

A Rare Case of Cystic Intradural Extramedullary Schwannoma at the Thoracolumbar Junction

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Case Report

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Abstract

In intradural extramedullary lesions, Schwannomas are benign peripheral nerve sheath tumours, mainly located in the spinal canal. Most spinal schwannomas are solid lesions¹⁶. Cystic degeneration is an uncommon histopathological finding and is difficult to diagnose.

A middle-aged female presented with low back pain and paresthesia of both lower extremities. Magnetic resonance imaging revealed a circumscribed intradural extramedullary lesion at the T12-L1 level with focal cystic alteration. The surgical procedure involved removal of the lesion, and histopathologic study showed an encapsulated spindle cell tumour with Antoni A and B patterns, intense cystic degeneration, and thick-walled hyalinized vasculature. No malignant features were identified.

This case highlights a rare form of cystic degenerative variant of spinal schwannoma. This histopathological variant should be identified so as to prevent misdiagnosis and ensure proper management.

Introduction

Schwannomas are benign tumours that arise from Schwann cells of the peripheral nerves and account for about 25–30% of the intradural extramedullary spinal tumors¹. These are slow-growing encapsulated lesions that most often occur at the cervical and lumbar locations². Schwannomas have a histologic structure that alternates between hypercellular Antoni A regions and hypocellular Antoni B regions³.

Long-term degenerative changes in schwannoma include cysts, haemorrhage, calcification, and vascular hyalinization, resulting in so-called ancient or degenerative types⁴. But prominent cystic degeneration of spinal schwannomas is uncommon, and in the literature, rare cases have been reported^{5–7}. We report a rare case of intradural extramedullary schwannoma at the thoracolumbar junction that exhibits marked cystic degeneration, and we address its pathological significance.

Case presentation

A 45-year-old female presented with low back pain (chronic) for over six months, with the onset of tingling sensations in her lower limbs. No history of trauma, bowel or bladder dysfunction or constitutional symptoms. The medical and family history was non-contributory.

The neurological examination showed reduced sensation in both lower extremities. Deep tendon reflexes and motor power were maintained. No upper motor neuron signs were observed.

Magnetic resonance imaging of the thoracolumbar spine showed a clearly intradural extramedullary lesion at the T12-L1 level, which was eccentrically situated on the right side. The lesion was iso-intense on T1-weighted images, hyperintense on T2-weighted images, and had heterogeneous post-contrast enhancement with a small non-enhancing cystic focus. The lesion led to left displacement of the spinal cord. According to the imaging, a provisional diagnosis of a schwannoma was taken into consideration (Fig. 1)

The patient underwent a laminectomy, where the lesion was excised surgically. During surgery, the mass that appeared around the nerve root was well encapsulated and was totally removed.

The resected specimen was an encapsulated, well-circumscribed mass of 2.1 x 1.2 x 1.0 cm. Cut surface showed mainly solid areas with focal cystic spaces filled with clear fluid. (Fig. 2)

Microscopic examination revealed a well-encapsulated tumour of spindle-shaped cells in alternating Antoni A and B regions. Antoni A areas displayed nuclear palisading and the appearance of Verocay bodies, whereas the Antoni B areas were hypocellular with loose myxoid stroma. A prominent cystic degeneration in the tumour. There were large hyalinized blood vessels with thick walls. No nuclear atypia, mitotic activity, necrosis or haemorrhage was present.(Fig. 3). Based on these findings, a diagnosis of intradural extramedullary schwannoma with cystic degeneration was made.

Discussion

Schwannomas are benign tumours that develop from Schwann cells of the peripheral nerve sheath and are among the most common spinal canal tumours. They account for about 25–30 per cent of intradural extramedullary spinal tumours, and typically originate from the dorsal sensory roots of spinal nerves. These tumours are most common in adults in the fourth to sixth decades and tend to have a noninvasive, slowly progressive course. Spinal schwannomas are usually easy to completely excise around the nerve root and have a good postoperative prognosis due to their encapsulated nature and eccentric origin.^{1,13}

