Letter to the Editor

An unusual cause of back pain in a child: spinal subdural haematoma secondary to intracranial arachnoid cyst haemorrhage

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Spinal subdural haematomas are rare entities which can occur secondary to trauma, clotting disorders, vascular malformations or iatrogenic procedures (1). Less commonly, a spinal subdural hematoma can have an intracranial origin, via gravity-dependent migration of blood into the spinal dural sac (2).

A 7-year-old boy presented to the emergency department with a 1-week gradual onset of worsening lower back pain. There was no history of trauma and he had previously been fit and healthy. On examination, there was no neurological compromise and his vital signs were normal. Blood tests, urinalysis and lumbar spine X-ray were unremarkable. Magnetic resonance imaging (MRI) of his lumbar spine was performed which showed linear T1-hyperintense collections dorsal and ventral to the lower cord and cauda equina, suspicious for spinal subdural haematomas (*Figure 1A,B*). MRI of the remainder of the neural axis and additional fat-saturated T1 sequences of the lumbar spine were subsequently obtained to confirm the presence of blood, determine their extent and identify a cause. The cervical and thoracic spine scans showed extension of the collections up to the level of C7 (*Figure 1C*). Axial fat-saturated T1 sequences confirmed the presence of blood within the subdural space (*Figure 2*). The brain MRI revealed a large arachnoid cyst in the left middle cranial fossa complicated by intracystic and subdural haemorrhage (*Figure 3*). Further history elicited from the patient was negative for headaches, nausea or previous head injury. A neurosurgical opinion was sought regarding these findings. As there was no midline shift or cauda equina compression on imaging and the patient was neurologically intact, surgical intervention was not deemed necessary at the time. The patient was managed conservatively with analgesia and continued to remain stable clinically. He was discharged 5 days after admission with planned neurosurgical and haematological follow-up.

In a large review by Kreppel *et al*., isolated spinal subdural haematomas were found to comprise only 4% of all spinal haemorrhages (3). This could be because, unlike the cranial meninges, the spinal meninges have no bridging veins between the dura and arachnoid which are vulnerable to tearing injury (4). The vast majority of spinal subdural haematomas are caused by either trauma or bleeding disorders (1). In the absence of these predisposing factors, an intracranial origin of the subdural blood should be suspected.

Differentials for spinal subdural haematoma on MRI include extradural haematoma, epidural lipomatosis and subdural abscess. Subdural haematomas can be differentiated from extradural haematomas on T1-weighted sequences by identifying a thin line of hypointense dura between the subdural collection and hyperintense epidural fat (5) (*Figure 2A*). Epidural lipomatosis can appear similar to a subacute subdural haematoma, as both are T1-hyperintense. However, on a fat-saturated T1 sequence, epidural lipomatosis would suppress whereas subdural blood would remain hyperintense (*Figure 2B*). A subdural abscess can resemble a hyperacute subdural haematoma as both would appear T1-isointense and T2-hyperintense. Post-contrast sequences can be helpful in differentiating the two entities. A subdural abscess would demonstrate diffuse, heterogeneous enhancement while a subdural haematoma can be non-enhancing or demonstrate only mild peripheral

