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The Epidural Defect on Myelography: Some Unusual Causes

Keenan L. Carroll, MD

This report describes four cases of epidural defect found on myelography that illustrate some unusual causes of this defect. These include a type I chondrosarcoma, primary hemangioendothelioma, hematoma, and an epidural abscess. Surgery was performed, and all four patients have recovered with little or no remaining neurological deficit.

The epidural defect is the most common defect seen in myelography, and it usually results from metastatic disease, traumatic hematoma, or a herniated disc. However, there may be other, less common causes, such as an acute abscess or hemorrhage. This paper describes four cases which illustrate more unusual etiologies of the epidural defect.

Materials and Methods
These four cases were selected from the year's caseload of myelograms (approximately 500) performed at Henry Ford Hospital. Pantopaque was used for all myelograms. The films were obtained in the frontal and horizontal beam lateral projections, with oblique and decubitus projections when necessary. The puncture was usually performed at the L2-3 or L3-4 interspace. When blocks were suspected, Pantopaque was introduced via a lateral cervical puncture at the C1-2 interspace.

Case Reports
Case 1
A 27-year-old black woman had been in perfect health until she came to the emergency room with a complaint of ill-defined neck pain. She said that the pain began suddenly while she had been skiing two months earlier. She denied trauma.

On examination, minimal neurologic findings suggested a left C6 radiculopathy. All findings were within normal limits except for the initial plain cervical spine x-rays, which suggested a possible destructive process in the left side at C3. Laminograms (Fig. 1) showed frank lytic destruction of the left lateral aspects of C1 through C3. The myelogram showed a smooth persistent epidural defect opposite C2 on the left side (Fig. 2), which appeared at fluoroscopy as though it were a flow defect. CT scan showed a soft tissue mass (Fig. 3) associated with a destructive process in the cervical spine. The lesion extended into the spinal canal on the left.

The differential diagnosis centered around an inflammatory or a neoplastic process. The patient's age, her general good health, and the multiple level involvement all favored an inflammatory condition.

The usual work-up for primary neoplastic and inflammatory conditions all proved to be within normal limits. At surgery, a decompressive laminectomy was performed, and a fleshy mass was removed in toto. According to the pathological report, the lesion was a primary chondrosarcoma, but the histology did not suggest the tissue of origin. It was classified as a well differentiated grade I type of chondrosarcoma.

Case 2
A 7-year-old white boy presented with a history of acute progressive left hemiparesis after an initial complaint of neck pain. He was otherwise healthy and had no contribu-
Carroll

Fig. 1
Case 1: Laminograms

tory or significant past medical history. Because of his age and his activity, trauma was considered a possibility; however, on close questioning, a definite history of trauma could not be elicited. Neurological examination showed only a left hemiparesis with no sensory deficit. Plain x-rays of the neck, skull, thoracic spine, and chest, as well as the blood tests, were all within normal limits. The rest of the patient's neurological examination was also within normal limits. His hemiparesis soon improved without treatment, except for left arm weakness.

A cervical myelogram showed a fairly large epidural defect involving the posterolateral aspect of the subarachnoid space on the left side and extending from the level of T2 to C5. The defect was associated with displacement of the cord to the right. The main differential diagnosis suggested: 1) posttraumatic hematoma likely resulting from trivial trauma that went unnoticed; and 2) in view of the patient's age, leukemic infiltrate or lymphoma. Although other rare entities were also considered, the primary consideration was a hematoma (Fig. 4) because of the negative work-up and the patient's general good health.

At surgery, a large fleshy, vascular mass lesion found outside the dura was totally removed. The pathology report demonstrated the mass to be a primary hemangioendothelioma.

Follow-up myelogram performed approximately three weeks after surgery showed a near normal appearance of the cervical cord. At a second follow-up examination, the area of the tumor appeared normal. The patient is now doing well, and his neurological deficit has completely resolved.

