Other full case

Screw driver: an unusual cause of cervical spinal cord injury

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Summary

Non-missile penetrating spinal injuries are rare. Screw driver injury, more especially to the cervical spine, represents an even rarer subset. To our knowledge, this is the first reported case from West Africa of cervical spinal cord injury from a screw driver. A middle-aged man was stabbed from the back with a screw driver. He presented with right-sided C4 Brown-Sequard syndrome with the impaling object in situ. Cervical spine x-rays showed the screw driver to have gone into the spine between the spinous processes of C4 and C5, traversing the spinal canal and lodged in the anterior part of the C4/5 intervertebral disc space. C4 and C5 laminectomies were performed and the screw driver removed under vision. The object was found to have traversed the right side of the cervical spinal cord. The dural tear was repaired. He had some neurologic improvement initially, but later declined. He died from severe pulmonary complications 2 weeks postinjury. Screw driver represents an unusual cause of non-missile penetrating cervical spinal injury. Its neurological effects and complications of the cord injury lead to significant morbidity and mortality.

BACKGROUND

Stab injuries to the spine, otherwise called non-missile penetrating spinal injuries (NMPSI) are unusual in most clinical settings. Apart from the large report of 450 cases from South Africa,¹ the global literature contains only rare case reports and small series. Most NMPSI are inflicted by assailants from the back and the impaling object, mostly knife,¹ is often deflected by bones away from the spinal cord. When spinal cord injury occurs, it is mostly incomplete with half of the patients with motor deficits presenting with Brown-Sequard syndrome.²

Screw driver as a cause of NMPSI is rare and injuries to the cervical spine from this object are even rarer. The assailant may choose this object with the realisation that it penetrates bone and is less likely to be deflected. When the implement is left in place, the management of the patients becomes very challenging with respect to transportation, positioning, anaesthesia and removal without causing further neurological deficits.

We present the case of a 52-year-old man who was stabbed with a screw driver in the neck and sustained a C4 Brown-Sequard syndrome. This is, to our knowledge, the first report of such from West Africa.

CASE PRESENTATION

A 52-year-old male commercial motorcyclist was hit from behind by his passenger with a screw driver in a rural suburb of Nigeria. He experienced immediate electric-shock like currents radiating throughout his body below the injury level and paralysis of the right limbs. He was rescued by passers-by and moved to the nearest tertiary health centre from where he was referred to us for specialist care transported in the lateral position. His motorcycle was stolen by the assailant.

He was of average build and was in painful distress. He had spastic right hemiplegia with muscle power of 0 below C4. Touch sensations were absent on the right side from C4 distally while pain and temperature sensations were absent on the left side from the same level. He was able to move the left limbs well. He had a screw driver impacted in his neck with the handle located along the midline between the C4 and C5 spinous processes. There were no abnormal cardiovascular, pulmonary or other systemic findings.

INVESTIGATIONS

Cervical spine x-rays revealed that the screw driver traversed the spinal canal and was lodged in the C4/5 intervertebral disc with its tip almost reaching the oesophagus anteriorly (figure 1A (i and ii)). We had no facility for CT.

TREATMENT

He had C4 and 5 laminectomies in the prone position under general anaesthesia. The challenges of his anaesthesia care have been detailed elsewhere (TB Rabiū, MD, AE Fadare, RN, unpublished data, February 2011). We exposed the spinous processes and laminae of C4 and C5 with the screw driver in situ. It was found to have traversed the right side of C4/5 inter-laminar space, dura and right side of the spinal cord and lodged in the anterior column. The C4 and 5 spinous processes and laminae were removed around it before it was gently removed under vision (figure 1B(i)). Eight centimetres of the screw driver had penetrated his body. There was a rent of 0.5 cm diameter in the dura with cord contusion visible through it (figure 1B(ii)). The dural was repaired with vicryl 4/0 suture after gentle irrigation of the injury site with saline impregnated with ceftriaxone and gentamicin. Routine wound closure was done. He had

Figure 1 A (i, ii) Cervical spine x-rays showing the screw driver traversing the spinal canal and lodged in the C4/5 intervertebral disc space anteriorly. (B) C4 and C5 laminectomies done around the screw driver which is seen to have gone through the spinal cord. (i) Cannular tip points to the dural tear (ii) following removal of the screw driver.

delayed recovery (of an hour) from anaesthesia, otherwise the procedure was well-tolerated. A rigid neck collar was put in place.

