Cervical epidural hematoma in children: a rare clinical entity

Case report and review of the literature

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Pediatric spinal epidural hematoma is a very rare clinicopathological entity. In the vast majority of cases, spinal epidural hematomas have a nonspecific clinical presentation; this, along with their rapid progression, makes their early diagnosis and prompt surgical evacuation critical. Magnetic resonance imaging is the neuroimaging modality of choice, whereas hemilaminectomy or laminectomy is the indicated surgical intervention. The outcome is good when hematoma evacuation is performed before the onset of complete sensorimotor paralysis.

In this communication, the authors describe a 12-year-old girl with a traumatic acute cervical epidural hematoma. This lesion was successfully evacuated through a hemilaminectomy, and the patient had an excellent outcome. The pertinent literature is reviewed in terms of the incidence, origin, management, and prognosis of this rare and potentially disastrous clinical entity.

KEY WORDS • cervical spine • epidural hematoma • trauma • children

Spinal epidural hematoma in children and young adolescents represents a very rare clinicopathological entity.1,20,23,34 The first description of a spontaneous cervical epidural hematoma was reported by Jackson in 1869.19 Since that initial report, only 32 other pediatric cases have been added to the literature, indicating the rarity of this entity. These reports emphasize the importance of early diagnosis and emergency evacuation for accomplishing good functional outcome.1,6,17,20,23,34 The vast majority of the reported cases represent spontaneous epidural hematomas,1,17,20,23,34 whereas very few are of traumatic origin.11,25–27

In this communication, we report on a 12-year-old girl who was admitted and whose injury was managed at our institution; we also review the pertinent literature.

Case Report

History. This 12-year-old girl presented to the emergency department because of severe neck pain (8 of 10 on the pain scale) and acute-onset right-sided hemiparesis, which was more prominent in the lower than the upper extremity. Her symptoms had started a few hours earlier while she was practicing gymnastics and hyperextended her neck. The patient’s medical and surgical history was unremarkable.

Examination. On examination, the patient was wide awake, alert, and oriented. Her motor examination revealed right upper-extremity weakness (4–5) and ipsilateral lower-extremity weakness (3/5). No sensory deficits were present. Her deep tendon reflexes were as follows: right biceps, 1; right triceps, 1; right brachioradialis, 1; right patellar tendon, 1–; and right Achilles tendon, 1–; whereas all other reflexes were 2+. Her rectal tone was intact. Her neck was tender to palpation at the midcervical area over the midline; the rest of her physical examination was unremarkable. She was fully immobilized on a hard board with double mattress pad, with her neck placed in a hard cervical collar.

Neuroimaging and Laboratory Findings. The patient’s radiographic evaluation included plain x-ray films, CT scanning with three-dimensional sagittal reconstruction, and MR imaging of the cervical spine without and with administration of Gd-DTPA. A complete cervical x-ray series revealed no fractures, and the anatomical alignment was normal, although there was some mild loss of the normal curvature (Fig. 1). Her CT scans revealed a hyperdense, space-occupying lesion extending from C-3 to C-7, with anterior displacement of the thecal sac (Fig. 2). Her cer-
vical spine MR images demonstrated an epidural space-occupying lesion measuring 2.9 × 0.8 cm and extending from the superior edge of the C-3 to the superior edge of the C-7 vertebral body (Fig. 3). Results of her laboratory studies, including C and S protein levels, were within normal limits (platelet count 210,000/mm³, prothrombin time 12.3 seconds, partial thromboplastin time 31 seconds, international normalized ratio 0.91).

Operation. The patient was brought to the operating room for emergency surgery; C3–7 right cervical hemilaminectomies and evacuation of the underlying spinal epidural hematoma were performed through a midline vertical skin incision, extending from the inion to the T-2 spinous process. No masses or vascular anomalies were identified intraoperatively. The procedure was performed with the aid of somatosensory evoked potential, motor evoked potential, and spontaneous electromyographic monitoring. There were no intraoperative complications. Histological examination of the specimen confirmed the diagnosis of hematoma.

Postoperative Course. The patient’s postoperative course was uneventful. A cervical spine MR imaging/MR angiographic study, which revealed no vascular or other abnormalities, was obtained postoperatively. She was discharged 96 hours after her presentation; she was neurologically intact and fully ambulatory. The patient was followed up on an outpatient basis for 18 months; she remained asymptomatic and neurologically intact, and she was eventually discharged from our outpatient clinic.

Discussion

Spinal epidural hematomas are very rare among children.1,6,17,20,23,34 The annual incidence of spontaneous epidural spinal hematoma has been reported to be 0.1 per 100,000 patients in the general population, whereas in the pediatric population this incidence is significantly lower. Only 32 cases have been reported in the literature; 28 of these were nontraumatic, whereas four were of traumatic origin (as in our case). It needs to be emphasized, however, that in a few nontraumatic spinal epidural hematomas there was a preceding minor injury, such as a weight-lifting injury,13 involvement in a traffic accident,23 or a fall.7 In the reported cases that had traumatic origins, the association of trauma and hematomas was clear.1,11,25,26 The cause of the nontraumatic cases might be related to tumors, arteriovenous malformations, epidural hemangiomas, coagulopathies, infections, and bleeding diatheses.8–10,16,18,20–23,32,33 With regard to the epidemiological characteristics of the patients whose cases have been reported, there is no male preponderance,20 and the presenting age ranges from in utero detection9 to 14 years.17,20 The anatomical location in the vast majority of these cases was cervical, as in our case; however, thoracic2,17,18,21,26 and lumbar20 epidural hematomas have been reported.

