



## Case Report

# Holocord intramedullary abscess: an unusual case with review of literature

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**Study design:** A rare case of a holocord intramedullary abscess with review of literature.

**Objectives:** Summary of clinical presentation, radiology, microbiology, etiology and management of intramedullary spinal cord abscess. Abscess involving the entire spinal cord is extremely rare and awareness of such an event could avoid delay in evacuation of the abscess.

**Methods:** The incidence, clinical presentation, radiological investigations, treatment and etiology of intramedullary spinal cord abscess in 100 consecutive cases are discussed.

**Results:** Intramedullary spinal cord abscesses are rare. Presently, only five cases of holocord intramedullary abscess are described. In our analysis of 100 cases of intramedullary abscess, a male preponderance was found. The first and the third decades were the most common age groups. Prognosis is poor if treatment is delayed. Contrast-enhanced MRI is the ideal investigation for diagnosis. Prompt surgical drainage of the abscess with appropriate antibiotic therapy is mandatory since the natural course of the disease has a very unfavourable outcome. *Staphylococcus* and *Streptococcus* were the most common causative organisms.

**Conclusion:** Intramedullary spinal cord abscess along the entire length of spinal cord is rare. A thorough history with precise clinical localisation, a high index of suspicion, contrast-enhanced MRI at appropriate level and prompt surgical drainage with appropriate antibiotic therapy are key to the eventual outcome and prognosis.

**Keywords:** spinal cord; intramedullary abscess; magnetic resonance imaging

## Introduction

Spinal cord intramedullary abscesses are rare.<sup>1</sup> The first case of a spinal cord intramedullary abscess was reported by Hart in 1830.<sup>2</sup> Since then approximately 100 cases of intramedullary abscess have been reported in the literature.<sup>3–14</sup> Involvement of the entire length of the spinal cord by an intramedullary abscess is uncommon. Hitherto, only five cases of holocord intramedullary abscess have been reported.<sup>15</sup> A sixth case of holocord intramedullary abscess is reported and recent literature on intramedullary spinal cord abscess is presented.

## Case report

A 22 year-old female, otherwise healthy and non-immunocompromised presented with pain in the upper dorsal region and high grade fever for 2 days. She

developed acute paraplegia with urinary retention and loss of all modalities of sensation below the level of the umbilicus. In the next 24 h she had a rapid neurological worsening and became quadriplegic.

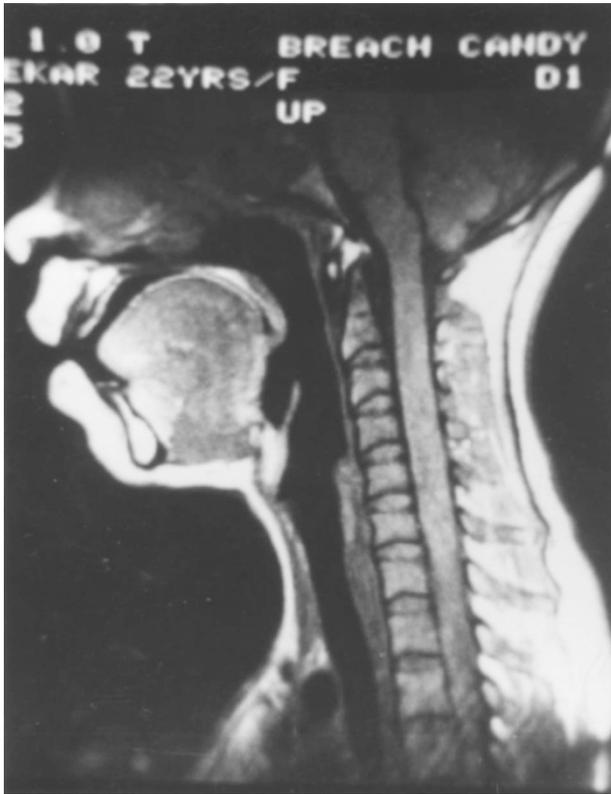
On examination, she had laborious shallow breathing, high grade fever, tachycardia and flaccid quadriplegia. The deep tendon jerks and plantar reflexes were absent. The sensory level was at D<sub>2</sub> dermatome.

The relatively poor quality plain cervico-dorsal MRI revealed a diffuse swelling of the spinal cord (Figure 1). It appeared hyperintense on T<sub>2</sub>-weighted images (Figure 2). A plain T<sub>2</sub>-weighted MRI of the dorsal spine showed an additional D<sub>7</sub>–D<sub>9</sub> extradural homogeneously hyperintense lesion (Figure 3).

The haematological investigations revealed leucocytosis with raised erythrocyte sedimentation rate. There was no laboratory evidence of immunosuppression.

Based on the clinical and radiological findings an emergency laminectomy from C<sub>1</sub>–D<sub>1</sub> was performed. The spinal cord was enlarged and oedematous.

