Case Report
Tumor/Infection
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RECURRENT THYMOMA WITH THORACOLUMBAR SPINAL INVASION

TIMOMA RECIDIVADO COM INVASÃO DA COLUNA TORACO-LOMBAR

TIMOMA RECIDIVANTE CON INVASIÓN DE LA COLUMNA TORACOLUMBAR

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ABSTRACT

Objective: To present an atypical case of recurrent thoracic thymoma in the thorax with secondary spinal invasion and to review the role of surgical intervention in the treatment of the disease based on similar cases in the literature. Case: A 73-year-old woman with a history of thymoma treated in 2013 presented in 2023 with recurrence, manifesting as cough, fever, and lumbalgia. Imaging studies demonstrated invasion of the rib cage, pleura, diaphragm, and the T11–T12 intervertebral foramen, with involvement of the XI spinal nerve, but without macroscopic lesion of the vertebral body. Management consisted of an en bloc surgical resection via costotransversectomy, sagittal osteotomy, and arthrodesis from T9 to L2, achieving clear surgical margins and a stable clinical outcome. Review: A total of seven similar cases were identified in the literature, suggesting that complete resection is associated with improved prognosis. Discussion: The lesion's proximity to the spine demands a surgical strategy that adheres to the oncological principle of en bloc resection with clear margins, which is crucial for reducing recurrence and enhancing long-term functional outcomes. The favorable outcome in this case, along with positive results in four others, reinforces the effectiveness of this strategy. Conclusion: The rarity of thymomas with secondary vertebral involvement limits the establishment of a standardized treatment approach. En bloc surgical resection with free margins demonstrates potential benefit, although the available evidence – including the present case report, classified as level of evidence IV – is limited by its observational design and the limited case series in the literature. ***Level of Evidence IV; Case Series.***

Keywords: Thorax; Spine; Thymoma; Recurrence; Margins Of Excision; Surgical Oncology.

RESUMO

Objetivo: Apresentar um caso atípico de timoma torácico recorrente com invasão secundária da coluna vertebral e revisar o papel da intervenção cirúrgica no tratamento da doença com base em casos semelhantes na literatura. Caso: Mulher de 73 anos, com histórico de timoma tratado em 2013, apresentou recidiva em 2023, manifestando tosse, febre e lombalgia. Estudos de imagem demonstraram invasão da caixa torácica, pleura, diafragma e do forame intervertebral T11–T12, com envolvimento do nervo espinal XI, mas sem lesão macroscópica do corpo vertebral. O tratamento consistiu em ressecção cirúrgica em bloco por meio de costotransversectomia, osteotomia sagital e artrodese de T9 a L2, alcançando margens cirúrgicas livres e um desfecho clínico estável. Revisão: Um total de sete casos semelhantes foram identificados na literatura, sugerindo que a ressecção completa está associada a um prognóstico melhor. Discussão: A proximidade da lesão com a coluna vertebral exige uma estratégia cirúrgica que siga o princípio oncológico de ressecção em bloco com margens livres, fundamental para reduzir a recorrência e melhorar os desfechos funcionais a longo prazo. O desfecho favorável neste caso, junto com os resultados positivos em outros quatro casos, reforça a eficácia dessa abordagem. Conclusão: A raridade dos timomas com envolvimento vertebral secundário limita o estabelecimento de uma conduta terapêutica padronizada. A ressecção cirúrgica em bloco com margens livres demonstra benefício potencial, embora as evidências disponíveis – incluindo o presente relato de caso, classificado como nível de evidência IV – sejam limitadas por seu desenho observacional e pelo número restrito de casos descritos na literatura. ***Nível de Evidência IV; Série de Casos.***

Descritores: *Tórax; Coluna Vertebral; Timoma; Recidiva; Margens Cirúrgicas; Oncologia Cirúrgica.*

