MR imaging of incisional spinal cord injury.

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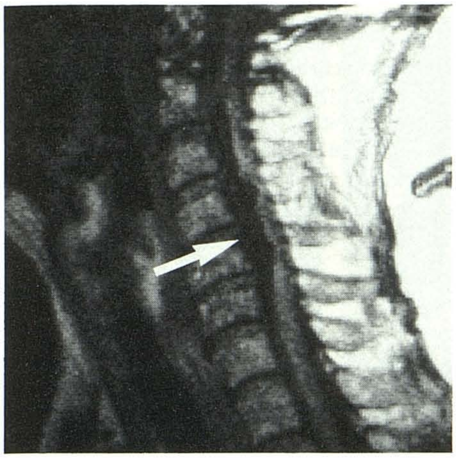

Fig. 1.—Sagittal MR image TE 32, TR 500 of cervical region shows lesion of low signal extending from C2 through C5 (*arrow*).

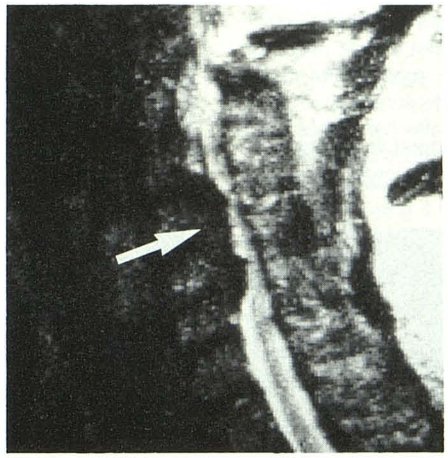

Fig. 2.—Sagittal MR image TE 120, TR 3000 again shows very low signal extending from C2 through C5 on this pulse sequence (*arrow*).

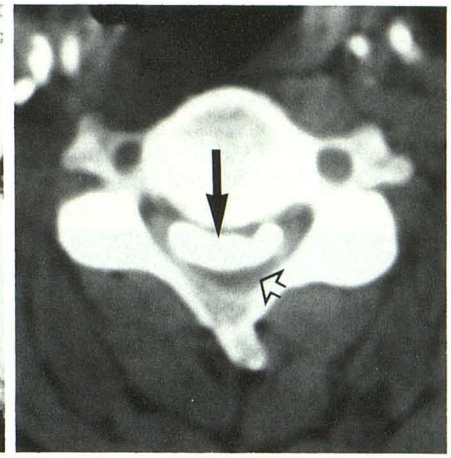

Fig. 3.—Axial CT scan with intrathecal contrast at same level shows extensive ossification (*solid arrow*) and a severely compressed spinal cord (*open arrow*) with narrowing of subarachnoid space.

posterior longitudinal ligament. In almost 19% of patients with OPLL registered in Japan, the upper extremities were disabled so severely that the patients were dependent on others to conduct activities of daily living and 10% were unable to walk [1]. The radiographic, tomographic, and CT appearances of OPLL are well described in the literature [4–6]. The MR appearance of OPLL has not been reported previously. We describe a case of OPLL diagnosed by MR.

Case Report

A 70-year-old white man with DISH had a 4-month history of lower extremity weakness and paresthesias below the waist. Physical examination revealed quadriparesis; decreased vibratory sensation and proprioception in the hands and feet; decreased pin-prick sensation, with a level of approximately C6; 4+ quadriceps reflexes; and upgoing toes bilaterally. Cervical myelopathy was diagnosed, and an MR examination was done. Imaging was performed with a 0.6-T superconductive magnet using spin-echo techniques. The MR examination (Figs. 1 and 2) showed anterior compression of the cervical cord at C2–C5 by an area of very low signal on relatively T1- and T2-weighted sagittal images. The diagnosis of OPLL was made. Radiographs of the cervical spine and CT of the cervical spine with intrathecal contrast (Fig. 3) were confirmatory. Decompressive laminectomy was performed, and OPLL was proven pathologically.