The clinical presentation of spinal epidural hematomas in pediatric patients varies significantly; abnormal crying might be the only symptom in infants, which makes the appropriate diagnosis even more challenging.23 Neck pain and tenderness (as in our case), torticollis,20 focal motor or sensory deficits (depending on the anatomical location of the hematoma), irritability, and Brown–Séquard syn-
drome are some of the most commonly reported presenting symptoms. The progression of the symptomatology and clinical signs is usually very rapid, which was true in our case, although slower progression over a few days has been reported. Interestingly, a case of chronic spinal epidural hematoma has also been reported.

The neuroimaging workup of patients with suspected spinal epidural hematoma should include an MR imaging study, not only to delineate the hematoma and its relationship with the displaced thecal sac, but also to rule out any underlying vascular or other disorder. The MR imaging characteristics of spinal epidural hematomas have been well described elsewhere. In addition, obtaining a preoperative spinal angiogram could allow accurate identification of an underlying vascular abnormality and provide valuable information to the surgeon regarding the precise localization of the feeding vessels for the appropriate and safer surgical management of this entity. Newer, noninvasive imaging modalities such as cervical spine CT angiography and cervical MR angiography could be good supplementary techniques for visualizing suspected vascular abnormalities. Furthermore, appropriate laboratory tests are essential to rule out any coagulopathies or bleeding diatheses.

Rapid surgical intervention is the recommended therapy for spinal epidural hematomas. Nevertheless, there have been a very few cases in which a positive outcome occurred with conservative management. The patient’s clinical examination and the size of the hematoma are the most important determining factors in the decision-making process. We strongly believe that the presence of a spinal epidural hematoma in a symptomatic patient is an absolute indication for rapid surgical evacuation of the lesion.

Hemilaminectomy (as in our case) appears to provide adequate exposure for hematoma evacuation, even in the case of large lesions that cross the midline, and it minimizes the risk of developing postlaminectomy deformity, which has been reported to be as high as 46% in patients younger than 19 years of age. Multilevel laminoplasty represents another surgical option for evacuating spinal epidural hematomas, and this procedure minimizes the risk of developing postlaminectomy deformity. As far as we know, the development of long-term postoperative deformities has not been investigated in any comparative study of multilevel hemilaminectomy and laminoplasty. In adult patients, however, laminoplasty appears to be superior to hemilaminectomy in avoiding postoperative worsening of cervical curvature, although no statistically significant difference between these two surgical techniques has been established with regard to postoperative changes in range of motion.

We selected hemilaminectomy in our case because of the shorter operating time and our better familiarity with the procedure, but laminoplasty definitely represents a valid surgical option in the management of these cases. The functional outcome varies significantly among the reported cases. In our patient the outcome was excellent, with full recovery occurring immediately postoperatively. Similarly, in their review article, Iguchi, et al., reported an excellent outcome in eight (61.5%) of 13 of the cases they reviewed, whereas a good outcome occurred in three (23.1%) of 13 and a poor outcome was reported in two (15.4%) of 13. Likewise, Nagel, et al., and Kirwan, et al., reported excellent outcomes in their cases. In their case report, Tender and Awasthi also reported full recovery, although this was accomplished 3 months postoperatively, after intensive physiotherapy and rehabilitation training.

**Fig. 3.** Preoperative MR images of the cervical spine obtained in a 12-year-old girl who was injured during gymnastic practice. A: Sagittal T1-weighted MR image demonstrating a large, slightly hyperintense, space-occupying lesion extending from the C3–7 vertebral bodies and displacing the spinal cord. B: Sagittal T1-weighted MR image demonstrating the same space-occupying lesion, which is isointense on this pulse sequence. C: Axial T1-weighted MR image demonstrating the previously described, slightly hyperintense, space-occupying lesion, which is compressing and displacing the spinal cord anterolaterally. D: Axial T1-weighted MR image obtained after administration of Gd-DTPA, showing a nonenhancing, slightly hyperintense, epidural, space-occupying lesion.
Conclusions

Spinal epidural hematoma in pediatric patients is a rare entity, but it does occur. Early diagnosis of this condition and rapid surgical evacuation are of paramount importance for a better neurological outcome. Unfortunately, the non-specific presenting symptomatology and clinical signs, especially in infants, makes the diagnosis quite challenging. The managing clinician should be suspicious of its presence and always include cervical spinal epidural hematoma in the differential diagnosis in pediatric patients who present with acute neck deformity or pain.

References

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