OUTCOME AND FOLLOW-UP

By the third postoperative day, he had some right elbow and knee extension but became worse on the 7th day with quadriplegia, chest infection and progressively worsened respiratory function. He died 2 weeks post injury.

DISCUSSION

The 1977 report by Peacock and his colleagues of 450 stab wounds of the spinal cord remains the largest of such up till date.¹ These injuries constituted about 25% of all cases of spinal cord injuries they managed over a 13-year period. The authors found knives to be the mostly used object (84.2% of the cases) followed by axe, screw driver, bicycle spoke, scissors, a garden fork, a sickle and a sharpened broom stick. Most of the injuries occurred in the thoracic region and over half of the lesions were of the Brown-Sequard syndrome type. Brown-Sequard syndrome, an incomplete spinal cord lesion caused by hemisection of the cord, is characterised by spastic paralysis and impaired touch sensation and proprioception ipsilateral to the lesion with contralateral loss of pain and temperature sensations. Spinal stab injuries from pencil and splinter have also been reported.^{3 4}

Reports of screw driver NMPSI are rare.⁵⁻⁸ It was probably chosen by the assailant as it was unlikely to be deflected by the bony spinous processes which was the spinal protective mechanism postulated by Peacock.¹ When the object is impacted, as in our patient, there are significant challenges with patient's positioning, transportation and anaesthesia.^{5 8}

X-rays need to be taken in two planes to avoid missing the retained object which may occur if x-ray is taken in a single plane parallel to the blade of the retained object.¹ In contemporary practice, CT scan is the investigation tool of choice. It detects foreign bodies, fractures as well as spinal haematomas.⁵ Its short acquisition time makes it particularly endearing in emergency cases like this. MRI may cause movements as well as heating-up of the retained foreign metallic object with worsening of deficits.⁹ It is, therefore, only useful if the implement is not retained. It may show cord contusion, trans-section or haematoma. Cervical spine x-rays were the only radiological investigation we could do in the index patient and these were sufficient in determining the location and route of passage of the screw driver. However, we could not demonstrate the exact cord pathology which might have helped in prognostication.

The decision of whether or not to operate patients with NMPSI need to be taken with due considerations of the neurological status of the patients, presence of foreign bodies and presence/duration of cerebrospinal fluid (CSF) leakage. Although, Rubin and his colleagues advocated

surgical exploration in all acute cases of penetrating spinal injury to repair dural tears,¹⁰ the established indications for operative intervention include the presence of foreign bodies, persistence of CSF leak, sepsis with a sinus or epidural abscess,¹ as well as radiologic sign of extrinsic spinal cord compression.¹¹ The decision to operate in our patient was straightforward. The object had clearly gone through the spinal cord and was lodged in the intervertebral disc. Removing it blindly could cause catastrophic bleeding from epidural venous plexus, traction injury to the cord and CSF leak from the dural tear as detailed by Goyal, *et al.*⁵ These were all avoided by its removal under vision after the laminectomies.

Neurological deficits in NMPSI may be primary or immediate as observed in our patient. This is often due to direct injury to the neural tissue but may also result from bony fragments or vascular compromise.^{1–4} Possibility of vascular injuries is to be considered in the management of patients with penetrating spinal injuries. Depending on the route of entry of the object, vertebral/carotid artery and major venous injuries may occur with or without spinal cord injury. Angiographic imaging of the neck vessels may prove useful in such cases not only in planning operative interventions but for possible embolisation of the injured vessel.¹² Angiography is also essential in evaluating post-operative neurologic decline from vascular compromise. The secondary or delayed deterioration in our patient was likely to be due to ascending cord oedema with the attendant compromise of his diaphragm. Spinal cord oedema, CSF leak,¹³ retained foreign body,^{14–16} and infection may all contribute to delayed neurological deficits.¹⁷

Learning points

- ▶ Cervical NMPSI caused by screw driver is rare. We have presented the first report of such from West Africa.
- ▶ Brown-Sequard syndrome, caused by hemisection of the cord, is characterised by spastic paralysis and hypoesthesia ipsilateral to the lesion with contralateral analgesia.
- ▶ Penetrating objects to the spinal cord need to be removed under vision to avoid undetected bleeding from epidural venous plexus, traction injury to the cord and CSF leak from the dural tear.
- ▶ Vascular imaging with angiography may be useful in those associated with vascular compromise.
- ▶ The attendant neurological deficits, especially delayed deterioration, may cause significant morbidity and mortality.
- ▶ The public and healthcare practitioners need to be aware of this new dimension to crime.

Competing interests None.

Patient consent Obtained.

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