

# Spinal adhesive arachnoiditis following surgery treatment for an intramedullary tuberculoma of the conus medularis: A case report

## ABSTRACT

**Objectives/Aims:** Describe a rare case of an intramedullary tuberculoma (IMT) complicated by chronic adhesive arachnoiditis (CAA).

**Presentation of case:** A 19-year-old woman presented with complaints of weight loss, progressive weakness of both lower limbs and urinary retention. Neurological examination corroborated the motor dysfunction of the lower limbs, associated with sensory disturbances. Magnetic resonance imaging (MRI) detected a ring-enhancing intramedullary mass that expanded the conus medularis. A provisional diagnosis of neoplastic origin lesion was made, and the patient received complete resection of the mass. Histopathology was consistent with tuberculoma. 8 months after beginning postoperative antituberculous therapy, the neurological symptoms worsened and follow-up MRI showed a distorted spinal cord with arachnoid cysts and septations, findings that corresponded to CAA. Despite a new surgical intervention, the patient remained with lasting disability.

**Discussion:** IMT is an uncommon presentation of spine tuberculosis. The clinical manifestations mimic those of any space-occupying lesion (SOL) and are dependent on the location in the spine, thus a differential diagnosis with neoplastic, inflammatory and other granulomatous lesions is required. Magnetic resonance imaging (MRI) is the optimal method to evaluate and diagnose IMT. Pharmacological and surgical interventions aim to decompress the spinal cord and restore neurological functions. However, unexpected complications such as CAA can occur, impeding a satisfactory recovery.

**Conclusion:** The diagnosis of IMT is challenging due to its low frequency and imaging characteristics. Therefore, this report emphasizes the importance of recognizing the clinical and radiological presentation of IMT to allow an early diagnosis, facilitate the selection of therapeutic interventions and avoid complications.

*Keywords: Tuberculosis, intramedullary tuberculoma, magnetic resonance imaging, chronic adhesive arachnoiditis.*

## 1. INTRODUCTION

Tuberculosis (TB) is a multifaceted disease secondary to the infection by the bacillus *Mycobacterium tuberculosis* [1]. Central Nervous System Tuberculosis (CNS TB) is a distinct disease among other extrapulmonary variants of TB due to its significant morbidity and devastating complications.

Tuberculous meningitis, tuberculoma, miliary TB, tuberculous abscess, tuberculous encephalopathy, encephalopathy and spinal TB constitute the spectrum of CNS TB [2]. In the spine, spine arachnoiditis, spondylitis, spondylitis and myelitis represent the vast majority of cases; however, cases, however there are rare presentations such presentations as the tuberculoma [2,3]. To the date about 175 cases of intramedullary tuberculoma (IMT) have been reported in the literature [4]. Given its low frequency, frequency, the prompt recognition of its clinical and radiological clinical-radiological features, in which magnetic Magnetic resonance imaging (MRI) plays play an important role, is of vital importance for the selection of of the therapeutic interventions and avoid complications [5].

In this report, report we summarize an unusual case of IMT affecting the conus medullaris that which progressed to chronic adhesive arachnoiditis (CAA), despite medical treatment.

## 2. CASE PRESENTATION

A 19-year-old woman female was admitted complaining of weight loss, sensory disturbances of the left lower limb, limb and progressive weakness of both lower limbs for the past 6 months. 1 week before admission, her admission persistent back pain and a feeling of incomplete urine incomplete voiding voiding of urine added. On examination, cognitive functions and cranial nerves were normal. Muscle The muscle strength in the right lower extremity was 4/5 and in the left lower extremity was 3/5. Hypoesthesia There was found hypoesthesia in areas below the T8 dermatome, her reflexes were brisk and a rest tremor was found in the right lower extremity. The patient tested negative forte HIV. Other blood parameters and plain X-rays X-Rays of the chest and dorsolumbar spine were were all normal. Magnetic resonance imaging MRI of the brain and entire whole spine revealed an intramedullary mass at the at T12-L1 level, causing a fusiform enlargement of the conus medullaris (Fig. 1). The oval-shaped mass measured 1.4 x 1 x 0.9 cm, had sharp margins, margins and showed a central isointense signal to the cord with a hyperintense halo in the in T1 weighted images (WI) and heterogeneous heterogeneous intensity, mainly hypointense in the in T2 WI, surrounded by cord edema spanning from T6 to L1. On the On post-gadolinium T1 sequence, sequence the mass exhibited an avid ring-enhancement pattern. Since this mass behaved as a space-occupying space-occupying lesion (SOL), (SOL) a provisional diagnosis of glioma or ependymoma was given and resection surgery was offered to the patient.



