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Case Report

# Spinal Extradural Arachnoid Cyst: Illustrative Case Report and Review of the Literature

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**Abstract:**

**Introduction**

Spinal extradural arachnoid cysts (SEACs) are benign dural outpouchings that can often communicate with the subarachnoid space, allowing cerebrospinal fluid (CSF) to accumulate. Magnetic Resonance Imaging (MRI) often fails to identify the defect which can make accurate localization and surgical planning difficult.

**Case description**

We report a case of a 42-year-old female with a large thoracolumbar SEAC (7.1 cm, spanning T11–L1) causing cord compression and neurological deficits. After conservative treatments failed, we performed a single-level T12 laminectomy to fenestrate the cyst and repair a small dural defect at the proximal left T12 nerve root. Intrathecal fluorescein injected via a lumbar drain helped identify the CSF leak. Intraoperative ultrasound confirmed complete cyst evacuation and spinal cord decompression. Postoperatively, the patient's neurological symptoms improved and there was no evidence of cyst recurrence or CSF leak after 4 weeks on follow-up MRI.

**Conclusion**

This case details a surgical approach that opts for limited exposure and defect closure instead of extensive laminectomies and full cyst excision in SEAC management. A multi-level cyst spanning three vertebrae was effectively resolved with a single-level approach focusing on the dural communication. There is consensus on repairing the dural defect, but the necessity of complete cyst wall resection is controversial. This case, combined with emerging evidence, suggests that targeted cyst fenestration with dural defect closure can achieve excellent outcomes in this rare pathology.

**Key words:** arachnoid cyst; spine; spinal arachnoid cyst; extradural cyst; spinal extradural arachnoid cyst; spinal cord compression; spinal cyst excision; spinal neurosurgery; spine

## Introduction

Spinal arachnoid cysts are an uncommon pathology which can present with progressive radicular and/or myelopathic symptoms. In most cases in which they are symptomatic they occur intradural extramedullary, but in rare cases they can occur extradurally as well [1-13]. These cysts can occur anywhere along the spinal tract, but have more commonly been found within the thoracic region. *Liu et al.* have described the middle to lower thoracic spine occurring in 65% of cases, but also have been reported in the lumbar and lumbosacral (13%), thoracolumbar (12%), sacral (7%), and cervical regions (3%).[1] Spinal extradural arachnoid cysts (SEACs) are essentially diverticular outpouchings occurring in the dura commonly while in communication with the subarachnoid space allowing for cerebrospinal fluid (CSF) to accumulate [1,8]. Due to the presence of this fluid, it can give rise to fluctuating symptoms based on the internal changes of the cysts including changes in hydrostatic pressure due to factors such as hydration, intraabdominal pressure due to sneezing, coughing, laughing, or the Valsalva maneuver [1]. Motor symptoms have commonly been described before the onset of sensory changes and cysts are largely described as occurring ventrally or dorsally with dorsal being far more common [8]. The case that we describe in this report involves a

young female patient with a radiographically confirmed SEACs occurring within the thoracolumbar segment between T11-L1.

## Case Description

The patient is a 42-year-old female with no pertinent past medical history who presents to neurosurgery spine clinic citing chronic back pain and muscle spasms after failure of conservative treatment including physical therapy, epidural steroid injections, and medications. The patient underwent preoperative imaging using CT and MRI and was diagnosed with a 7.1 cm extradural arachnoid cyst at T11 to L1; **Preoperative MRI displayed in figures 1-3 below**. This extradural arachnoid cyst was causing compression of the cord and resulting in severe and worsening thoracic back pain and bilateral lower-extremity symptoms including pain, numbness, and loss of balance. The patient was positioned in a lateral decubitus position, lumbar region prepped with chlorhexidine then draped in usual sterile fashion. Lumbar drain was placed, clear CSF obtained, 0.2cc fluorescein in 10cc sterile saline was injected then the lumbar drain was secured with Ioban.