RESUMEN

Objetivo: Presentar un caso atípico de timoma recidivado en el tórax con invasión secundária a la columna y revisar el papel del tratamiento quirúrgico en la enfermedad, a partir de casos similares reportados en la literatura. Caso: Mujer de 73 años, con antecedente de timoma tratado en 2013, presentó recurrencia en 2023, manifestada por tos, fiebre y lumbalgia. Los estudios de imagen evidenciaron invasión de la parrilla costal, pleura, diafragma y foramen intervertebral T11–T12, con compromiso del XI nervio espinal, sin lesión macroscópica del cuerpo vertebral. La conducta incluyó resección quirúrgica en bloque mediante costotransversectomía, osteotomía sagital y artrodesis de T9 a L2, logrando márgenes libres y evolución clínica estable. Revisión: Se encontraron siete casos similares en la literatura, sugiriendo que la resección completa mejora el pronóstico. Discusión: La proximidad de la lesión con la columna exige un abordaje quirúrgico basado en el principio oncológico de resección en bloque con márgenes libres, con el objetivo de reducir recurrencias y mejorar la funcionalidad a largo plazo. El desenlace favorable de este caso, sumado a resultados positivos en otros cuatro, refuerza la eficacia de la cirugía como tratamiento. Conclusión: La rareza de este caso dificulta el consenso sobre el manejo de los timomas con afectación vertebral secundaria. La resección quirúrgica en bloque con márgenes libres demuestra un beneficio potencial, aunque la evidencia disponible – incluido el presente reporte de caso, clasificado como nivel de evidencia IV – es limitada por su diseño observacional y la escasez de series de casos en la literatura. ***Nivel de evidencia IV; Serie de casos.***

Descriptores: *Tórax; Columna Vertebral; Timoma; Recurrencia; Márgenes Quirúrgicos; Oncología Quirúrgica.*

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INTRODUCTION

Thymoma accounts for 0.2–1.5% of all neoplastic lesions and 20% of mediastinal tumors in adults. It is the most common neoplasm of the anterior mediastinum.[1] The annual incidence ranges from 0.13 to 0.26 per 100,000 inhabitants, with peak prevalence in the fifth and sixth decades of life. It is rare in young individuals and slightly more frequent in women.[2] Clinical presentation varies from incidental findings to compressive symptoms (such as chest pain, cervical mass, and superior vena cava syndrome), with myasthenia gravis present in 10–15% of cases.[3] Complete surgical resection is the treatment of choice for primary lesions.[4]

For prognosis and treatment planning, the Masaoka-Koga and WHO classification systems are essential. The Masaoka-Koga system stages thymomas from I to IV based on tumor invasion (Table 1), with 5-year survival rates ranging from 94% in stage I to 77.8% in stage IVb.[5] The WHO classification categorizes thymomas into types A, B, or AB, associating histological features with tumor behavior. (Table 2)

Table 1. Masaoka-Koga Staging System.

Estágio	Definição
I	Tumor completely encapsulated, both macroscopically and microscopically
IIa	Transcapsular microscopic invasion
IIb	Macroscopic invasion into the thymus or surrounding adipose tissue or grossly adherent but not rupturing the mediastinal pleura or pericardium
III	Macroscopic invasion into neighboring organs (e.g., pericardium, large vessels, or lung)
IVa	Pleural or pericardial metastases
IVb	Lymphatic or hematogenous metastasis

Source: adapted from Masaoka A. Staging system of thymoma. J Thorac Oncol. 2010;5(10 Suppl 4):S304–S312. doi:10.1097/JTO.0b013e3181f20c05

Table 2. World Health Organization (WHO) Histological Classification of Thymic Tumors.

Tipo	Histologia
A	Neoplastic thymic epithelial cells, fusiform or oval in shape, no nuclear atypia, few or no non-neoplastic lymphocytes
AB	Areas characteristic of type A thymoma are mixed with lymphocyte-rich foci.
B1	Areas that appear virtually identical to normal thymic cortex and regions that resemble thymic medulla.
B2	Robust epithelial cells, vesicular nuclei with distinct nucleoli, abundant lymphocytes, perivascular pattern with palisade effect.
B3	Rounded or polygonal epithelial cells, minimal or no atypia, few lymphocytes, growth in sheets

Source: adapted from Rosai J, Sobin LH. Histological typing of tumours of the thymus. 2nd ed.

Recurrence occurs in 10–30% of cases and may be localized without pleural involvement (39%) or disseminated intra-/extrathoracically (61%).[2] Most recurrences are treated with complete surgical resection when feasible.[6]

In rare cases of spinal recurrence, there is no established therapeutic consensus. Most reports support surgical resection, in line with general management strategies for recurrent disease.[7-13] However, evidence-based guidelines for this approach are lacking.

