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A. Alkan
T. Baysal
K. Saraç
A. Sığırcı
R. Kutlu

Early MRI findings in stab wound of the cervical spine: two case reports

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A. Alkan · T. Baysal (✉)
K. Saraç · A. Sığırcı · R. Kutlu
Inonu Universitesi Turgut Ozal
Tıp Merkezi, Radyoloji Anabilim Dalı,
44069 Malatya, Turkey
E-mail: tamerbaysal@hotmail.com
Tel.: +90-422-3410834
Fax: +90-422-3410834

Abstract MR imaging was found to be the most sensitive modality for the detection of spinal cord abnormalities in the acutely injured spine. Although it is reported that traumatic pneumomyelogram indicates a base-of-skull or middle cranial fossa fracture and is almost certainly associated with intracranial subarachnoid air, early MR imaging may demonstrate subarachnoid air in penetrating trauma of the spinal cord without head injury. We report two cervical-spine stab-wound cases, one of which had subarachnoid air on early MR findings.

Keywords Trauma · Cervical spine · Pneumomyelogram · Spinal cord · MR

Introduction

Spinal cord injuries are undoubtedly attended by a high morbidity and mortality rate. All coexisting visceral or vascular injuries as well as any posttraumatic complications could affect the rehabilitation process. The cause of injury was motor vehicle crashes in 30%, stab wounds in 26%, gunshot wounds in 35%, and miscellaneous causes in 9% [1]. Severity of injury was determined to be "complete" if complete paraplegia or quadriplegia resulted along with complete absence of sensation. "Incomplete" injury was defined as the existence of some neurological function, either motor or sensory, at all segmental levels [2, 3].

Most neurological deficits associated with stab wounds to the spinal column occur at the time of the acute injury [4]. We present MR findings of two cases of cervical spine stab wound obtained only hours after injury. One of the cases reported here had traumatic pneumomyelogram (air myelogram) in the spine, a rare complication of stab wound.

Case reports

Case 1

A 24-year-old man had been stabbed with a knife during a fight 3 h previously. On arrival at our institution, the patient was alert and oriented, and had stable vital signs with a BP of 130/80 mmHg and an 82/min-pulse rate. On physical examination, he was found to have a 2–3 mm puncture wound in the back of the neck, 4–5 cm below the hairline. Neurological examination revealed three-fifths motor strength in both upper-extremity distal flexors and extensors and paralysis of both lower extremities. Sensory examination showed total anesthesia caudally from the level of C7. Chest X-ray was within normal limits. Cervical spine radiographs revealed no bone abnormalities. MR imaging of the cervical region revealed edema and hematoma accompanying soft-tissue tract extending from the skin surface to the spinal canal at the C7–T1 level. The tract had low signal intensity on T1- and high signal intensity on T2-weighted images, with thickening of the spinal cord representing spinal cord laceration and edema. Axial T2-weighted images showed the penetration of the spinal cord with the hyperintense tract at the C7–T1 level. Left anterolateral subarachnoid air was also observed (Fig. 1).