Fig. 1. (A) Neuroaxis ~~magnetic resonance imaging~~~~MRI~~ and (B) sagittal T2 weighted image of the ~~thoracolumbar~~~~thoraco-lumbar~~ spine showing a hypointense intramedullary lesion ~~at the~~~~T12-L1 level~~ associated with cord edema spanning from T6-L1. (C) ~~In the~~~~On~~ sagittal T1 weighted image a fusiform dilation of the conus medullaris is seen. (D) Gadolinium-enhanced T1 weighted image ~~that reveals~~~~revealing~~ a ~~ring-enhancing~~~~ring-enhancing~~ pattern of the lesion.

The excision of the lesion was ~~made by~~~~done through~~ posterior approach ~~through~~~~via~~ laminectomy ~~from the level~~~~from~~ T11 to ~~L2~~~~L2 level~~. The ~~midline~~~~Midline~~ durotomy exposed a ~~soft,~~ whitish, avascular, multilobulated, soft tumor, reaching the pial surface and infiltrating the dorsal nerve roots, ~~thereby dissected~~~~thereby~~ the tumor ~~using~~ ~~was dissected~~ ~~employing~~ microsurgical technique. Histopathological examination ~~showed~~ ~~chronic~~~~showed~~~~granulomatous~~~~granulomatous~~ ~~chronic~~ inflammatory changes characterized by granulomas composed of central caseating necrosis ~~surrounded~~~~encircled~~ by peripheral multinucleated Langhan's-type giant cells, epithelioid cells and lymphocytes. Ziehl-Neelsen staining identified *M. tuberculosis* (Fig. 2). These findings were consistent with ~~IMT~~~~IMT~~ and ~~therefore~~~~accordingly~~, the patient started antituberculous pharmacotherapy (APh). However, 8 months after surgery and APh, the weakness of both lower ~~extremities~~~~limbs~~ and sensory disturbances worsened, leading to the confinement of the patient to bed. She was readmitted and a follow-up MRI at this point showed a distorted and tethered spinal cord secondary to cord atrophy alternating with cord edema, loculated arachnoid cysts with mass effect on the ~~cord~~~~cord~~ and arachnoid septations, extending from T6 to L1 levels. ~~At the~~ ~~bottom~~~~Beneath~~ ~~L2 level~~ ~~of~~ ~~L2 level~~ the nerve roots were ~~clumps that formed~~~~lump-forming~~ a soft tissue mass. After ~~gadolinium~~~~gadolinium~~ a pial and dural enhancement was observed (~~Figs.~~~~Fig.~~ 3-Fig. 4). The previous findings corresponded to CAA and a new surgical intervention with cyst drainage ~~and~~ ~~adhesion~~~~and~~~~mycolysis~~~~mycolysis~~ ~~of~~ ~~adhesions~~ was performed. Despite these ~~procedures~~~~procedures~~ the strength of the lower extremities was not recovered.