Discussion

The differential diagnosis for structures that are low signal intensity on both T1- and T2-weighted images is rather limited: (1) low proton density, such as areas of calcification; (2) flowing blood or CSF; (3) occasionally, paramagnetic substances, as seen in the liver in hemochromatosis. In this case the differential includes OPLL, a calcified meningioma, and arteriovenous malformation. A meningioma spanning five vertebral levels would be unlikely. Arteriovenous malformations are usually posterior and rarely produce this degree of cord compression. For these reasons, the MR in this case is most consistent with OPLL.

MR is the procedure of choice in evaluating cervical myelopathy at our institution. If a lesion of low signal intensity on both T1- and T2-weighted images is identified anterior to the thecal sac, especially in a patient with a history of DISH, OPLL should be considered. Additionally, MR is invaluable in evaluating the degree of cord compression.

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MR Imaging of Incisional Spinal Cord Injury

Conventional myelography and metrizamide-CT myelography have been used to delineate spinal injury [1–3]. At best, these techniques reveal the outline of the cord and the presence of cord compression. The correlation between the spinal injury seen on CT and clinical neurologic damage is rather poor [4]. MR is an excellent technique for visualizing the spinal cord and cord pathology [5, 6].

We report a case in which MR was used to study a stab wound through the spinal cord. The findings of the initial cord injury and subsequent evolutionary changes and correlation with patient's neurologic status are also made.

Case Report

A 26-year-old man sustained a knife stab wound in the back. He immediately lost motor and sensory function in both lower extremities and collapsed to the ground. He was rushed, with the knife still impaled in this thorax, to a local trauma center. No sign of hematoma or pneumothorax was seen and chest film and barium swallow ruled out esophageal perforation (Fig. 1). Clinical examination revealed total motor and sensory loss below the T2 cord level. An MR study done 2 weeks after the injury showed a bandlike lesion of increased signal

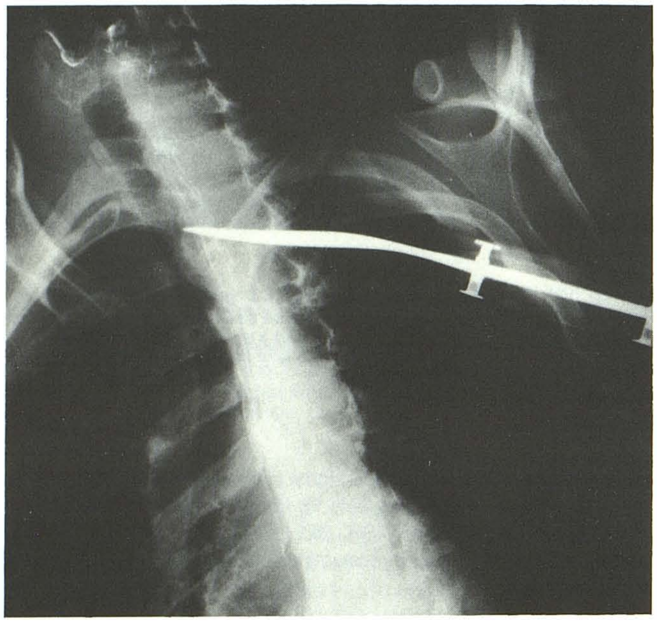
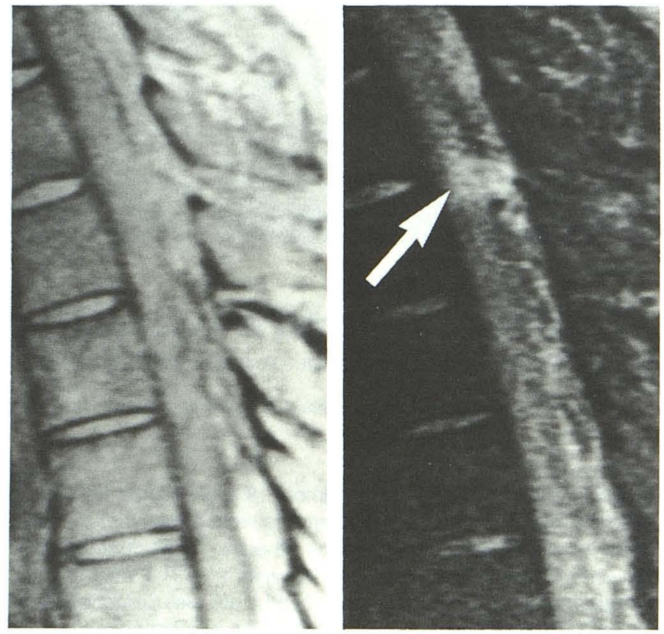
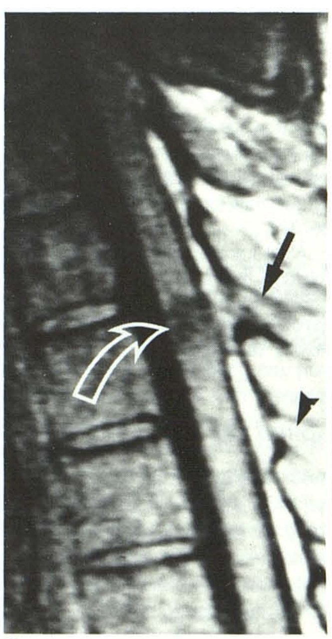