Case 3

A 72-year-old white woman with a known history of diabetes mellitus of adult onset, arteriosclerotic heart disease, and hypertension came to the emergency room with a chief complaint of neck pain and weakness in the right arm and legs. She had been relatively well until a few hours before admission when she felt a sudden pain in the neck that radiated to her occiput, across both shoulders, and down both arms. She then developed weakness in her right arm and leg that spread to the left arm and leg.
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Fig. 2
Case 1: Myelogram

Fig. 3
Case 1: CT scan.

Fig. 4
Case 2: Myelogram
On admission, she had an irregular heart rate of approximately 80/minute with normal blood pressure and a normal general physical examination. Neurological work-up revealed decreased sensation to all modalities up to the level of C5. Her extremities were flaccid with minimal motor function in the left lower leg. She had no vibration sense and complained of some tenderness in the posterior cervical region.

Blood work revealed slightly elevated clotting factors even though the patient was known to be taking anticoagulant drugs. The LDH was 175, SGOT was 14.5. Blood sugar taken randomly was 270 mgm%. EKG showed atrial fibrillation, and chest x-ray showed mild cardiac enlargement.

The initial diagnosis was transverse myelitis at the level of C5. An emergency myelogram done by a lateral cervical puncture to exclude a compressing lesion revealed a long epidural block extending from C3 to C6 (Fig. 5).

At surgery, a large epidural hematoma found at the level of the block was evacuated in toto. Inspection of the dura and thecal canal showed no evidence of abnormal vessels. No specific arterial feeders were identified.

The patient's postoperative course was uneventful, and she has almost totally recovered. Since surgery revealed no definite bleeding points or abnormal vessels, the hematoma was presumed to be spontaneous, possibly secondary to the patient's anticoagulant therapy.

Case 4

A 23-year-old black woman, a known heroin addict, presented to the emergency room with quadriplegia. The condition began five days before admission with slowly progressive weakness that began in her left lower leg and progressed to total paralysis over a five-day period.

On admission, she was totally quadriplegic with complete loss of sensation and bladder and bowel control. She complained of neck pain, and the examination revealed tenderness in the neck. The history indicated that the patient had been injecting herself in the neck. Plain x-rays of the cervical spine showed soft tissue fullness in the prevertebral soft tissue space and suggested an abscess at the injection sites. The bones of the cervical spine at that time showed no evidence of osteomyelitis or ongoing infection (Fig. 6).

An emergency myelogram via cisternal puncture was performed, and approximately 6cc of Pantopaque were instilled into the thecal canal. The films showed a complete block due to an epidural lesion beginning at the level of C3 (Fig. 7). The lower limits of the block were not elucidated.

An emergency decompressive laminectomy was performed, and a large epidural abscess was found that extended from the level of the block at C3 down to the level of T1. Cultures of the abscess grew Staphylococcus aureus.
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A follow-up myelogram in the immediate postoperative period showed no evidence of block in the cervical region. By the first follow-up, the patient had begun to regain the use of her upper extremities. By the time of this writing, the patient had regained complete use of her arms, and sensation had returned to her legs.

Discussion

These cases represent some uncommon causes of epidural defects seen at Henry Ford Hospital over the past year. Although the epidural defect is the most common myelographic defect, it should be reported with the degree of differential diagnosis one would use to report intradural or intramedullary myelographic defects. This is especially true if there is no clinical correlation or the findings are atypical.

Although primary neoplasms of the epidural space are known to occur, they are considered rather rare. The first two cases presented here of chondrosarcoma and hemangioendothelioma only stress this point.

Hemangioendothelioma is a decidedly rare soft tissue tumor (1,2). A literature search failed to show any reported cases of hemangioendothelioma arising in the epidural space. The primary chondrosarcoma represents another rare primary tumor. In our patients, it was a type I chondrosarcoma, which is considered a low grade, well-differentiated tumor with a relatively good prognosis. Chondrosarcomas represent less than 10% of all primary malignant bone tumors and are even rarer when they are primary in the spine (3). According to Torma in his paper on malignant bone tumors of the spine, chondrosarcoma accounted for only slightly over 5% of approximately 250 verified tumors. Their most common site of occurrence is thought to be the thoracic spine. A literature search revealed only four reported cases of chondrosarcoma arising as primary in the cervical spine (4).

