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One-Stage Resection of Giant Invasive Thoracic Schwannoma: Case Report and Review of Literature

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ABSTRACT

Background: Schwannomas comprise approximately 25% of all spinal tumors, being the third most frequent soft-tissue tumor after hemangiomas and lipomas. Grade 5 invasive giant schwannomas erode the vertebral bodies, involve 2 or more levels, and invade the myofascial planes. Because 3 compartments are involved, these tumors represent a surgical challenge and frequently require staged surgeries with a multidisciplinary surgical team.

Case Report: We report the case of a 62-year-old female who presented with intermittent upper back pain for 3 years. A magnetic resonance imaging scan of the thoracic spine showed a mass invading the vertebral body, pedicle, and lamina of T4 and part of T3 and T5. Needle biopsy confirmed the diagnosis of schwannoma. The patient underwent surgery using a parascapular extracavitary costotransversectomy approach.

Conclusion: Giant invasive spinal schwannomas are rare in the thoracic spine, and surgical approaches usually have entailed multiple-stage surgeries with the assistance of other surgical specialties. Our 1-stage complete surgical resection of a giant invasive spinal schwannoma used a parascapular costotransversectomy approach that maintained spinal stability and thus avoided the need for instrumentation.

INTRODUCTION

Schwannomas are the third most frequent soft-tissue tumor after hemangiomas and lipomas, and they comprise approximately 25% of all spinal tumors.[1] Malignant transformation is rare but occurs more commonly in patients with large tumors. About 76% of malignant transformation occurs in tumors greater than 5 cm in size. Patients with large tumors usually have an indolent course due to the slow tumor growth and generally present with back pain.[1-7]

Sridhar et al classified spinal schwannomas according to their radiological appearance.[1] Grade 5 invasive giant schwannomas erode the vertebral bodies, involve 2 or more levels, and invade the myofascial planes.[1] Most of these tumors occur in the lumbosacral spine with only a few cases reported in the thoracic spine.[5,8-11] Because they invade 3 compartments, giant schwannomas represent a surgical challenge and frequently require staged surgeries with a multidisciplinary surgical team.

CASE REPORT

A 62-year-old female presented with intermittent upper back pain for 3 years. The pain, which she described as dull, was located in the midline of her upper back and radiated around her left rib cage and breast. Her physical exam showed Babinski signs bilaterally. The rest of the neurological examination was otherwise normal.

A magnetic resonance imaging (MRI) scan of the thoracic spine showed a mass invading the vertebral body, pedicle, and lamina of T4 and part of T3 and T5 (Figures 1 and 2). Needle biopsy confirmed the diagnosis of schwannoma.

During careful preoperative planning, we decided to use a parascapular extracavitary costotransversectomy approach. During surgery, a semilunar left-sided incision was made to move from normal to abnormal tissue (Figure 3). We identified the myofascial extension of the tumor and tailored the number of hemilaminectomy levels according to the intracanalicular extension of the tumor. A 3-level hemilaminectomy was performed and the tumor was identified. The tumor's edges were delineated and tumor core debulking was achieved using an ultrasonic aspirator. This maneuver allowed us to peel the tumor off the dura, recognize it as extradural, and resect the

