Lumbar epidural hematoma associated with spondylolyses

Report of 3 cases

CHIMA O. OHAEGBULAM, M.D.,1 IAN F. DUNN, M.D.,2 PIERRE D’HEMECOURT, M.D.,3 AND MARK R. PROCTOR, M.D.2

1Division of Neurosurgery, New England Baptist Hospital; and 2Department of Neurosurgery and 3Division of Sports Medicine, Children’s Hospital of Boston, Massachusetts

This report describes 3 young male patients with multiple lumbar spondylolyses in combination with a symptomatic epidural hematoma. The records of all 3 patients were reviewed for clinical details. All patients were successfully treated without surgical intervention. Initial neuroimaging results for all patients revealed epidural hematomas, and follow-up imaging confirmed resolution of the hematomas. The relevant literature is briefly reviewed to examine the rarity of this combination. Spontaneous epidural hematomas may occur in the setting of spondylolysis, and this diagnosis should be considered when imaging reveals an unusual epidural lesion in a young active patient.

(DOI: 10.3171/SPI/2008/8/2/174)

KEY WORDS • epidural hematoma • pars interarticularis • radiculopathy • spondylolysis

Spinal epidural hematomas may result from a number of different causes. The association with disc herniation and radiculopathy has been previously reported.3,4 The association with a fracture of the pars interarticularis is very uncommon. We report the cases of 3 young patients with an epidural hematoma at the same level as a pars fracture, 2 of whom presented with radiculopathy.

Case Reports

The records of 3 patients treated by the authors were reviewed to obtain clinical information. Initial and follow-up MR imaging was available in all 3 cases showing the epidural hematomas, as well as CT scans that showed pars defects. These results are summarized below.

Case 1

This 15-year-old athletic male patient was referred for evaluation because of several months of back pain, which had significantly worsened over the month prior to presentation. The low-back pain was moderate in intensity but typically responded to acetaminophen. The pain had begun to radiate into his right lower thigh during the 2 weeks prior to presentation. There was no involvement of his left lower extremity. The patient denied any bowel or bladder symptoms and also denied any limb or general weakness, sensory changes (apart from pain), fever, malaise, or other systemic symptoms.

Notably, the patient was a very active male. He regularly played basketball and football in the past, but in the year prior to presentation, he was most often an active baseball player and had played the catcher position in > 100 games.

The patient had an unremarkable general examination on clinical evaluation. He did not have an unusual amount of posterior spine tenderness. He demonstrated normal strength, sensation, and reflexes in both lower extremities.

Because of the patient’s history of worsening low-back pain and more recent pain that radiated into the leg, he was referred for MR imaging (Fig. 1). These imaging results revealed the presence of a right-sided epidural collection at the L3–4 level. This collection appeared mildly hyperintense with peripheral enhancement on T1-weighted images and bright on T2-weighted images, suggesting that this was a late subacute or early chronic hematoma. A CT scan showed the presence of bilateral L3 and L-5 pars defects (Fig. 2). A nuclear bone scan confirmed the presence of high uptake of radionuclide tracer in the posterior elements bilaterally at L-3 and L-4, especially on the right.
Symptomatic epidural hematoma and lumbar spondylolysis

**Fig. 1.** Case 1. Sagittal (top row) and axial (bottom row) T2-weighted (A and B), T1-weighted (C and D), and Gd-enhanced T1-weighted (E and F) MR images showing a bright (on T2-weighted), mildly enhancing isodense (on T1-weighted) lesion at the L3–4 level consistent with a subacute epidural hematoma.

**Fig. 2.** Case 1. Axial (A and B), coronal (C), and sagittal (D) lumbar CT scans showing L-3 and L-5 pars fractures.
side. This high uptake indicated that the L-3 defects were new with a stress response at L-4 and an old mature defect at L-5. Laboratory results were unremarkable with a normal peripheral white blood cell count and an erythrocyte sedimentation rate of 2 mm/hr.

On the basis of the patient’s clinical presentation and examination, as well as his imaging and laboratory studies, it was believed that he had an epidural hematoma. Because pain was the patient’s only symptom, and because he had a normal neurological examination, the decision was made to treat him conservatively. He was placed in a thoracolumbosacral orthosis and restricted from participating in sports.

