

## Case Report

# Brown-Sequard syndrome associated with unusual spinal cord injury by a screwdriver stab wound

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**Abstract:** Introduction: Stab wounds resulting in spinal cord injuries are very rare. In direct central back stabbings, the layers of muscles and the spinal column tends to deflect blades, rarely causing injuries to the spinal cord. We report an unusual case of traumatic spinal cord injury by a screwdriver stab, presented as Brown-Séquard syndrome and discuss possible pitfalls on the surgical treatment. Case report: A 34 year-old man was brought to the emergency department after a group assault with a single screwdriver stab wound on the back. Neurological examination revealed an incomplete Brown-Sequard syndrome, with grade IV motor deficit on the left leg and contralateral hemihypoalgesia below T9 level. Radiological evaluation showed a retained 9 cm screwdriver that entered and trespassed the spinal canal at T6 level, reaching the posterior mediastinum with close relation to the thoracic aorta. Vascular injury could not be excluded. The joint decision between the neurosurgery and the vascular surgery teams was the surgical removal of the screwdriver under direct visualization. A left mini-thoracotomy was performed. Simultaneously, a careful dissection was done and screwdriver was firmly pulled back on the opposite path of entry under direct visualization of the aorta. The neurological deficit was maintained immediately after the surgical procedure. Follow-up visit after 1 year showed minor motor deficit and good healing. Conclusions: It is important to consider all aspects of secondary injury on the surgical planning of penetrating spinal cord injury. The secondary injury can be minimized with multidisciplinary planning of the surgical procedure.

**Keywords:** Spinal cord injury, wounds, stab, Brown-Sequard syndrome

## Introduction

Stab wounds resulting in spinal cord injuries (SCI) are very rare, except in South Africa where Lipschitz, et al. published the largest series in the 60's and the 70's decades [1-3]. Although the distribution of SCI in South Africa has changed over the years, stab wounds still account for a disproportionate number of injuries (26%) in comparison to the other trauma centers around the world, where reported incidence vary from 0.4 to 3 cases a year [4-6]. A screwdriver stab wound resulting in spinal cord injury is even rarer, with only a few cases reported [1]. We report a unique case of retained screwdriver causing a thoracic SCI, with screwdriver route through the spinal canal, and patient with minor motor deficit. We also discuss about surgical approach.

## Case report

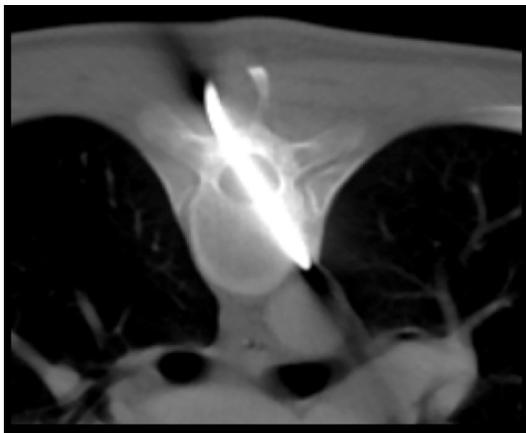
After a group assault, a 34 year-old man was brought to the emergency department with minor wounds on the face and a single screwdriver stab wound on the back. The patient was admitted with normal and stable vital signs, a motor deficit on the left leg and a retained right paravertebral foreign metallic body. (**Figure 1**) The neurological examination revealed a Brown-Sequard syndrome, with grade IV motor deficit on the left leg below T9 level. The joint position and vibration modalities were preserved, with no sphincter disturbances.

Radiological evaluation with thoracic Computed tomography (CT) and CT angiography revealed a retained 9 cm linear metallic element in the mid thoracic region. The screwdriver entered and trespassed the spinal canal at T6 level from the

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**Figure 1.** Image of the patient in the hospital admission. A retained screwdriver on the patient's back can be identified.