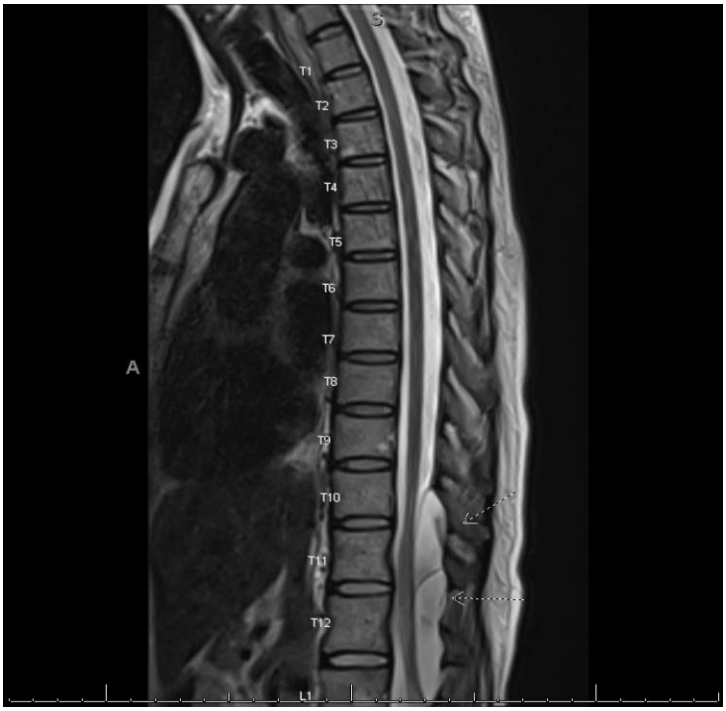


**Figure 1:** Sagittal T2 weighted MRI without contrast done preoperatively demonstrating a large SEAC spanning T11 to L1

