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Original Article

Spinal stab injury: A rare injury and individualized management

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ABSTRACT

Aims: The spinal stab injuries being very rare, there have been no established management guidelines. Our aim is to establish an algorithm for management of this injuries.

Methods: We in our study report three cases of spinal stab injury which were managed individually. All of them were managed by different modalities of treatment with satisfactory results. Analyzing the different management protocols applied to each case, we try to formulate an algorithm for management of these rare injuries.

Results: Out of three cases reported, one of the spinal stab injury patient was managed conservatively as there was no CSF leak. Other patient was managed with CSF diversion as patient had delayed wound CSF leak following wound repair. In contrast our third patient underwent direct primary repair of dural defect as he presented early with CSF wound leak. Analyzing these three patients we propose an algorithm for management of spinal stab injuries.

Conclusion: The spinal stab injuries are very rare without established management protocols. In this case series we emphasize on individualized management. The simple algorithm proposed here can be useful in managing spinal stab injuries. A timely appropriate intervention can improve the outcome in spinal stab injury patients and unnecessary interventions can be avoided.

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1. Introduction

The spinal injuries can be due to penetrating and non-penetrating trauma. The penetrating spine injuries (PSI) are divided into missile and non-missile PSIs. Spinal stab injuries are a type of non-missile PSIs and an uncommon of all spinal injuries. The incidence of these injuries is more in the region of South Africa with majority of cases reported from that region.[1] The spinal stab injuries constitute less than 1.5% of all spine injuries.[1–3] The most common site of spinal stab injury is thoracic spine followed by cervical and the lumber spine. The craniovertebral junction is the least common site reported.[4–6] The spinal cord injuries can be complete or incomplete. In complete injuries there is complete loss of sensory and motor functions below the level involved. In contrast any sparing of function at lowest sacral levels is considered as incomplete injury. The incomplete injuries are more common than complete injuries.

The stab wounds of the spine are usually on back as these injuries occur commonly when attacked from behind. The upper part of spine is more accessible for stabbing. This is the reason why cervicothoracic region is commonly involved in stab injuries. On most instances the deep penetration and thus injury to cord is prevented by bony architecture of spine. But on rare occasions sharp weapon may find the way to dura and spinal cord generally with injury to the bone. The issues in these type of injuries include the management of wound, dural tears & cerebrospinal fluid (CSF) leak and relieving spinal cord compression due to hematoma or bone fragments. In addition, injuries involving osteoligamentous complex causing instability caused by high impact stab injuries especially in mobile segments of spine like cervical and lumbar region may require instrumentation and fusion. If the abdominal viscus or vascular injuries are associated with spinal stab, an alliance with general surgeon or vascular surgeon may be required. As these type of injuries are uncommon, there is no established consensus regarding the management.

Here we are presenting three cases of spinal stab injuries with emphasis on individualized management protocol.

2. Case discussion

2.1. *Case 1*

This 35 years old gentleman presented with alleged history of assault with long sharp knife on the neck, head and face. He was seen in our hospital around 40 h following trauma. All of these wounds were cleaned and sutured in a local hospital and were healthy.

On examination patient had a sutured sharply cut wound of 3 cms length running horizontally in midline in upper part of neck on the left side. There was no redness or other signs of infection or CSF discharge. There was no respiratory distress. He had weakness of all four limbs. The power in bilateral upper limbs and left lower limb were 0/5 as per Medical research Council Scale (MRC Scale) in all the groups. The power of proximal right lower limb was 0/5 and distally it was 4/5. There was no sensory impairment. The deep tendon reflexes (DTRs) were absent in both the upper limbs and left lower limb. The DTRs were elicitable in the right lower limb. Patient had urinary and fecal incontinence. He was catheterized for urinary incontinence.

He was evaluated with MRI scan of cervical spine which showed partial cord transection at C2–C3 level. (Fig. 1) There was no hematoma or bone injury. The tract the weapon had traversed through between the spinous processes of C2 and C3 vertebrae was seen.

This patient was managed expectantly as there was no CSF leak from the wound. He was started on empirical antibiotics. Simultaneously neuro-rehabilitative program was also

Fig. 1 – This T2W MRI of cervico-dorsal spine showing (arrow) cord injury at the level of C2–C3.

Fig. 2 – A CT cervico-dorsal spine showing a spec of subdural air (arrow) at T1–T2 level in the figure on left and C6-T1 spinous process fractures in the figure on right.

initiated. On discharge a week later there was no improvement in his clinical status. Patient is on regular follow up and power has not improved significantly.

2.2. *Case 2*

This 16 years old young female presented with alleged history of assault with an axe on neck. She underwent debridement and suturing of the wound with drain placement in local hospital and later was referred to us. She presented on the second day after assault. She complained neck pain & tenderness and watery discharge from the wound. She did not have any symptoms of meningitis or wound infection.