**Figure 2.** Computed tomography showing the metallic object trespassing the spinal canal.

right to the left, reaching the vertebral body and the T5-T6 discal space. (**Figure 2**) The object tip reached the posterior mediastinum with close relation to the thoracic aorta. (**Figure 3**) There was no radiological evidence of pneumothorax or pneumo/hemomediastinum, however we could not exclude a vascular injury. Esophagoscopy showed no perforation.

The joint decision between the neurosurgery and the vascular surgery teams was the surgical removal of the screwdriver under direct visualization, after considering the possibility of a fatal bleeding in case of vascular injury.



**Figure 3.** Computed tomography angiography before surgery showing the screwdriver in close relation to thoracic aorta.

### *Surgical procedure*

After selective orotracheal intubation, the patient was positioned in right lateral decubitus with the left inguinal area prepared for the use of an endovascular prothesis, if needed. A left mini-thoracotomy was performed and the extremity of the cross-tipped (Phillips®) screwdriver could be palpated. No pleural, or vascular injuries were identified. Simultaneously, a straight midline incision was performed and a careful dissection was done of the right T5-T6 intervertebral space and screwdriver was firmly pulled back on the opposite path of entry under direct visualization of the aorta. No laminectomy or dural exploration was done. No active bleeding or cerebrospinal fluid leak was observed, and closure of the back incision was done after copiously irrigation with normal saline solution. The thoracotomy closure was executed after a chest tube insertion and the patient was kept with intravenous prophylactic antibiotics.

### *Postoperative course*

The neurological deficit was maintained immediately after the surgical procedure. Chest tube was removed and the patient ambulated on the second postoperative day.

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Postoperative MRI showed a diagonal transfixing lesion of the spinal cord, on the left anterior and posterior horns at T6 level, with a discrete spinal cord edema.

The patient was discharged on the seventh postoperative day with no signs of cerebrospinal fluid (CSF) fistula and an improvement in the grade IV motor deficit on the left leg.

Follow-up visit after 1 year showed minor motor deficit and good healing.

### Discussion

Our case coincides with other reports considering that the majority of stab injuries to the spinal cord occur in young men, attacked from behind in a single stab, more frequently in the thoracic region. The most typical manifestation is incomplete SCI. The uniqueness of our report is type of weapon used in the assault, neurological condition of the patient, the presence of a retained object in the mid-thoracic region and the surgical planning considering a possible thoracic aorta injury.

Typically, the weapon used is a knife that is withdrawn by the attacker, rarely wedging or breaking into bone to present as a retained foreign body. In direct central back stabbings, the layers of muscles and the spinal column tends to deflect blades, which usually slides or snaps, rarely causing injuries to the spinal cord and central retro peritoneum structures [7].

Screwdrivers are infrequently used in such assaults as described in a few intracranial [8-11] and spinal cord injuries reports [12-14]. As a weapon it is able to apply a concentrated force to a small area, with a rigid stem allowing it to penetrate bone as compared to a blade. In our opinion, the cross-tipped (Phillips®) screwdriver dissects the injured structures, instead of cutting, minimizing tissue damage. We believe that this is one of reason for our patient's incomplete deficit.

The preservation of the neurological status was also related to the surgical technique used to remove the retained object. The skin incision and dissection was necessary to expose the rectilinear portion of the screwdriver and permitted a removal in a straight line, on the opposite direction of the path of entry. The minimal

dissection of the adjacent soft tissue avoided movements contrary to the object trajectory, minimizing secondary damage during the removal.

It is also important to note the possibility of thoracic CSF fistula [4] in cases spinal cord stab injury associated with pleural perforation [13], not seen in our patient. The decision to not perform laminectomy, disinsertion of paravertebral musculature or dural exploration may have been important for the absence of post-operative incisional CSF fistula.

Stab wound injuries to the spinal cord are very rare, especially with the retained object. The surgical removal is intuitive; however it is important to consider all aspects of secondary injury on the surgical planning. In our unusual case report, we successfully minimized secondary injury with multidisciplinary planning of the anesthesiology, vascular surgery and neurosurgery teams.

### Disclosure of conflict of interest

None.

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