Although spinal schwannomas can develop at any level of the vertebral column, they are most common in the cervical and lumbar regions, while the thoracic region is comparatively less affected. Lesions occurring at the thoracolumbar junction, especially around the conus medullaris, are rare and may be difficult to diagnose due to their close association with important neural structures like the conus medullaris and cauda equina. Compression of such structures can lead to symptoms such as chronic back pain, radicular pain, paresthesia, sensory deficit, and even motor weakness. In this case, the patient had chronic low back pain and bilateral lower limb paresthesia, which aligns with the clinical manifestations of thoracolumbar spinal schwannomas reported previously.¹⁴

It is clear that magnetic resonance imaging (MRI) is the preferred imaging modality for assessing of spinal tumours and is important in preoperative diagnosis. Classically, spinal schwannomas are well-circumscribed intradural extramedullary masses iso- to hypointense on T1-weighted sequences and hyperintense by T2-weighted sequences. These tumours typically show uniform or heterogeneous gadolinium contrast based on the internal structure. The related radiologic appearances include displacement of the spinal cord, enlargement of the neural foramina, and compression of the neighbouring neural structures.¹⁵

Degenerative changes are common in long-term schwannomas and may include cystic degeneration, haemorrhage, calcification, fatty alterations, and vascular hyalinization. The causes of these changes include chronic ischemia, microhaemorrhages, and tumour degeneration, which occur gradually, especially in spinal schwannomas.¹⁶ Cystic degeneration is another rare morphological variant. Even though cystic change is comparatively well-characterised in intracranial schwannomas, particularly in vestibular schwannomas, it is less commonly reported in lesions of the spine.^{5,6}

Several case reports in the literature have reported cystic intradural extramedullary schwannomas of various spinal levels. Karatas et al. and Yildirim et al. described cystic thoracic intradural schwannomas with neurological symptoms as a result of cord compression.^{5,6} Another study also reported cystic thoracic outlier schwannomas with significant degenerative alterations that were treated by complete excision.^{7,9–11} Recent reports have also

described cystic intradural extramedullary schwannomas at the lumbar and conus level, including cases reported by Nazwar et al. and Aalinezhad et al.^{10,11}

These tumours are cystic, which can lead to diagnostic error when distinguishing them from other cystic lesions of the spinal canal, such as arachnoid cysts, cystic meningiomas, epidermoid cysts or other intradural lesions. The systematic review of intradural cystic schwannomas has highlighted that radiologic differentiation can be challenging¹² when the cystic component is dominant within the lesion. A close correlation between the images and histopathological analysis is vital in the diagnosis.

The definitive diagnosis of schwannoma is still carried out by histopathological examination. Schwannomas exhibit two architectural patterns, microscopically termed Antoni A and Antoni B regions. Antoni A areas consist of closely attached spindle cells organised in fascicles and nuclear palisading with the formation of Verocay bodies, whilst Antoni B areas are hypocellular and consist of loosely organised cells in a myxoid stroma. There may also be degenerative changes, including cyst formation, stromal oedema and hyalinized blood vessels.^{2,18}

Histopathological analysis of the current case showed classical Antoni A and Antoni B areas, massive cystic degeneration, and hyalinized blood vessels with thick walls, which are typical of degenerative schwannomas. Notably, no nuclear atypia, mitosis or necrosis were observed, thus ruling out malignant peripheral nerve sheath tumour (MPNST). Schwannomas typically demonstrate S-100 protein positivity¹⁸, reflecting their Schwann cell origin. In the present case, the diagnosis was established based on characteristic histological features; immunohistochemistry may be useful in diagnostically challenging cases.¹⁸

The intradural extramedullary tumour differential diagnosis is meningioma, neurofibroma, and malignant peripheral nerve sheath tumour. Neurofibromas: These masses, in contrast to schwannomas, lack a well-defined capsule and are an uneven blend of Schwann cells, fibroblasts and perineurial cells. Meningiomas tend to be attached to the dura and often show a typical dural tail appearance on MRI.¹⁹ Malignant peripheral nerve sheath tumours, in contrast, are highly cytologic, hypermitotic, necrotic, and infiltrative in their growth pattern.

