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Case Report

A Traumatic Spinal Epidural Haematoma in a Child with Magnetic Resonance and Computed Tomography Findings: A Case Report

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Abstract Spinal epidural haematomas most commonly occur secondary to neoplasms, arteriovenous malformations, epidural haemangiomas, coagulopathies and infections. But traumatic spinal epidural haematoma is an extremely rare entity which leads to major neurological conditions such as hemiparesis, paraparesis, quadriparesis and paraplegia. In this report we present the non-enhanced computed tomography (CT) and magnetic resonance (MR) imaging findings of a paediatric case of a traumatic spinal epidural haematoma extending from the 3rd cervical to the 10th thoracic vertebral level, which was associated with multiple vertebral body fractures due to a high-energy trauma. To the best of our knowledge, this case had the longest caudocranially spreading, traumatic spinal epidural haematoma detected in children, compared to previous reports in the literature. A spinal epidural haematoma is a challenge for patients, especially those with a non-traumatic origin. For this reason, the spinal epidural space must be properly examined for the presence of haematomas on the CT and MR images in patients with trauma.

Key words *Computed tomography; Magnetic resonance; Spinal epidural haematoma; Trauma*

Introduction

A traumatic spinal epidural haematoma is a very rare entity, with only a few published reports in the literature.[1,2] In this report we present the computed tomography (CT) and magnetic resonance (MR) imaging findings of a paediatric case of a traumatic spinal epidural haematoma extending from the 3rd cervical to the 10th thoracic vertebral level, which was associated with multiple vertebral body fractures.

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Case Report

A 12 year-old female with a high-energy trauma was admitted to the emergency department after a traffic accident. Her heart rate was 110 beats/minute, blood pressure was 130/80 mm Hg and respiratory rate was 25/minute. Results of the laboratory examinations were within normal limits. She reported a pain in her chest and left shoulder, and a right-sided headache. She also developed numbness in both her lower extremities in the emergency room, 25 minutes after the injury. However, she had a normal motor strength, and normal deep tendon reflexes in all the four extremities. A non-enhanced CT examination revealed a fracture in the left humerus, contusions in the bilateral posteriobasal segments of the lower lobes of the lungs, and a subcutaneous haematoma in the cranium.

Fractures were also detected in the 7th cervical, and the 3rd and 4th thoracic vertebral bodies. However, indentation of the spinal canal by bony fragments, narrowing of the spinal canal, or spondylolisthesis were not detected. There were no signs of osteoporosis, rhematic diseases or vertebral lesion which could lead to a pathological fracture on

imagings. A linear hyperdensity which was located in the spinal canal posterior to the spinal cord was detected (Figure 1). A non-enhanced MR imaging was performed to rule out any haematoma or oedema within the spinal cord. T1- and T2-weighted images did not show any signal abnormalities within the spinal cord, thus suggesting no contusion or oedema. However, a haematoma with a thickness of 6.3 mm, which was mildly hyperintense compared to the spinal cord in T1-weighted images, and mildly heterogeneous-hyperintense to the spinal cord in T2-weighted images, was detected (Figures 2 & 3). This haematoma elevated the posterior dura mater between the levels of the 3rd cervical and the 10th thoracic vertebral bodies.

After the intravenous administration of dexamethasone, the numbness in her extremities regressed dramatically within 20 minutes. However, because of the marked lenght of the haematoma, after 1,5 hours of the injury, an emergency laminectomy performed and about 25 ml haematoma evacuated from the epidural space. No