On examination she had a sutured wound running slightly obliquely upwards from left to right on lower part of nape of neck. The length of the wound was 5 cms. She did not have any neurological deficits. There was no sphincter involvement or respiratory distress.

She was evaluated with CT cervico-dorsal spine which showed spinous process fracture of C6 to T1 vertebrae. There was a spec of air in subdural space at T1–T2 level (Fig. 2).

As there was peridrain leak as well as wound CSF leak, the drain was removed. The lumbar drain was placed for CSF diversion. The CSF analysis was not suggestive of infection and CSF culture was negative. She was on injectable empirical antibiotics and managed with lumber drain. Three days later CSF leak stopped and lumber drain was removed. She was discharged with healthy wound. The patient party was not willing for further MR imaging of cervical spine. As patient also did not have any neurological deficit suggestive of cord injury, further MR imaging was deferred.

2.3. *Case 3*

This 30 year old gentleman presented with alleged history of assault with sharp weapon (exact weapon details were not known) on lower back. Since the time of trauma patient had right lower limb weakness and urinary retention for which he was catheterized. He presented 4 days following injury to our hospital. He did not have any symptoms of meningitis.

On examination patient had a 3 cms long transverse sutured wound in upper lumber region at L1 level. There was CSF leak from the wound. There were no signs of local infection or of meningitis. Right lower limb power was 0/5 MRC Scale with absent reflexes and loss of sensations. The neurological examination of rest of the limbs was normal.

He was evaluated with MRI dorso-lumber spine which showed tract of penetration between D12 and L1 spinous processes transecting the cord. There was no hematoma or foreign body compression on the cord (Fig. 3).

He was on empirical injectable antibiotics. He underwent D12 and L1 laminectomy and repair of horizontal dural tear with local fascial graft. Postoperatively there was no CSF leak from the wound. The neuro-rehabilitative measures were started. On discharge his power in right lower limb improved minimally to 2/5.

3. Discussion

The spinal stab injuries are uncommonly encountered. There are no specific management guidelines. Each spinal stab injury should be individualized as far as the management is concerned. All three patients in the present series were managed with individualized protocol. The steroids are recommended in indirect blunt spinal cord injuries[2] but for penetrating spine injuries there is no role.[7–11] The completeness or incompleteness of injury should not change the management per se but incomplete spine injury has better prognosis as compared to the other. Although outcome of complete spine injury is unpredictable but it may improve.[1,12] The incidence of CSF leakage is 0–4%.[13–15]

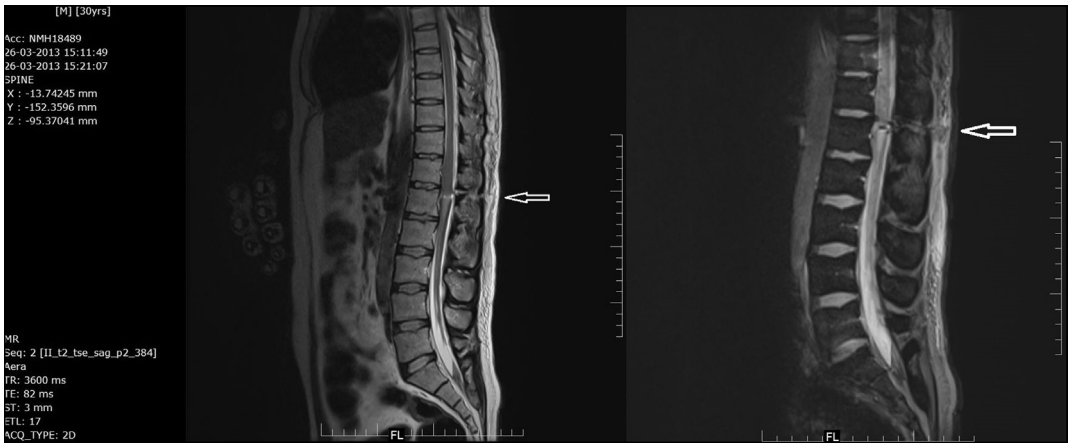

Fig. 3 – An MRI of dorso-lumber spine T2W (left) and FLAIR (right) images showing (arrows) tract of penetration between D12 and L1 spinous processes and cord transection.

As in our case 1, patient had cervical cord penetrating injury without wound CSF leak and he was managed conservatively with only injectable antibiotics. Patients with CSF leak from stab wound can be managed either with distal CSF diversion if possible or direct repair of dural defect as in our case 2 and case 3 respectively. In case of delayed wound leak, the dural repair may not be successful due to tissue edema and inflammation in contrast to cases detected early with wound CSF leak following trauma. All spinal injury patients require empirical prophylactic antibiotics even if there is no definitive evidence of specific infection. The patients of spinal stab injuries who have neurological deficits will require neuro-rehabilitative care.