This report presents an atypical case of recurrent thymoma in the thorax with secondary thoracolumbar extension, reviews similar case reports, and discusses surgical management to support evidence-based recommendations.

CASE REPORT

Clinical history and course

A 73-year-old female patient with a history of thymoma treated in January 2013 underwent sternotomy, total thymectomy, and non-anatomical segmentectomy of the right upper lung lobe. At the time, the tumor was staged as Masaoka-Koga stage III due to pulmonary invasion. Complete resection was performed, with histopathological confirmation of negative margins. The patient received adjuvant radiotherapy.

In 2022, a recurrence was diagnosed in the right pleura, resulting in disease progression to Masaoka-Koga stage IV. The patient underwent resection via video-assisted thoracoscopic surgery (VATS). Histopathological analysis confirmed free surgical margins and revealed WHO classification types B3 (50%), B2 (40%), and B1 (10%).

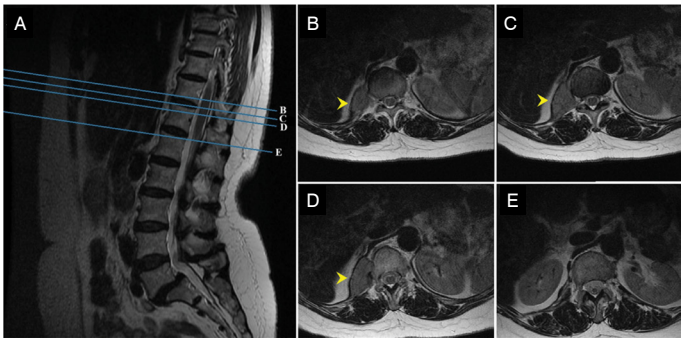
After one year of follow-up, in 2023, the patient presented with cough, episodes of fever, and low back pain, prompting her to seek emergency care. Chest radiography revealed a mass causing mediastinal widening. A CT-guided biopsy diagnosed a new recurrence at the surgical bed from the second procedure. This time, histopathological analysis showed subtype AB.

The patient was referred by the hematology team to the spine and thoracic surgery services for evaluation and treatment planning of the mediastinal mass. At the time of the spine consultation, she presented with dorsalgia, with resolution of the cough and fever. On physical examination, no motor or sensory deficits were noted, corresponding to Frankel grade E.

Lesion

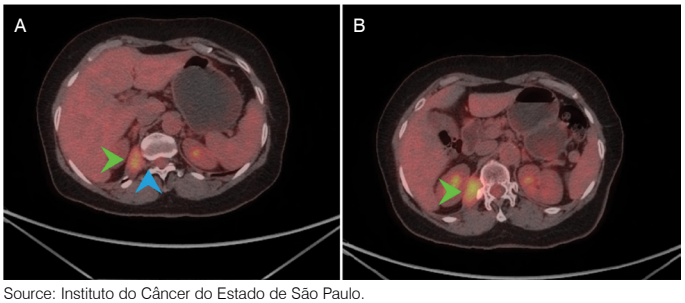
Magnetic resonance imaging revealed invasion of the right costal arch, right mediastinal pleura, and diaphragm, with proximity to the thoracic spine at T11 and T12 levels. No macroscopic invasion of the vertebral body was observed, but there was involvement of the right 11th spinal nerve. (Figure 1)

Positron emission tomography combined with computed tomography (PET/CT) confirmed the presence of a right pleuropulmonary mass in close contact with the T11 and T12 vertebral bodies, infiltration of the intervertebral foramen, and loss of the cleavage plane with the 11th spinal nerve. (Figure 2)



Source: Instituto do Câncer do Estado de São Paulo.

Figure 1. T2-weighted magnetic resonance imaging, sagittal plane (A). Axial slices showing the lesion (yellow arrows) in the right paravertebral region at the level of T11 (B) and T12 (D), invading the T11–T12 vertebral foramen (C), with no apparent lesion near L1 (E).



Source: Instituto do Câncer do Estado de São Paulo.