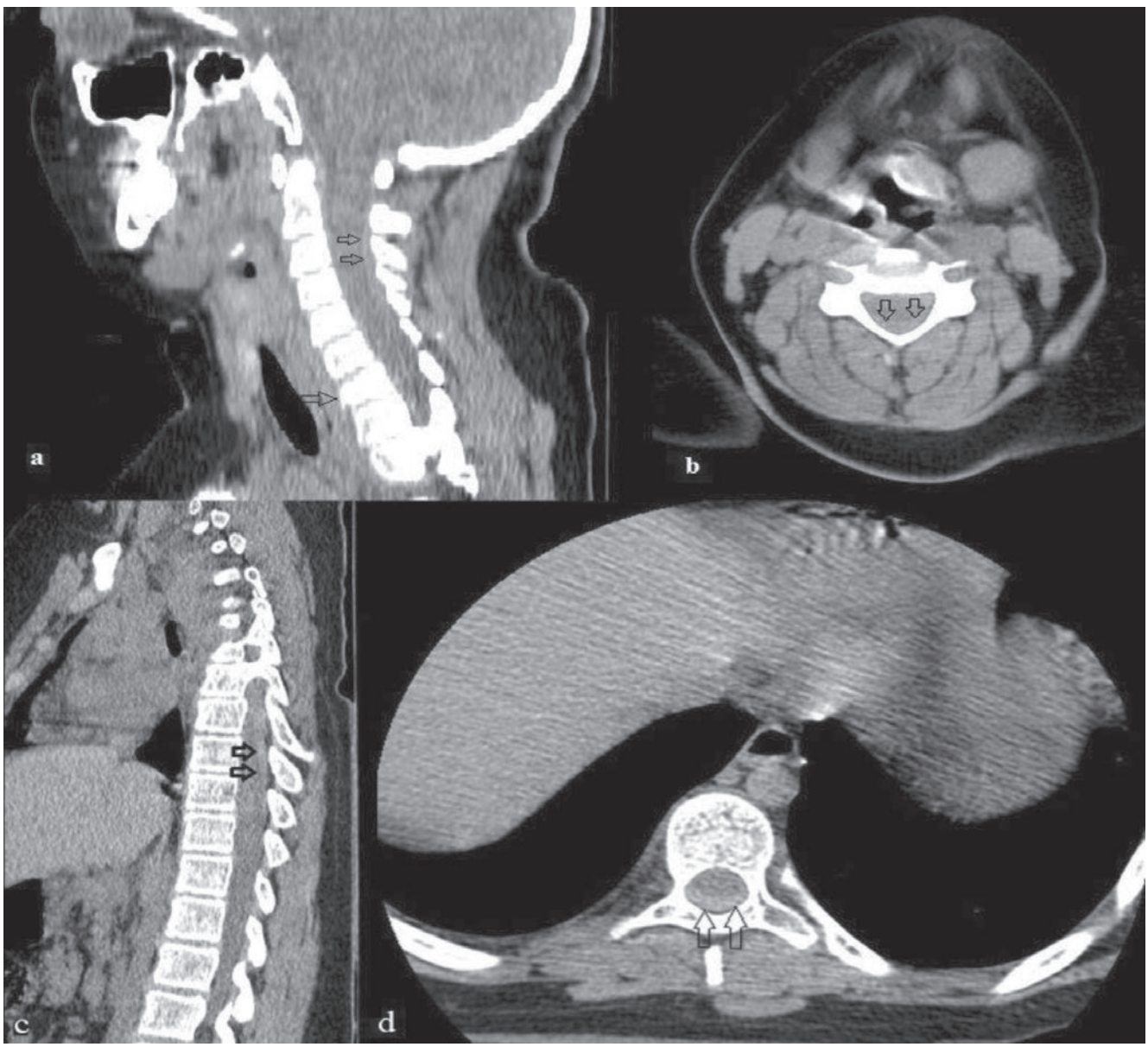

Figure 1 Sagittal reformatted (a) and axial CT images of the cervical spine (b) showing a hyperdense haematoma located in the posterior epidural space of canalis spinalis (short arrows) and a fracture in 7th cervical vertebral body (long arrow) (a). A sagittal reformatted (c) and axial (d) CT image of the thoracic spine showing an epidural haematoma (arrows).

