Case Reports in Neurology

Case Rep Neurol 2024;16:249–255
DOI: 10.1159/000541522
Received: July 27, 2024
Accepted: September 14, 2024
Published online: September 18, 2024



**Single Case – General Neurology**

# Spinal Teratoma with Recurrent Epileptic Episodes in Adults: A Case Report

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## Keywords
Epilepsy · mGluR5 · Spinal teratomas · Conus medullaris teratoma · Case report

## Abstract
***Introduction:*** Spinal teratomas are rare, accounting for nearly 0.2–0.5% of all spinal tumors and 2% of all teratomas. Teratomas at the conus medullaris location do not inherently lead to epilepsy. However, potential epileptic seizures are caused when teratoma ruptures and the chemical stimulation of teratoma components enter the dural sac. ***Case Presentation:*** A 31-year-old Asian male patient suffering from epileptic onset and poor antiepileptic treatment was demonstrated. The spinal imaging examination was performed, and the patient suffered a space-occupying lesion within the conus medullaris related to spinal deformity, spinal embolism, etc. The autoimmune encephalitis spectrum revealed mGluR5 antibody IgG (+) 1:10 response. The patient stabilized after treatment with hormones and human immunoglobulin. Some hair and lipid droplets could be observed in the dural sac intraoperatively, and more hair and lipid-like material were present in the spinal cord. Postoperative pathology established the diagnosis as a conus medullaris teratoma in adults. Epileptic seizures stopped after surgery, and no additional seizures were reported during the 33-month follow-up period. ***Conclusions:*** Conus medullaris teratoma rupture in adults rarely causes epileptic seizures. For spinal deformity patients with unexplained epileptic symptoms, spinal MRI can be helpful in early diagnosis, and more appropriate treatment improves disease prognosis.



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## Introduction

Teratomas are typical congenital tumors comprising three embryonic germ layers. Spinal teratomas are rare, accounting for nearly 0.2–0.5% of all spinal tumors and 2% of all teratomas [1–3]. Teratomas at the conus medullaris location do not inherently lead to epilepsy. However, potential meningoencephalitis is caused when a teratoma rupture and the contents enter the dural sac. We describe a patient with a ruptured conus medullaris teratoma, primarily presenting with recurrent epileptic seizures as the primary symptom. The diagnosis was complemented using hair and sebaceous material in the dural sac. The case is a result of the teratoma rupture, enabling teratoma components entry into the dural sac and triggering epileptic seizures [4–6]. Based on reviewing relevant literature, this is the first report in which a ruptured conus medullaris teratoma in an adult caused epileptic seizures with epilepsy as the predominant symptom. The clinical features, diagnostic, and treatment strategies of the case have been discussed. The CARE Checklist has been completed by the authors for this case report, attached as online online supplementary material (for all online suppl. material, see https://doi.org/10.1159/000541522).

## Case Report

The neurology department of our hospital admitted a 31-year-old Asian male patient experiencing intermittent epileptic seizures and paroxysmal episodes of loss of consciousness for more than a month. The short stature of the patient was since birth, and he had thoracic and spinal deformities. On the second day of admission, the patient suffered a severe epileptic seizure. Despite levetiracetam treatment, controlling epileptic seizures was inadequate, with nearly daily episodes. Brain CT and MRI scans indicated calcifications in the bilateral hippocampi but no intracranial lipid droplet signals (Fig. 1). The electroencephalogram depicted intermittent low-to-moderate amplitude slow activity with sharp waves (Fig. 2). Blood investigations demonstrated the presence of mGluR5 antibodies IgG (+) with 1:10 titer. The patient was treated with steroids and intravenous immunoglobulin. Additionally, the blood tumor marker CA199 exceeded 1,000 μ/mL. A chest, abdomen, and pelvis CT scan was performed to exclude the possibility of an abdominal tumor, revealing lumbar scoliosis, spina bifida, and spinal meningocele. A spinal MRI indicated a lesion within the spinal canal at the L4–5 level, along with a tethered spinal cord (Fig. 3). The lesion depicted mixed signal characteristics and was closely linked with the spinal cord. Subsequently, the patient was transferred to the neurosurgery department for surgical intervention. During the operation, some hair and sebaceous material were seen inside the dural sac (Fig. 3). Further exploration in the spinal cord depicted more hair and sebaceous material (Fig. 3). All the hair and sebaceous contents were removed entirely, and the germinative epithelium was treated using low-power galvanocautery. The pathological examination established the presence of a teratoma (Fig. 4). After the surgical procedure, the patient's epileptic seizures ceased. In a subsequent examination after 1 year of the surgery, a lumbar spinal MRI reexamination demonstrated the complete removal of the L4–5 spinal cord lesion and the untethering of the spinal cord (Fig. 3). The patient has remained to date seizure-free during the 33-month follow-up.

