Thoracic Intramedullary Cysticercosis
—Two Case Reports—

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Abstract
A 36-year-old male and a 20-year-old male presented with intramedullary cysticercosis in the thoracic spinal cord. Magnetic resonance imaging clearly identified the cysts. Surgery was performed to decompress the spinal cord, as both patients had progressive and severe worsening of their neurological condition. Intramedullary cysticercosis can be treated successfully by surgery and/or medical therapy.

Key words: neurocysticercosis, spinal cord, intramedullary cysticercosis, magnetic resonance imaging

Introduction
Cysticercosis is the most common parasitic disease affecting the central nervous system, and is more frequently seen in Southern Asia and Africa.4,8) Involvement of the spine is rare, ranging from 0.7–5.8%.11,26) Involvement of spinal subarachnoid space is six to eight times commoner than the spinal cord parenchyma.13) Extradural involvement is rare. Intramedullary involvement is uncommon,3,22) with only 45 reported cases since 1881.1–3,5,7,9–20,23,25,28) We report two cases of spinal intramedullary cysticercosis, and analyze the indications for surgical treatment.

Case Reports
Case 1: A 36-year-old male presented with complaints of gradual onset of progressively spastic paraparesis for the past 2 months. Two weeks prior to admission he became unable to walk without bilateral support. He had constipation for one week and had developed urinary retention a day before admission. There was no history of trauma or tuberculosis.

Motor examination revealed spastic paraparesis. Manual muscle test revealed strength of grade 2 in both lower limbs. All modalities of sensation were impaired below the T-10 dermatome. Deep tendon reflexes in both lower limbs were exaggerated. Extensor plantar reflexes were present bilaterally. Cerebrospinal fluid (CSF) studies were not performed. Magnetic resonance (MR) imaging of the thoracic spine showed a well-circumscribed, circular intramedullary lesion at the T-7 and T-8 vertebral levels (Fig. 1A). The spinal cord adjoining the lesion was edematous. The lesion was hypointense on the T1-weighted images and hyperintense on the T2-
weighted images, with a peripheral rim of enhancement after contrast administration (Fig. 1B). The wall of the lesion was regular in outline, with a uniform thickness and was well demarcated. MR imaging of the brain showed no abnormalities. A surgical exploration was considered in view of the acute, progressive, and severe neurological deficits.

Laminectomy was performed from T-7 to T-9. The spinal cord was swollen. A midline myelotomy was performed and the pearly-white, thick-walled cystic lesion was identified. The clear fluid within the cyst was aspirated, slackening the cyst and facilitating intact excision. There was a well-defined plane of dissection. Adequate care was taken to avoid any spillage of fluid. Intravenous methylprednisolone (30 mg/kg bolus and 5.4 mg/kg/hr maintenance dose) was administered in the perioperative period. Histological examination showed a cystic lesion with a characteristic scolex along with its chitinous wall confirming the diagnosis of *Cysticercus cellulosae* (Fig. 2). Examination of the cyst fluid showed increased protein and salt contents.

The postoperative course was uneventful. The patient showed remarkable recovery of strength in both lower limbs. He could walk with minimal support within a week of surgery. He was given albendazole (15 mg/kg/day) for a period of one month. At 3-month follow up, the patient had mild weakness of the legs but could walk independently without any support. Posterior column sensations were mildly impaired. His micturition was normal. Postoperative MR imaging of the dorsal spine after 3 months showed no evidence of the intramedullary cysticercus (Fig. 3).

**Case 2:** A 20-year-old male butcher complained of acute onset of backache in the lower thoracic region, weakness in both lower limbs, and retention of urine for the past 3 days. He was afebrile and there was no history suggestive of trauma or tuberculosis.

Physical examination found strength of grade 1 in both lower limbs with sensory loss below T-10 level. CSF studies were not performed. MR imaging of the thoracic spine showed a well-defined intramedullary cystic lesion opposite the T-8 and T-9 vertebral levels, including a speck of hyperintensity, which was suggestive of a scolex (Fig. 4). The surrounding cord tissue was edematous. The MR imaging findings were suggestive of intramedullary cysticercosis, but surgery was selected since the patient had acute neurological deterioration associated with bladder dysfunction. MR imaging of the brain showed no abnormalities.

Laminectomy was performed from T-8 to T-10. A midline myelotomy was carried out at the site of maximum swelling. The lesion was encountered at a depth of 3 mm from the surface. The cystic lesion contained mildly hazy fluid with a soft mucinous membrane. The capsule was thick, grayish-white, and densely adherent to the adjacent spinal cord tissue. After meticulous sharp dissection, the entire cyst was excised.

The postoperative course was uneventful. Histological examination of the parasitic cyst showing the scolex with its chitinous wall. HE stain, ×160.

Fig. 2 Case 1. Postoperative sagittal T1-weighted magnetic resonance image with contrast medium showing complete excision of the cysticercal cyst.
logical findings were consistent with parasitosis of *C. cellulosae*. Albendazole (15 mg/kg/day) was administered for a period of one month. The patient did not show any appreciable improvement in neurological condition at discharge and at follow up after 3 months.