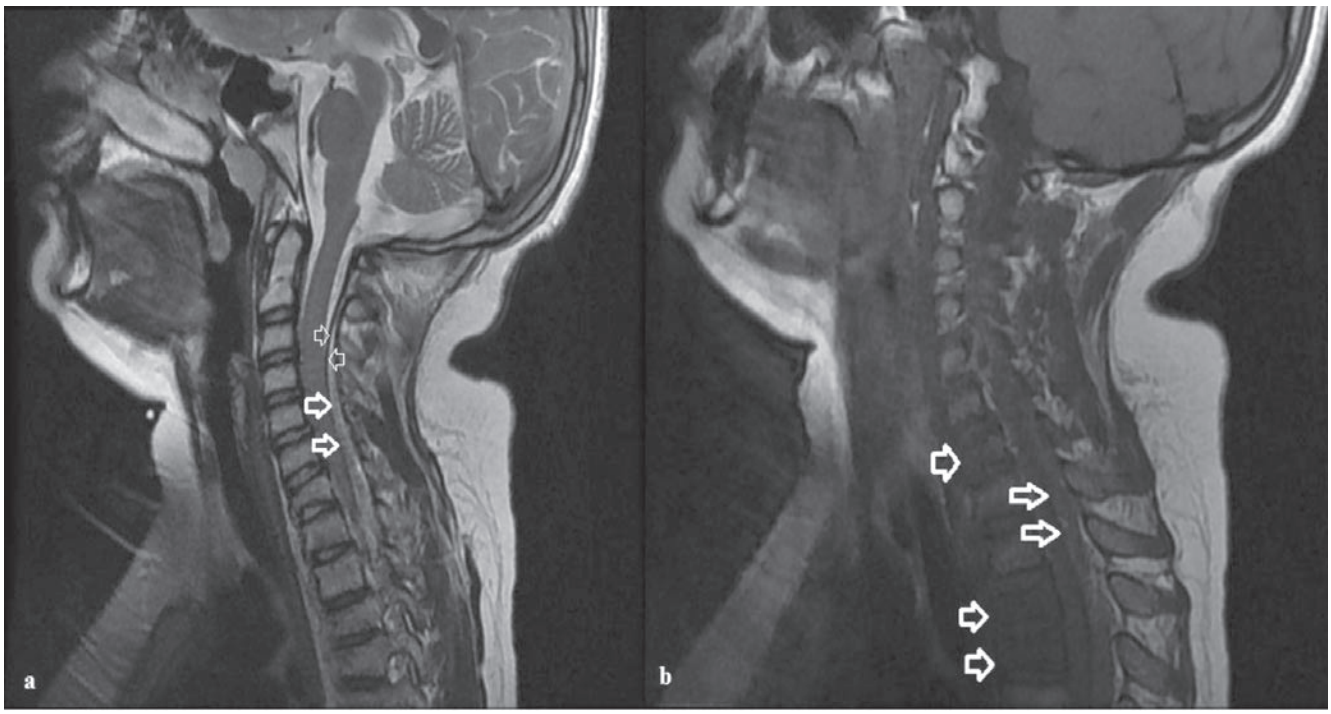

Figure 2 A sagittal T2-weighted MR image of cervical spine (a) shows an epidural haematoma (long arrows). Furthermore, elevation of the dura secondary to the haematoma is seen (short arrows). A sagittal T1-weighted image of the cervical spine (b) demonstrates a mildly hyperintense haematoma, compared to the spinal cord (long arrows). Note that there are hyperintense foci within the haematoma. Also fractures in the 7th cervical and 3rd-4th thoracic vertebral bodies are seen (short arrows).