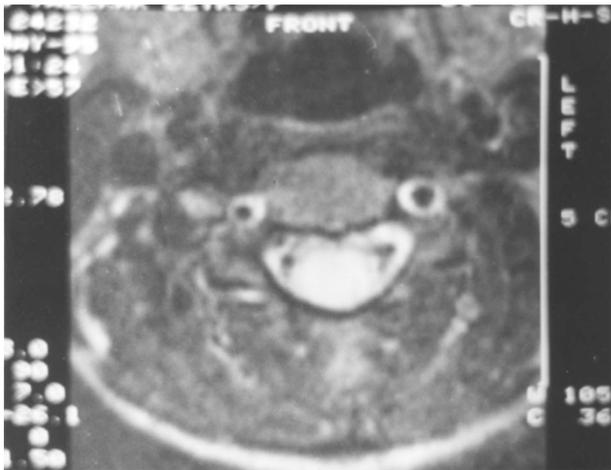
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**Figure 1** Plain T<sub>1</sub>-weighted sagittal MRI of the cervico-dorsal region up to D<sub>3</sub> showing diffuse swelling of the cord



**Figure 3** Plain T<sub>2</sub>-weighted sagittal MRI of the dorsal region up to D<sub>12</sub> showing extradural homogeneously hyperintense lesion extending from D<sub>7</sub> to D<sub>9</sub>. The lower dorsal cord appears to be normal



**Figure 2** Plain T<sub>2</sub>-weighted axial MRI of the cervical region showing the hyperintense intramedullary abscess

Through a midline myelotomy, a large intramedullary abscess was drained. The spinal cord became lax after drainage of the abscess. Simultaneously, a D<sub>7</sub>–D<sub>9</sub> laminectomy was performed and radical debulking of the extradural granulation tissue was done. Culture of the pus revealed *Staphylococcus aureus*. Following surgery the patient had rapid improvement in the

power of her hands and her respiration. She continued, however, to remain paraplegic.

In view of her persistent paraplegic state, a contrast-enhanced magnetic resonance imaging (MRI) was done. The scan revealed a well defined dorso-lumbar intramedullary abscess involving the entire dorsal cord up to the conus (Figure 4). The cervical spinal cord showed no abscess suggesting adequate drainage from the previous surgery. Laminectomy from D<sub>1</sub> to L<sub>1</sub> was then performed and intramedullary abscess at these levels was evacuated.

However, she showed no improvement in the power of her lower limbs and continued to remain paraplegic. No local spinal pathology or any primary focus of infection could be detected. At follow-up after 1 year, she was paraplegic and needed intermittent self-catheterisation.

## Discussion

### Incidence

In 1950, following Courville's report of a single case of spinal cord abscess in 40,000 autopsies, an average of one spinal cord abscess per year has been reported in the literature.<sup>16</sup> In the 100 cases which were analyzed, a



**Figure 4** Contrast-enhanced sagittal T<sub>1</sub>-weighted MRI from C<sub>4</sub> till S<sub>2</sub> showing the intramedullary abscess extending from D<sub>1</sub> till conus. The cervical cord shows complete resolution of the abscess

male predominance with M:F ratio of 5:3 was noted. The age incidence varied from 7 months to 72 years with a mean of 28.9 years. The most frequent age-group of presentation was the first and the third decade. Females were affected mainly in the first four decades.

#### *Clinical presentation*

The clinical features are variable and depend upon the location of the abscess. Neurological deficit is the commonest presentation along with localised pain and fever.<sup>15</sup> The patients were divided into three clinical groups depending upon their clinical presentation viz. acute (less than 1 week), subacute (1–6 weeks), chronic (>6 weeks).<sup>15,17,18</sup> Patients with acute presentation are more likely to have fever and leucocytosis than those with chronic symptoms. The most common complaint at the time of admission was motor impairment (80%) followed by sensory loss (43%), sphincter disturbances (36%), fever (23%) and dorsal pain (10%). Acute spinal cord abscess often follows a clinical course similar to that of transverse myelitis while chronic

abscess follows a pattern similar to that of an expanding spinal cord tumour.<sup>19</sup> Our patient had an acute onset neurological worsening. Menezes *et al* observed a worse outcome in cases with an acute presentation.<sup>17</sup> Patients with symptoms less than 4 days had mortality of 90% while those with symptoms more than 1 week had a mortality of 60%.

In most of the reported cases, laboratory examination of the cerebrospinal fluid revealed normal values or non-specific alterations.<sup>20–23</sup> In some cases, frank pus was seen. A differential diagnosis of acute transverse myelitis, spinal epidural or subdural abscess, intraspinal tumour and herniated thoracic disc should be ascertained.

#### *Radiology*

Plain films are often normal but may reveal vertebral osteomyelitis. Myelograms generally showed either a block or a widened spinal cord.