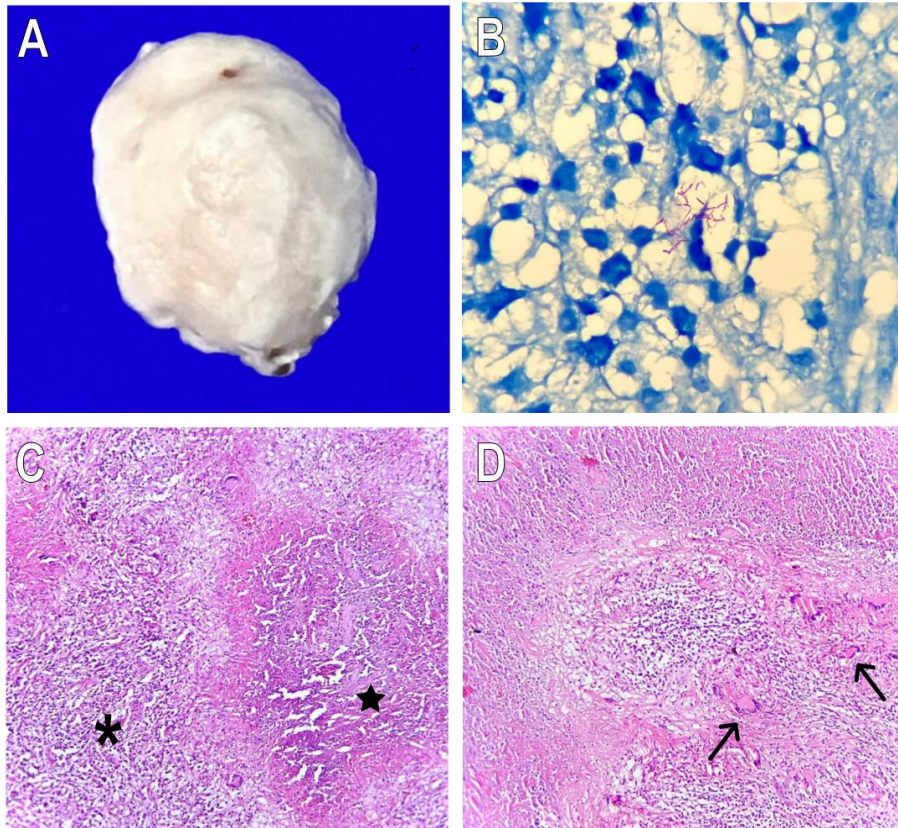


Fig. 2. (A) Photograph of the pathologic specimen obtained by laminectomy showing a whitish and rounded soft tumor. (B) Photomicrograph highlighting acid-alcohol resistant bacilli at Ziehl-Neelsen stain (100 x). (C-D) Photomicrographs of hematoxylin and eosin staining showing a granulomatous lesions with central caseating necrosis (star) surrounded by epithelioid cells, lymphocytes (asterisk) and peripheral giant Langhans-type giant cells (arrows).

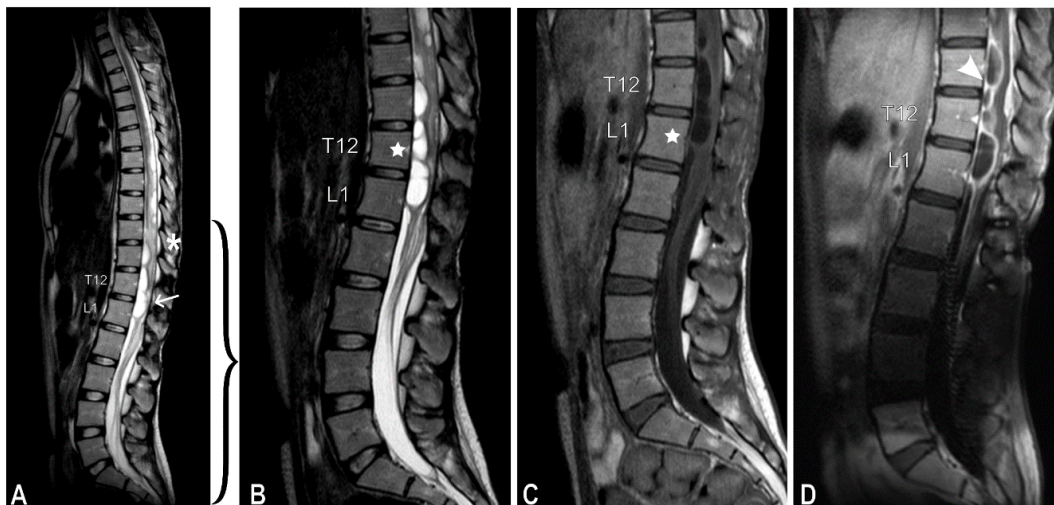


Fig. 3. Follow-up magnetic resonance imaging (MRI). (A) Weighted sagittal T2-weighted image of the thoracolumbar spine showing a distorted cord, with edema, and alternating segments of tethered cord (asterisk) and atrophy (arrow) extending from T6 to L1. (B-C) Sagittal T2 and T1-weighted images focused on the low thoracic and lumbar spine exhibiting loculated arachnoid cyst with mass effect on the cord, delimited by arachnoid septations (star). (D) Gadolinium-enhanced T1-weighted image revealing pial and dural enhancement (arrow head).