## Discussion

Most intraspinal teratomas in adults fall into mature teratomas. Mature teratomas are cystic, and dermoid cysts depict a specific form of mature teratomas. Dermoid cysts primarily consist of ectodermal germ-layer derivatives, such as squamous epithelium, and their

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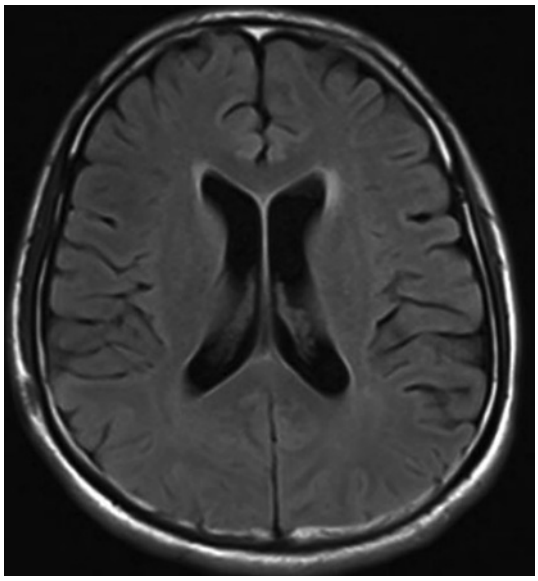

**Fig. 1.** Brain MRI indicated no noticeable lipid droplet signals in intracerebral or subarachnoid space.

associated structures, including sebaceous glands, hair follicles, and teeth [1, 7, 8]. The clinical symptoms in patients are primarily due to tumor growth exerting pressure on the spinal cord and nerves. The most common symptoms involve sensory disturbances, lower limb weakness, and urinary and bowel dysfunction [9]. Presently, there are no reported cases of intraspinal teratomas with epilepsy as the initial symptom. Formerly, epilepsy was more commonly related to the rupture of intracranial teratomas, but it is uncommon, with over 60 cases reported [10].

Like intracranial teratomas, intraspinal teratomas in adults can rupture, but it is even rarer for conus medullaris in adults to rupture. Cheng et al. [11] depicted 14 cases of the rupture of dermoid cysts entering the central canal of the spinal cord. In our case, the patient had no history of lumbar trauma and no lumbar stretching activity, indicating spontaneous rupture. Some intraspinal teratoma patients may exhibit evident clinical symptoms of spinal cord compression. Once rupture occurs, the initial symptoms could be epilepsy, even consciousness disturbance, etc. This can complicate teratoma diagnosis in the spinal cord. In our case, the initial symptom was epileptic seizures and, in certain instances, loss of consciousness. An early diagnosis is crucial for regulating epileptic seizures and preventing consciousness deterioration or disturbance. In the initial stages of the disease, intracranial pathology was suspected, and the rupture possibility of a teratoma in the spinal cord was not considered. However, a chest-abdomen-pelvis CT and spinal MRI were performed to rule out digestive system tumors since the patient had significantly elevated CA199 levels in the blood after seizure onset, revealing the conus medullaris teratoma. The patient had experienced intermittent loss of consciousness by this point.

The mechanism of spontaneous rupture of teratomas in adults should be investigated. Some scholars believe that symptoms typically do not manifest immediately post-rupture, as it takes time for the disseminated fat to exert its effects [12, 13]. Others suggest that the rupture of teratoma disseminates its contents along the subarachnoid space, leading to mechanical compression and chemical nerve irritation, which becomes an emergency case [12, 14]. Some scholars argue that teratoma rupture spreads the fatty droplets into the spinal cord. With the cyst rupture, fatty droplets enter the cavity; with repeated cyst rupture, fatty droplets continue to enter the cavity, enlarging it [11, 14]. Preoperative imaging could require further differentiation from the spinal ependymomas in such cases.

