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Calcified Hemangioma of the Spinal Canal: Unusual CT and MR Presentation

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With the advent of high-resolution CT, criteria for the diagnosis of intraspinal hemangiomas have been established. These consist of the presence of intracanalicular soft-tissue masses of mild to moderately hyperdense attenuation with variable degrees of contrast enhancement, primarily in association with vertebral hemangioma [1–6]. The presence of calcification in the intraspinal soft-tissue component has not to our knowledge been reported. We report a symptomatic intraspinal hemangioma with marked soft-tissue calcification causing cord compression. Whenever a calcified intraspinal extradural soft-tissue mass is encountered on CT the differential diagnosis of hemangioma should be included as an alternative to a calcified extradural meningioma since the former is a hypervascular lesion prone to massive, uncontrollable bleeding during surgery [7]. This case is also of interest as it represents the first demonstration of intraspinal hemangioma by MR imaging.

Case Report

A 57-year-old woman was admitted with a 2-month history of progressive difficulty in walking and bilateral lower extremity numbness with gradual spread into the chest, more recently accompanied by worsening upper back pain. There was no history of trauma. Physical examination revealed spastic paraparesis and increased deep-tendon reflexes in the lower extremities with clonus. Sensory examination localized the lesion at the T5 level. The frontal plain film of the thoracic spine (Fig. 1) revealed multiple linear calcific densities projected over the upper aspect of the T5 vertebra with indistinct pedicles. No abnormalities were identified on the lateral plain film.

A multiplanar T1-weighted MR study of the thoracic spine performed on a 0.3-T system disclosed a posterior extradural mass compressing the cord extending from mid T4 to low T5 (Fig. 2). Thoracic myelography with water-soluble contrast material (iohexol) revealed a complete epidural block at the low T5 level (Fig. 3). Subsequent CT confirmed a posterior epidural mass at the level of the T5 posterior arch causing marked cord compression anteriorly. Calcifications of various types were seen within the soft-tissue mass, which seemed at one point to be closely related to an expanded right T5 lamina (Fig. 4). Coarse trabeculations were identified within the right transverse process and lamina of T5.

After myelography there was rapid deterioration in the patient's neurologic status, necessitating immediate decompressive laminectomy. Spinal angiography could therefore not be done. At surgery, the right lamina of T5 was easily identified as abnormal; it was expanded and, with probing, was found to be of spongy and porous consistency. The T4, T5, and T6 laminae were removed in multiple fragments and a bluish-red vascular soft-tissue mass was exposed posteriorly. Although there was some adherence of the intraspinal mass to the laminae, it was easily detachable from the dura. Profuse bleeding was encountered, making resection more difficult and requiring transfusion of 4 units of blood intraoperatively. Hemostasis was accomplished by cauterization. The postoperative course was uneventful and there was dramatic improvement in the patient's neurologic status with renewed ability to ambulate.

Histologic examination of the operative specimen, which included laminae as well as soft-tissue masses, showed an abundance of endothelialized thin-walled vessels of particularly large caliber containing erythrocytes that were sinusoid in appearance (Fig. 5). There were also areas of old hemorrhage. The histopathologic diagnosis was consistent with intraosseous as well as epidural hemangioma of mixed cavernous and capillary type.

Discussion

Spinal hemangiomas are benign vascular neoplasms that most commonly occur in the mid-thoracic spine [8, 9] and that usually involve the vertebral body; less frequently they extend into the neural arch [4, 10]. Judging from autopsy series [8], the reported relatively high frequency of asymptomatic vertebral hemangiomas is 10.7%, which stands in sharp contrast to the low frequency of symptomatic cases (0.9%) [11]. Any of four mechanisms can cause neurologic symptoms: pathologic fracture with posterior displacement of bone fragments; hematoma; bony expansion or "ballooning"; or epidural extension of tumor [7, 12].

The classical radiographic description of vertebral body hemangioma is the so-called "corduroy cloth" appearance caused by coarsened, vertically oriented trabeculae with enlarged intertrabecular spaces filled with hemangioma. Less commonly, any part of the neural arch can be involved, sometimes with local expansion of bone [7, 13, 14]. The CT

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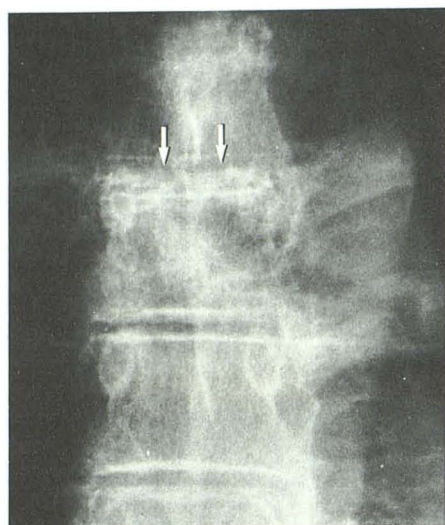
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Fig. 1.—Anteroposterior plain film of thoracic spine displaying periosteal reaction of T5 lamina. Note spicular bony changes and small curvilinear calcifications projected over superior aspect of T5 (*arrows*).