Seven weeks later, the patient reported no more back pain and no additional symptoms. A repeat MR image showed that his epidural collection had completely resolved (Fig. 3). A bone density scan demonstrated age-matched osteopenia. An endocrinological evaluation was pursued, and he was treated with calcium and vitamin D supplementation. The patient was placed on a physical therapy program for anti-lordotic strengthening, maintained in the brace for another month, and gradually was allowed to return to sports participation.

Case 2

The second patient was examined a few months after Case 1 and was referred to us for a second opinion prior to planned surgery. This patient was an 18-year-old male ice hockey player who had experienced low-back pain for 2 years prior to examination. The low-back pain had worsened just before presentation, with the onset of numbness down the right leg. He had no other symptoms, and both his back pain and right-leg numbness improved with cessation of physical activity.

The patient presented as a large well-developed young man on examination. He had normal strength but his neurological examination was notable for a mild decrease in his right ankle jerk reflex and relative numbness to light touch and pinprick in the right L-4 area.

An MR image that had been obtained prior to his visit to our clinic had revealed a lesion that was principally isointense on T1-weighted MR imaging and bright on T2-weighted imaging in the epidural space at the L3–4 level (Fig. 4). This lesion was originally believed to be a synovial cyst, for which surgery was planned by the referring physician. A second MR image was obtained and it was found that the epidural lesion was no longer visible (Fig. 5). Given the similar history to Case 1, we obtained a CT scan of the lumbar spine to rule out associated bone abnormalities (Fig. 6); this CT scan demonstrated bilateral pars defects of L-4 and L-5 and mild L-5 to S-1 spondylolisthesis of unclear age.

He was thus considered to have had a small epidural hematoma (subacute in appearance on the first MR image) associated with bilateral L-4 and L-5 pars fractures. Given the resolution of his epidural lesion on MR imaging (likely a hematoma), the patient was treated with a back brace and

Fig. 3. Case 1. Sagittal (A) and axial (B) T2-weighted and sagittal T1-weighted (C) MR images show resolution of the epidural hematoma after 7 weeks.
physical therapy. His radicular symptoms resolved over the course of 3 weeks, and his back pain resolved over 1.5 months.

Case 3

This patient was a 35-year-old active male who experienced the onset of back tightness the morning after playing soccer. He started to play again on that day and suffered the onset of severe (“7 to 8 out of 10”) left-sided back pain while taking a soccer shot. Over the next several days, the pain was worse during movement, especially with bearing weight on his left side and during extension. Extension caused sharp pain, and flexion caused some “stretching discomfort.” He denied any leg weakness or pain but did experience some transient numbness and tingling in both feet.

His neurological examination was normal. An MR image, obtained 1 month after symptoms developed, showed an epidural collection dorsolateral to the thecal sac at L2–3 and eccentric to the left, causing mild thecal sac compression (Fig. 7). This epidural collection was bright on both T1- and T2-weighted MR imaging sequences and did not enhance with gadolinium administration and, thus, had the imaging characteristics of subacute blood consistent with the onset of his symptoms. A CT scan of his lumbar spine revealed bilateral pars defects (Fig. 8) but no spondylolisthesis.

The patient’s symptoms had been improving, and as such, he was treated conservatively. A follow-up MR im-

Fig. 4. Case 2. Sagittal (A) and axial (B) T2-weighted, and T1-weighted sagittal (C) and axial (D) MR images show a bright (on T2-weighted), isointense (on T1-weighted) epidural hematoma at L3–4.

Fig. 5. Case 2. Follow-up T2-weighted sagittal (A) and axial (B) MR images 3 months after initial presentation show resolution of the hematoma.
Fig. 6. Case 2. Axial (A–C), coronal (D), and sagittal (E) CT scans show bilateral pars fractures.

Fig. 7. Case 3. Sagittal (A) and axial (B) T2-weighted, and T1-weighted axial (C) MR images obtained 1 month after symptoms developed show a hyperintense epidural collection dorsolateral to the thecal sac at L2–3.
age 3 months after his initial examination showed resolution of his hematoma (Fig. 9).