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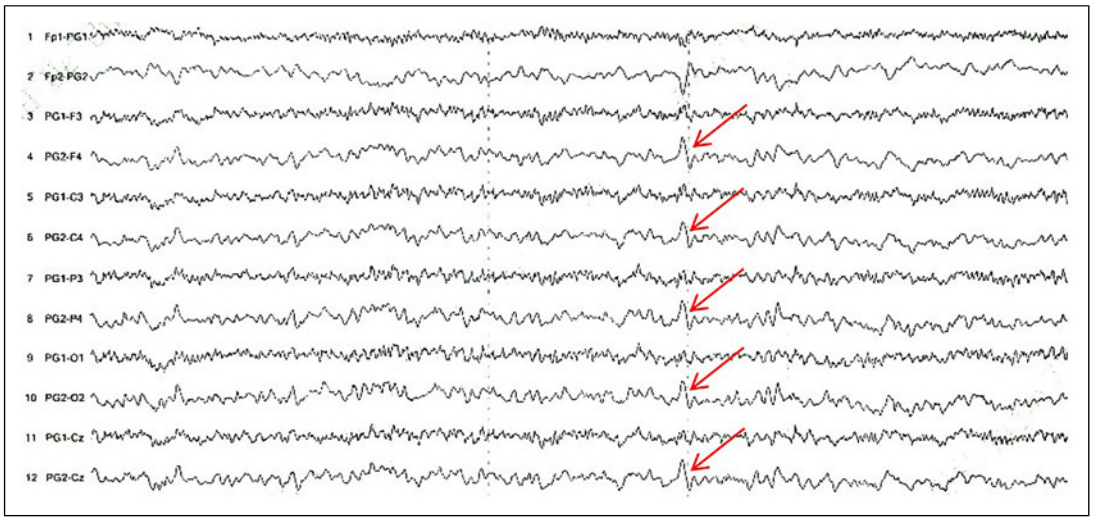


**Fig. 2.** Electroencephalogram (EEG) abnormalities with PG2 intermittent low-to-medium amplitude.

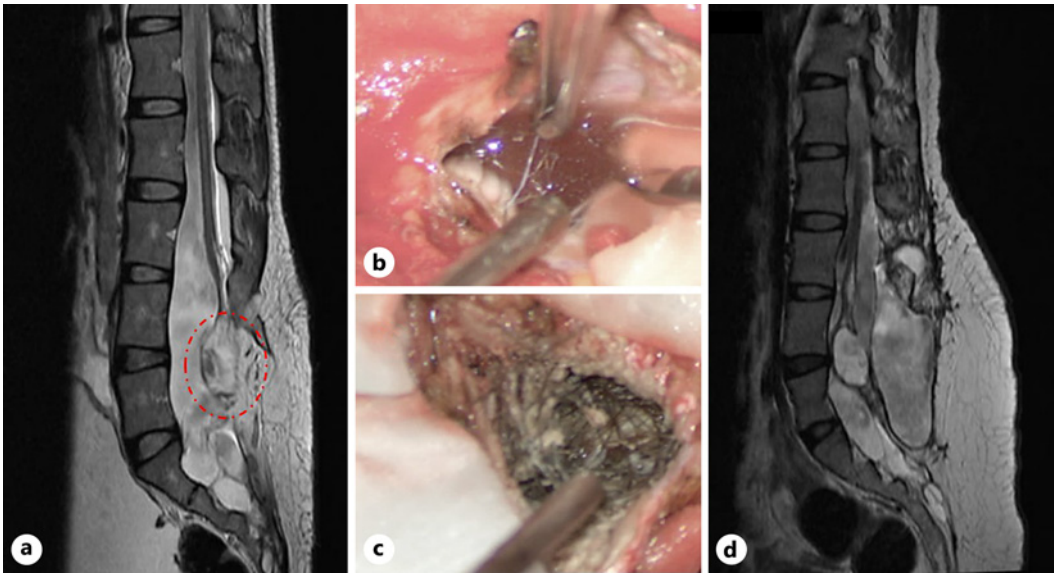


**Fig. 3. a–d** Preoperative MRI in the sagittal plane with T2-weighted images (T2WI), indicating the conus medullaris lesion and the phenomenon of spinal cord tethering (cord anchoring). Intraoperative gross photographs of teratoma.

Spinal CT and MRI scans help diagnose intraspinal teratomas. Teratoma helps calcifications, hair, fatty components, and sebaceous secretions, and it will appear heterogeneous on imaging. Typically, spinal cord teratomas indicate mixed signals on MRI T1 and T2 sequences. In contrast-enhanced sequences, they could exhibit either no or partial mild enhancement. Fatty components inside the lesion appear as low signals on fat-suppressed sequences and as mixed high-frequency signals in DWI. In contrast, fatty droplets within the subarachnoid space are highly indicative of the teratoma rupture risks.