Fig. 1.—Oblique chest film after a barium swallow shows that distal portion of knife blade is in spinal canal. Contrast is seen in esophagus without evidence of extravasation.



A B

Fig. 2.—*A* and *B*, Sagittal SE 20/2000 (*A*) and 80/2000 (*B*) images obtained 2 weeks after injury show increased signal intensity in spinal cord (*arrow*) on T2-weighted image. Its bandlike appearance probably represents path of knife blade through the cord.



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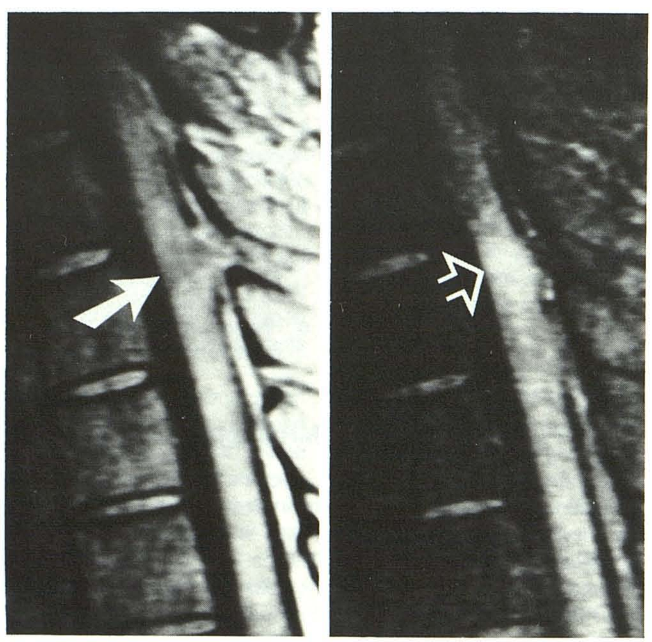

A B

Fig. 3.—Sagittal T1-weighted image (SE 20/800) obtained 3 months after stab wound shows decreased signal intensity within spinal cord at level of original injury (*curved arrow*). Abnormal signal intensity seen in region of interspinous ligament (*black arrow*) probably represents scar tissue replacing the normally observed bright fat signal (*arrowhead*).

Fig. 4.—*A* and *B*, Sagittal SE 20/2000 (*A*) and SE 80/2000 (*B*) images obtained 3 months after trauma. Abnormal decreased signal intensity in cord is seen on the spin-density image (*A*). A larger area of increased signal intensity is seen on the T2-weighted image (Fig. 4B). This probably represents myelomalacia surrounding cystic changes seen on T1-weighted image (Fig. 3) and spin-density image (Fig. 4A).