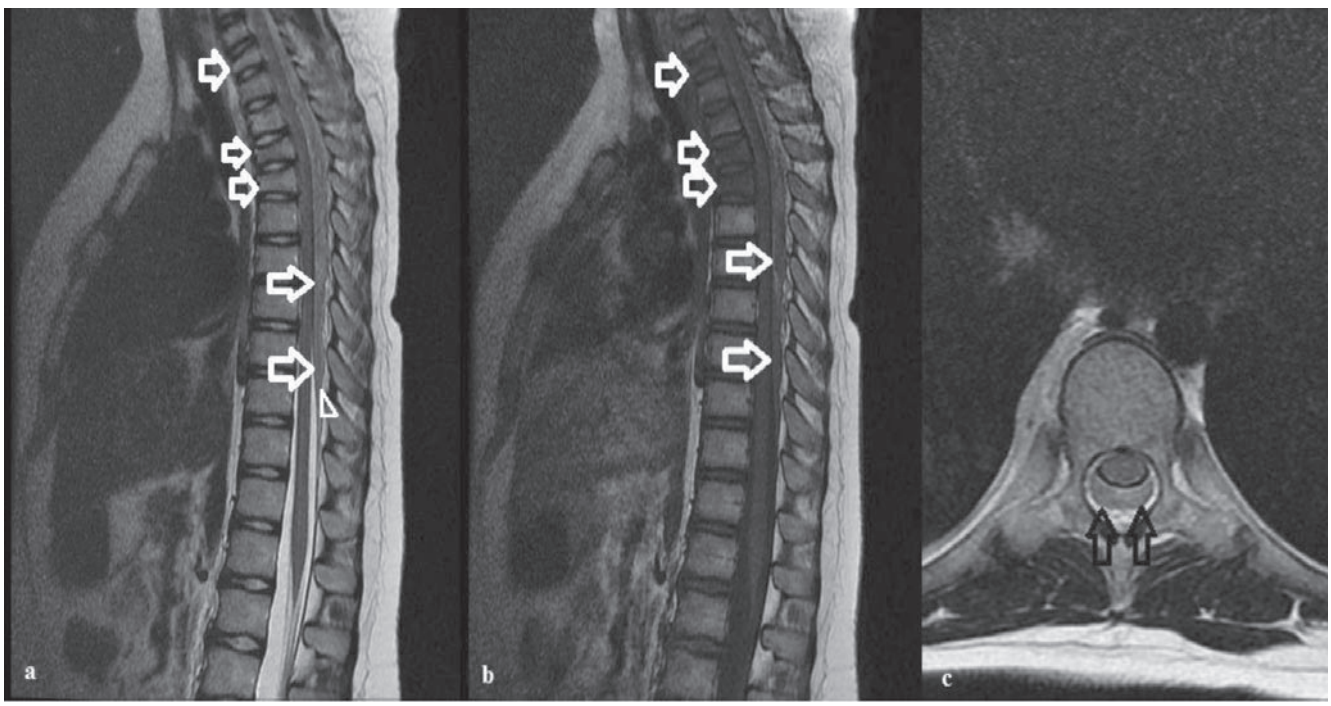

Figure 3 A sagittal T2-weighted MR image (a) showing an epidural haematoma (long arrows), and fractures in vertebral bodies (short arrows). Note that there are hypointense foci within the haematoma. Also, elevation of the dura due to the expansion of the epidural haematoma is seen (arrowhead). A sagittal T1-weighted MR image (b) demonstrates an epidural haematoma (long arrow) and fractures in the vertebrae (short arrows). Note that there are hyperintense foci within the haematoma. Also, elevation of the dura due to expansion of the epidural haematoma is seen. An axial T2-weighted MR image (c) shows an epidural haematoma located posteriorly to spinal cord (arrows).

underlying vascular malformation was detected on surgical exploration and also on MR imagings. The patient had no a history of coagulation disorders also her preoperative PT (Prothrombin Time) and aPTT (Activated Partial Thromboplastin Time) results were within normal limits. The patient was discharged with full recovery 11 days after the hospitalisation. On 1 month follow-up there was a mild neck and back pain but no sensorial or motor deficit.