One interesting feature demonstrated by these two primary neoplasms is that the degree of neurological deficit is usually rather minimal. This reflects the slow growth of the tumor mass and the ability of the spinal cord and nervous tissue to accommodate the slowly expanding lesions. Another interesting finding is that both patients regained full function of the involved extremities after their tumors had been removed and showed no evidence of residual neurological deficit. This confirms the general consensus that if these slow growing, primary neoplasms are totally removed, prognosis for full recovery of neurologic function is considered very good. Chondrosarcoma type I carries a very good prognosis with about a 75% ten-year survival rate. The hemangioendothelioma, on the other hand, is not a very well known tumor. Because there are no histological signs to suggest benignity or malignancy, the prognosis for hemangioendothelioma is always guarded. According to some pathologists, the natural history is that of either a totally benign neoplasm or a relatively aggressive malignant tumor.

The acute epidural hematoma and acute epidural abscess of Cases 4 and 5, respectively, have similar clinical presentations (5,6) and classically demonstrate these findings. Reports in the literature (5-7) all stress that early recognition of these two entities is paramount for good clinical results. The spontaneous epidural hematoma is considered exceedingly rare and most commonly thought to result from a vascular malformation (6). It has been reported in patients on aspirin or anticoagulant therapy and also sometimes following spinal anesthesia. The clinical pattern is fairly characteristic, usually starting with acute back pain or, in the case of cervical epidural hemorrhages, acute neck pain. These symptoms are then usually followed almost immediately by some degree of paresis that progresses fairly rapidly to paralysis. The most common location for spontaneous epidural hemorrhage is in the thoracic spine. Our case is one of cervical epidural hemorrhage which, in itself, is not very common and accounts for only 25% of all spontaneous epidural hemorrhages (7).
Acute epidural abscess is also an important entity. In most cases, it is suspected because a clinical history of some antecedent cause, such as septicemia or surgical intervention in the region of the epidural space, leads the clinician to suspect an abscess. The cervical region is considered an uncommon region for acute epidural abscess, as suggested by Dandy in 1926. However, over the past year at our institution we have seen three cases in heroin addicts. On the basis of follow-up examinations of these patients, it is thought that the abscesses are due either to direct extension from soft tissue abscesses secondary to infection at injection sites in the neck or secondary to osteomyelitis of the cervical vertebrae that again occurs secondary to abscesses developing in the soft neck tissues.

When acute, spinal epidural abscess and epidural hemorrhage are acute surgical emergencies, and their early recognition is essential to insure good recovery of the patient's neurologic functions. The general consensus from the literature is that these entities must be recognized and treated within five days of their onset to insure some degree of neurologic recovery. Treatment that occurred more than five days after the onset of the neurologic symptoms met with poor clinical results or no recovery at all. This natural history is almost the opposite of that shown in cases of primary neoplasm arising in the epidural space in which the degree of neurologic deficit is rather minimal and usually reverts to normal quite soon after the primary tumor has been removed. Pathologic analysis of spinal cords of patients who died after acute epidural abscess or hemorrhage has shown that although the lesion is seen within the epidural space, there is evidence of acute pressure phenomenon in the cord due mainly to vascular occlusions. Hence, the neurological deficit is usually permanent if the pressure is not relieved before the ischemic process becomes irreversible in the spinal cord.

**Conclusion**

This paper has described several rare causes of epidural defects, some of which occur more frequently than others. We may never again see a hemangioendothelioma because of its rarity, but acute abscess or hemorrhage will probably be seen again. These are acute surgical emergencies that can be cured if treated properly.

Because the epidural defect is so common, radiologists may tend to stereotype them. We want to stress that if there is anything unusual about the defect or if the clinical findings do not agree with the radiographic films, the radiologist should be alert for other, less common causes. If a full differential diagnosis is provided, one may diagnose an acute hemorrhage in time to avert permanent neurologic damage to the patient.

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**References**