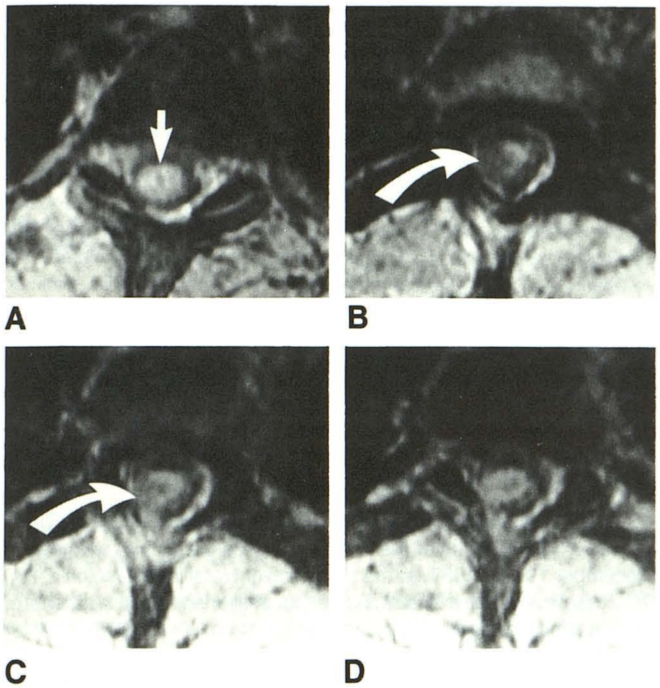

Fig. 5.—1-mm thick axial images obtained by using gradient recalled acquisition in steady state at different levels of upper thoracic cord.

***A*, Normal cord is seen below level of trauma.**

***B* and *C*, Images through lesion show a crescentic area of normal cord signal intensity on left side. Central and right lateral cord regions have a CSF-like signal intensity consistent with cystic changes.**

***D*, Normal-appearing cord with only a small central cystic lesion is noted in superior portion of lesion.**

intensity at the T2–T3 disk level (Fig. 2). No mass effect or hemorrhage was observed. The findings were thought to represent cord edema secondary to the incisional injury.

A repeat MR study performed 3 months later again showed abnormal signal intensity at the T2–T3 level that was thought to represent posttraumatic evolutionary changes of syringomyelia and myelomalacia (Figs. 3 and 4). Axial T1-weighted images at this level revealed a small crescentic area of normal spine cord signal intensity (Fig. 5). The patient's neurologic status was still unchanged.

Discussion

The evaluation of spinal trauma includes plain films, myelography, and CT. Osseous and ligamentous damage can be studied adequately with CT [1–3], but imaging of cord injuries with CT is suboptimal [1]. The prediction of a patient's neurologic damage in acute spinal trauma on the basis of CT is poor [4]. Some trauma centers recommend using metrizamide myelography and metrizamide CT in all patients with spinal trauma [1].

The efficacy of MR in evaluating acute and chronic cord trauma has been shown recently [5, 7, 8]. Moreover, good correlation between MR findings and clinical prognosis has been reported [8]. Acute cord lesions with increased signal on T2-weighted images have been associated with a good prognosis for neurologic recovery and most likely represent traumatic cord edema. Acute cord hemorrhage, however, is recognized as decreased signal on T2-weighted images obtained by using 1.5-T magnets. These lesions reportedly indicate a poor prognosis [8].

In our case, the initial abnormality seen 2 weeks after injury was mild when compared with blunt cord injuries, which appear more extensive in terms of MR-detected cord edema without or with neurologic impairment [8, 9]. In this case, however, the initial signal abnormality was minimal, probably because the incised wound caused very little cord hemorrhage and/or edema. The potential for neurologic recovery remained poor, however, because the cord was transected. The MR study done 3 months later confirmed the cord lesion and showed evolutionary changes of cyst formation and myelomalacia within it.

This case report demonstrates that a spinal cord incisional injury can be demonstrated well on MR. The initial lesion may not be as dramatic as that seen with blunt cord injury, but it probably carries a bad prognosis.

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