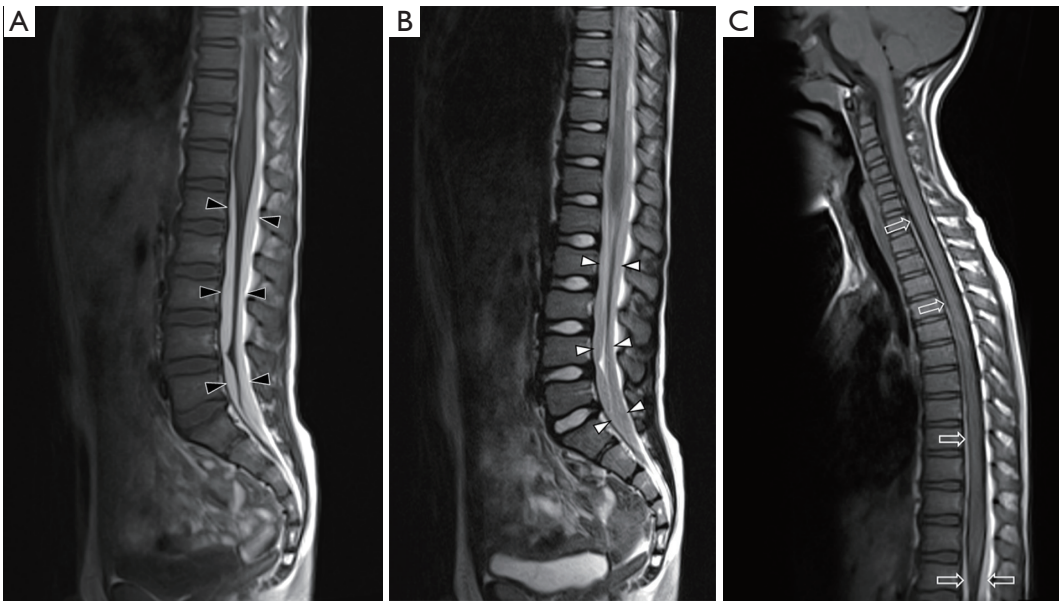

Figure 1 Sagittal (A) T1-weighted and (B) T2-weighted MR sequences of the lumbar spine; (C) sagittal T1-weighted sequence of the cervical and thoracic spine. There are linear collections dorsal and ventral to the lower cord and cauda equina which are hyperintense on T1 (black arrowheads) and intermediate signal on T2 (white arrowheads). The collection extends ventral to the spinal cord up to the level of C7 (open arrows). The location and signal characteristics of these collections raise suspicion for subdural haemorrhage. The T1-hyperintensity of the blood would be consistent with subacute blood (>3 days). There is no significant compression of the lower cord and cauda equina.

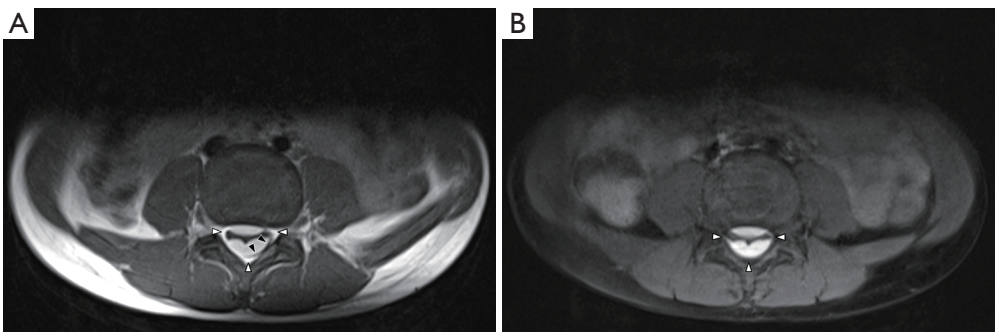

Figure 2 Axial (A) T1-weighted and (B) fat-saturated T1-weighted sequences of the lumbar spine. On the T1-weighted sequence, the thin hypointense dura (black arrowheads) is outlined between the hyperintense collection and epidural fat (white arrowheads). On the fat-saturated T1 sequence, the epidural fat suppresses but the collection remains bright, confirming the presence of blood.

enhancement.

Arachnoid cysts are benign, congenital, CSF-filled lesions which do not communicate with the ventricular system. They are most commonly found in the middle cranial fossa, anterior to the temporal lobes. Other common locations include the cerebellopontine angle and the suprasellar cistern. Arachnoid cysts are more common in males. They are usually asymptomatic and remain stable in size throughout the individual's lifespan (6). Intracystic and subdural haemorrhages are rare complications of arachnoid cysts, which can arise spontaneously or following head trauma (7). Fewer than 30 cases of spontaneous intracystic haemorrhage have been reported in the literature, at least six of which occurred in patients under the age of 18 (7-11). Patients with these complications would be expected to present with headache, vomiting or neck stiffness (11,12). However, our patient did not describe any of these symptoms.

