

## CASE REPORT

# Postlumbar puncture arachnoiditis mimicking epidural abscess

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## SUMMARY

Lumbar spinal arachnoiditis occurring after diagnostic lumbar puncture is a very rare condition. Arachnoiditis may also present with fever and elevated infection markers and may mimic epidural abscess, which is one of the well known infectious complications of lumbar puncture. We report the case of a 56-year-old man with lumbar spinal arachnoiditis occurring after diagnostic lumbar puncture who was operated on under a misdiagnosis of epidural abscess. In the intraoperative and postoperative microbiological and histopathological examination, no epidural abscess was detected. To our knowledge, this is the first case of a patient with postlumbar puncture arachnoiditis operated on under a misdiagnosis of epidural abscess reported in the literature. The authors suggest that arachnoiditis may mimic epidural abscess due to its clinical and radiological features and should be considered in the differential diagnosis of complications of lumbar puncture.

## BACKGROUND

Spinal arachnoiditis is an insidious disease caused by an inflammatory process of the arachnoid membrane resulting from many possible causes, such as infection, intrathecal injection of steroids or anaesthetic agents, trauma, subarachnoid haemorrhage, ionic myelographic contrast materials, multiple back surgeries and lumbar puncture.<sup>1 2</sup> Diagnosis is based on clinical symptoms and MRI findings.<sup>3 4</sup>

Arachnoiditis can also mimic the symptoms of other diseases, such as spinal cord tumours, cauda equina syndrome, arachnoiditis ossificans and syringomyelia.<sup>5</sup> Arachnoiditis mimicking lumbar spinal epidural abscess is another possibility since epidural abscess is one of the potential complications of lumbar puncture.<sup>5 6</sup> Owing to the fact that arachnoiditis may present with the signs of an infection such as epidural abscess, differentiating between arachnoiditis and infectious complications such as epidural abscess is mandatory.<sup>7 8</sup>

## CASE PRESENTATION

A 56-year-old male patient was admitted to our clinic with a 2-week history of low back pain. It was learnt from the history that the patient had been admitted to a neurology clinic for bilateral numbness of the lower extremities. Spinal MRI had been performed to exclude any spinal lesion. On normal spinal MRI (figure 1A,B), a lumbar puncture had been performed for the purpose of further evaluation to rule out Guillain-Barré syndrome. The low back pain had started 10 days after lumbar puncture

and had increased gradually before the patient was referred to us. On our examination, the body temperature was 38.5°C. There was no neurological deficit but a slight tenderness in the low back. The examination of the other systems was unremarkable.

## INVESTIGATIONS

Laboratory examination revealed elevated erythrocyte sedimentation rate (80 mm/h) and C reactive protein level (23 mg/L) with  $9.5 \times 10^9/L$  white blood cells. Preoperative blood culture for *Mycobacterium* and other microorganisms and sputum culture for *Mycobacterium* were all negative. Non-contrast-enhanced T1-weighted sagittal MRI of the patient demonstrated a nearly biconcave lesion resembling an abscess (figure 2A). The entrance site of the lumbar puncture was seen between the spinous processes of L3 and L4 (figure 2B). In contrast-enhanced T1-weighted MRI, a biconcave-shaped and peripherally enhanced lesion was seen with some irregular contrast enhancement (figure 2B,C). The roots were displaced peripherally and adherent to the meninges forming a cerebrospinal fluid (CSF) filled cavity in the centre (figure 2D).