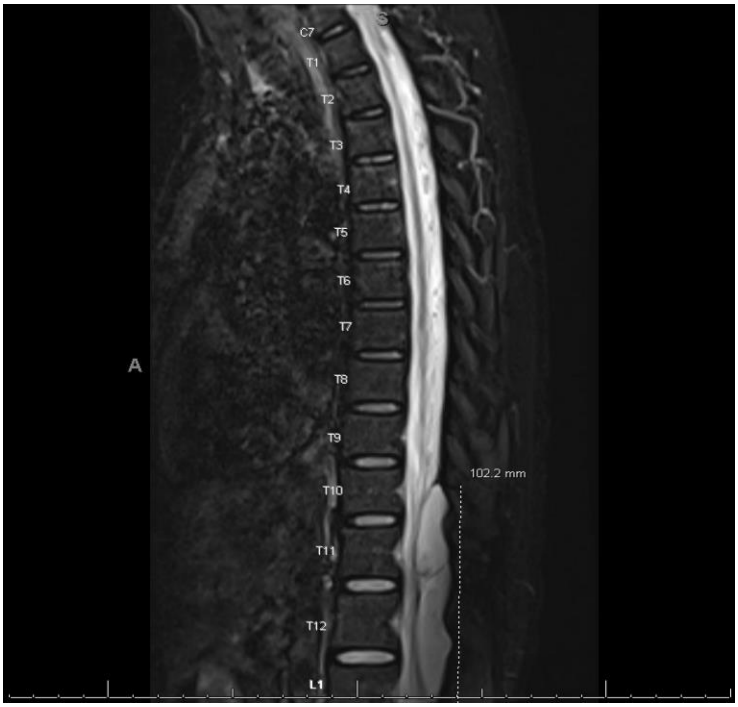


**Figure 2:** Sagittal STIR MRI without contrast demonstrating a large SEAC spanning from T11 to L1.

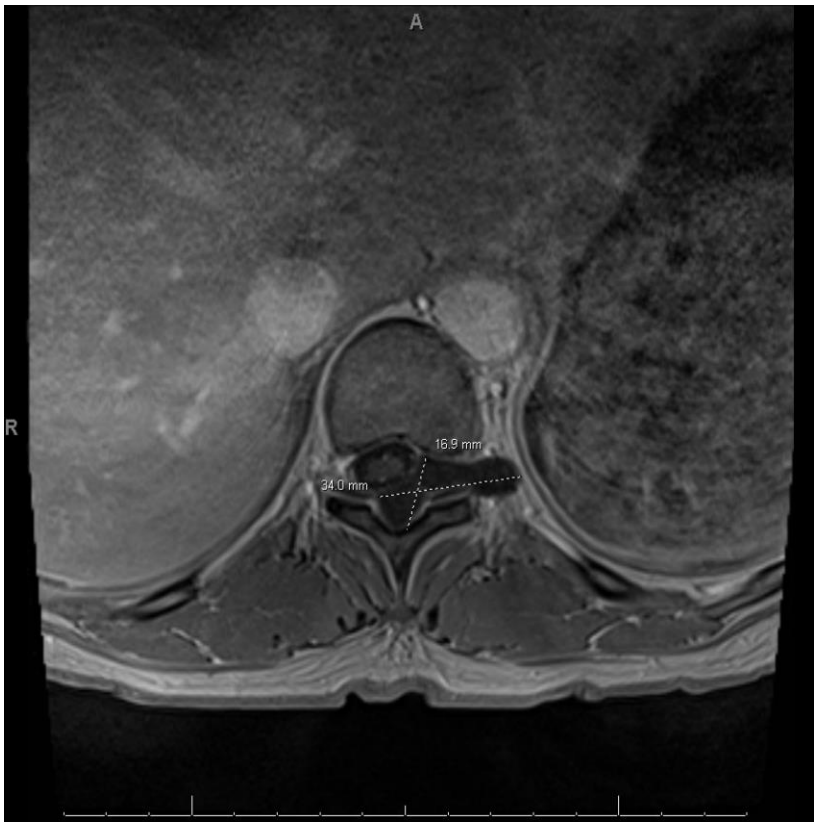


**Figure 3:** Axial T1 weighted MRI from top of superior endplate at T11.

The patient was then positioned prone on a Jackson table with a Wilson frame. All pressure points were carefully padded. The thoracic region was prepped with alcohol then chlorhexidine and allowed to dry, and draped in the usual fashion. Baseline neuromonitoring was obtained. Incision was localized with fluoroscopy to T12. Local anesthetic was administered and a midline incision was made. Midline dissection to spinous process then subperiosteal dissection performed with electric cautery to expose the lamina. T12 level confirmed with fluoroscopy. Next T12 laminectomy was performed with a high-speed drill and kerrison. The extradural arachnoid cyst was identified and noted to have fluorescein. The extradural cyst was confirmed with ultrasound and noted to cause spinal cord compression. A microscope with sterile drape was brought in. The cyst was opened in the midline, CSF stained with fluorescein was encountered. The cyst edges were tacked up with 4-0 neurolon to the muscle. The cyst was explored internally and fenestrated. CSF leak was identified at the proximal left T12 nerve root. This was closed with 4-0 neurolon suture and muscle patch. Multiple Valsalva maneuvers were performed; no further leak of CSF or fluorescein was identified. Tachosil was placed over the dural closure, then spine duraseal. Ultrasound was used to confirm evacuation of the cyst and confirm decompression of the spinal cord.

A medium hemovac was placed. The wound was closed in multilayered fashion: 0 vicryl in muscle and fascia, 2-0 vicryl in subcutaneous layer, 3-0 monocryl in subcuticular layer. Drain secured, dermabond and dressing placed. Final neuromonitoring stable compared to baseline. Final operative counts correct. The patient tolerated the procedure well. The patient was observed and discharged 6 days following completion of her surgery. The patient was seen in the clinic 2 weeks later and has had significant improvement since the surgery. Her incision is healing well and there are no signs of infection, CSF leak, or areas of dehiscence. The patient underwent an MRI at 4 weeks post-operatively which showed no evidence of cyst reformation or residual extradural CSF collection. The patient continues to recover from pre-operative symptoms and is followed with physical therapy and pain management. Post-operative MRIs were taken 4 weeks after, displayed in figures 4-5 below.

