

Original Article

Our experience of civilian bullet injuries of dorsal region — a series of three cases

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Penetrating spine injury (PSI) forms the third most common cause of spine injury, only next to road traffic accidents and fall. Gunshot wound (GSW) forms the major bulk of PSI¹. Due to easy availability of firearms and antisocial behaviour, GSW which were predominant in military population is now increasingly seen in civilized society. Here, we present three cases of civilian GSW, indirectly causing complete spinal cord injury due to shock wave generated by the bullet, along with its systematic management. Role of management is usually conservative in bullet injuries of thoracic region except in, CSF fistula¹ and incomplete neurological deficit². Two cases had CSF fistula and one case had incomplete neurological deficit. Operation is straightway indicated in bullet injuries of cervical region and cauda equina region^{5,6}.

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Key words : Gunshot wound of spine, missile, shock wave, spinal cord injury, penetrating spinal injuries.

Penetrating spine injury (PSI) forms the third most common cause of spine injury, only next to road traffic accidents and fall. Gunshot wound (GSW) forms the major bulk of PSI. Due to easy availability of firearms and antisocial behavior, GSW which were predominant in military population is now increasingly seen in civilized society. Here, we present a detail case review of unique cases of civilian GSW indirectly causing complete spinal cord injury due to shock wave generated by the bullet, along with its systematic management. The majority of Spinal cord injury (SCI) are the result of motor vehicle accidents and falls; however, penetrating spine injury (PSI) (primarily gunshot wounds [GSWs]) accounts for 13-17% of injuries¹. So PSI is 3rd most common cause of spinal injuries, only next to road traffic accidents and fall from height. According to the National Spinal Cord Injury Database, the mean age of penetrating SCI is 29.7 years, with a 4:1 male predominance². First case of traumatic spine injury was given in 1700 BC in ancient Egyptian document of Imhotep¹⁰. Later on, Galen (130-200 BC) showed that longitudinal spinal cord lesions do not cause serious functional damage while transverse lesions were associated with paraplegia related to the level of the lesion.

Ambrose Pare (1557) was the first to give the description of penetrating SCI caused by firearms. The wound depends on the type of weapon, ballistic properties of the bullet, and the distance from where it has been fired. Controversies in the management of GSW to spine existed right from the beginning and persist even today. Treatment is usually conservative in bullet injuries of thoracic region except in, (1) CSF fistula and (2) Incomplete neurological deficit. Two cases in this series had CSF fistula and one case had incomplete neurological deficit. Operation is straightway indicated in bullet injuries of cervical region and cauda equina region^{3,4}.

MATERIALS AND METHODS

The study was done from 2012 to 2014 in Medical college, Kolkata and Nightengale hospital. Three cases were found. All the patients were male. Age Range 40-55 years. All were shot at the back by unknown assailants. Two were Goldsmith and one was office clerk. Patients presented to emergency with bleeding wound from the back. Two patients were in shock. CSF was coming from the wound in those two cases. Complete paraplegia with retention of urine was noted, Benezel & Larson Grade -I. ENTRY Wound was on D12 & D11 spinous process. In third patient, ENTRY Wound was on D12 spinous process. Patient had Incomplete paraplegia-Benezel & Larson Grade -III. Patient was in shock. Patient had retention of urine. All the patients were conscious (GCS-15) Clinical examination of the cases revealed following ----- Pulse, -- tachycardia. BP--Unrecordable, Sensory Level-D10(Bilateral)-in all three cases. Motor- 0/5 (Both lowerlimbs)-Two cases, one Case (Both lowerlimbs)-2/5, Reflexes were nonelicitable in two cases, and Plantars were equivocal in one case. There

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was no exit wound in all three cases. Examination of chest, abdomen and other systems were normal.

INVESTIGATIONS

X-ray of dorsolumbar region revealed bullet in dorsal region. CT SCAN was the diagnostic modality in these cases. CT scan can delineate fracture precisely (Figs 1-4). Intraspinal fragments and soft tissue foreign bodies can be visualised. There is no displacement of ferromagnetic metallic fragments. MRI role in bullet injuries is limited as it can cause displacement of ferromagnetic metallic fragments. Moreover movement artefacts can cause difficulties in interpretation of MRI finding. Role of MRI in bullet injuries is helpful in postoperative follow up, exit of missile, and in post-traumatic formation of syrinx.

Treatment :

Aim of the treatment is stabilisation of the patient by maintenance of airway, breathing and circulation and removal of bullet by posterior midline standard laminectomy approach⁵. Electrocautery was avoided. Debridement of wound was given. Water tight tension free dural suture was done. Regarding stabilisation, transpedicular titanium screws and rods fixation was done in one case as bullet traversed through pedicles and facets.