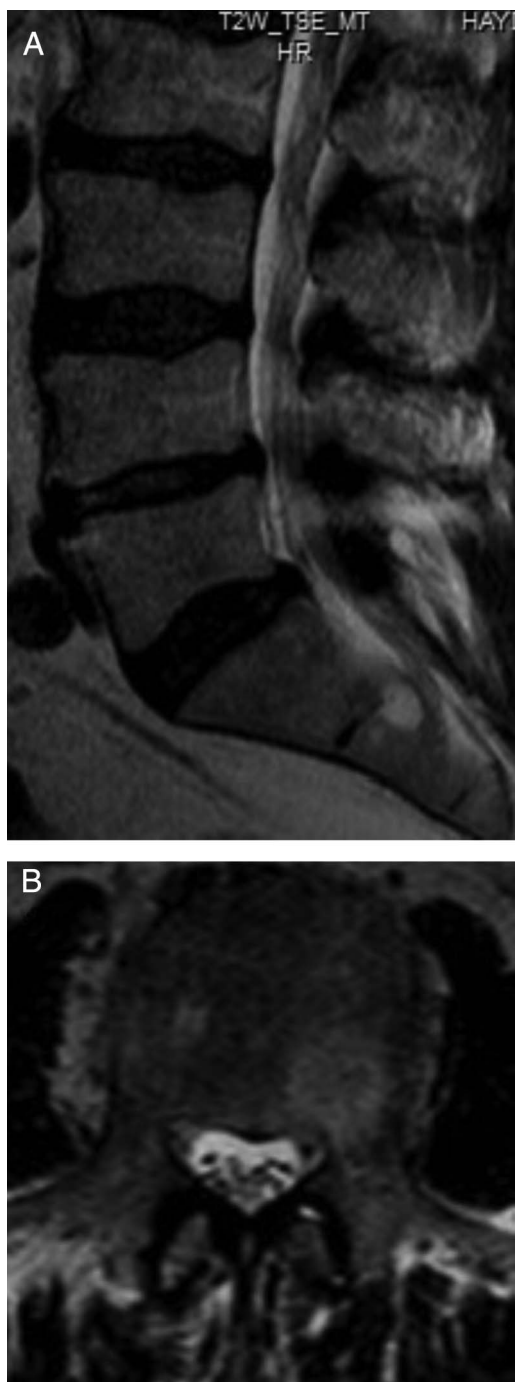
## DIFFERENTIAL DIAGNOSIS

Our differential diagnosis was arachnoiditis and epidural abscess. Irregular contrast-enhanced regions directed us towards arachnoiditis, but the contrast-enhanced biconcave region of the lesion, together with fever and elevated infection markers suggested epidural abscess. However, the radiology department insisted on an epidural abscess and the patient underwent operation.

## TREATMENT

Sulbactam ampicillin was started empirically 3 days before surgery and continued 5 days postoperatively until the preoperative tissue cultures were confirmed negative by the microbiology department. During the operation, there was no purulent material or anything suggesting an abscess other than some irregular granulation tissue over the dura. We did not open the dura to avoid any further complication. Those granulation tissues were sent for microbiological examination for *Mycobacterium* as well as other microorganisms and they were all negative. In the histopathological examination, no sign of infection was seen. Examinations of CSF taken by lumbar puncture for the likelihood of Guillain-Barré syndrome were negative. Postoperative recovery was uneventful and the patient was discharged from the hospital with no neurological deficit.

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**Figure 1** (A) Non-enhanced T2-weighted sagittal MRI of the lumbar spine taken before lumbar puncture demonstrates no prompt pathology and the nerve roots and subarachnoid space are seen in their normal locations. (B) Non-enhanced T2-weighted axial MRI of the lumbar spine taken before lumbar puncture demonstrates no prompt pathology and the nerve roots and subarachnoid space are seen in their normal locations.

#### OUTCOME AND FOLLOW-UP

The clinical condition showed progressive improvement with no recurrence or related discomfort over 1 year of follow-up.

#### DISCUSSION

Symptomatic spinal arachnoiditis is an inflammatory process of the arachnoid membrane in which there is a scar formation within and between the leptomeninges.<sup>2-9</sup> This inflammatory



**Figure 2** (A) Non-contrast-enhanced T1-weighted sagittal MRI of the lumbar spine taken 15 days after lumbar puncture demonstrates a nearly biconcave lesion resembling an abscess. (B) Contrast-enhanced T1-weighted sagittal MRI of the lumbar spine taken 15 days after lumbar puncture demonstrates the entrance site of the needle (black arrow) and a biconcave-shaped contrast-enhanced lesion (white arrow) leading to the misdiagnosis of epidural abscess. (C) T1-weighted sagittal MRI of the lumbar spine demonstrates an irregular contrast-enhanced lesion suggesting arachnoiditis. (D) Contrast-enhanced T1-weighted axial MRI of the lumbar spine demonstrates the roots which are displaced peripherally adherent to the meninges forming a cerebrospinal fluid filled cavity in the centre.

process involves all three meningeal layers as well as the nerve roots.<sup>1</sup>

