Traumatic epidural hematoma of the cervical spine: diagnosis with magnetic resonance imaging

Case report

GOLDEN PAN, M.D., MADAN KULKARNI, M.D., DAVID J. MACDOUGALL, D.O., AND MICHAEL E. MINER, M.D., PH.D.

Departments of Diagnostic Radiology and Neurosurgery, University of Texas Health Science Center, Houston, Texas

A traumatic epidural hematoma of the cervical spine is reported in a 13-year-old girl. The patient recovered spontaneously over several days without surgical intervention. The diagnosis was made on magnetic resonance (MR) imaging, which also demonstrated subsequent resolution of the hematoma. The etiological factors of spinal epidural hematomas are reviewed and the utility of MR imaging in differentiating other causes of acute spinal cord injury is emphasized.

KEY WORDS • epidural hematoma • spinal cord injury • magnetic resonance imaging

Epidural hematoma (EDH) of the spine is an uncommon entity that was first reported as long ago as the 17th century. Jackson is generally credited with the first report of a spontaneous case in 1869. \(^2^6\) Over 200 reports have appeared in the literature since then, and numerous etiologies have been described. \(^2^5^,^9^,^2^2\) Spinal EDH’s due to trauma are relatively uncommon and have usually caused progressive neurological deficits and required surgical decompression.\(^9\) We report a case of a traumatic EDH of the cervical spine which was diagnosed by magnetic resonance (MR) imaging; the lesion subsequently regressed spontaneously.

Case Report

This very muscular 13-year-old girl was doing backflips on a trampoline at school in her gymnastics class when she fell and landed on her right shoulder and neck. She clearly described a hyperflexion and abduction injury to her neck. She was momentarily stunned but then noted inability to move both of her lower extremities as well as weakness of her right upper extremity. She did not complain of any dysesthesias or other sensory abnormalities, and there was no loss of bowel or bladder control.

Her first neurological evaluation was conducted approximately 4 hours later. She had clearly improved but complained of lower neck pain and tenderness in the right shoulder. She had a minimal right hemiparesis although she could move all muscle groups against gravity and resistance, with the exception of her right triceps muscle which had barely antigravity strength. Her tendon reflexes were normal except for an absent right triceps reflex. There was a Babinski sign on the right side. Her sensory examination was normal, as was her anal tone. Cervical and thoracic spine x-ray films were normal.

Magnetic resonance imaging of the cervical and upper thoracic spine performed approximately 5 hours after the injury demonstrated a lentiform mass in the right posterior epidural space extending from C-4 to C-7 (Fig. 1 left). Displacement of the cord anteriorly and to the left was evident on the axial images (Fig. 1 right). The MR signal characteristics on the T\(_1\)- and T\(_2\)-weighted images were consistent with an acute EDH. No intramedullary abnormalities of the spinal cord nor any ligamentous injuries of the cervicothoracic spine were seen on MR imaging.

Repeat neurological examination at that time demonstrated some improvement in the patient’s strength. It was therefore elected to treat her conservatively in a cervical collar and follow her neurological status closely. She was observed to improve slowly overnight and by the following morning her lower-extremity strength was normal. By the 4th day after injury her triceps strength improved...
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FIG. 1. Magnetic resonance images of the cervical spine. Left: Sagittal view demonstrating the dorsally located spinal epidural hematoma (arrow). The cervical spine and spinal cord are intact. Right: Axial image at the level of the C6–7 neural foramen showing the lateral extent of the hematoma (arrow), which displaces the spinal cord anteriorly and to the left.

had nearly returned to normal and her triceps reflex had returned. A repeat MR study on that day showed nearly complete resolution of the spinal EDH with only a small focus of high signal intensity at the right C-7 root on the T1-weighted images, consistent with residual hematoma (Fig. 2). Subsequently, at follow-up examination the patient was able to do one-arm pushups equally well with either arm; the remainder of her neurological examination was normal.

Discussion

Spinal EDH's are believed to originate from the rich venous plexus of the epidural space. The most common area involved is the thoracic spine, where the epidural space is most prominent. The location of this venous plexus perhaps explains the greater number of reported EDH's of the spine compared with subdural and subarachnoid hemorrhage. It has been postulated that local pooling within the valveless, thin-walled epidural veins in combination with sudden brief increases in intravascular pressure may be the cause of such bleeds. It is not clear, however, why spinal EDH's remain relatively uncommon when many opportunities exist for rupture of these veins.

