Diagnosis and Treatment of a Lumbar Extradural Arteriovenous Malformation

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Arteriovenous malformations (AVMs) are the most common spinal vascular anomaly. The majority are intradural and are supplied by the spinal arteries. This paper presents an unusual AVM that was fed by the lumbar arteries and was located totally in the extradural space; in fact, its drainage enlarged the internal vertebral venous plexus, resulting in its clinical presentation as a right lumbar radiculopathy.

Case Report

Over a period of several years, a 27-year-old man experienced progressively increasing back pain that radiated to the posterior aspect of his right leg. Physical findings included a positive right straight-leg raising reflex and a decreased right patellar reflex. It was noted that the leg pain increased in severity with the Valsalva maneuver. All laboratory values were normal.

Radiographs of the lumbar spine showed bony erosion of the posteriorinferior aspect of the L4 vertebral body. CT of the lumbar spine without contrast administration revealed a soft-tissue mass in the right L4 paravertebral region. This mass extended through the intervertebral foramen, resulting in the bony erosion and obliteration of the epidural fat (Fig. 1). A metrizamide myelogram showed a large right extradural filling defect from L2–L5.

Since the clinical, physical, and radiologic examinations led to a working diagnosis of plexiform neurofibroma, surgical removal via a total L2–L4 laminectomy was undertaken. Abnormal arterIALIZED, dilated, and tortuous vessels were found; the incision was then closed to allow for further radiologic evaluation.

A midstream abdominal aortogram showed the lesion to be an AVM fed by a large L4 lumbar artery and a smaller L3 artery (Fig. 2A). The lesion was located predominately in the paravertebral region and drained via the radicular vein into the internal vertebral venous plexus. These draining veins account for the intraforaminal and epidural masses seen at myelography and CT.

Selective catheterization of the L4 lumbar artery was done next for embolization (Fig. 2B). Due to the size of this feeding artery and resultant high-speed flow, a large (8-mm) Gianturco coil was required for initial hemostasis. A repeat selective injection was done after insertion of five additional coils in the following order: 8-mm, 8-mm, 5-mm, 5-mm, 5-mm; minimal residual flow through the lesion was evident (Fig. 2C). Complete occlusion was then achieved by inserting a final 5-mm coil; this was confirmed by a test selective injection, since a direct-pressure injection at this point could have resulted in peripheral emboli as fragments of fresh blood clot formed by retrograde thrombosis of the arterial segment proximal to the coils could be dislodged into the aorta. The catheter was quickly withdrawn and a repeat midstream aortic injection showed no further L4 flow (Fig. 2D). This embolization resulted in complete relief of the patient’s leg pain.

Despite successful L4 arterial occlusion, it was felt that further surgery was required to ligate the right internal vertebral venous plexus, as these dilated veins occupied much interspinous space volume, could be filled by unknown sources of inflow, and might exert masslike pressure. It was next determined that occlusion of the L3 artery would be more readily accomplished surgically, although it was agreed that embolization could also have been done. Surgery proceeded without incident, and the postoperative course was excellent. Follow-up epidural venography using digital subtraction technique confirmed a totally occluded right internal vertebral venous plexus; the aortic phase showed no recurrence.

Discussion

Most authors have classified spinal AVMs as intradural (i.e., intramedullary, extramedullary), extradural, or vertebral [1]. Recent experience has more clearly determined that malfor-
mations with nidus in the extradural space and draining veins to the intradural region (mainly via the coronal plexus) are the most common spinal AVM [1–3]. Malformations with all components in the paravertebral and/or extradural space have been described, mostly in the cervical region [4, 5]. This case is, to our knowledge, the second reported lumbar extradural AVM, but the first to have been treated by catheter embolization and surgery. The first reported case was illustrated without clinical details [6].

The prime differential diagnostic consideration is a neoplasm, such as plexiform neurofibroma, meningioma, teratoma, or lymphoma. Theoretically, other vascular lesions (e.g., arteriovenous fistula) might cause a similar picture. Finally, a combined tumor and vascular lesion (e.g., neurofibroma associated with AVM) might occur [4].

Surgical removal of a spinal AVM is known to be difficult. The advent of angiographic occlusion via embolization has simplified treatment of these lesions, and successful results combining embolization and surgery have been reported [3, 7, 8].

Embolization technique is somewhat variable, depending on the lesion's size and location and also on the exact embolizing agent used. We chose not to introduce an agent with small particles (e.g., Gelfoam, Silastic spheres, Ivalon sponge, etc.) because of the risk of pulmonary embolus. Although Gianturco coils were successful in this case, a detachable balloon technique could also have been used [8].

REFERENCES