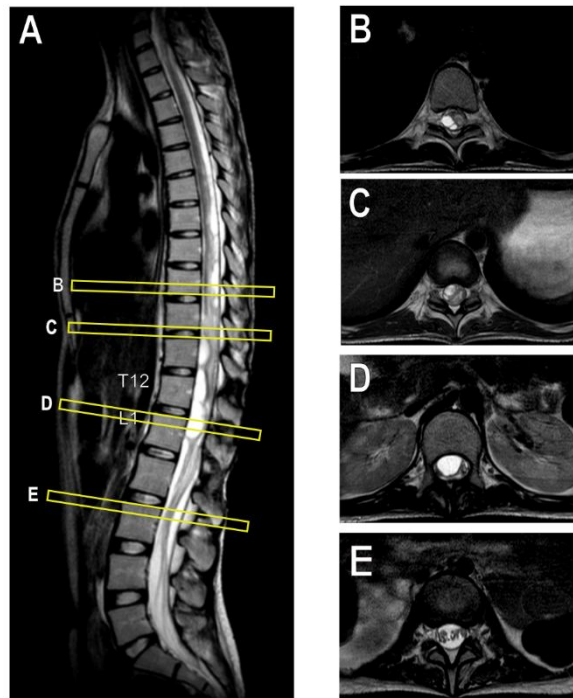


Fig. 4. Follow-up magnetic resonance imaging (MRI). (A) Weighted sagittal T2-weighted image of the thoracolumbar spine showing axial sections at different levels (yellow rectangles). (B-C) Axial T2 weighted images showing a loculated arachnoid cyst with a tethered cord, (D) cord atrophy and (E) cauda equina nerve fibers forming a soft tissue mass at both margins of the thecal sac.

### 3. DISCUSSION

IMT was first described by Abercrombie in 1828, occurs in 2 out of 1000 cases of TB of the CNS-TB and the intracranial tuberculoma to IMT ratio is approximately 42:142:1 [4, 7]. As in our case, the highest incidence of IMT is found in young people (mean age: 29.7 years) and that has been attributed to the reactivation of a previous TB infection by immunodeficiency disorders, although our patient has neither a history of TB nor evidence of immunosuppression [5, 8]. The clinical presentation differs according to the location of the injury, but motor weakness (100%) and sensory involvement (50%) are frequently described [5]. The bilateral weakness of the lower extremities associated with back pain, paresthesia and urinary dysfunction allowed us to suspect a conus medullaris syndrome, thus establishing the location of the disease in the spine [9]. Miyamoto et al. [10] reviewed 15 cases of IMT and found that the cervical and thoracic cord were the preferred

segments affected with 47% of the cases each and the remaining 6 % corresponded to IMT of the conus. ~~These frequencies have~~ has been proposed ~~to be~~ that these frequencies are determined by the distribution ~~of~~ the blood flow in the spinal cord, ~~with the~~ with thoracic segment receiving 45% of the entire supply of the cord [11].

~~The clinical~~ Clinical presentations of IMT are indistinct from any other ~~SOL; therefore, SOL, hence~~ MRI is the optimal method to characterize intramedullary lesions [5]. ~~The IMT~~ shows depicts a varying appearance according to each stage of ~~the formation of the~~ granulomatous ~~lesions, lesion formation.~~ In the early ~~phase, phase~~ a ~~noncaseating non-~~ caseating ~~zone~~ zone of necrosis surrounded ~~by an~~ by external collagenous tissue capsule ~~forms~~ shapes a solid caseating tuberculoma, which behaves isointense at T1WI and isointense to hypointense at T2WI. At contrast-enhanced imaging a ring enhancement with hypointense center that gradually ~~becomes~~ become hyperintense, as the caseation ~~progresses, progress,~~ gives the appearance of the target sign. The imaging findings and histological examination of our patient ~~were~~ was consistent with this ~~last~~ latter phase. ~~In the last stage, a~~ A tuberculoma with central liquefaction is ~~formed~~ formed in the last stage ~~and~~ it may be indistinguishable from an infectious abscess [5,8]. This variability in the ~~appearance of the magnetic resonance MRI appearances~~ may mimic neoplastic, inflammatory, demyelinating, ~~vascular, vascular~~ and other granulomatous lesions. In addition ~~to the~~ unusual imaging findings, the absence of ~~previous~~ past or concurrent TB infection in a young adult ~~without~~ with no comorbidities led to doubt in diagnosis [5,12]. Surgical treatment was indicated due ~~to the~~ suspicion of a neoplastic SOL, the size of the ~~lesion, lesion~~ and the rapid onset ~~of the~~ neurological dysfunction. ~~Once IMT~~ Once diagnosis ~~diagnosis of IMT~~ was ~~confirmed, confirmed~~ we initiated APH, expecting an ~~increase~~ enhance in its effectiveness, after removal ~~of the~~ necrotic content and debulking of the tuberculoma [7,10].