Discussion

Spondylolysis (or defects of the pars interarticularis of the vertebral arch) reportedly occurs with a frequency of 3 to 8% in the Caucasian population.\(^2,10,11\) This condition appears to be less common in females and African-Americans but is reported with a much higher frequency in the Inuit population.\(^9\) As much as 47% of the adolescent patients presenting to a sports clinic with low-back pain showed spondylolysis in one study,\(^6\) compared with 5% of adults with low-back pain; however, in another study,\(^10\) evaluation of >3000 active athletes, regardless of symptoms, revealed an overall incidence of spondylolysis no different from that in the general population, unless specific sports (such as those involving throwing, rowing, and gymnastics) were examined separately. Spondylolysis in athletic adolescents may represent a somewhat different entity than the asymptomatic cases detected in early childhood. It is during the adolescent growth spurt that there is a natural increase in lordosis,\(^1\) and it is during this growth period that athletes may participate in sports that emphasize extension and rotation. This combination may amplify traumatic stress to the posterior arch.

The majority of spondylitic defects occur at L-5 (85–95%) followed by those that occur at L-4 (5–15%).\(^11\) Involvement of higher lumbar levels is exceedingly rare. Several large studies\(^2,10\) report no cases of L-3 involvement specifically, and in Stewart’s study\(^12\) of Alaskan natives, L-3 spondylolysis alone accounted for <2% of all cases in that high-risk population. It is also unusual for multiple levels to be involved.\(^2,9,10,12\) Most cases are bilateral, although the incidence of unilateral cases increases when asymptomatic subjects are included in the evaluation.\(^10\) In 1980, Ravichandran\(^8\) estimated that 1.5% of the patients in a back pain clinic showed multiple level involvement, although Stewart\(^12\) reported rates as high as 5.6% in Alaskan skeletons regardless of the cause of death. Associated spondylolisthesis can be present at the time of diagnosis >50% of the time, but is usually less than a 30% vertebral slip, and tends not to progress to a significant extent.\(^2,9\)

Most cases of spondylolysis are asymptomatic, especially in the absence of a vertebral slip. Symptomatic patients typically present with low-back pain that may radiate to the buttocks. Radicular pain may result from foraminal nerve root entrapment in spondylolysis, typically accompanying a slip or a disc herniation.

The association of an epidural hematoma with a pars defect is very unusual. Nagata and colleagues\(^7\) reported the case of a 17-year-old male rugby player who presented with radicular pain in his left lower extremity and whose initial plain radiographs showed spondylolysis of the third lumbar vertebra. Worsening pain despite conservative treatment led to an MR image that showed an epidural mass of unclear origin. During surgical exploration, this mass was found to be a chronic epidural hematoma.

To our knowledge, these are only the second, third, and fourth cases in the literature of a symptomatic hematoma adjacent to a pars defect and the only cases for which the diagnosis was established without surgery. These cases were also unusual because of the spondylolyses at multiple levels in 2 of the cases and the involvement of the L-3 vertebra in 2 cases (rather than the more common involvement of L-4 and L-5). It is also unusual to have radiculopathy in the absence of spondylolisthesis or disc herniation.

A normal neurological examination, erythrocyte sedimentation rate, and MR imaging appearance strongly suggestive of a hematoma rather than an infection or neoplasm, led to the decision for nonsurgical treatment in all patients. All patients were treated successfully with limitation of physical activity and the use of a back brace in slight extension until the back and radicular pain had resolved, after which the patients successfully had their activity levels advanced and brace use scaled back. The disappearance of the mass in each patient at the time of the repeat MR image, as well as the resolution of symptoms, supported the decision to not intervene surgically. This lesion course is consistent with the spontaneous resolution of epidural hematomas associated with disc herniations.\(^3\)
Conclusion

This report describes the clinical and imaging findings in 3 cases of an epidural hematoma associated with spondylolysis. All cases resolved without surgery and without neurological deficit. This diagnostic possibility should be considered in the young active patient who experiences new or increased back and/or leg pain, and it may be reasonable to avoid surgery in such cases in which there is reasonable certainty that the lesion noted on MR imaging is a hematoma and there is no progressive neurological deficit.

References


Address correspondence to: Mark R. Proctor, M.D., Department of Neurosurgery, Children’s Hospital, 300 Longwood Avenue, Boston, Massachusetts 02115. email: mark.proctor@childrens.harvard.edu.