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Large solitary osteochondroma of the thoracic spine: Case report and review of the literature

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Abstract

Background: Spinal osteochondromas are typically benign tumors, but patients may present with myelopathy and neurologic deficits if there is tumor encroachment within the spinal canal.

Case Description: We report here a case of a large solitary osteochondroma originating from the posterior vertebral body of T9 causing spinal cord compression and myelopathy. A 17-year-old man presented with 3 months of bilateral feet numbness and gait difficulty. Imaging demonstrated a large left-sided 5.9 cm × 5.0 cm × 5.4 cm osseous mass arising from the T9 vertebra consistent with an osteochondroma. He underwent bilateral costotransversectomies, and a left two-level lateral extracavitary approach for three partial corpectomies to both safely decompress the spinal canal as well as obtain a gross total resection of the tumor. Use of the O-arm intraoperative stereotactic computed tomographic navigation system assisted in delineating the osseous portions of the tumor for surgical removal. He experienced complete neurologic recovery after operative intervention.

Conclusion: Careful surgical planning is needed to determine the best approach for spinal cord decompression and resection of this tumor, especially taking into account the bony elements from which it arises. We present this case, to highlight the feasibility of a single-stage posterior approach to the ventral thoracic spine for the resection of a large solitary thoracic osteochondroma causing cord compression.

Key Words: Costotransversectomy, lateral extracavitary, osteochondroma, thoracic vertebrae

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INTRODUCTION

Osteochondroma, known otherwise as "osteocartilaginous exostosis," is the most common benign tumor of the long bone, and results from abnormal endochondral ossification.[1,5] Although uncommon, tumors can arise from the axial skeleton, affecting the spine in 1–4% of cases.[3] In this paper, we present a case of a large thoracic osteochondroma causing myelopathy which required an extensive single-stage posterior approach to the ventral thoracic spine for gross total resection and decompression. Use of the O-arm intraoperative stereotactic computed tomographic (CT) navigation system assisted with osseous tumor removal.

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CASE REPORT

Presentation

A 17-year-old male presented with numbness in both his feet for 3 months duration. His physical examination demonstrated full strength in the lower extremities, but hyperactive ankle knee jerk and ankle jerk reflexes of 3+ (with sustained ankle clonus), and bilateral Babinski responses. Sensory exam showed decreased sensation from the umbilicus down. He had difficulty with tandem gait testing.

Thoracic magnetic resonance imaging (MRI) showed a large 5.9 cm × 5.0 cm × 5.4 cm mass emanating from the T9–T10 level with severe cord compression [Figure 1], while the CT scan with bone windows confirmed this mass to be osseous in nature, arising from the posterior vertebral body (VB) of T9 vertebra [Figure 2]. Both studies were consistent with an osteochondroma. A soft tissue component presumed to be cartilage was noted at the left lateral aspect abutting the pleural margin of the left lung.

Operative resection and pathology

A wide laminectomy and bilateral facetectomy were performed at the T8–T10 levels followed by a right-sided costotransversectomy at T9. A left-sided T8 costotransversectomy and T9–T10 lateral extracavitary approach was now performed, and the lateral borders of the tumor were identified with the assistance of the stereotactic CT navigation system. A partial left-sided T8, T9, and T10 corpectomy was then performed to further decompress the thecal sac and remove the rest of the medial portion of the tumor. Gross total resection of the tumor was achieved and confirmed with the assistance of the stereotactic CT navigation system [Table 1].

Pathologically, the lesion was noted to have a cartilaginous cap centered by trabecular bone with endochondral ossification at the bone-cartilage interface [Figure 3]. These findings were consistent with a diagnosis of osteochondroma.