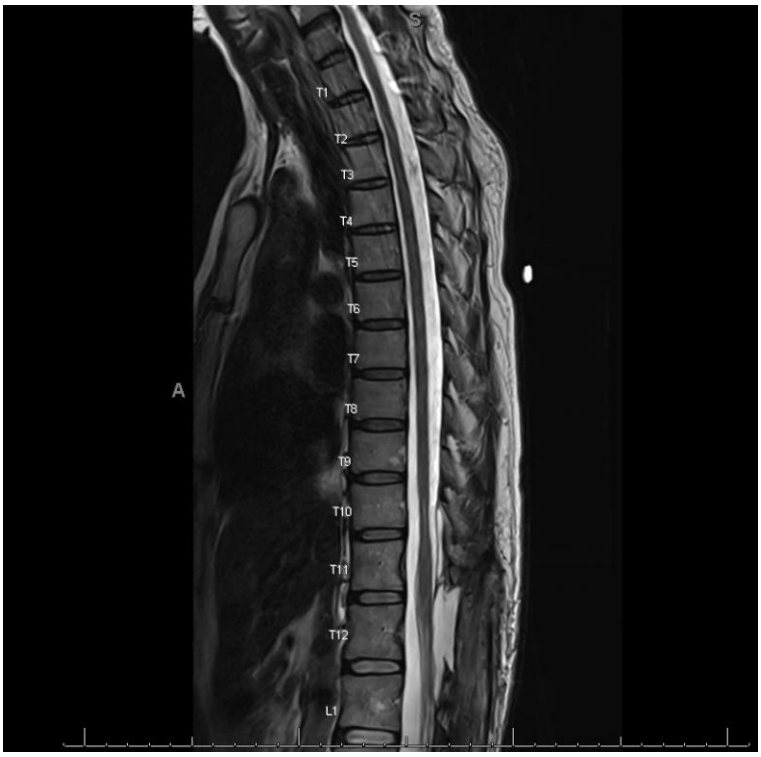


**Figure 4:** Sagittal T2 weighted MRI taken 4 weeks post op

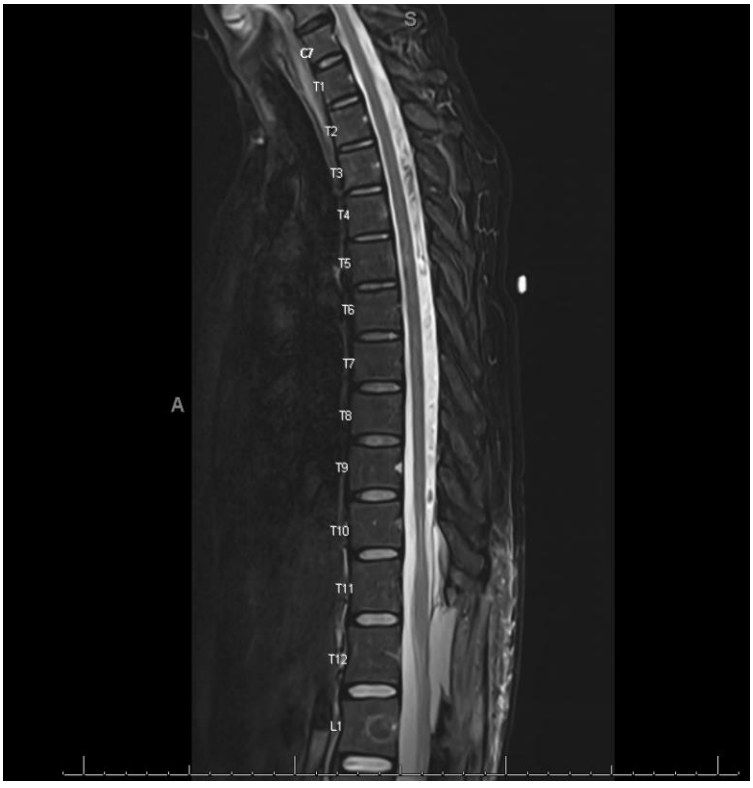


**Figure 5:** Sagittal STIR MRI taken 4 weeks post op

## Discussion

Spinal extradural arachnoid cysts (SEACs) are rare benign lesions that can occur anywhere along the spinal axis, though they most commonly affect the thoracic region [1-15]. Clinical presentation typically includes progressive myelopathic and radicular symptoms such as spastic weakness, paresthesia, pain, bowel or bladder dysfunction, neurogenic claudication, and sensory deficits [1-13]. The pathophysiology involves a "ball-valve" mechanism whereby CSF enters the cyst through a dural defect but drainage is impaired, leading to progressive enlargement and neural compression [16,17]. This communication with the subarachnoid space gives rise to fluctuating symptoms triggered by changes in

intracranial pressure during exercise, increases in intra-abdominal pressure from coughing or straining, or postural changes [18,19].