Numerous etiologies for spinal EDH's have been described. A considerable number of these occur without an obvious cause. "Spontaneous" spinal EDH's have been defined as those occurring in the absence of any known bleeding disorder, vertebral trauma, or vascular anomaly, although "soft" factors such as hypertension, pregnancy, atherosclerosis, or minor trauma may be present. The term "idiopathic" has been applied to spinal EDH's without any associated causative factors, however minor.

Abnormal bleeding tendencies, whether from hematological disorders or from anticoagulant therapy, have been anecdotally associated with spinal EDH's; however, reviews of such cases have not revealed a definite causal relationship between abnormal clotting parameters and the onset of EDH. Vascular anomalies, such as arteriovenous malformations or vertebral hemangiomas, are another source of hemorrhage,
and some have postulated that undiscovered malformations may be the major cause of "spontaneous" spinal EDH's.19,20

Traumatic causes of spinal EDH include vertebral fractures, obstetrical birth trauma, lumbar punctures, postsurgical bleeding, and missile injuries.2,3,17,20 Reports of lumbar puncture-induced spinal EDH have primarily concerned patients with hematological disorders or those receiving anticoagulation therapy.9 Spinal EDH's are rarely reported in association with spine fractures, with the incidence ranging from 0.5% to 7.5% in several series.2,4,20,21 In neonates suffering from obstetrical birth trauma, EDH's are a major factor in spinal cord injury, occurring in 85% of one series of cord-injured neonates.2,20 In children and young adults, traumatic spinal EDH may occur (as in this case) without bone disruption because of the greater elasticity of the spinal column.3,18

Epidural hematomas of the cervical spine have predominantly been described as acute lesions with progressively worsening neurological deficits, as opposed to EDH's of the lumbar spine, which may be chronic in nature.10,22 This difference is because the spinal cord occupies a greater percentage of the spinal canal in the cervical region than it does elsewhere, and the nerve roots of the cauda equina are relatively more tolerant of compressive mass lesions.

A few cases of spontaneous resolution of spinal EDH's have been reported previously.19 The fatty areolar tissue of the epidural space contains a vast network of capillaries which normally facilitate rapid absorption of extraneous substances (such as anesthetic agents)1 so that it is possible that most spinal EDH's will be resorbed over a period of time. Clinically, of course, most of these patients would have suffered some degree of irreversible cord injury by the time the hematomas are resorbed so that immediate surgical decompression remains the primary consideration in the management of patients with progressive neurological deficits. This patient was relatively unique in that her neurological status steadily improved after injury. The decision not to operate was based on her clinical status rather than her pathological diagnosis.

Although speculative at this point, one reason that EDH's are not more commonly found in spinal trauma may be that patients with severe cord injury who are not candidates for surgical intervention are frequently not studied immediately after injury. In cases where diagnostic studies or autopsies are performed many days after the original onset of symptoms, the spinal EDH's that may have been present could have already been resorbed.

Magnetic resonance imaging of the spine is capable of detecting ligamentous injuries as well as areas of hemorrhage or cord edema that are not readily diagnosed with other imaging techniques.8,16 Differentiating between the various potential causes of neurological deficit in the spine-injured patient, such as spinal EDH, herniated vertebral disc, bone compression, cord edema, cord hemorrhage, or subdural or subarachnoid hemorrhage, is of great prognostic and therapeutic benefit.4,11

Previously, the preoperative diagnosis of spinal EDH has been made with myelography or computerized tomography (CT).7,10,22 In the cervical region, intrathecal injection of contrast material is usually necessary for CT to consistently differentiate the structures within the spinal canal. However, there may be a reluctance to use intrathecal contrast material in patients with spine trauma unless surgery is contemplated, because of the attendant risk of worsening the neurological deficit. Magnetic resonance imaging is capable of providing details of both intra- and extramedullary cord abnormalities without the administration of contrast material. At present, the use of MR imaging in patients with spine trauma is limited by its incompatibility with the array of monitoring equipment and ventilatory support and traction devices that frequently accompany these patients. However, as nonferromagnetic or remote versions of these devices are developed,13 MR imaging is likely to play a greater role in the management of spine trauma.

References
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Address reprint requests to: Golden Pan, M.D., Department of Radiology, Room 2.132 MSB, University of Texas Health Science Center at Houston, 6431 Fannin, Houston, Texas 77030.