Fig. 2.—Sagittal MR scan (SE 610/28) of thoracic spine demonstrating biconvex posterior epidural mass (*arrow*) isointense to compressed spinal cord. Focal areas of signal void within mass are consistent with calcifications. No abnormalities were identified within vertebral bodies or posterior elements (axial scan not shown).

A
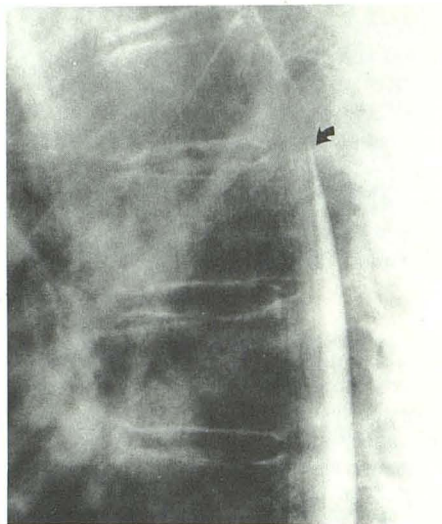
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Fig. 3.—*A* and *B*, Frontal and lateral radiographs from thoracic myelogram. There is complete block at inferior aspect of T5 (*curved arrows*) by a posterior epidural mass. Spicular bony projections at high T5 (*straight arrows* in *A*).

equivalent of these osseous findings has been well demonstrated. In cases of hemangioma, intraspinal epidural soft-tissue mass has been described as showing mild to moderate hyperdensity and contrast enhancement, usually associated with displacement of the dural tube [1–6, 9].

To our knowledge, calcifications have not been a feature of intraspinal hemangioma in the radiology literature. Elsewhere in the body, skeletal muscle and deep soft tissues are relatively common sites for finding hemangioma with calcifications. Such calcifications could be of three types, the most common being the phlebolith, with a frequency of 49%. Less often, one encounters the two other types of calcification—amorphous and curvilinear or metaplastic ossification [11, 15]. The patient in this case presented with amorphous and curvilinear calcifications.

The unusual finding of heavy calcifications widened the differential diagnostic possibilities to include thoracic meningioma, since the thorax is a well-known predilection site in

middle-aged women. Meningioma is the most common spinal tumor to calcify; it is visible on plain film in 4% of cases [16, 17], increasing to 10% when conventional tomography is used [18]. Intraspinal meningioma occurs more often in women, in a ratio of 5:1, and its peak occurrence is in the fourth to sixth decades. Eighty to ninety percent of these tumors are found in the thoracic spine, usually in the dorsolateral position [19]. While extradural meningioma occurs only in 10% of cases [20], the facts of the present case strongly supported a diagnosis of an atypical presentation of a common intraspinal tumor. However, the conspicuous finding of laminar expansion is not associated with intraspinal meningioma; only rarely, in 10% of cases, will meningioma of the spine result in erosive changes, usually with no alteration of or reaction in bone [19, 20].