TB ~~is the~~ is most common cause of infectious spinal arachnoiditis [13]. CAA is a devastating form of persistent pia-arachnoid inflammation that favors the formation of fibrinous ~~exudates~~ ~~on~~ exudate in the surface ~~of the~~ nerve roots ~~and~~ and the spinal cord, ~~which, which~~ in association with fibroblast proliferation and collagen ~~deposition, deposition~~ lead to intrathecal scars and dural adhesions ~~that affect~~ affecting cerebrospinal fluid (CSF) flow [14]. To the ~~best~~ extent of our ~~knowledge, knowledge~~ this is the first report that relates CAA to IMT. The uncommon ~~relationship~~ relation between CAA and IMT can be explained by the tuberculoma structure itself, which is ~~surrounded by~~ surrounded a collagenous capsule and nervous tissue, ~~characteristics~~ features that ~~make~~ difficult the extension to the meningeal ~~layers~~ difficult layers. The etiology ~~Etiology~~ of CAA is heterogeneous, with trauma, previous spinal surgery, ~~infections, infections~~ and epidural anesthetics among the main causes. Therefore, we believe that the surgical intervention ~~synergized~~ synergized the TB infection to develop CAA. ~~Magnetic resonance imaging MRI~~ is the gold standard for the diagnosis of CAA, having 92% sensitivity and 100% specificity [14,15]. In the follow-up MRI of our case, we found the most frequent findings ~~related~~ linked to CAA affecting the ~~thoracolumbar~~ thoraco-lumbar spine, such as cord atrophy and tethering, cord edema, ~~located~~ loculated arachnoid cyst, arachnoid ~~septations, septations~~ and pial-dural enhancement [15]. ~~The distribution of~~ The cauda equina nerve ~~fibers~~ fibers distribution was ~~described as~~ described forming a soft tissue mass at both margins of the thecal sac, thus corresponding to the most advanced stage of the disease or group 3 proposed by Delamarter et ~~al.~~ al [16]. Despite the vast descriptions of the imaging features of CAA, many studies suggest that MRI and clinical findings are not ~~related; therefore, related, then~~ clinicians should ~~make~~ take decisions based on clinical data [17]. The progressive behavior ~~of the~~ motor and sensory symptoms in our patient prompted the ~~choice of~~ election for surgical intervention to ~~release~~ release the

cicatrical adhesions and recover CSF flow. However, as many other severe cases, our case was refractory to ~~surgery and remained surgery, remaining~~ with lasting disability.

#### 4. ~~CONCLUSIONS~~CONCLUSION

In this report, we presented a unique case of two uncommon ~~clinical and radiological~~~~clinical-radiological~~ presentations of CNS TB. As patients with IMT may show only unspecific signs of an SOL, MRI is essential ~~to discern for discerning~~ the etiology ~~among the among~~ more frequent intramedullary lesions. ~~Recognition~~~~The recognition of the~~ imaging characteristics ~~allows one allows~~ to reach an early diagnosis, easing the selection ~~of of the~~ therapeutic interventions that may yield a better result and avoid complications. CAA is an unexpected complication after surgical removal of IMT with a complex and not entirely understood pathophysiology. Therefore, future studies are required ~~to improve that ameliorate~~ the diagnosis and management of this devastating disease.

#### CONSENT

All authors declare that written informed consent was obtained from the patient ~~for the for~~ publication of this case report ~~and the and~~ accompanying images.

#### ETHICAL APPROVAL

As per international standards or university ~~standards, standards~~ written ethical approval has been collected and preserved by the author (s).

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