Various aetiological factors have been implicated in the development of spinal arachnoiditis. Although spinal surgery is the most common antecedent associated with arachnoiditis, multiple causes have been reported, including infection, intrathecal administration of steroids, anaesthetic agents and ionic myelographic contrast material, trauma and subarachnoid haemorrhage.<sup>1-11</sup> One example of iatrogenic trauma causing arachnoiditis is lumbar

puncture. Although lumbar puncture, one of the spinal interventions, is generally considered safe, it may lead to complications such as arachnoiditis, various infectious diseases, radiculopathy and myelopathy.<sup>2–9</sup> In contrast to the fact that arachnoiditis generally occurs as a result of the introduction of drugs or contrast materials into the subarachnoid space, arachnoiditis which occurs after diagnostic lumbar puncture without injection of any drug or substance into the subarachnoid space, as seen in our case, is very rare. In our case, the trace of the needle was clearly seen at the site of the arachnoiditis, strongly suggesting that arachnoiditis had been caused by lumbar puncture.

The pathogenesis of spinal arachnoiditis is similar to the repair process of serous membranes, such as the peritoneum, with a negligible inflammatory cellular exudate and a prominent fibrinous exudate.<sup>11</sup> The inflammation of the arachnoid mater may produce a fibrinous exudate around the roots that causes them to adhere to the dural sheath.<sup>2</sup> As a result of inflammatory tissue, the nerves are displaced and the cord appears separated by arachnoid septates. CSF filled cavities form within the cord and they may enlarge gradually giving rise to extensive syrinx formation. Syrinx formation associated with arachnoiditis is explained by two mechanisms: the meningeal inflammatory process leads to severe arachnoid scar formation and microvascular compression resulting in spinal cord ischaemia, necrosis and cyst development. CSF enters the cyst and enlarges it, thus forming a syrinx cavity.<sup>12</sup> In our case, the nerve roots were displaced peripherally by irregular, inflammatory tissues and cystic cavities.

MRI is the gold standard in the diagnosis of arachnoiditis.<sup>3–4</sup> Chiapparini *et al*<sup>13</sup> pointed out that subarachnoid cysts and irregularities of the surface of the spinal cord, extensive and complex syringes within the cord, compression of the cord by arachnoid loculations, traction by adhesions, septate formation and thin appearance of the cord are MRI findings of arachnoiditis. Ross *et al*<sup>4</sup> found MRI to correlate excellently with CT myelographic and plain-film myelographic findings of arachnoiditis. They divided arachnoiditis into three anatomic groups: group 1 showed conglomerations of adherent roots residing centrally within the thecal sac, group 2 demonstrated roots adherent peripherally to the meninges giving rise to an 'empty-sac' appearance and group 3 demonstrated a soft tissue mass replacing the subarachnoid space. In our case the roots were adherent peripherally to the meninges creating a gap in the centre, which was found to correspond to group 2.

Arachnoiditis can also mimic the symptoms of other diseases, such as spinal cord tumours, cauda equina syndrome, arachnoiditis ossificans and syringomyelia.<sup>5–14–15</sup> Arachnoiditis mimicking lumbar spinal epidural abscess is another possibility since epidural abscess is one of the potential complications of lumbar puncture and usually presents with fever, low back pain, local tenderness, neurological deficit or elevated infection markers.<sup>6–8</sup> In our case there was low back pain, fever and elevated infection markers. The presence of a lesion on both non-contrast-enhanced and contrast-enhanced lumbar MRI led us to make an incorrect diagnosis of abscess, since an abscess can be seen even on a non-contrast-enhanced MRI. The presence of low back pain, elevated infection markers and the history of lumbar puncture, radiological features of the lesion led us to make the misdiagnosis of epidural abscess. However, in the intraoperative and post-operative microbiological and histopathological examinations, no

epidural abscess was detected and the diagnosis was lumbar spinal arachnoiditis.

In conclusion, arachnoiditis may result from lumbar puncture and may mimic epidural abscess with respect to its clinical manifestations and radiological appearance and it should be considered in the differential diagnosis of complications of lumbar puncture to avoid an incorrect diagnosis and unnecessary surgical intervention.

### Learning points

- ▶ Spinal arachnoiditis may result from infection, intrathecal injection of steroids or anaesthetic agents, trauma, subarachnoid haemorrhage, ionic myelographic contrast materials, multiple back surgeries and lumbar puncture.
- ▶ Arachnoiditis can also mimic the symptoms of other diseases, such as spinal cord tumours, cauda equina syndrome, arachnoiditis ossificans and syringomyelia.
- ▶ Arachnoiditis may present with the signs of epidural abscess, so it is important to differentiate between arachnoiditis and infectious complications.

**Competing interests** None.

**Patient consent** Obtained.

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