Case 2

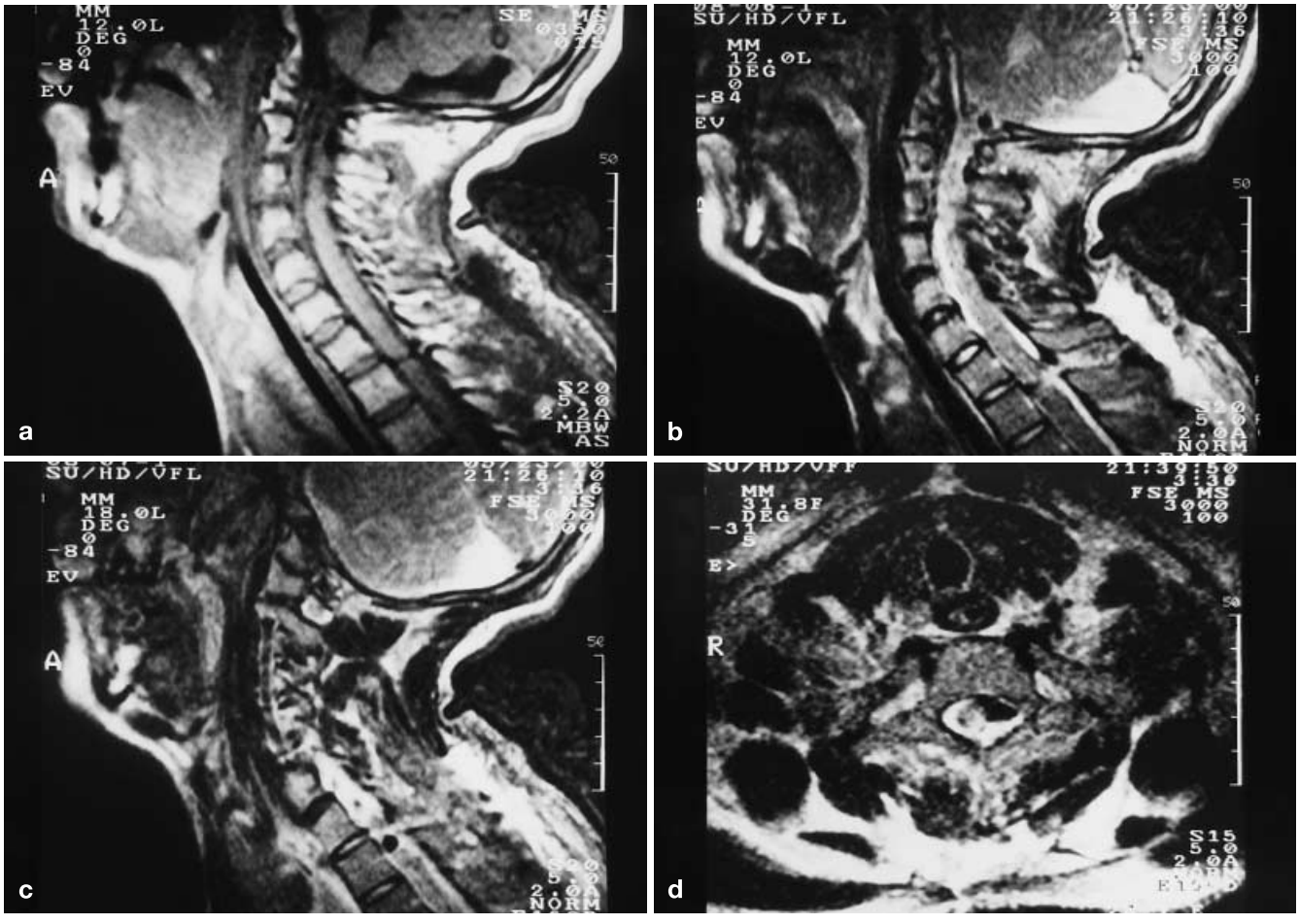
A 29-year-old man was admitted to the emergency room due to a stab wound in the neck 5 h previously. On admission, the patient was alert and oriented and was hemodynamically stable (BP: 130/80 mmHg and an 82/min-pulse rate). On physical examination, he was found to have two stab wound holes and accompanying hematomas in the upper posterior neck. Neurological examination revealed quadriplegia. Sensory examination showed total anesthesia caudally from the level of C4. He had urinary retention. Chest X-ray, radiographs and CT of the cervical region were within normal limits. Sagittal T2-weighted MR images revealed the hyperintense tract of the stab wound penetrating the spinal cord through the posterior bone elements of the cervical spine at the level of C5–C6. The tract had hypointense signal on T1-weighted images. Spinal cord edema and laceration were observed (Fig. 2).

Discussion

Stab wounds to the spinal cord are relatively infrequent. Peacock et al. reported on 450 patients with stab wounds to the spinal cord in 13 years, representing over 25% of the patients admitted with spinal cord injuries. In their series, 63% of the wounds were in the thoracic region, 30% in the cervical region, and 7% in the lumbar region. They reported that approximately 21% of the patients had complete lesions of the cord while 55% had a modified Brown-Séquard syndrome [5].

Although in most of the spinal cord injury cases spinal transmission was reported to have ceased immediately after severe trauma, some delayed traumatic myelopathy cases secondary to retained spinal fragments have also been reported in the literature [4, 6, 7, 8]. Complete X-ray studies should be obtained to rule out the presence of bone injury and retained metallic fragments [4]. In both our cases spinal cord dissection occurred without injury in the posterior vertebral structures, suggesting that the neck was in flexion during assault.