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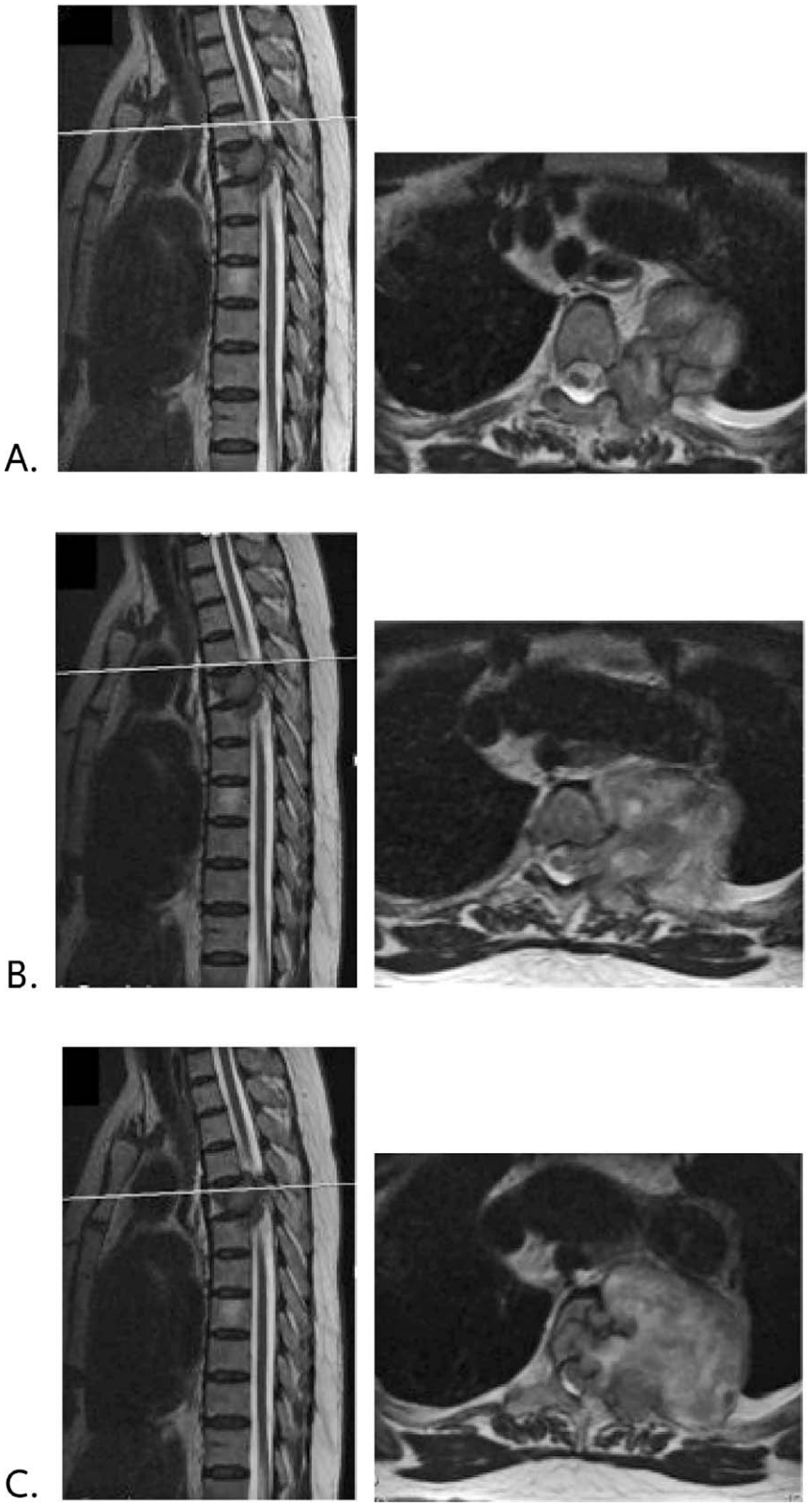

Figure 1. Magnetic resonance imaging T2-weighted noncontrast of giant invasive thoracic schwannoma from cephalad to caudal. A, B: T3 vertebral body slices; the tumor widens the left foramen and left-sided lamina. C, D: T4 vertebral body slices; the tumor erodes the vertebral body, widens the foramen, and erodes the left-sided lamina and rib, invading the myofascial plane. The spinal cord has lost its shape, but cerebrospinal fluid signal is still seen around it. The descending aorta is pushed anteriorly by the mass effect of the tumor. E: T5 vertebral body slice; the tumor erodes part of the vertebral body and left-sided pedicle.