Surgical excision is still the preferred mode of treatment of spinal schwannomas. These tumours are normally encapsulated and eccentrically originating at the nerve root, and therefore gross total resection may be done in many cases without impairment of the neurological functions. Some research findings indicate excellent long-term outcomes with complete tumour removal, with recurrence rates typically less than 5%.¹³ Early surgical intervention has also been associated with improved neurological recovery, especially when initiated before the onset of the severe neurological deficit.

The current case presents an unusual cystic intradural extramedullary schwannoma in the thoracolumbar junction (T12-L1). The identification of this morphological variant of abnormality is essential, as the cystic appearance can be similar to other cystic lesions in the spine on radiography. Recognition of this entity and close radiologic-pathologic correlation are key to making an accurate diagnosis and providing the appropriate management.

Conclusion

Cystic degeneration of spinal schwannomas is an uncommon histopathologic form. This entity should be known, and a close microscopic examination should be done to ensure proper diagnosis and treatment. The current case contributes to the small body of literature describing cystic intradural extramedullary schwannomas.

Abbreviations

IDEM

Intradural Extramedullary

MRI

Magnetic Resonance Imaging

T12

L1–Thoracolumbar Vertebral Level 12–Lumbar Vertebral Level 1

MPNST

Malignant Peripheral Nerve Sheath Tumour

Declarations

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Conflict of Interest -

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Consent to publish -

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Author Contribution

The authors declare no conflict of interest. Author Contributions Statement 1. Dr Shraddha L Khanke – revision and verification of the manuscript 2. Dr Aishwarya Hire – drafting, revision and verification of the manuscript 3. Dr Charusheela R Gore- verification of manuscript 4. Dr Ashwini Sonwane- verification of manuscript.

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Tables

Table 1. Summary of previously reported cases of cystic intradural extramedullary schwannomas⁵⁻¹¹

Author (Year)	Spinal Level	Location	Cystic Pattern	Histopathological features	Treatment	Outcome
Kahiloğulları et al. (2005)	Conus medullaris	IDEM	Solid	Classical schwannoma	Total excision	Good
Karataş et al. (2007)	Thoracic	IDEM	Predominantly cystic	Spindle cells, Antoni areas	Total excision	Good recovery
Yildirim et al. (2007)	Thoracic	IDEM	Cystic	Palisading nuclei, Verocay bodies	Surgical resection	Neurological improvement
Azl et al. (2007)	Conus	IDEM	Degenerative	Hyalinization, cysts	Surgical excision	Favorable
Canbay et al. (2011)	Conus medullaris	IDEM	Solid	Antoni A & B areas	Surgical removal	Symptom-free
Bansal et al. (2016)	Conus	IDEM	Cystic + solid	Ancient schwannoma changes	Surgical resection	Neurological recovery
Kumar et al. (2017)	Thoracic	IDEM	Completely cystic	Antoni A & B areas, cystic degeneration	Surgical excision	Symptom resolution
Samman et al. (2021)	Thoracic	IDEM	Large cystic component	Antoni A & B, hyalinized vessels	Gross total excision	Excellent
Nazwar et al. (2024)	Lumbar	IDEM	Giant cystic	Degenerative schwannoma	Laminectomy + excision	Improved
Aalinezhad et al. (2025)	Lumbar	IDEM	Completely cystic	Schwann cells, cystic spaces	Surgical excision	Complete recovery
Venkatesan et al. (2025)	Conus	IDEM	Cystic	Antoni A/B areas, degeneration	Total excision	Improved
Present case (2025)	T12–L1	IDEM	Cystic	Antoni A & B areas, hyalinized vessels	Complete excision	Excellent

Figures



Figure 1

Magnetic resonance imaging of the thoracolumbar spine demonstrating an intradural extramedullary lesion at the T12–L1 level.

(A) Sagittal T2-weighted image showing a well-defined hyperintense lesion at the T12–L1 level causing displacement of the spinal cord.

(B) Sagittal T2-weighted image (adjacent slice) demonstrating the intradural extramedullary location of the lesion with effacement of the surrounding cerebrospinal fluid space and leftward displacement of the spinal cord.