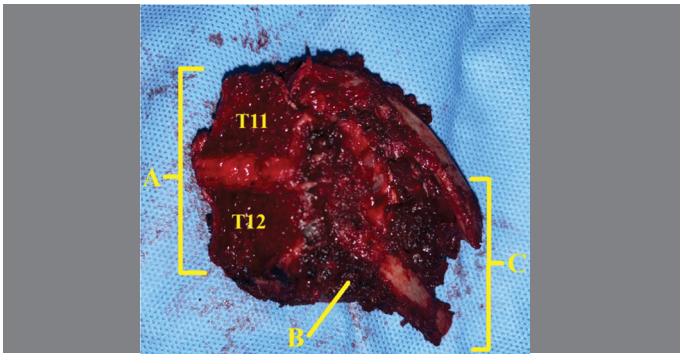
Figure 2. PET/CT after intravenous infusion of the radiotracer 18FDG (Fluorodeoxyglucose labeled with Fluorine-18). Presence of a hypermetabolic right paravertebral mass (green arrow) infiltrating the intervertebral foramen (blue arrow), involving the 11th spinal nerve (A) and abutting the T12 vertebral body (B).

Surgery

En bloc resection was performed, including metastasectomy of the costal, pleural, and diaphragmatic lesions; resection of a right subcutaneous nodule; pleuroscopy; costotransversectomy combined with sagittal osteotomy at T11 and T12 (Figure 3); and spinal fusion from T9 to L2 (Figures 4 and 5). The surgical approach was multidisciplinary, involving the spine and thoracic surgery teams.

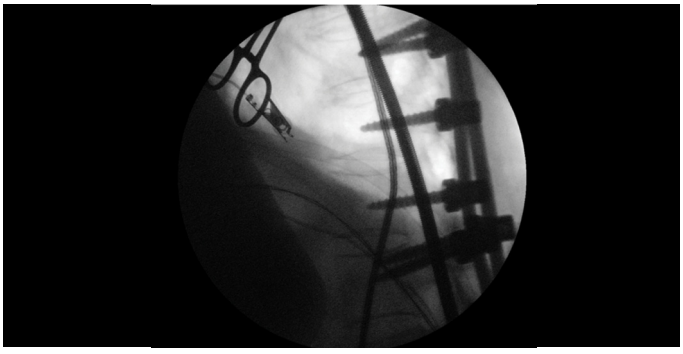
Pathological findings

Recurrent thymoma compatible with WHO types B2 and AB, total size 4.2 cm. No necrosis; three mitoses per 10 high-power fields; absence of angiolymphatic invasion. Adjacent fibroadipose, muscle, skeletal, and bone tissues were involved. Surgical resection margins were free of neoplasia. Immunohistochemistry: Ki-67: Positive (low index);PAX-8: Positive (epithelial component); p63: Positive (epithelial component); TdT: Positive (lymphocytes); CAM5.2: Positive (epithelial component); CD117/c-KIT: Negative.



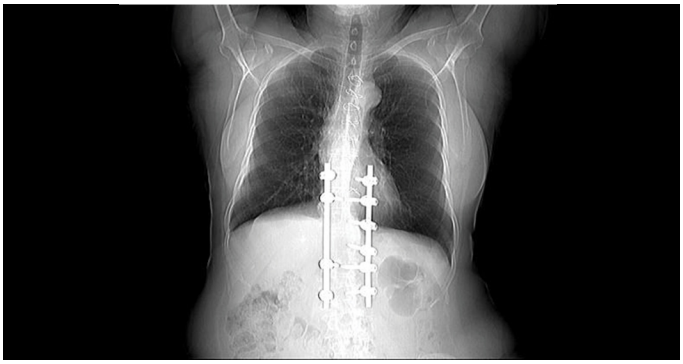
Source: Instituto do Câncer do Estado de São Paulo.

Figure 3. Surgical specimen from the en bloc tumor resection, including vertebral segment T11–T12 (A), pleuropulmonary portion (B), and costal portion (C).



Source: Instituto do Câncer do Estado de São Paulo.

Figure 4. Intraoperative image acquired by fluoroscopy during spinal fusion. Bilateral fixation is observed at T10 and L1, and unilateral fixation at T11 and T12 after costotransversectomy combined with sagittal corpectomy.

