Neurosci* 2004; 11: 190-4. [\[CrossRef\]](#)
5. Dettnerbeck FC, Nicholson AG, Kondo K, Van Schil P, Moran C. The Masaoka-Koga stage classification for thymic malignancies: clarification and definition of terms. *J Thorac Oncol* 2011; 6: S1710-6. [\[CrossRef\]](#)
6. Giaccone G. Treatment of malignant thymoma. *Curr Opin Oncol* 2005; 17: 140-6. [\[CrossRef\]](#)
7. Tamura Y, Kuroiwa T, Doi A, Min KY. Thymic carcinoma presenting as cranial metastasis with intradural and extracranial extension: case report. *Neurosurgery* 2004; 54: 209-12. [\[CrossRef\]](#)
8. Müller-Hermelink HK, Marx A. Pathological aspects of malignant and benign thymic disorders. *Ann Med* 1999; 31: 5-14.
9. Ersahin M, Kilic K, Gögüsgeren MA, Bakirci A, Vardar Aker F, Berkman Z. Multiple brain metastases from malignant thymoma. *J Clin Neurosci* 2007; 14: 1116-20. [\[CrossRef\]](#)
10. Al-Barbarawi M, Smith SF, Sekhon LH. Haemorrhagic brain metastasis from a thymic carcinoma. *J Clin Neurosci* 2004; 11: 190-4. [\[CrossRef\]](#)
11. Levine GD, Rosai J. Thymic hyperplasia and neoplasia. a review of current concepts. *Hum Pathol* 1978; 9: 495-515. [\[CrossRef\]](#)
12. Chahinian AP. Chemotherapy of thymomas and thymic carcinomas. *Chest Surg Clin N Am* 2001; 11: 447-56.
13. Husari A, Skouri A, Abou Mourad Y, Chehal A, Zaatari G, Shamseddine A. Metastatic thymoma to the peritoneum: A case report. *Respiratory Medicine Extra* 2005; 1: 89-92. [\[CrossRef\]](#)
14. Liu T, Qiu G, Tian Y. Thymic carcinoma with primary spine metastasis. *J Clin Neurosci* 2011; 18: 840-2. [\[CrossRef\]](#)
15. Kondo K, Monden Y. Lymphogenous and hematogenous metastasis of thymic epithelial tumors. *Ann Thorac Surg* 2003; 76: 1859-64. [\[CrossRef\]](#)
16. Kondo K, Monden Y. Therapy for thymic epithelial tumors: a clinical study of 1,320 patients from Japan. *Ann Thorac Surg* 2003; 76: 878-84. [\[CrossRef\]](#)
17. Elliott KS, Borowsky ME, Bakdounes K, Huang J, Abulafia O, Lee YC. Malignant thymoma metastatic to the pelvis: A rare case and considerations for management. *Gynecol Oncol* 2005; 99: 228-31. [\[CrossRef\]](#)
18. Shapiro CL, Hardenbergh PH, Gelman R, Blanks D, Hauptman P, Recht A, et al. Cardiac effects of adjuvant doxorubicin and radiation therapy in breast cancer patients. *J Clin Oncol* 1998; 16: 3493-501.