Postoperative care and clinical follow-up

A postoperative CT scan obtained while he was still an inpatient showed gross total resection of the tumor as well as appropriate positioning of the hardware [Figure 4]. His hospital stay was uneventful without complications, and he was discharged 6 days later with a full strength

Table 1: Surgical exposure and maneuvers required in this reported case for the purposes of spinal cord decompression and gross total resection of osteochondroma

Procedure list
T8-T10 laminectomy and bilateral facetectomy
Right T9 costotransversectomy and pediculectomy
Left T8 costotransversectomy
Left T9-T10 lateral extracavitary approach and pediculectomy
Left T8-T10 partial corpectomies
T6-L2 posterior spinal fusion and instrumentation

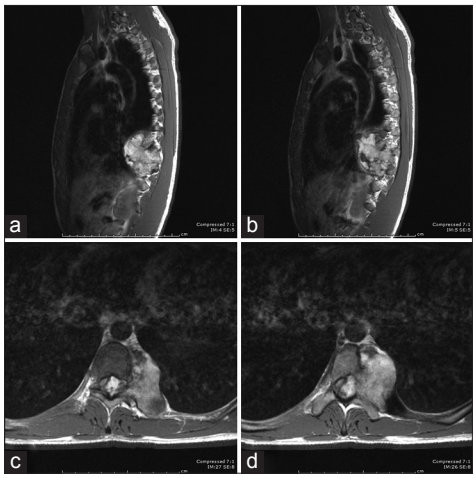

Figure 1: Preoperative T2-weighted magnetic resonance imaging in both sagittal (a and b) and axial (c and d) dimensions demonstrating the osteochondroma causing spinal cord compression

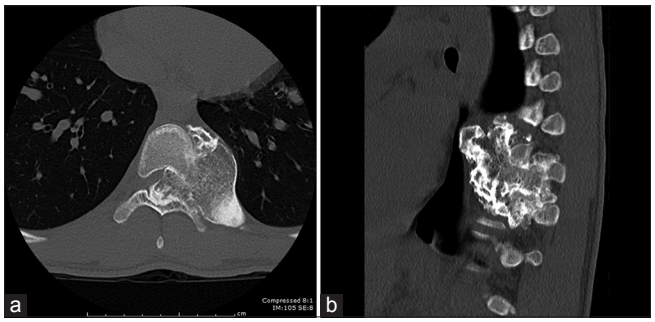

Figure 2: Preoperative noncontrast computed tomographic scan in both axial (a) and sagittal (b) dimensions demonstrating the osteochondroma with significant encroachment within the spinal canal

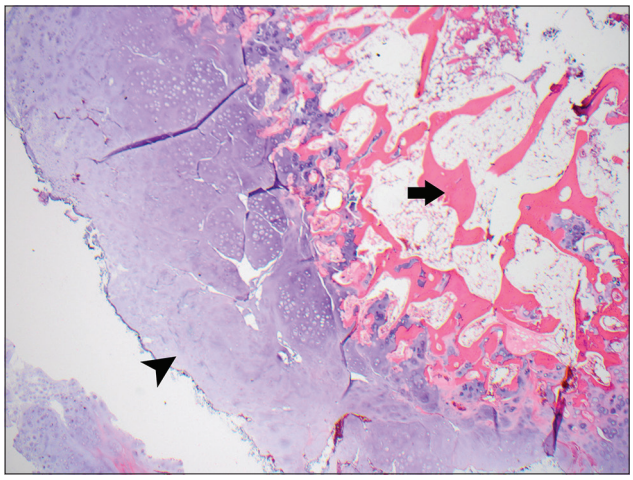

Figure 3: Photomicrograph of the osteochondroma (hematoxylin and eosin stain). A cartilaginous cap (black arrowhead) is noted to be covering the trabecular bone (black arrow)

Table 2: Reported cases of solitary thoracic osteochondroma presenting with myelopathy