Intraosseous hemangioma, when occurring in the laminae, can cause ballooning with or without soft-tissue extension into the canal [7, 12], which is what led us to the diagnosis
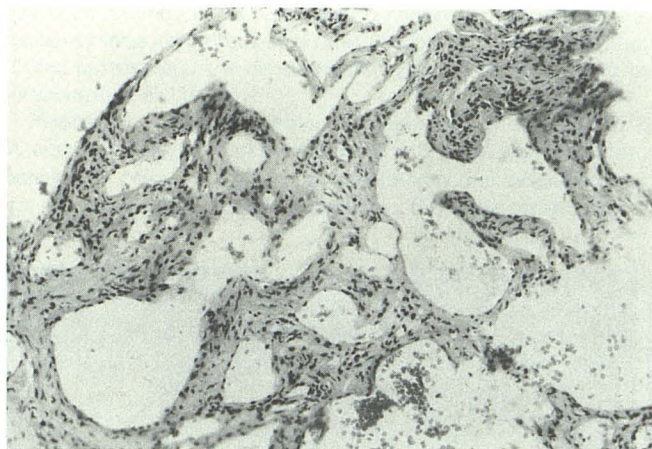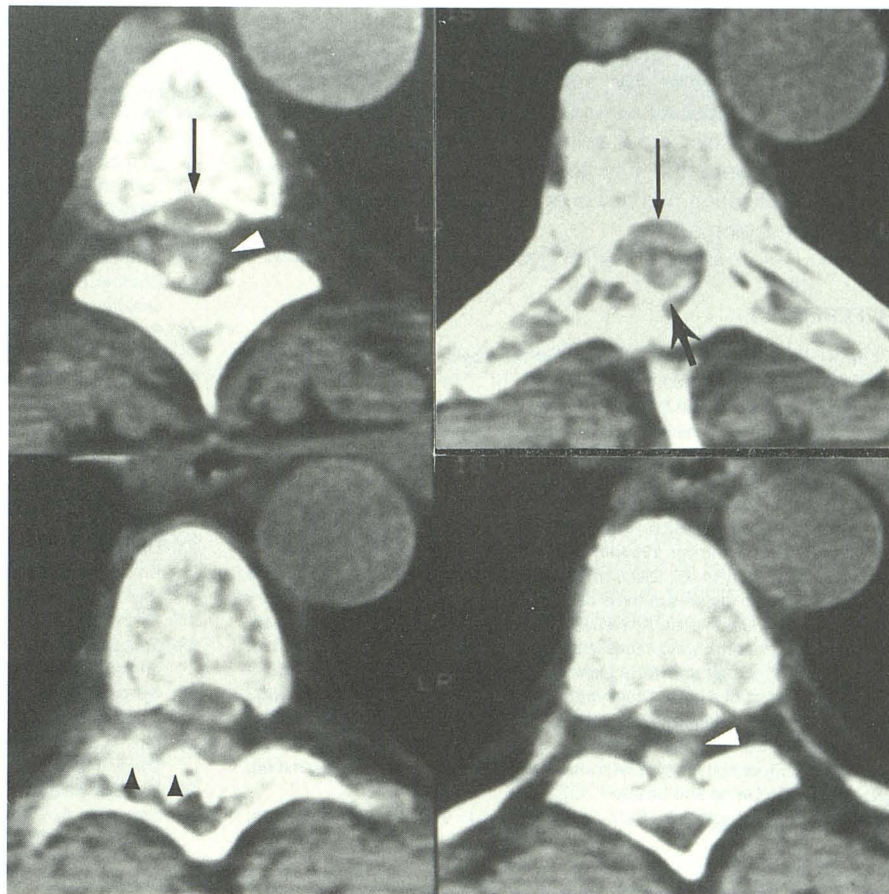
Fig. 5.—Histologic section of intraspinal cavernous hemangioma. There are dilated, thin-walled vascular spaces with a single layer of endothelium. (H & E ×200)

of hemangioma. Of interest is the fact that the plain-film findings were limited to prominent periosteal reaction, which can be seen with hemangioma [11], while more characteristic findings of this entity were not demonstrated on plain radiographs.

Primary bone neoplasms arising from lamina—such as giant cell tumor, aneurysmal bone cyst, and osteoblastoma—would cause expansion of lamina, but when the cortex is well preserved one would not expect a large intracanicular soft-tissue mass. Osteochondroma is an unlikely diagnostic possibility, as this lesion possesses a separate cortex that usually merges with the cortex of the affected bone.

Selective spinal arteriography is important if surgical management is contemplated, as preoperative embolization reduces the intraoperative risk of uncontrollable bleeding [21, 22]. The angiographic appearance is specific. Sinuous dilated arterioles arising from the intercostal artery supply the diseased vertebra. There is filling of multiple confluent vascular spaces in the early films followed by intense and homogeneous opacification in the late capillary phase. Opacification beyond the normal cortical limits demonstrates any extravertebral spread of angioma, which would be expected in our case and thereby corroborated the diagnosis of hemangioma [23].

To date no cases of intraspinal hemangioma have been described in the MR literature. The one well-recognized advantage of MR—that is, the clear depiction of intraspinal anatomy by using direct multiplanar acquisitions [24]—was useful in this instance only in that the procedure was noninvasive and easily obtainable. However, the subtle osseous changes of focal laminar expansion could only be demon-

strated with CT, which in general is more accurate for radiographic investigation of bony alterations [25] and in our case was a subtle but important sign to suggest the proper diagnosis. The MR appearance of the intraspinal mass itself was entirely nonspecific. In our opinion the bony radiographic and CT findings were the key to the correct diagnosis, even though calcification had not been a reported feature of intraspinal hemangioma.

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