Results :

Two cases with complete cord transection-benzel and larson- Grade-I was improved to Grade-II, one case with incomplete neurological deficit improved from Grade - III to Grade-VI. There was no CSF leak postoperatively

DISCUSSION

Injuries to the thoracic region of the spine are the most common, followed by the thoracolumbar area and cervical spine. Missile injuries of spine are third principal cause of traumatic injury to the spinal cord after RTA and falls. Gunshot injuries to the spinal cord itself account for up to 25% of all such injuries, with neurological deficit resulting from direct trauma to the nervous tissue as a result of direct impact by the bullet, bone, or displaced disc frag-

ments. Effect is most probably the result of the kinetic energy transmitted by the projectile^{6,7}.

The cord lesions of the specimens can be divided, according to its severity, into four grades:

- (1) Transection,
- (2) Complete destruction---permanent paraplegia;
- (3) Incomplete destruction—result in incomplete paraplegia—can eventually recover
- (4) Mild damage,---concussion,---can resume perfectly.

The mutual effects among them would make one think it reasonable to classify cord injury as follows:

- (1) Injury from bullet through spinal canal or vertebral body usually causes cord transection;
- (2) Injury from bullet through canal wall at high speed would make a chance of complete destruction in 94%; at low speed, a chance of either complete or incomplete lesion in 50% each⁵. Neurological Grading System—Benzel And Larson—1987 shows that Grade I- Complete functional neuronal transection—No motor or sensory function below the level of injury, Grade II—motor complete. No voluntary motor function below the level of injury, with preservation of some sensation, Grade III— Motor incomplete—nonfunctional—minimal nonfunctional voluntary motor function below the level of injury, Grade IV—Motor incomplete—functional. Unable to walk, some functional voluntary motor function below the level of injury. Grade V—Motor incomplete—functional, limited walking, lack of endurance or fear of falling, Grade VI—Motor incomplete—functional, unlimited walking, difficulties with micturition and slightly dis-coordinated gait. Grade VII—Normal⁴. Role of surgery in treatment of GSW to spine is controversial. Most of the war time injuries prefer surgical exploration with wound debridement, laminectomy and removal of bullet. In contrast, the civilian literature favors nonsurgical management unless there is evidence of incomplete injury to the spinal cord with progressive neurological deterioration and persistent CSF fistula and migration of bullet within the spinal canal⁵. In spite of debate,



Fig 1 — X-ray plain shows bullet

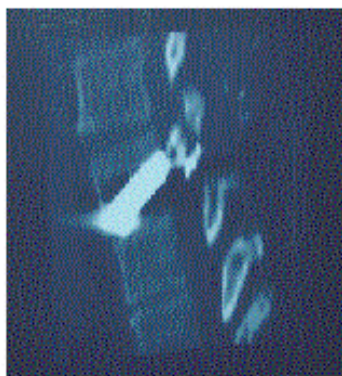


Fig 2 — CT scan shows bullet precisely

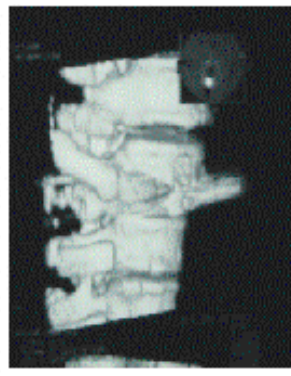


Fig 3 — CT scan, 3D reconstruction Sagittal view. Shows bullet

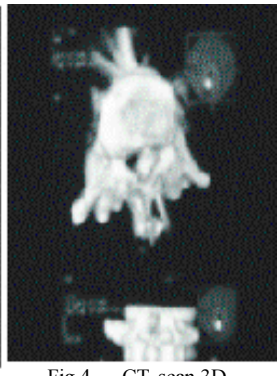


Fig 4 — CT, scan 3D reconstruction axial view. Bullet in vertebral canal

Role of management in thoracic spine missile injuries is in favour of conservative management except in: (1) CSF Fistula and (2) Incomplete neurological deficit.

Two cases had CSF fistula and one case had incomplete neurological deficit. Operation is straightway indicated in cervical region and cauda equina region.

Conclusion :

Surgical intervention is not always essential for thoracic spinal gunshot injury; However, it may be beneficial for patients with CSF fistula, infections and compressing foreign bodies in the injury site, instability, and rapid neurological deterioration and incomplete neurological deficit. In the thoracic spine, removal of bullet fragments lodged within the spinal canal has been shown to significantly improve neurological recovery but enlodgement of bullet in the vertebral bodies after complete laceration of spinal cord is associated with variable neurological recovery.

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