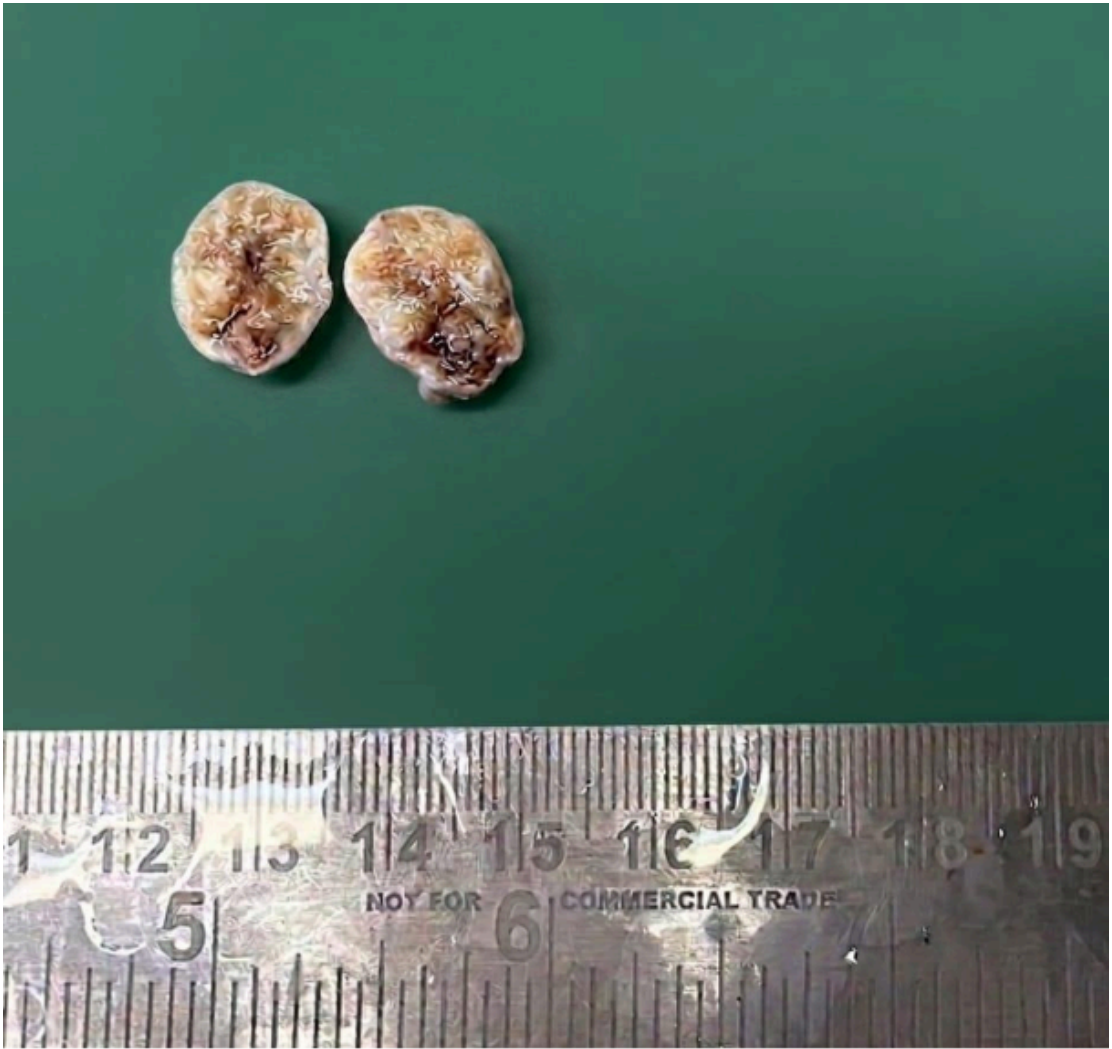


Figure 2

Gross specimen of excised intradural extramedullary tumour showing well-circumscribed greyish-white nodular tissue with cystic changes.