MRI allows precise localisation of the lesion.<sup>8,24,25</sup> It shows a low signal intensity on T<sub>1</sub>-weighted images and a high signal intensity on T<sub>2</sub>-weighted images. On contrast administration, a poorly defined marginal enhancement is noted on T<sub>1</sub>-weighted images while follow-up imaging shows a well-defined enhancing margin with a central hypointensity within the spinal cord. Also after initiation of therapy, T<sub>2</sub> signal abnormalities decrease markedly and show a ring enhancement on contrast-enhanced studies.<sup>26</sup>

The periependymal gray matter and the adjacent medullary oedema takes up the contrast favouring an infectious rather than tumoural formation. The clinical course and serial change in size and enhancement patterns on MRI allow differentiation of intramedullary abscess from other abnormalities.<sup>26</sup> Contrast-enhanced MRI should always be performed for the accurate diagnosis of an intramedullary spinal cord abscess.

#### *Spinal cord level*

Intramedullary spinal cord abscess most commonly involves the thoracic cord. The sluggish blood flow in the dorsal cord as well as the extent of the watershed area of vascularity makes the dorsal cord more prone for haematogenous bacteria to settle within its substance.<sup>15</sup> The rostro-caudal extent of the abscess ranged from three vertebral levels to over six vertebral levels.<sup>19</sup> Only six cases (including our case) of holocord involvement are described in literature. The abscess extend longitudinally preferably along the fibre tracts.

#### *Management*

Since the natural history of the disease has a very unfavourable outcome, prompt evacuation of the abscess is the key to the prognosis of the patient. Decompressive laminectomy, myelotomy with surgical drainage is necessary. Appropriate antibiotic therapy

using susceptibility testing of the cultured organism for a variable period of time has improved the prognosis to a significant extent.<sup>3,15,23</sup>

Bartels *et al* reported 13.6% mortality in surgically treated cases. All 34 non-operated patients succumbed of which 31 did not even receive any antibiotics (28 of these cases occurred before 1929—the preantibiotic era).<sup>5</sup> Morbidity and mortality has improved in the era of modern neurosurgery and with introduction of high powered antibiotics.<sup>15,23,27</sup> The usefulness of post-operative steroids is doubtful.<sup>19</sup> It is likely that failure to improve in the paraplegia could be due to infarction consequent upon infection rather than pressure related dysfunction.<sup>28</sup> Early diagnosis and prompt management offers a favourable prognosis even in cases having severe neurological deficits.<sup>3,4,15,23</sup>

#### *Etiology and pathogenesis*

Intramedullary abscess in the spinal cord commonly occurs secondary to a primary focus of infection. The abscess starts in the grey matter and extends peripherally into the white matter. It then extends rostro-caudally separating the fibre tracts. It does not cause compression until late in the disease process. The area surrounding the abscess undergoes fibrous proliferation and gliosis. This is responsible for the thickening of the meninges. The veins in the vicinity are frequently thrombosed.<sup>14</sup>

The infective foci commonly seen are pneumonitis, genitourinary tract infection, peripheral skin infections, endocarditis and meningitis.<sup>15,23</sup> Abscesses are also associated with dermoids,<sup>29</sup> epidermoids,<sup>22</sup> infected dermal sinus tract,<sup>30–32</sup> ependymomas<sup>33</sup> and spinal dysraphism.<sup>28,34,35</sup> In about 25% cases primary source of infection was not detected.<sup>20</sup> Bartels *et al* found primary focus of infection in 7.5% of cases.<sup>5</sup> Immunocompromised state secondary to diabetes, HIV infection, prolonged steroid therapy and drug addiction also seem to play a significant role.<sup>14,19,23</sup> Our patient was neither in an immunocompromised state nor was there any evidence of primary infective focus.

The organisms enter the spinal cord through haematogenous dissemination, septic emboli, contiguous spread from the adjacent infection, direct penetrating trauma to the spine or by continuity from an infected dermal sinus.<sup>4,18,30–32</sup> The thoracic spinal cord is a common site for intramedullary spinal cord abscess.

The failure of improvement in the paraplegic state in our case was probably due to permanent neurological insult incurred from the infarction of the cervico-dorsal cord and delay in the surgical treatment.

#### *Microbiology*

A sterile culture was the most common finding reported earlier.<sup>15</sup> It was more common in chronic cases.<sup>19</sup> The

commonest causative organisms isolated on culture examination were *Staphylococcus aureus* (23%) and *Streptococci* (16%).<sup>5</sup> The other organisms identified were *Actinomyces*, *Brucella-abortus biotype 3*, *Proteus*, *D. Pneumonia*, *E. coli*, *Pseudomonas*, *Listeria*, *Mycobacterium tuberculosis* and *C. Albicans*.<sup>4–6,10,12–15,24,29</sup> The culture of pus in the present case revealed *Staphylococcus aureus*

#### *Conclusion*

Intramedullary spinal cord abscess along the entire length of spinal cord is rare. A thorough history with precise clinical localisation and early diagnosis is valuable since initial symptoms can be misleading. A contrast-enhanced MRI at appropriate level is the ideal investigation. Prompt surgical drainage with appropriate antibiotic therapy are key to the final outcome of the patient.

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