Author	Age	Sex	Level	Origin	Surgery
Bradford *et al*., 1954	61	Female	T9	Posterior VB	Laminectomy
	29	Male	T8	Posterior VB	Laminectomy
Twersky *et al*., 1975	12	Male	T4	CVJ	Laminectomy
Natarajan *et al*., 1976	21	Male	T4-T5	CVJ	Thoracotomy
Le Goff *et al*., 1978	54	Female	T10	Posterior arch	Laminectomy
Loftus *et al*., 1980	28	Male	T4	VB, pedicle	Laminectomy
Palmer and Blum, 1980	31	Female	T2	Pedicle	Laminectomy
Spallone *et al*., 1981	22	Female	T1-T2	Pedicle, TP	Thoracotomy, laminectomy
Karian *et al*., 1984	24	Male	T4	VB, pedicle	Laminectomy
Linkowski *et al*., 1985	33	Male	T3	Lamina, facet	Laminectomy
Kak *et al*., 1985	40	Female	T7-T8	Lamina	Lamimectomy
Czorny *et al*., 1985	22	Male	T1-4	VB	Thoracotomy
Lanzieri *et al*., 1985	18	Female	T11-T12	CVJ	NR
Marchand *et al*., 1986	49	Female	T8-9	Lateral VB	Laminectomy, facetectomy
Kulali *et al*., 1991	9	Female	T2	Posterior arch, pedicle	Laminectomy
Prasad *et al*., 1992	45	Male	T6	VB	Laminectomy
	16	Female	T10	Pedicle	Laminectomy
Braunschweig and Rose, 1994	51	Female	T1	Pedicle	Laminectomy
Shuangshoti and Lerdlum, 1997	21	Male	T1	Lateral VB	Laminectomy
Sener, 1998	65	Male	T6	Posterior arch, rib	Hemilaminectomy
Govender and Parbhoo, 1999	33	Male	C7-T1	Posterior elements	Laminectomy
Javadpour *et al*., 1999	51	Female	T5	Posterior arch	Laminectomy
Khosla *et al*., 1999	39	Male	T1	Posterior arch	Laminectomy
	5	Male	T8	Lamina, pedicle	Laminectomy and fusion
Gorospe *et al*., 2002	18	Male	T4	Posterior VB	Laminectomy, facetectomy
Sharma *et al*., 2002	18	Female	T12	Pedicle	Laminectomy
	13	Male	T4	Pedicle	Laminectomy
Blamoutier *et al*., 2002	38	Male	T7	*	*
Kulkarni *et al*., 2004	15	Male	T10-T11	Facet	Laminectomy, facetectomy
Brastianos *et al*., 2005	26	Female	T12	Posterior VB	Corpectomy
Faik *et al*., 2005	19	Male	T4-5	CVJ	Laminectomy
Bess *et al*., 2005	19	Male	T11	Lamina	Laminectomy and fusion
Song and Lee, 2007	11	Male	T4	Facet	Laminectomy
Lotfinia *et al*., 2010	55	Male	T9	VB	Combined anterior and posterior approach for resection and fusion
Lee *et al*., 2011	47	Male	T12	CVJ	Laminectomy
Mehrian *et al*., 2013	19	Male	T8-T10	Posterior arch	Laminectomy
Mardi *et al*., 2013	9	Male	T1	VB	*
Sciubba *et al*., 2015	46	Female	T9-T10	*	*
	76	Female	T11-T12	*	*
	60	Male	T12	*	*
	13	Female	T1	*	*
	36	Female	T11-T12	*	*
	21	Male	T7	*	*
	28	Male	T1-T2	*	*
	22	Female	T8-T11	*	*
Zaijun *et al*., 2015	11	Male	T1-T7	Lamina	Laminectomy and fusion
	17	Female	T6	Pedicle	Laminectomy and fusion
	56	Female	T5	VB	Laminectomy and fusion
Current study	17	Male	T9-T10	Posterior VB	Laminectomy, facetectomies, pediculectomies, partial corpectomies, and fusion

*Not reported. CVJ: Costovertebral junction, TP: Transverse process, VB: Vertebral body

motor exam and no new deficits. On the last follow-up at 6 months, he was neurologically intact with a resolution of his sensory deficits, and a 6-month postoperative MRI showed no tumor recurrence [Figure 5].

DISCUSSION

A review of the English-language literature demonstrated 49 cases of solitary thoracic osteochondromas presenting with myelopathy, the majority of which underwent laminectomy for decompression and excision of tumor [Table 2]. A total of 8 patients required instrumentation and fusion for stabilization of the thoracic spine after resection of the osteochondroma [Table 3]. Brastianos *et al.* described performing a T12 corpectomy with a distractible cage and locking plate and screws from an anterolateral approach for a posterior VB osteochondroma with the subsequent complete recovery of the patient's presenting symptoms.[2] Lotfinia *et al.* described one patient in their series who initially underwent a posterior transpedicular approach for a T9 VB osteochondroma which was unsuccessful and had to be aborted.[4] This