Apart from that spinal stab injuries might be associated with spinal instability, abdominal viscus injuries or vascular injuries. In case of spinal instability due to injury to osteoligamental complex which are common in cervical and lumbar spinal segments due higher mobility, instrumentation for stabilization may be contemplated if there is no gross evidence of contamination of stab wound at operative site. If the abdominal viscus injury is suspected or diagnosed, involvement of general or trauma surgeon in management of the

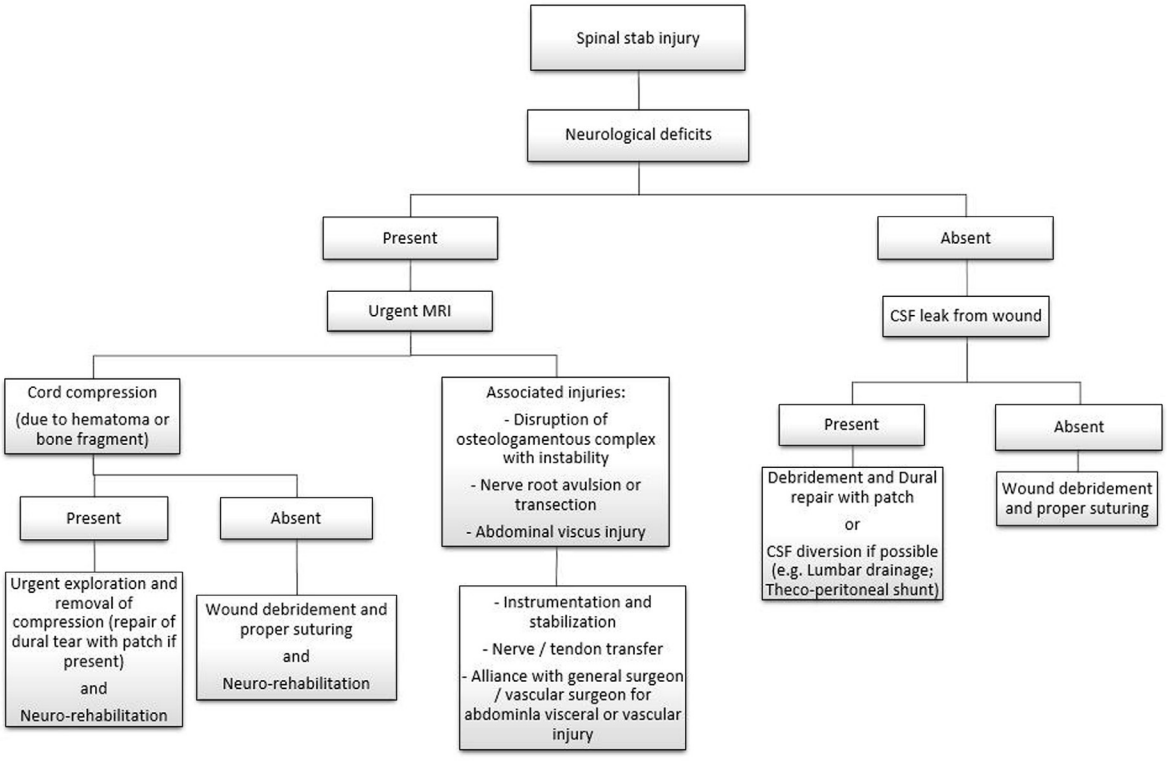

Fig. 4 – A proposed algorithm for management of spinal stab injuries.

patient is required. Similarly for associated vascular injuries which are immediately life threatening, urgent intervention by a vascular or endovascular surgeon may be sought for.

So we propose the following algorithm for the management of spinal stab injuries (Fig. 4).

4. Conclusion

The Spinal stab injuries, although rare, require individualized protocol based management. Many patients with spinal stab injuries can be treated with the management of stab wound only and prevention of neuroinfection. But some of the patients may require neurosurgical intervention. The neurosurgical intervention may range from temporary CSF external drainage or internal CSF diversion procedures like Thecoperitoneal Shunt to proper surgical exploration and repair of dural tear, instrumentation for instability, nerve repair or tendon transfer. In case of associated abdominal visceral injury or vascular injury general or vascular surgeon's help may be sought for.

The management modality should be individualized and the algorithm proposed here may be used. Some of the patients with associated abdominal or vascular injuries may need multispeciality management. The proper and timely decision making can improve the outcome in spinal stab injury patients.

Conflicts of interest

All authors have none to declare.

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