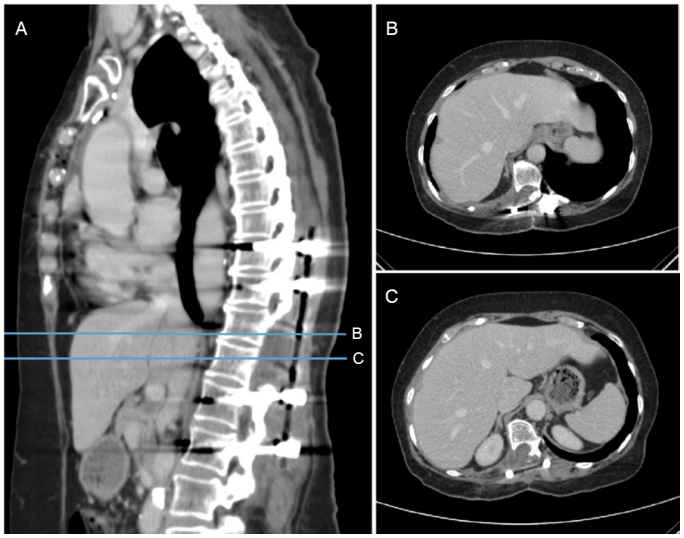


Source: Instituto do Câncer do Estado de São Paulo.

Figure 5. Anteroposterior radiograph on postoperative day 7 showing successful fusion from T10 to L2.

Follow-up

The patient remained pain-free (verbal categorical scale), neurologically stable, and showed no signs of recurrence seven months after surgery. (Figure 6)



Source: Instituto do Câncer do Estado de São Paulo.

Figure 6. Sagittal computed tomography at 7 months postoperative (A). Axial slices show resection of the right posterior hemivertebral arch and sagittal corpectomy of T11 (B) and T12 (C), with spinal fusion from T10 to L2. No evidence of recurrence is seen using this imaging method.

Literature review

An advanced search was conducted in the PubMed database using the following Boolean algebra algorithm: (“Thymoma” OR “Carcinoma, Thymic” OR “Carcinomas, Thymic” OR “Thymic Carcinoma” OR “Thymic Carcinomas” OR “Thymomas”) AND (“Spine” OR “Column, Spinal” OR “Column, Vertebral” OR “Columns, Spinal” OR “Columns, Vertebral” OR “Spinal Column” OR “Spinal Columns” OR “Vertebra” OR “Vertebrae” OR “Vertebral Column” OR “Vertebral Columns” OR “Vertebral Body” OR “Arch, Vertebral” OR “Body, Vertebral” OR “Cancellous Centra” OR “Cancellous Centras” OR “Cancellous Centrum” OR “Cancellous Centrums” OR “Centrum, Vertebral” OR “Lamina, Vertebral” OR “Pedicle, Vertebral” OR “Pedicle, Vertebral Arch” OR “Processe, Spinous” OR “Processe, Transverse” OR “Processes, Spinous” OR “Processes, Transverse” OR “Spinous Processe” OR “Spinous Processes” OR “Transverse Processe” OR “Transverse Processes” OR “Vertebral Arch” OR “Vertebral Arch Pedicle” OR “Vertebral Arch Pedicles” OR “Vertebral Bodies” OR “Vertebral Centra” OR “Vertebral Centras” OR “Vertebral Centrum” OR “Vertebral Lamina” OR “Vertebral Laminas” OR “Vertebral Pedicle” OR “Vertebral Pedicles”).

A total of 47 articles were identified (after removal of duplicates) and screened by title and abstract, followed by full-text reading. Two publications in Japanese and one in German were excluded due to language. Additionally, 37 studies were excluded because they did not address involvement of thoracic structures and the spinal column. The search period ended in March 2025. Seven articles were included for review, focusing on cases with concurrent thoracic and spinal involvement, similar to the present case. A summary of the review, including the seven studies and the current case, is presented in Table 3.

Among the eight reviewed articles, the median age at diagnosis of spinal metastasis was 52 years (range: 29 to 79 years), with a slight female predominance (5 women, 3 men). Dorsalgia or radicular pain was the most common clinical presentation. Two patients

Table 3. Summary of the review of 8 cases of metastatic thymoma to the thorax and involvement of the spine.