Currently, surgical resection is an effective treatment method, particularly in patients with symptomatic or neurologically deficit signs induced by tumor compression. The

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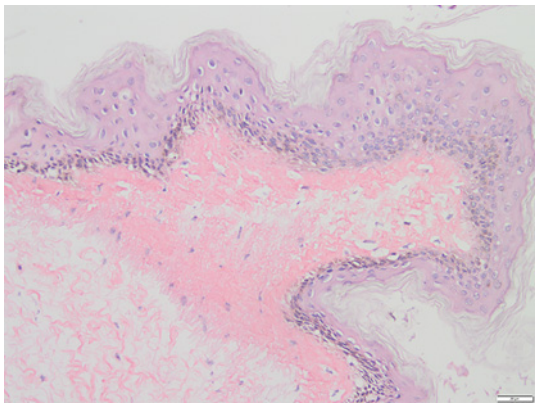

**Fig. 4.** Postoperative pathological examination established the diagnosis of conus medullaris teratoma.

surgical goal is to remove the tumor and restore cerebrospinal fluid circulation, excise any herniated masses, and release spinal cord tethering. Cystic-solid components are present in many teratomas, and the cystic portion can be addressed in the initial stages. Once the cyst wall collapses, the tumor's inner lining can be identified. This layer can be gently separated or treated with low-power diathermy to prevent additional adhesion. In the solid tumor component, primarily consisting of fat, CUSA ultrasonic aspiration can be utilized for effective removal, minimizing the risk of injuring small nerves and blood vessels. In this case, partial hair and sebaceous material were found in the dural sac during the surgery. Upon opening the prominent swelling in the L4–5 spinal cord level, more hair and sebaceous-like material could be identified in the spinal cord. The tumor contained a mixture of fat and fibrous tissue, making it tenacious and closely adherent to the nerves and making dissection difficult. Thus, some parts were preserved. If tumor contents disseminate during surgery, rinsing the resection area and subarachnoid space with physiologic saline containing dexamethasone can reduce the postoperative meningitis risk or delayed brain injury. Some teratomas possess solid portions and membrane envelopes tightly adherent to critical spinal cord neural structures. Thus, aggressively pursuing complete tumor removal can frequently raise electrophysiological monitoring alarms and increase the risks of damaging neurological function. In such cases, a subtotal resection could be a safer option. We argue that the prognosis is primarily related to the tumor's pathological nature and is less associated with the resection method or postoperative adjuvant radiotherapy or chemotherapy. Subtotal resection is linked with a low recurrence rate. Thus, balancing the benefits of complete resection with the risks of inducing neurological deficits becomes necessary.

## Conclusions

Conus medullaris teratomas are exceptionally rare in adults. Based on the literature review, no documented cases of rupture of conus medullaris teratomas in adults could be identified that would cause recurrent epileptic episodes as the first symptom. In most cases, conus medullaris teratomas develop slowly and may present without specific symptoms. Performing comprehensive spinal MRI examinations is advisable in spinal deformity patients with aseptic meningitis, which intracranial lesions cannot explain. This may aid in identifying the underlying causes and devising effective treatment strategies. Otherwise, a misdiagnosis could potentially delay timely treatment initiation.

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## Acknowledgment

The authors thank Dr. Xin Zhang for assistance in acquiring and explaining the pathological images.

## Statement of Ethics

Ethics approval for this study was obtained from the Ethics Board of Shengli Oilfield Central Hospital. The ethics code is YXLL202410401. Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

## Conflict of Interest Statement

The authors declare that no conflict of interest exits in the submission of this manuscript, and the manuscript is approved by all authors for publication. I would like to declare on behalf of my coauthors that the work described was original research that has not been published previously and is not under consideration for publication elsewhere, in whole or in part. All the authors listed have approved the manuscript that is enclosed.

## Funding Sources

This work was supported by the China Scholarship Committee 202008440406.

## Author Contributions

Jinlong Wang drafted the manuscript and collected data. Bo Cao revised the manuscript.

## Data Availability Statement

The authors confirm that the data supporting the findings of this study are available within the article and its supplementary materials. Further inquiries can be directed to the corresponding author.

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