Discussion

Most of the spinal epidural haematomas occur secondary to non-traumatic conditions. Non-traumatic spinal epidural haematomas are associated with neoplasms, arteriovenous malformations, epidural haemangiomas, coagulopathies, and infections.[1] A traumatic spinal epidural haematoma is very rare in children, with only a few cases reported in the literature.[1] The most common symptoms are those associated with compression of the spinal cord or the spinal roots, which include neck stiffness, neck pain, a decrease in neck movement, irritability, crying, hemiparesis, paraparesis, quadriparesis, and paraplegia.[2]

Tamburelli et al, reviewed the clinical and radiological findings of seven patients with traumatic spinal epidural haematomas. Epidural haematoma was detected in the thoracic spinal canal in five of these seven patients. In one patient the epidural haematoma was located in the cervical canal, and in the seventh patient it was in the lumbar spinal canal. In six patients, the haematomas were associated with spine fractures.[3] Similarly, in our patient also the haematoma was associated with a spinal fracture. However, there were spinal fractures at three levels (7th cervical, and 3rd and 4th thoracic vertebrae) in our patient, which may have contributed to the more caudal (10th thoracic vertebra) and cranial (3rd cervical vertebra) extension of the epidural haematoma.

Lim et al, reported a 20-month-old girl with a non-traumatic spinal epidural haematoma which was extending between her 7th cervical and 4th thoracic vertebral levels. They also reviewed the clinical and radiological findings of thirteen infants in the literature, who had a non-traumatic spinal epidural haematoma. In most of their cases (10 of 13) the haematoma was located in cervicothoracic region.[4]

Raasck et al, reported their six cases with spontaneous spinal epidural haematomas by reviewing 65 patients from twelve different studies in the literature. While 16 of these 71 patients with spontaneous epidural haematoma were treated conservatively, in the remaining 55 patients, surgery was performed.[5]

Non-enhanced computed tomography findings of a spinal epidural haematoma are a hyperdense (50-70 HU), extradurally located mass. MR imaging features depend on the age of haematoma. However, acute spinal epidural haematomas are iso-hyperintense to the spinal cord on T1-weighted images, and heterogeneously hyperintense to the spinal cord with hypointense foci on T2-weighted images.[6-8] In our patient the haematoma was heterogenous, mildly hyperintense to the spinal cord with marked hyperintense foci on T1-weighted images, and heterogenous, mildly hyperintense to the spinal cord with hypointense foci on T2-weighted images. Furthermore, an anterior displacement of the dura mater is an important finding for the detection of spinal epidural haematomas.[9]

To the best of our knowledge, in the literature, this case had the longest (from C3 up to T10) caudocranially spreading, traumatic spinal epidural haematoma detected in children. This is probably due to bleeding from epidural veins[10] in different levels due to multiple vertebra corpus fractures. Despite the marked craniocaudal length of the haematoma, there was only a mild numbness in her lower extremities but no motor function impairment with normal deep tendon reflexes. We think that this occurred because the haematoma extended craniaocaudally rather than anteroposteriorly which reduced the compression of the medulla spinalis. Sometimes even a small but more expansive epidural haematoma leads more compression and associated symptom and deficits. Elevated dura mater by the expansion of the epidural haematoma is well demonstrated at the cranial and caudal end-points of the haematoma. Also, non-enhanced computed tomography findings of the haematoma are well delineated. In our patient there was an excellent outcome which may be due to also the lack of spinal contusion or oedema and the limited compression to spinal cord which was removed early.

A spinal epidural haematoma is a challenge for patients, especially those with a non-traumatic origin. For this reason, non-enhanced computed tomography images of such patients with neurological findings must be carefully examined. Spinal epidural haematoma must be kept in mind when a hyperdensity located peripherally in the spinal canal is seen on axial and sagittal reformatted CT images. Furthermore, urgent non-enhanced spinal magnetic resonance imaging must be performed in these patients to detect haematomas, and an elevated dura mater. In addition, cerebrospinal fluid pulsation artefacts on T2-weighted

images may cause confusion, but in these cases diffuse or focal hyperintensity (as in our case) on T1-weighted images, and also elevation of the dura mater will be helpful for the diagnosis of haematoma.

Conclusion

The spinal epidural space must be properly examined for the presence of haematomas on the CT and MR images in patients with trauma. Also the suspicion of epidural haematoma secondary to vertebra fractures must be raised in the trauma patients with even minor sensory or motor deficits.

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