

Penetrating Stab Injury of Spine; Diagnostic Value of Thin-Section Multislice Computed Tomography

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Abstract

Penetrating stab injuries of the spinal cord (PSISC) are extremely rare and typically associated with immediate neurological damages. However, some patients may represent with atypical and indistinct symptoms. Herein we report a case of atypical presentation of spinal canal penetration which was not detected in thorax computerized tomography (CT) scans performed in emergency room, but subsequently was revealed in thoracic CT and magnetic resonance imaging (MRI) scans. Initial neurological examination was normal except for the hypoesthesia in the right lower extremity. Surgical treatment was not performed since any foreign body or effusion consistent with hematoma and/or dural leak, or extrinsic cord compression was present. After administering a prophylactic tetanus shot and initiating a broad-spectrum antibiotic prophylaxis, patient was discharged with recommendations. On follow-up, he described that hypoesthesia was decreased, but still present at end of the first month of injury. To conclude, it is very important to scan the affected region with thin slice thickness-multislice CT or with MRI for proper diagnosis in patients with stab wounds presented with neurological symptoms.

Keywords: Stab injury; Spinal cord; MRI; CT

Introduction

Penetrating injuries of the spinal cord are very rare. Typically missile objects, most commonly gunshot wounds, account for more than 99% of the penetrating spinal cord injuries (PSCI). Penetrating stab injuries of the spinal cord (PSISC) are extremely rare; account for less than 1% of spinal cord injuries in USA, but with a more frequent incidence in South Africa. PSCI are typically associated with immediate neurological damages [1-4]. Herein we report a case with a stab wound injury which was detected on thin-section multislice computed tomography.

Case Report

A 45 year old man was referred to the emergency room with a stab wound injury on his back. Although he couldn't remember exactly how it did happen, he stated that he had been involved in a fight after drinking some alcoholic beverages. He was complaining about the numbness in his right leg. On physical examination, a regularly contoured stab wound at a size of 1-2 cm was seen at the thoracic region. On neurological examination, global hypoesthesia was present in the right lower extremity without any motor deficit. Laboratory findings were in normal ranges. Thorax CT with a slice thickness of 8 mm (Siemens Somatom Emotion Duo, Germany) was performed in emergency room and free air in posterior subcutaneous tissue at the level of T6 vertebra was revealed. To explain the sensory deficit, thoracic CT examination was done in Radiology Department with multislice system (Toshiba Aquilion 64, Japan) with a slice thickness of 0.5 mm. A fracture with tiny bone fragments at the T6 level extending from the spinous process to the left lamina (Figure 1a-1c) was seen. Subsequently, MRI examination was performed to evaluate the spinal cord. MRI revealed a linear tract extending from the T6 lamina to the left side of the spinal cord on T2 weighted images which was consistent with penetrating knife injury (Figure 2a and 2b). No foreign body or effusion consistent with hematoma and/or dural leak was detected. Surgical treatment was not performed. After administering a prophylactic tetanus shot and initiating a broad-spectrum antibiotic prophylaxis, patient was discharged with recommendations. On follow-up, patient described that hypoesthesia was decreased, but still present at the end of the first month of injury without any additional neurological deficit.

Discussion

Stab injuries of the spinal cord are relatively rare and represent approximately 1% of spinal cord injuries. Injured patients are usually young male adults and thoracic spine is the most commonly affected region. These injuries may range from a normal appearing cord to complete destruction of cord. Immediate neurological symptoms develop at the acute stage of the injury [2,3]. Most cases with PSCI



Figure 1a: Axial BT image - fracture (thin white arrows) in thoracic vertebra compatible with knife tract extending from spinous process to the left lamina. Small bone fragments (black arrow) and free air (thick white arrows) are also seen. Reformatted coronal BT image.

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Figure 1b: Axial BT image - shows knife tract (black arrows). Three dimensional reconstructed CT scan.

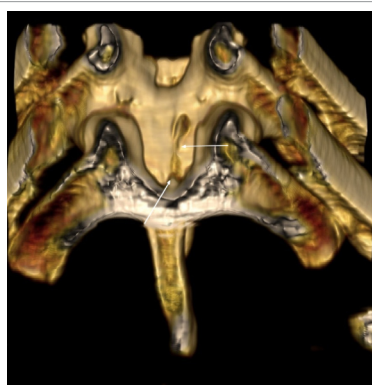


Figure 1c: Axial BT image - shows knife tract (white arrows).

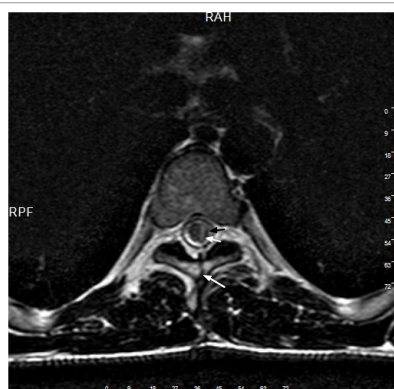


Figure 2a: T2 weighted image - in axial plane shows knife tract extending from spinous process into the spinal cord (white arrows). Note the hyperintense tract signal within the cord. Hypointense knife tract signal is detected on T1 weighted image.



Figure 2b: T2 weighted image - in axial plane.

represent with major neurological deficits or symptoms of Brown-sequard syndrome [5-7].