This case highlights the successful treatment of symptomatic thoracolumbar SEACs through a targeted, communication-focused surgical approach. The 42-year-old patient presented with classic features of SEACs, including chronic thoracic back pain and progressive bilateral lower extremity symptoms. Imaging revealed a sizable 7.1-cm extradural arachnoid cyst compressing the spinal cord from T11 to L1. After failure of conservative therapy, surgery was indicated to decompress the canal and address the suspected dural communication contributing to cyst expansion [3,10,12].

While MRI serves as the gold standard for SEAC diagnosis due to its ability to demonstrate cyst location, extent, and relationship to neural structures, it frequently fails to identify the precise site of dural communication, a critical limitation that directly impacts surgical planning and outcomes [3,5,20-22]. Alternative modalities such as CT myelography and high-resolution T2-weighted imaging may enhance localization, though these techniques often fall short as well [6,7].

Given these diagnostic limitations, intraoperative adjuncts become essential for successful management. In this case, dilute intrathecal fluorescein (0.2 cc in 10 cc sterile saline) administered through a lumbar drain provided enhanced visualization of CSF dynamics and successfully pinpointed the leak at the left T12 nerve root which was not identified on preoperative imaging [23,24]. The use of intrathecal fluorescein, although not routine, proved valuable in this setting. Given its risks, fluorescein should be reserved for select cases where localization is uncertain [23,24].

Historically, complete cyst excision via multilevel laminectomy was considered the standard approach [25-29]. However, extensive laminectomies carry significant risks of postoperative kyphosis and chronic pain, particularly in pediatric patients but also in adults [29]. Partial resection with or without dural closure has also been reported with variable outcomes [15,26,30]. Accumulating evidence now demonstrates that durable outcomes depend primarily on identifying and sealing the dural communication rather than achieving complete cyst wall resection [1,2,5,16,31]. Contemporary approaches favor limited exposure with targeted closure of the communication site through selective laminectomies [32,33]. Once the dural defect is sealed, the cyst decompresses naturally due to elimination of the osmotic gradient and pulsatile CSF flow, resulting in lower recurrence rates and reduced surgical morbidity compared to extensive resection [5,16]. Existing literature consistently supports that additional cyst wall resection provides little clinical benefit once the communication is addressed and may actually increase operative risks including CSF leak, neurological injury, and prolonged recovery [3,5,10,12,31].

Our case reinforces this communication-directed paradigm: despite the cyst spanning three vertebral levels (T11-L1) and measuring 7.1 cm, a single-level T12 laminectomy with focused cyst fenestration and targeted dural repair was sufficient to achieve complete symptom resolution and prevent early recurrence, confirmed with intraoperative ultrasound.[7] Multiple Valsalva maneuvers confirmed watertight closure, and adjunctive sealants (Tachosil and Duraseal) provided additional security against CSF leak.

Postoperatively, this patient experienced rapid recovery, with marked symptom improvement and no recurrence or CSF leak on follow-up MRI. As described in prior series, sensory and pain symptoms typically resolve early, while motor and balance symptoms may improve more gradually [3,4,10,11,12]. Longer-term follow-up is warranted, especially in large or multi-level cysts. Overall, this case supports a minimally invasive, communication-directed strategy using adjunct tools (fluorescein, ultrasound) to ensure effective, durable results in managing thoracic SEACs [3,5,7,10,12,31].

## Conclusion

Durable resolution of thoracolumbar SEACs relies on precise detection and closure of the dural communication. In this case, a single-level T12 laminectomy, cyst fenestration, and targeted repair of a root-sleeve defect, guided by intrathecal fluorescein and confirmed with intraoperative ultrasound, resulted in rapid symptomatic improvement and no early recurrence. These findings support a limited-exposure, communication-focused surgical paradigm over routine full cyst excision. Ongoing follow-up will be essential to confirm long-term efficacy.

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