Author/Year	Age (a); Gender	Presentation	Type of thymoma (WHO)	Injury	Treatment	Result	Neoadjuvant/ adjuvant treatment
Toba et al.[7] (2009)	29, F	Back pain	B3	Right pleura, diaphragm, intervertebral foramen T10-T11	En bloc resection: vertebral arch of T10 and T11, 10th and 11th ribs, right intercostal nerve X	Resolution of back pain, with no recurrence after 15 months	46 Gy RT
Jazi et al.[8] (2014)	44, M	Pneumonia, atrial fibrillation	B3	Mediastinum, right lower lobe, and C7	Carboplatin/paclitaxel, prednisone, pyridostigmine, plasmapheresis, azathioprine	Diplopia, myasthenia gravis, and cervical paraspinal weakness	Not specified
Low et al.[9] (2016)	79, M	Back pain and radiculopathy	C	Diffuse subpleural, left T8-T9 intervertebral foramen	RT	Disease control	Not specified
Achey et al.[10] (2017)	38, F	Pain in left side and thigh	B3	Paraspinal, invasion of the T12-L1 intervertebral foramen	Facetectomy and total macroscopic resection T12-L1, fusion T11-L2	Resolution of neurological symptoms	ATR + Irinotecan chemotherapy
Prieto et al.[11] (2018)	63,M	Back pain	AB	Right pleura, T8-T9 intervertebral foramen, right T8 spinal nerve	Laminectomy, right foraminotomy, and medial facetectomy T8-T9	Pain resolution, no neurological symptoms	CT refused by patient
Li et al. [12] (2024)	51, F	Segmental cough, pain, and paresthesia	B1	Diffuse pleural lesion with T2 invasion and osteolysis	Refused by the patient	Not specified	Not specified
Fabbri et al.[13] (2024)	53,F	Radiculopathy	B2	Left retrocrural costofrenic, pedicle, and vertebral body of T12	En bloc resection of retroperitoneal, diaphragmatic, and vertebral tumor	No recurrence	RT
Paro et al. (2025)	73,F	Dry cough, fever, lower back pain	AB	Costal rib cage, pleura, diaphragm, T11-T12, intervertebral foramen T11-T12	Costotransversectomy, sagittal osteotomy T11-T12, arthrodesis T9-L2	Pain resolution, with no recurrence after 7 months	RT

Caption: F: female; M: male; RT: radiotherapy; CT: chemotherapy; ATRi: ATR kinase inhibitor drug.

had concomitant respiratory symptoms, while one presented solely with respiratory complaints and no neurological signs. According to the WHO classification for thymomas, type B3 was the most common (3/8), followed by type AB (2/8), and types B1, B2, and thymic carcinoma (type C), each reported in one case. The thoracic spine was the most frequently affected site (5/8), followed by two thoracolumbar cases and one cervical (C7) case. Most patients underwent surgical resection combined with adjuvant therapies (radiotherapy, chemotherapy, or both), resulting in symptomatic improvement or local disease control in the majority of cases.

All included studies were case reports (level of evidence IV), carrying considerable risk of bias – particularly selection and publication bias.

DISCUSSION

Our case is notable for presenting with a delayed primary metastasis to the costal arch, pleura, and diaphragm, with secondary involvement of the spine due to tumor growth. Invasion of the vertebral foramen and proximity to the spine – without macroscopic vertebral body involvement – suggest that the spinal lesion was diagnosed at an early stage. Nonetheless, the spinal column could not be preserved while ensuring clear surgical margins, necessitating partial resection of T11 and T12 as part of the en bloc resection.

Hamaji et al.[14] conducted a meta-analysis comparing surgical and non-surgical treatment of recurrent thymomas, including 11 studies and a total of 232 patients – 156 treated surgically and 76 non-surgically. The 5-year survival rate was approximately 2.4 times higher in the surgical group (70.9% vs. 29.6%), and the 10-year survival was approximately 2.7 times higher following surgery (49.6% vs. 18.4%). This association suggests a significant role of surgery in disease prognosis.

Additionally, an analysis by Sandri et al.[15] comparing complete versus incomplete resection of recurrent thymomas – regardless of the site – showed a 1.4-fold increase in 5-year survival (82.4% vs. 55.9%) and in 10-year survival (65.4% vs. 46.5%) favoring complete tumor removal, underscoring the prognostic importance of total resection.