**Discussion**

Intramedullary involvement of cysticercosis is uncommon and only isolated cases have been reported. An analysis of 753 cases of neurocysticercosis found the incidence of spinal intramedullary cysticercosis to be 0.77%. About 50% of patients harbored the parasite in other sites, such as the brain (30%) and muscles (25%).

The low spinal cord blood flow, the type of vascularization of the cord (low caliber vessels under low pressure), and peculiarities of the cord tissue (harder consistency) are thought to contribute to the rarity of intramedullary cysticerci. The incidence of occurrence is probably proportional to the rate of blood flow and the volume of the parenchyma of the spinal cord. Thus, the thoracic cord has a higher predilection for intramedullary cysticercosis since it receives a larger percentage of blood flow than any other spinal segment. Migration of larvae through the ventriculoependymal pathway has been postulated as another mechanism, although there is no convincing supporting evidence. Spinal cysticercosis is present in 2–13% of patients with proven cranial disease. Although concomitant intracranial involvement is usually found, but isolated spinal cysticercosis is known.

The clinical presentation is usually of varying degrees of progressive spastic para- or quadripareisis. There may also be sphincter involvement, sensory deficits, radiating pain, and sexual impotence. The neurological manifestations may be acute or chronic in nature. Several mechanisms have been postulated for the appearance of neurological symptomatology, such as an inflammatory reaction caused by the metabolites of the parasite or the degenerated larval remains, mass effect of the intramedullary or extramedullary cyst, and cord degeneration due to pachypleptomeningitis or vascular insufficiency.

The available laboratory data in our cases suggested a parasitic infection, but were not specific for cysticercosis. The CSF examination findings included moderate lymphocytic pleocytosis, variable eosinophilic pleocytosis, an elevated protein level, and a normal or a low glucose level. The enzyme-linked immunoelectric transfer blot assay for cysticercus antibodies is reported to be 98% sensitive and 100% specific. The sensitivity is directly proportional to the number of lesions. The sensitivity decreases with solitary and calcified lesions. Radiography may reveal multiple punctate calcifications. MR imaging is the most sensitive and ideal investigation for diagnosis of intramedullary cysticercosis. The typical findings are cystic areas within the spinal cord substance with intensity of cyst fluid similar to that of CSF on both T1- and T2-weighted images. A subtle hypointense rim may surround the intramedullary cyst on the T2-weighted images. Occasionally, the scolex can be identified as a mural nodule within the cyst cavity on the T1-weighted images. The scolex is isointense to the spinal cord parenchyma on the T2-weighted images and may not be visualized if isointense to the surrounding cyst fluid. MR imaging with contrast medium shows the cyst, the precise location, and the proximity to neural structures as well as the scolex of the cysticercosis larvae. Degenerating cysts may show an irregular peripheral enhancement. An associated syrinx may be secondary to arachnoiditis, parenchymal circulatory insufficiency, or spinal cord atrophy. The differential diagnosis of intramedullary cyst on MR imaging includes other parasitic diseases (like hydatid disease), neoplasia, and post-traumatic syrinx. In the absence of scolex formation, no feature or group of features enables the differentiation of cysticercosis from the other diseases.

Surgery is a viable option for the treatment of intramedullary cysticercosis. With the use of microsurgical techniques, the outcome of surgery is not as dismal as previously reported. Over the
years, the concept for management of intramedullary spinal cysticercosis has changed due to the advent of potent anticysticercal drugs. Surgery was not performed in some cases of intramedullary cysticercosis, as an excellent response to praziquantel and albendazole therapy was observed.\(^1,9,13\) However, there are no controlled studies to establish the efficacy because of the rarity of the disease. Steroids can be safely administered together with albendazole to decrease the inflammatory response without decreasing the therapeutic level of albendazole in the blood, since there is a danger of further neurological deterioration associated with cord edema.\(^13\)

In our cases, the diagnosis of neurocysticercosis was established based on the MR images, but a conservative approach using albendazole seemed inadequate. Surgical removal of the intramedullary lesion facilitated extirpation of the disease, immediate decompression, and rapid resolution of the cord edema, thus preventing further damage as well as expediting recovery with minimal morbidity. The histological diagnosis was also available to institute adjuvant medical therapy. This proved critical in the first case, as there was immediate and good recovery after surgical excision, because cysticercosis is a generalized disease with focal manifestation.

In an endemic area, cysticercal pathology should be strongly considered in a patient with myelopathy with the characteristic MR picture. Such a pathology should also be considered for all intramedullary cystic lesions, even in a non-endemic area. Surgical treatment is recommended in patients with large lesions presenting with progressive neurological deficit. Medical therapy can be instituted in patients with early neurological symptoms and signs under strict surveillance, since surgical decompression may be needed in the event of any neurological deterioration or failure of medical therapy.

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