Figure 4: Postoperative noncontrast computed tomographic scan in both axial (a) and sagittal (b) dimensions showing gross total resection of the osteochondroma

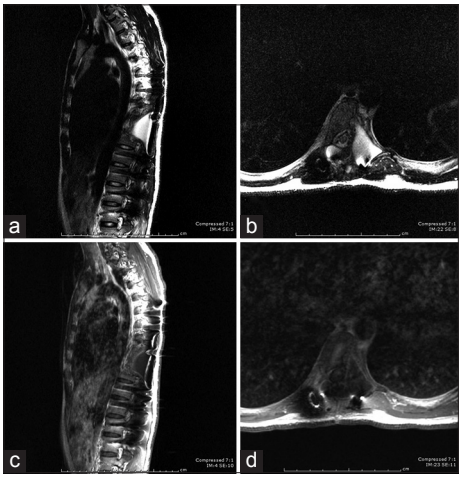

Figure 5: A 6-month follow-up magnetic resonance imaging demonstrates no residual or recurrence of disease. Shown here is the T2-weighted sequence in sagittal (a) and axial (b) dimensions as well ash a T1-weighted postcontrast sequence in sagittal (c) and axial (d) dimensions

Table 3: Reported cases in detail of solitary thoracic osteochondroma presenting with myelopathy requiring instrumentation and fusion

Author	Age/sex	Level	Origin	Clinical presentation	Surgery	Follow-up	Clinical outcome	Radiographic outcome
Khosla *et al.*, 1991	5/male	T8	Right pedicle and facet	Progressive difficulty walking, paraparesis, hyperreflexia, spastic gait	T8-T9 laminectomy and fusion	20 months	Complete recovery	No recurrence
Bess *et al.*, 2005	19/male	T11	Lamina	Ataxia, weakness, sensory deficit	T11-T12 laminectomy and fusion, en bloc tumor resection	7 years	Complete recovery	No recurrence
Brastianos *et al.*, 2005	26/female	T12	Posterior VB	Weakness and numbness, unsteady gait	T12 corpectomy	5 months	Complete recovery	*
Lotfinia *et al.*, 2010	55/male	T9	VB	Paraparesis and sphincter dysfunction	Unsuccessful transpedicular approach Reoperation for combined anterior transthoracic and posterior approach	4 years**	Gradual recovery to independent ambulation	No recurrence
Zaijun *et al.*, 2015	11/male	T1-T7	Lamina	Pain and paraparesis	Laminectomy and fusion	88 months	Good	*
	17/female	T6	Pedicle	Pain and hypesthesia	Laminectomy and fusion	42 months	Good	*
	56/female	T5	VB	Back pain, hypesthesia, and paraparesis	Laminectomy and fusion	2 months	Partial recovery	*
Current study	17/male	T9-T10	Posterior VB	Numbness and unsteady gait	Laminectomies, facetectomies, bilateral costotransversectomy and lateral extracavitary approach for pediculectomies and partial corpectomies, posterior instrumentation and fusion	6 months	Complete recovery	No recurrence

*Not reported, **Mean follow-up for entire reported patient series. VB: Vertebral body

patient then underwent a reoperation for combined anterior transthoracic resection of tumor and posterior placement of instrumentation and fusion. Both of these cases highlight the importance of careful surgical planning for the purposes of spinal cord decompression and complete resection of the osteochondroma.

Our patient presented with significant spinal cord compression causing myelopathy from a large osteochondroma originating from the T9 posterior VB. He required bilateral costotransversectomies and a left two-level lateral extracavitary approach for three partial corpectomies to both safely decompress the spinal canal as well as obtain a gross total resection of the tumor. Use of the O-arm intraoperative stereotactic CT navigation system assisted in delineating the osseous portions of the tumor for surgical removal. To our knowledge, this is the first report of a single-stage extensive posterior approach to the ventral thoracic spine for the purpose of osteochondroma resection. We present this case to highlight the feasibility and successful execution of this technique for resection of a solitary thoracic osteochondroma causing cord compression originating from the posterior VB.

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Conflicts of interest
There are no conflicts of interest.

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