BRIEF REPORT

Diagnosis and microsurgery of symptomatic spontaneous spinal epidural hematoma

W. Qiu · W. Sun · C. Guo · Z. Wu · M. Ding · H. Shen

Received: 19 June 2009 / Accepted: 8 July 2010 / Published online: 3 August 2010
© Royal Academy of Medicine in Ireland 2010

Abstract

Background Symptomatic spontaneous spinal epidural hematoma (SSEH) is an uncommon cause of cord compression that needs emergent treatment. Without effective management of the symptomatic SSEH, irreversible severe spinal injury would be possible.

Objectives We aimed to investigate the diagnosis and surgical management of symptomatic SSEH.

Methods Five cases of symptomatic SSEH with favorable neurological recovery after emergent microsurgery were prospectively analysed.

Results The main clinical presentations were root pain and palsy. The main manifestations of MRI were long-segment epidural lesions of high intensity on T1- and T2-weighted images without enhancement. Laminectomy via posterior approach and hematoma removal were undergone for all patients. All patients achieved full neurological recovery without complications.

Conclusions MRI manifestation assisted with the main clinical symptoms may aid the preoperative diagnosis of SSEH, and the delay in obtaining preoperative Digital subtraction angiography is worthwhile, especially for those with progressive neurological deterioration.

Keywords Spontaneous spinal epidural hematoma · Magnetic resonance imaging · Digital subtraction angiography · Microsurgery · Prognosis

Introduction

Symptomatic spontaneous spinal epidural hematoma (SSEH), an uncommon cause of cord compression which needs emergent treatment, is the accumulation of blood in the epidural space with unknown etiology inclusive of minor trauma, and could occur after normal daily activity [1–3]. It is a relatively rare cause of pain in back or neck, and the estimated incidence is 10 out of 1 million individuals. Its risk factors such as anticoagulant therapy, blood dyscrasias and arteriovenous malformations are well known, and there are other rare risk factors such as thrombolytic therapy, cocaine use, chiropractic spinal manipulation and valsala maneuver (lifting, coughing and sneezing) [2, 4, 5]. But some patients with symptomatic SSEH did not demonstrate such above-mentioned risk factors that cause the SSEH. Some patients with SSEH would recover without severe consequence even without surgical decompression [6]. However, without effective management of the symptomatic SSEH (especially with aggressive palsy or cauda equina syndrome), irreversible severe spinal injury would be possible [2, 4]. Therefore, this subgroup of patients still needs emergent surgery. In this study, we demonstrated five cases of symptomatic SSEH and aimed to investigate the relative diagnosis and surgical management.
Materials and methods

Five patients aged from 24 to 53 years (mean 38.4), 2 males and 3 females, were admitted to our department between January 2004 and December 2007. No patient had a history of a recent trauma or any abnormal past history. With the sudden back or neck pain, all patients demonstrated progressive motor disturbance and cauda equina syndrome such as bladder or bowel dysfunction 30 min–2 days after the onset of pain. Physical examination revealed that all these patients demonstrated excessive patellar reflex and two patients demonstrated positive Babinski sign. The coagulation and fibrinolysis tests were normal.

Computerized tomography (CT) was performed for four patients, but no positive signs were found. SSEH was diagnosed with magnetic resonance imaging (MRI) for all patients. On MRI images, there were 4 cervical hematomas and 1 thoracic–lumbar hematoma in the shape of bar or fusiform. The hematomas were 3–8 cm in length on sagittal images, four of which were dorsal to the spinal cord. The hematomas revealed as hyperintense and hypointense to isointense on the T1- and T2-weighted MRI images, respectively. Four of the patients received the Gd-DTPA enhancement MRI, and no enhancement of the hematoma was detected. There were indirect signs such as the compression of the spine and narrowed subarachnoid space on all MRI images. Three patients received angiography of spine using of Digital subtraction angiography (DSA) equipment. There was no obvious abnormality in DSA images (Figs. 1, 2, 3, 4, 5).

With the microsurgery system, surgical decompression was performed with general anesthesia via post approach within 2–48 h after the onset of symptoms. During decompressive laminectomy, the hematoma position was found to be in accordance with what was demonstrated on MRI images. The hematomas measured from about 5 to 15 ml, respectively. Mannitol and neurotrophic treatment were accompanied afterwards, and such rehabilitation as functional exercise was also followed. During the whole course of treatment, patients got strengthened basic nursing, psychological care, pathogenetic condition observation and safety management: the avoidance of anticoagulation, careful transport of patient, rehabilitation such as physiotherapy and functional exercise, electropuncture, manipulation and infrared physiotherapy in the early stage and so on.

Results

Postoperative MRI images showed that the hematoma was evacuated completely and the signs of compression vanished (Fig. 6). According to the NASCIS (National Acute Spinal Cord Injury Study) score [5], full neurological recovery was achieved for all patients with the above-mentioned management 11 to 30 days after the onset of the pain. There was
Discussion

SSEH is uncommon and there are only hundreds of cases that have been reported [1, 4, 6–9]. The posterior internal vertebral venous plexus seems to play an important role in the development of the SSHE, since it mostly occurs without obvious trauma. The main pathological mechanism of symptomatic SSEH is the compression of the related section of spinal cord. The clinical presentation depends on the size, the location and the formation speed of the hematoma [4]. The typical manifestation involves a sudden

no evidence of complications at follow-up at 3 and 6 months after microsurgery.