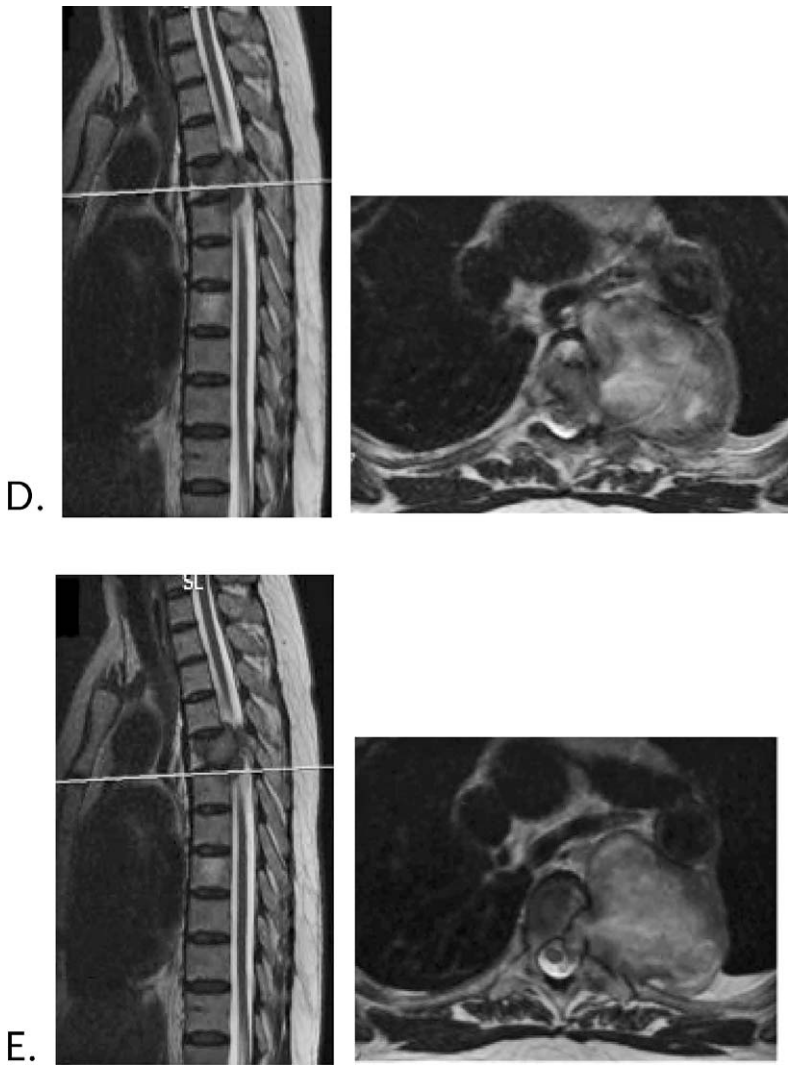

Figure 1. Continued.

intracanalicular component (Figure 4). Once neural decompression was achieved, we continued to debulk the intrathoracic core of the tumor until we were able to separate the tumor edges from aorta and parietal pleura. Total gross resection was achieved (Figure 5).

Because T4 was the most affected level and still had half of the vertebral body mass, intact right-sided pedicle, and intact contralateral half of the posterior elements, including the spinous ligament (Figure 5), we decided not to instrument the patient.

DISCUSSION

Conventionally, giant invasive spinal schwannoma (GISS) surgery has required 2 stages: the laminectomy stage for canal and foraminal decompression, followed by the thoracotomy stage for intrathoracic decompression. Symptomatic relief is always the main goal. When complete resection is not possible, subtotal resection can achieve good decompression and avoid neurological deficits. GISS patients should be followed closely to monitor tumor regrowth and need for further surgeries.[4]

Preoperative planning should consider the need for reconstruction, instrumentation, and cooperation from additional surgical teams.[12] Hardware artifact will compromise ideal radiological evaluation of tumor regrowth. Hence, whenever possible, instrumentation should be avoided, especially in the thoracic spine where the rib cage provides stability support and the empty space left by the removed tumor becomes filled with scar tissue that contributes additional stability support.[13] In general, indications for instrumentation are destruction of one-third or more of the vertebral body, compromise of facet joints, multilevel laminectomies, and destruction of the posterior tension band and disc capsule.[1,4,8,14,15]