Fig. 1a–d. A 24-year-old man with knife wound to the neck and pneumomyelogram. **a** Sagittal SE T1-weighted MR image shows the hypointense tract of the stab wound at the C7–T1 level and hypointense fluid collection in the subcutaneous tissue of the posterior neck. **b, c** Sagittal FSE T2-weighted MR image reveals soft-tissue tract extending from the skin surface to the spinal canal, representing laceration at the C7–T1 level with spinal cord edema. An anterior pneumomyelogram is also seen adjacent to the tract. **d** Axial FSE T2-weighted MR image shows the left anterolateral pneumomyelogram with posterior cord incomplete laceration



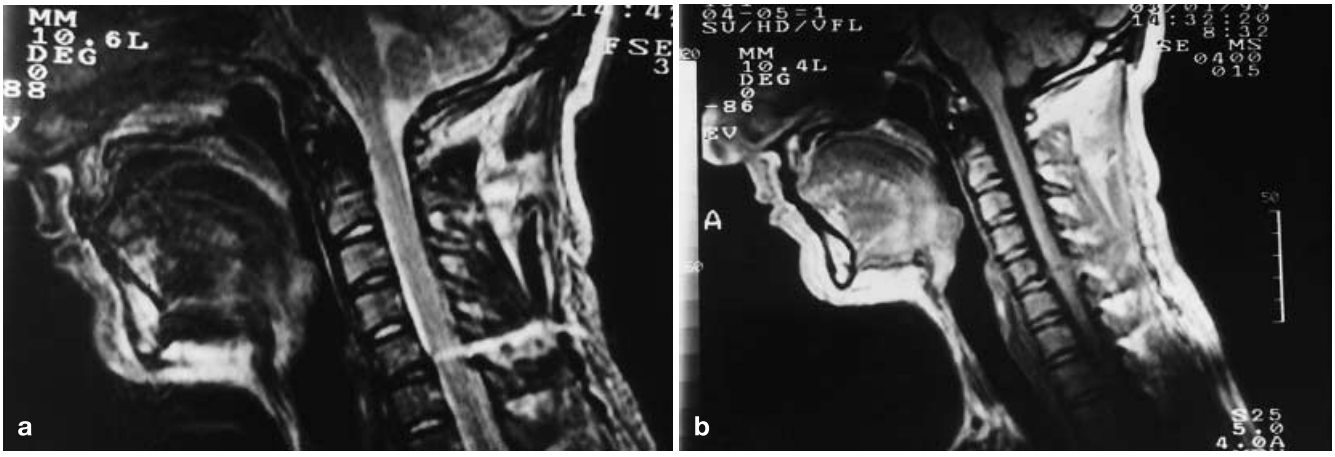


Fig. 2a, b. A 29-year-old man with stab wound to the neck. **a** Sagittal FSE T2-weighted MR image showing the knife-tract entrance and high signal intensity in C5–C6 spinal cord through the posterior bone elements of the cervical spine representing cord laceration and edema. **b** Sagittal SE T1-weighted image shows mild spinal cord thickening and hypointensity representing edema and laceration

It is reported that gunshot injury patients suffer the lowest recovery rate, while stab-injured patients achieve the highest rates in recovery, due to less edema and tissue injury [1]. A close correlation between the location of the abnormality in the spinal cord at MR imaging and the neurological findings was reported [9]. Patient 1 had a more distal injury unaccompanied by proximal muscle-strength loss, while patient 2 had tetraplegia.

Posterior neck stab wounds require a systematic approach for complete evaluation. Chest radiographs can be used to exclude pneumothorax in stab wounds to the lower neck and upper back. Cervical spine radiographs may show some bony abnormalities. CT can reveal bony fragments, disk herniation, foreign bodies, pneumocephalus or hematomas as the source of neurological deficits. MR imaging was found to be the most sensitive modality for the detection of disk protrusions and spinal cord abnormalities in the acutely injured spine [3, 6, 10]. Although it is reported that traumatic pneumomyelogram implies a base-of-skull or middle cranial fossa fracture and is almost certainly associated with intracranial subarachnoid air [11], early MR imaging may demonstrate subarachnoid air in penetrating trauma of the spinal cord without head injury. The extent of injury to the other organs has been regarded as an important factor in influencing the evaluation of early and late prognosis of spinal cord injuries. We also evaluated the patient with subarachnoid air for cranial trauma, but any finding of head injury was observed. This case reveals that traumatic pneumomyelogram in the cervical region may be an isolated finding of spinal cord penetrating injury.

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