Fig. 3 On the sagittal T2-weighted image, the lesion demonstrates without enhancement

Fig. 4 On the axial T1-weighted image, the lesion is located on the left portion dorsal to the dural sac without obvious enhancement after intravenous injection of Gd-DTPA

Fig. 5 Spinal angiography reveals no pathological signs

Fig. 6 On the sagittal T1-weighted image 4 days after microsurgery, the hematoma is evacuated and spine compression disappeared with full neurological recovery
onset of axial spine (neck or back) pain that radiates to corresponding dermatomes [10]. The pain always follows with the signs of spinal cord compression (such clinical signs as the immediate or delayed neurological deficit) in the following hours. The manifestation of compression differs from hemiparesis to acute cauda equina syndrome [7, 10–12]. In this study, the patients demonstrated the relative compression signs that consisted the location revealed on the MRI.

MRI is the neuroimaging tool of choice, since it can demonstrate more clearly than CT the location and extent of the hematoma, as well as the degree of cord compression. As illustrated in the present study, we suggest that MRI should be applied for preoperative differentiation and in guiding surgical treatment. On T1-weighted imagine, SSEH usually displays isointense signal to the spinal cord within 24 h after symptom onset and hyperintense signal after 36 h. T2-weighted spin-echo or gradient-echo sequences is helpful for differential diagnosis in the early stage because of the characteristic focal low signal intensity caused by deoxyhemoglobin [3, 5, 13, 14]. Contrast enhancement may be an MRI finding of some acute SSEH, especially in bleeding diathesis, which indicates that the active lesion needs early diagnosis and management [3]. Since the abnormality does not appear until in the late venous phase, MR angiography will most certainly have difficulties in depicting the lesion because of the slow variable flow in different directions of the tortuous vessels. DSA, the gold standard for vascular diseases in the central nervous system, might be useful in diagnosis and differentiation of vascular malformation resulting in intravertebral canal hematoma. However, DSA is not necessary in the diagnosis of SSEH in acute stage with deterioration, because the time consumed in this examination would deteriorate the spine compression. Furthermore, DSA is not readily available in all medical units now. Therefore, the delay in obtaining angiograms is worthwhile, especially for those patients with progressive neurological deterioration. Since hematoma may be the initial presentation of vascular malformation, DSA should be considered post operation for evaluation of operation and exclusion of the vascular malformation such as an aneurysm [3, 6–9].

The differentiation of SSEH includes subdural hematomas and other spinal epidural lesions such as metastases, lymphoma, abscesses and congenital cysts [3, 5, 13, 14]. SSEH is frequently located dorsal to the spinal cord because of the tight fixation of the dura to the vertebral bodies. In contrast, spinal subdural hematomas are mostly located ventral to the spinal cord when extravasated blood accumulates in the pre-existing subdural space. The clue to the diagnosis of ventrally located subdural hemorrhage is the absence of the ”curtain sign”, which is typical for epidural tumors. Epidural metastases are usually associated with bone destruction and are visible as homogeneous enhancement in post contrast MRI images. Focal accumulation of fatty tissue with high signal on T1WI and low signal on fat-suppression T2WI techniques is one of the characteristics for epidural lymphoma. Epidural abscesses are often associated with diskitis or osteomyelitis of the spine. The discs and the affected vertebrae always demonstrate high signal intensity on T2WI images and low signal intensity on T1WI images. Enhancement could always be observed in the epidural space during the initial stages, which is followed by the enhanced abnormal signal of the epidural space on MRI images after liquefaction. There is also the abnormal enhancement in the affected disc or vertebrae. As for the congenital cysts in the spinal canal, the characteristics on MRI images are the loculated fluid collection with signal intensity similar to that of cerebrospinal fluid without abnormal enhancement [15–18].

Some patients with symptomatic SSEH should receive emergent decompression rather than conservative management [5, 6, 19]. The indications for surgical management are progressive deterioration of neurological function and mass effect on MRI images. It was demonstrated that the favorable factors for SSEH surgery were incomplete neurological injury at the time of the preoperative status and the short operative time interval [5, 14]. For acute SSEH, especially with progressive deteriorations, evacuation and decompression should be performed as soon as possible. Subacute SSEH with progressive deteriorations, decompression also should be performed [5, 6, 19].

For patients with SSEH extending beyond five vertebral levels, minimally invasive technique may be advantageous over extensive surgery by minimizing surgical exposure, easing the postoperative pain and reducing the risk of cerebrospinal fluid leak. The intermittent subtotal lavage of recombinant tissue plasminogen activator (rt-PA) can be used with a limited surgical exposure. In the present study, the laminectomy via posterior approach and hematoma removal were undergone in all cases, and the postoperative neurological outcome evaluated by NASCIS score was E without severe complications.

**Conclusion**

The present study further confirms that MRI assisted with the main clinical symptoms may aid preoperative diagnosis of symptomatic SSEH, and microsurgery is an effective method. More importantly, angiography with DSA post operation may be useful for exclusion of a vascular malformation, but the delay in obtaining such angiograms before surgery is worthwhile, especially for those patients with progressive neurological deterioration. Favorable
outcome is not only related to the primary neurological status and progressive intervals, but also related to other factors such as the spinal manifestation on MRI and the effective decompressive laminectomy with least complications [16–22]. Surgical management performed too late after symptom onset is likely to be unsuccessful for full recovery, and emergent microsurgery inclusive of drainage of hematoma should be applied as soon as possible for these patients with symptomatic SSEH 16–20.

References