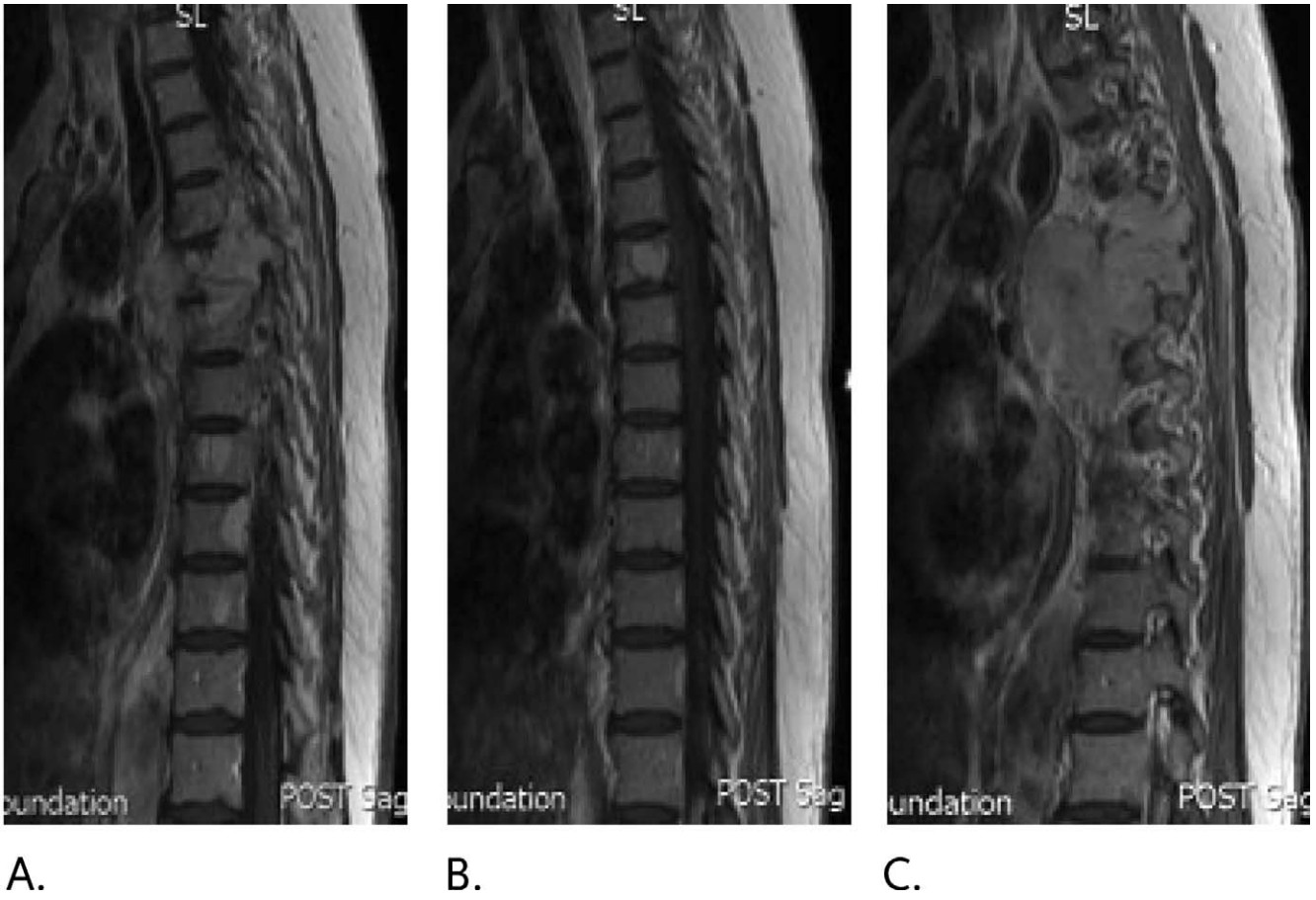

Figure 2. Magnetic resonance imaging T1-weighted with contrast scan showing the sagittal view of the giant invasive spinal schwanomma. A, B: The tumor erodes the T5 vertebral body and pedicle, pushes the aorta anteriorly, and invades the myofascial plane posteriorly. C: Paramedial view of the tumor causing mass effect over the aorta and invading the myofascial plane posteriorly.

Figure 3. Surgical planning with curvilinear incision allowing extension to the left. The edges of the marked line are off midline to the left.

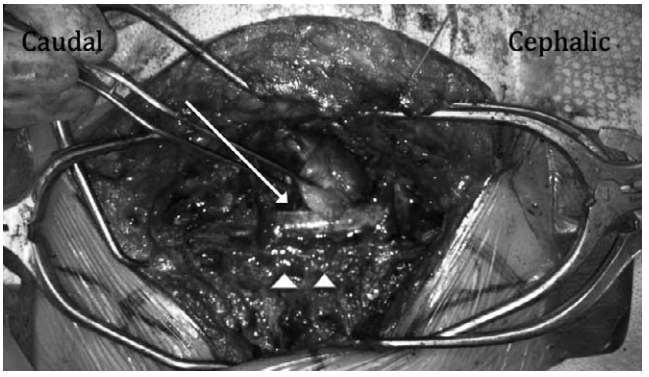

Figure 4. Intraoperative imaging with the final step before total gross resection of the schwannoma. The schwannoma is retrieved with forceps after it has been resected internally. The hemilaminectomy with the decompressed thoracic spinal canal is marked with an arrow. Spinous processes are marked with arrowheads.