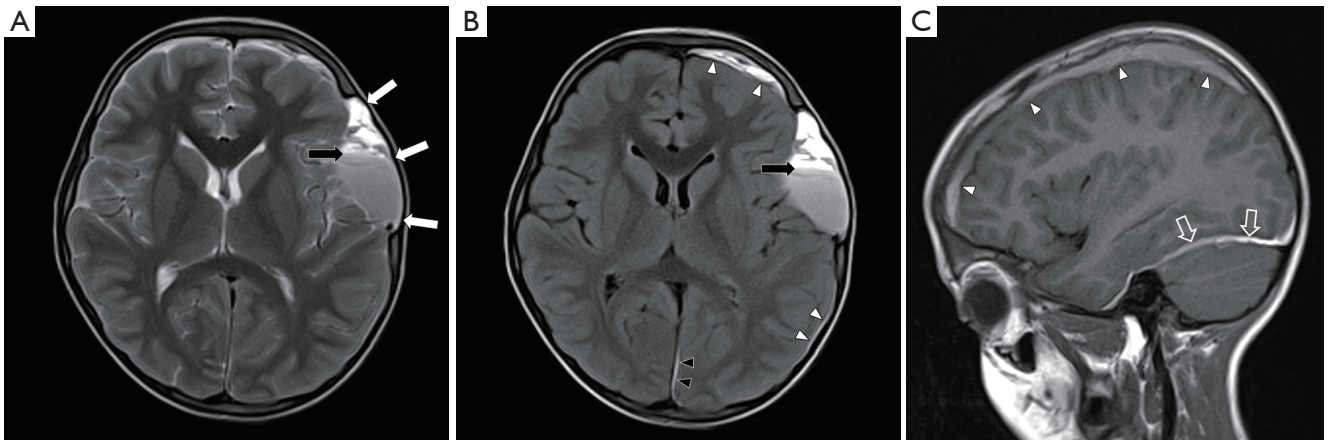

Figure 3 (A) Axial T2-weighted, (B) axial FLAIR and (C) sagittal T1-weighted sequences of the brain. There is a cystic extra-axial lesion in the left middle cranial fossa containing a fluid-fluid level (black arrow). The location and morphology of the lesion is consistent with an arachnoid cyst. On the FLAIR sequence, the signal within the cyst does not suppress, suggesting intracystic haemorrhage. There is also subdural blood overlying the left cerebral convexity (white arrowheads), within the posterior interhemispheric fissure (black arrowheads) and along the tentorium (open arrows). The overlying skull vault is thinned (white arrows) and there is an absence of sulcal effacement or midline shift despite the size of the lesion. These features are indicative of a longstanding process which has remodeled the adjacent skull vault and brain parenchyma.

On MRI, arachnoid cysts are seen as well-defined, extra-axial lesions with internal signal that follows CSF on all sequences. They do not enhance with contrast. Scalloping of the overlying skull vault and hypoplasia of the adjacent brain parenchyma can be seen, secondary to remodeling by the cyst (*Figure 3*). Arachnoid cysts suppress completely on fluid-attenuated inversion recovery (FLAIR) and do not restrict on diffusion-weighted imaging—two features which differentiate them from epidermoid cysts (6). Lack of suppression on FLAIR and fluid levels within the cyst are features of intracystic hemorrhage (*Figure 3B*).

Our patient was managed conservatively because there was no significant mass effect on MRI and no signs of neurological compromise. In a similar case described by Lohani *et al.*, the patient was also managed non-operatively, although oral steroids were given due to clinical evidence of radiculopathy (11). Spontaneous resolution of the intracranial and spinal haematomas was reported in that case and has also been described elsewhere in the literature (11-13). If there is mass effect or neurological deficit, several surgical options are available. Drainage of the intracranial subdural haematoma through a burr hole, leaving the cyst intact, has been advocated as first-line operative management. Other surgical options include craniotomy and cyst resection, endoscopic fenestration and cystoperitoneal shunting (14). Spinal subdural haematomas would be managed with decompressive laminectomy and haematoma evacuation.

This case illustrates the importance of imaging the entire neuraxis when a spinal subdural haematoma is seen, to exclude an intracranial origin for the bleed. In children, bleeding from an intracranial arachnoid cyst should be considered as a potential cause for subdural haematomas, even in the absence of a history of trauma or headache.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

Informed Consent: Written informed consent was obtained from the patient for publication of this manuscript and any accompanying images.

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