CASE REPORT

Spinal Subdural Enhancement Mimicking Metastases Following Suboccipital Craniotomy

DD Rasalkar,1 WCW Chu,1 DYW Siu,1 BK Paunipagar,1 HT Wong,2 XL Zhu2

1Department of Diagnostic Radiology and Organ Imaging, and 2Department of Surgery, Faculty of Medicine, The Chinese University of Hong Kong, Prince of Wales Hospital, Shatin, New Territories, Hong Kong

ABSTRACT

A 14-month-old boy underwent suboccipital craniotomy for cerebellar tumour. Magnetic resonance screening of the spine a day after the craniotomy revealed striking spinal subdural enhancement in the thoraco-lumbar region. The differential diagnosis included subacute subdural haematoma (in view of the recent operation) versus spinal metastases (in view of the marked enhancement). The enhancement resolved spontaneously within 1 month of the operation. Thus, striking enhancement can occur in patients with subdural haematoma and should not be misinterpreted as a disastrous advanced metastatic disease.

Key Words: Craniotomy; Ganglioneuroma; Hematoma, subdural; Magnetic resonance imaging
MR spectroscopy showed elevated choline and reduced N-acetyl aspartate within the lesion, suggestive of neoplastic growth. Emergency suboccipital craniectomy and intraventricular shunt placement were performed on the same day as the MR imaging. In view of reduced power and reflexes in both lower limbs 1 day after the operation, an MR imaging examination of the brain and spine was carried out. This revealed a small amount of blood at the operative bed and the intracranial subdural space, whereas the primary cerebellar tumour was noted to be largely excised. Unexpectedly however, there was a thick rind of T1-isointense and T2-hyperintense tissue along the subdural space in the thoraco-lumbar region, causing a reduction in canal area of more than 70% (Figures 2a and b). This thickened subdural tissue showed intense post-gadolinium enhancement (Figure 2c). The above findings were interpreted as a spinal subdural haematoma (SSH) or extensive spinal metastases. Subsequent histopathology confirmed the cerebellar lesion to be gangliocytoma, which is a benign hamartomatous lesion. No further adjuvant treatment was given. The child regained the lower limb power gradually. A follow-up study of the spine 1 month later showed complete resolution of the abnormal spinal subdural enhancement (Figure 3).

DISCUSSION

In this case, the primary brain tumour was relatively benign, hence rebutting the differential diagnosis of spinal metastasis. There was a strong temporal association between the craniectomy and abnormal spinal subdural enhancement, which subsequently resolved spontaneously, thus supporting the diagnosis of SSH.

Weiner et al. described similar features on contrast-enhanced MR spine examinations in 3 patients who had increased signal intensity within the spinal canal 3 days after resection of posterior fossa tumours. The authors ascribed the abnormal diffuse cerebrospinal fluid hyperintensity to the presence of occult subarachnoid blood and/or diffuse leptomeningeal enhancement as a result of meningeal irritation due to subarachnoid blood. In that series, non-contrast images were not available to determine whether the T1 hyperintensity represented contrast enhancement or T1 shortening (presence of blood). In our case, there was no T1 hyperintensity within the spinal thecal sac with non-contrast imaging, but definite enhancement of the subdural tissue in post-contrast images. Meningeal enhancement detected on MR imaging brain is commonly associated with cranial subdural collections, including postoperative subdural collections and especially in children. Neovascularisation, which is seen histologically, may explain for the enhancement of these collections that may be provoked by inflammatory components of the fluid containing blood products. The capillaries in this neovascularisation bed have numerous fenestrations, with open endothelial junctions, which are absent in normal capillaries. Exudation from these vessels is one mechanism to account for such chronic subdural collections. Contrast leaking from this neovascularature could accumulate subdurally and very likely explains for the subdural enhancement we encountered. As proven for pineal lesions that also lack a blood-brain barrier,
delayed accumulation of contrast agent is probably related to passive diffusion of the contrast material.\textsuperscript{5}

SSH is a rare condition. In the few cases reported following cranial surgery, there were co-existent intracranial subdural haematomas complicating ventriculoperitoneal shunting. In our case, we postulate that following craniotomy and ventriculoperitoneal shunting, there was acute migration of blood from the cranial subdural space into the most dependent spinal subdural space (at the thoracolumbar level) under the influence of gravity.\textsuperscript{6} This presumably gave rise to the T1-isointense and T2-hyperintense signals in the subdural space on the pre-contrast scan. Subsequently, contrast materials exudated into the subdural collection via neovascularisation, resulting in subdural enhancement that became very intense. Thus, enhancement of the postoperative spinal subdural collections can sometimes be striking and should not be confused with metastases. Neovascularisation in the early postoperative period and contrast leaking from fenestrated neovascularature very likely explain the subdural enhancement. Similar mechanism may also explain the postoperative meningeal enhancement and thickening, which has been well reported predominantly over the cerebral convexities.\textsuperscript{7}

In conclusion, post-craniotomy meningeal enhancement very likely results from an inflammatory or neovascularisation process caused by bleeding into the

Figure 2. Magnetic resonance imaging of the spine of the same child within 24 hours of the suboccipital craniectomy and intraventricular shunt placement. (a) Sagittal T1-weighted image shows a thick rind of T1-isointense tissue (arrowhead) at the anterior and posterior subdural space extending from T8 down to the lumbar region. (b) Sagittal T2-weighted image shows the subdural tissue is hyperintense with compression of the cauda equina (white arrow). (c) Contrast-enhanced T1 axial image shows more intense enhancement of the subdural lesion (white arrow). Note the mass effect on the spinal cord (black arrow).

Figure 3. Magnetic resonance imaging of the spine taken 1 month later. A sagittal post-gadolinium T1-weighted image shows complete resolution of the enhanced subdural lesion. The previous compression onto the cauda equina (level indicated by white arrow) has also resolved.
subarachnoid space at the time of surgery, and does not necessarily indicate leptomeningeal tumour spread. Thus, it is crucial to perform MR staging of the spine preoperatively, to avoid possible misdiagnosis of spinal metastasis, and thereby prevent the overstaging of malignant posterior fossa tumours.

REFERENCES