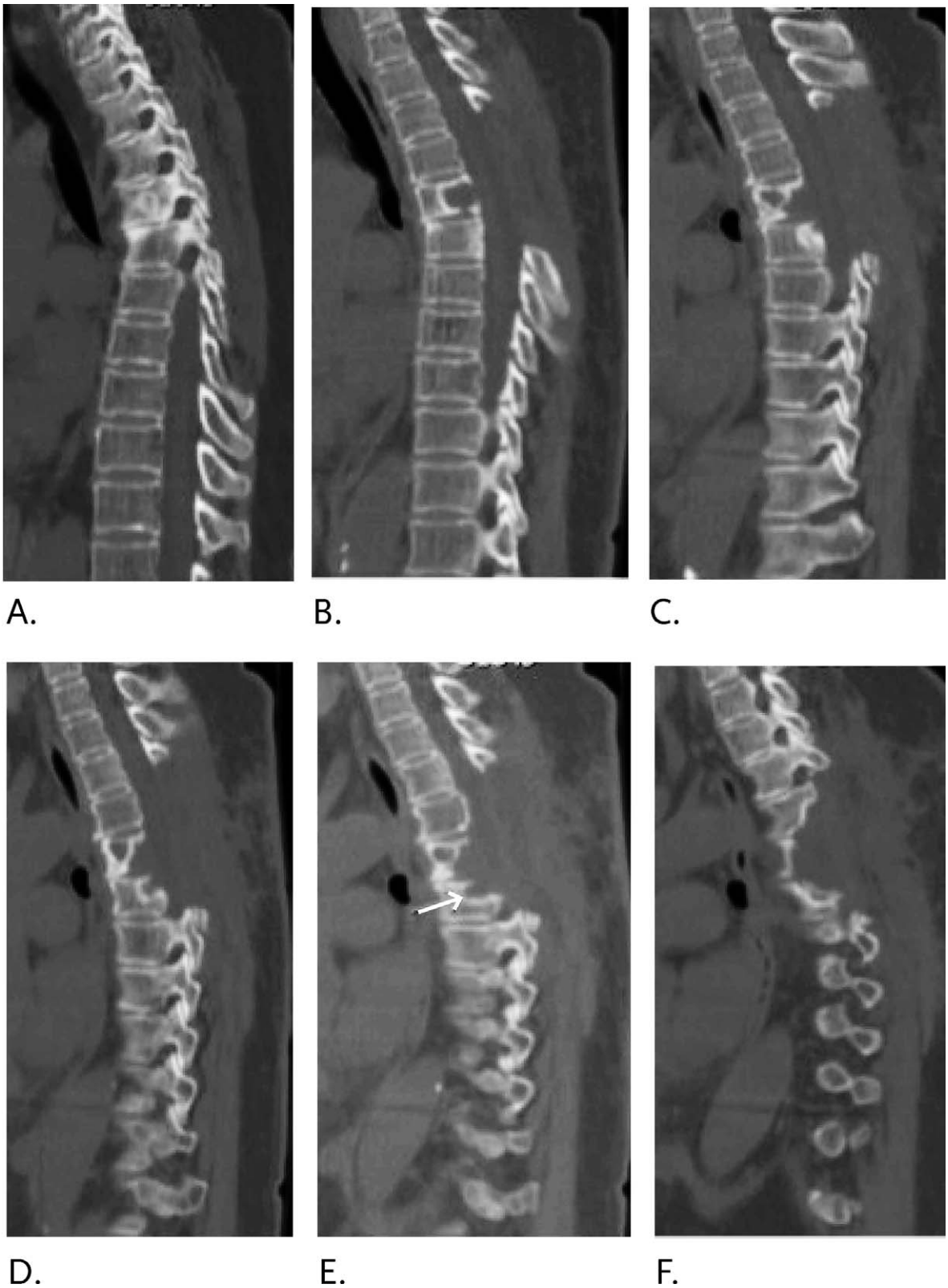

Figure 5. Sagittal computed tomography scan from right to left (A to F) showing complete tumor resection. The arrow in E indicates the sclerotic border of the vertebral body caused by the slow growth of the tumor.

Extracavitary approaches for thoracic pathology have been well documented. Such approaches avoid the need to stage surgeries and allow decompression and instrumentation at the same time.[2,16] Extracavitary costotransversectomies provide a posterolateral angle of attack that allows resecting lesions in the anterior vertebral body. Tumor debulking in giant schwannomas is key for manipulation of the tumor walls and separation from neural elements. We applied all these concepts when approaching the tumor in our patient.

Our patient underwent a 1-stage resection without instrumentation. We considered that despite having 3-level hemilaminectomies, tumor destruction of 50% of the T4 vertebral body, and 1 ipsilateral pedicle, the intact posterior tension band, disc capsule, facet joints in the contralateral side, and the extra support of the rib cage to thoracic stability would justify not instrumenting.

Long-term follow-up is necessary in GISS patients to monitor recurrence and any signs of instability, especially in patients who were not instrumented. Our patient presented neither signs of recurrence on MRI nor thoracic instability on standing x-rays at her 1-year follow-up.

CONCLUSION

GISSs are rare in the thoracic spine, and surgical approaches have usually entailed multiple-stage surgeries with the assistance of other surgical specialties. Our 1-stage complete surgical resection of a GISS used a parascapular costotransversectomy approach that maintained spinal stability and thus avoided the need for instrumentation.

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