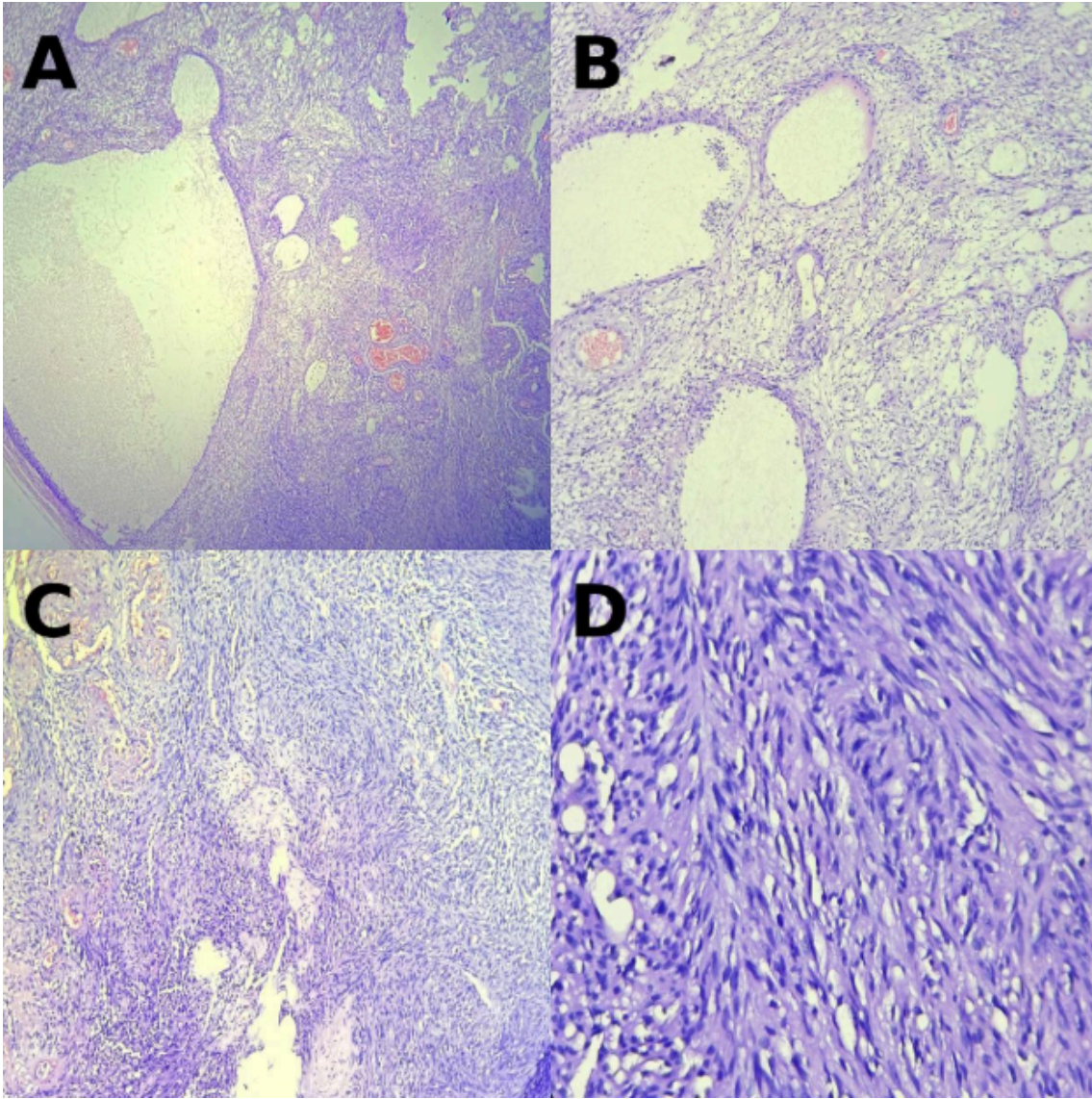


Figure 3

Histopathological features showing intradural extramedullary schwannoma with cystic degeneration.

- (A) Low-power view showing a well-circumscribed, encapsulated lesion with prominent cystic degeneration
- (B) Hypocellular Antoni B areas are characterised by loosely arranged spindle cells within a myxoid stroma and multiple cystic areas
- (C) Hypercellular Antoni A areas demonstrating compact spindle cells arranged in fascicles with thick-walled blood vessels.
- (D) High-power view showing spindle-shaped cells with nuclear palisading and formation of Verocay bodies.