In cases of spinal recurrence, the metastatic behavior of thymomas remains poorly understood, unlike that of breast, prostate, or lung cancer, whose vertebral metastases are well documented and frequently studied. With an estimated incidence of 3.2 cases per million inhabitants and rare vertebral involvement, the number of publications remains limited. Most available data come from case reports or small series, and treatment modalities – including clinical outcomes – have not been adequately compared. As such, there is no consensus on the optimal management approach; therapeutic decisions are often individualized and, when surgical, guided by the surgeon's experience and patient-specific characteristics.[10]

While the ideal treatment strategy remains underexplored, studies comparing surgical techniques for thymomas with secondary spinal involvement are even scarcer. Most reports and series have focused on primary spinal metastases, with no studies addressing the specific invasion pattern described in our case. After analyzing 28 cases of metastatic thymoma involving the spine (not necessarily with thoracic involvement), Achey et al.[10] proposed an algorithm similar to the principles applied here. The study recommended surgical intervention in patients with spinal metastases and symptoms refractory to conservative treatment, while suggesting chemotherapy or radiotherapy with follow-up in asymptomatic cases, depending on the degree of spinal cord compression. Ultimately, treatment should be individualized, and we emphasize the importance of maximal surgical resection for improving prognosis and survival.

The review presented in Table 3 compiles scientific literature on thymoma metastases affecting both thoracic and spinal structures – either through confirmed macroscopic or microscopic invasion – requiring vertebral resection to achieve negative oncological margins. From the literature review, a representative profile of patients and management strategies was compiled for conditions similar to the present case.

Although the scope of this review is limited and the available data are of low robustness – reflecting the scarcity of studies – this compilation represents the best current overview in the literature. Cases involving complete surgical tumor resection showed favorable outcomes, including functional improvement and absence of

recurrence, consistent with both the present patient and the findings reported by Hamaji et al.[14] and Sandri et al.[15].

The decision to perform costotransversectomy with sagittal osteotomy at T11 and T12 and spinal fusion was based on oncological principles of maximal tumor resection and the goal of functional recovery. Boriani[16] emphasizes that oncologic spine surgery must consider both objectives and reinforces the importance of negative margins for local and systemic prognosis. Therefore, the pleural and diaphragmatic lesion in contact with the vertebral body and invading the vertebral foramen justified spinal resection to uphold the principle of margin-free excision.

For surgical resection, we opted for a posterior approach and performed a costotransversectomy. The medial portions of the 11th and 12th ribs and adjacent transverse processes were removed, allowing deep access to spinal bone structures. Costotransversectomy offers several advantages, enabling selective removal of affected osseous components (rib head, costovertebral joint, facet, and pedicle), providing spinal canal decompression. Moreover, it facilitates safe posterior stabilization and avoids complications inherent to transthoracic approaches.[17]

This was followed by sagittal corpectomy. With neurovascular structures protected, we minimized the risk of complications and proceeded with sagittal corpectomy of T11 and T12, aiming for margin-free en bloc resection and decompression of the right 11th spinal nerve.

Spinal stabilization was the final pillar for achieving surgical success. Notably, fixation of the left (contralateral) segment was performed during en bloc resection to avoid misalignment during tumor removal. Spinal fixation is essential to ensure biomechanical stability.[18] The partial removal of T11 and T12 compromises vertebral integrity, which bears most of the spinal axial load, making it susceptible to collapse, progressive deformity, or additional neurological injury – all of which could impair patient function postoperatively. Furthermore, spinal instrumentation facilitates early mobilization, reducing the risk of complications from prolonged immobilization and improving long-term outcomes.

Internal instrumentation was completed with pedicle screws and bilateral rods from T9 to L2, achieving proper redistribution of mechanical load. This stability was crucial to prevent micro-movements that could lead to pseudoarthrosis, failure of the operated segment, and chronic pain.

In this case, the patient showed no recurrence (albeit with short follow-up), experienced neurological improvement and pain relief, and maintained long-term spinal stability. Thus, our outcome, along with four other successful cases (Table 3), suggests that surgery may offer clinical benefit in recurrent thoracic thymomas with secondary spinal involvement.

We acknowledge that this analysis presents limitations inherent to case reports and small series. Its observational, descriptive, and retrospective nature, absence of a control group, and small sample size prevent robust recommendations regarding surgical management of thymomas with vertebral invasion. These limitations increase the risk of selection, information, publication, or observer bias, potentially resulting in inappropriate extrapolation of results.

CONCLUSION

Based on the presented case and the reviewed literature, surgical resection shows potential for pain reduction, neurological symptom remission, and tumor growth control, while preserving long-term functional spinal stability following arthrodesis. Nevertheless, the low level of evidence does not support a robust recommendation of surgery as the best treatment option, and the management of metastatic thymomas involving the spine remains a clinical challenge.

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