Physical damage of penetrating weapon to neural tissue, pressure of the displaced bony fragments or hematoma and vascular injuries are the main causes of acute neurological symptoms. Remained fragments, infection, edema, cerebrospinal fluid (CSF) leak, granuloma formation, iron encrustation may lead to delayed symptoms [5]. Although immediate neurological symptoms develop at the acute stage of the injury as usually expected, some patients may present with indistinct symptoms. Likewise, only hypoesthesia of right lower extremity was present in our patient without any motor or additional neurological deficit.

Alcohol frequently complicates the diagnosis of trauma-related injuries, since physicians may underdiagnose especially some indistinct symptoms by attributing them to the alcohol use. The numbness of right leg could also be easily underdiagnosed and could be attributed to alcohol in our patient, but fortunately necessary imaging procedures were performed after detection of hypoesthesia on neurological examination.

Diagnostic imaging plays an important role in the diagnosis and management of patients with penetrating spinal cord injuries. In cases with suspected spinal cord injury due to stabbing, X- rays can be performed as the first step imaging procedure to detect the level of lesion if there is remained stab or stab fragment. However, in cases without any remained stab or stab fragment, radiography will be insensitive.

CT is superior to the plain radiography in detection of spinal fractures [5,8,9]. CT scanning is also recommended to evaluate the bone injury and the knife tract. Besides, bone and nonmissile weapon fragments, hematoma and adjacent organ injury can be detected with CT examination. Faster scanning and improved bony detail of the spine compared with single slice spiral CT are achieved with the generation of multidetector CT [10]. Multislice CT allows a larger anatomical volume to be scanned with thinner collimation in a shorter time while producing images with high spatial resolution. The initial CT examination of thorax with 8 mm slice thickness had been insufficient in revealing the bone fractures consistent with penetrating injury in our case. However, multislice CT of thoracic vertebra with 0.5 mm slice thickness demonstrated the fracture with tiny bone fragments at the T6 level extending from the spinous process to the left lamina. Therefore we assume that it is important to scan the affected region with thin-section multislice computed tomography if symptoms are not explained with other procedures.

MRI is important in identifying the injury tract, cord or root lesions and associated lesions including hematoma, disc herniation and bone fragments [3,5,11] and has a far greater sensitivity than CT. However, metallic fragments may exist around the lesions in most cases with penetrating stab injuries and MRI cannot be performed in such cases. In our case there was no remaining stab or stab fragment, so MRI was performed and successfully demonstrated the penetrating cord lesion.

A broad-spectrum antibiotic prophylaxis and prophylactic tetanus shots are recommended in patients with penetrating spinal cord injuries. The decision of surgical treatment depends on the patient's condition, physical and neurological symptoms. Some authors recommend the exploration of the penetrating injury during the acute stage and closure of any dural tears. In South Africa, where the most of the nonmissile penetrating injuries are reported, remained foreign body, persistent CSF leak, and radiological signs of extrinsic cord compression are the indicators of the surgical intervention [12]. Surgical intervention wasn't considered in our patient since there was no remained foreign body, existing hematoma or CSF leak, or extrinsic cord compression. Patient's complaints were decreased, but still present at the end of the first month.

Conclusion

To conclude, penetrating injuries of the spinal cord are very rare and typically associated with immediate neurological damages. However, some patients may represent with atypical and indistinct symptoms. It is very important to scan the affected region with thin-section multislice computed tomography for proper diagnosis.

References

1. Yılmaz N, Kıymaz N, Mumcu C, Demir I (2009) Penetrating spinal injury: reports of two cases. *Ulus Travma Acil Cerrahi Derg* 15: 91-94.
2. Doğan S, Kocaeli H, Taşkınlioğlu MO, Bekar A (2008) Stab injury of the thoracic spinal cord: case report. *Turk Neurosurg* 18: 298-301.
3. Kamaoui I, Maaroufi M, Benzagmout M, Sqalli Houssaini N, Boujraf S, et al. (2007) MRI findings in spinal cord penetrating injury: three case reports. *J Neuroradiol* 34: 276-279.
4. Saeidiborojeni HR, Moradinazar M, Saeidiborojeni S, Ahmadi A (2013) A survey on spinal cord injuries resulting from stabbings: a case series study of 12 years' experience. *J Inj Violence Res* 5: 70-74.
5. Shahlaie K, Chang DJ, Anderson JT (2006) Nonmissile of the literature penetrating spinal injury. Case report and review. *J Neurosurg Spine* 4: 400-408.
6. McCarron MO, Flynn PA, Pang KA, Hawkins SA (2001) Traumatic Brown-Séquard-plus syndrome. *Arch Neurol* 58: 1470-1472.
7. Leven D, Sadr A, Aibinder WR (2013) Brown-Séquard syndrome after a gun shot wound to the cervical spine: a case report. *Spine J* 13: e1-5.
8. Brown CV, Antevil JL, Sise MJ, Sack DI (2005) Spiral computed tomography for the diagnosis of cervical, thoracic, and lumbar spine fractures: its time has come. *J Trauma* 58: 890-895.
9. Grogan EL, Morris JA, Dittus RS, Moore DE, Poulouse BK, et al. (2005) Cervical spine evaluation in urban trauma centers: lowering institutional costs and complications through helical CT scan. *J Am Coll Surg* 200: 160-165.
10. Li AE, Fishman EK (2003) Cervical spine trauma: evaluation by multidetector CT and three-dimensional volume rendering. *Emerg Radiol* 10: 34-39.
11. Provenzale J (2007) MR imaging of spinal trauma. *Emerg Radiol* 13: 289-297.
12. Gulamhuseinwala N, Terris J (2004) Evolving presentation of spinal canal penetrating injury. *Injury* 35: 948-949.