Gunshot Injuries to Spine: Our Experience in Bir Hospital

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The incidence of missile injuries to spine continues to increase with the violent nature of society. In Nepal gunshot wound to spine is increasing day by day due to armed political conflicts and growing criminal activities. This study is to assess the overall outcome of missile injuries of spine after surgical decompression.

This is a retrospective study of 13 patients who underwent surgical procedures for bullet injuries of spines at department of Neurosurgery between October 2001 and September 2010.

Preoperative and postoperative neurological status was measured by Frankle's grade.

Follow up period ranged from 2 to 10 years. There were 12 males and 1 female and age ranged from 13 to 58 years. On admission, 10 (77%) patients had complete cord injury and Three (23%) had incomplete cord injuries. Level wise, Three patients had Cervical, 9 had thoracic and 1 had lumbar spine injuries.

All patients underwent surgery and had a course of intravenous antibiotics. No steroid was administered.

Six patients developed postoperative complications and one patient with high cervical injury died of respiratory problem.

After treatment no neurological improvement was observed in patients with complete cord injuries, however, some neurological recovery was noticed in patients with incomplete cord injury on their follow up.

This study suggests that neurological recovery after surgical decompression in patients with complete cord injury due to missile is unlikely, whereas, incomplete cord injury may have some neurological improvement after surgical decompression.

Key Words: Frankle's grading system, gunshot wound of spine, missile injury to spine, surgical decompression

The rate of spinal missile injuries continues to increase with military conflicts and violent nature of society. Gunshot wounds of spine are the 3rd most common cause of traumatic spinal cord injuries in US Civilian populations.[12] The incidence of gunshot wounds to the spine has increased in Nepal for last 10 years due to ongoing political conflicts and increased crime in the society. So far, there has been no data on missile injuries of spine presented from Nepal. This is most probably the first retrospective study of bullet injuries of spine produced from Nepal.

There is a continuing debate on the management of gunshot wounds to spine, with views ranging from conservative to aggressive surgical debridement. In addition, there is growing evidence that surgical exploration may not offer significant improvement in the final recovery of function of the patients with gunshot injury to the spine.[1,8,15] On the other hand, it has been reported that surgery enhances functional recovery from gunshot wound to the cauda equina, in this case, decompressing the neural elements by eliminating of bony, bullet and disc fragments may be beneficial.[8,2,19] Another reason cited for surgical management of gunshot wound to spine is prevention of subsequent infection.[6] This paper reviews our experience with 13 missile injuries to spine observed during 10 year period, between 2001 and 2010.

Materials and Methods

Thirteen patients were retrospectively reviewed who underwent surgery for missile injuries of spine between 2001 and 2010 at department of Neurosurgery. All the patients included in this study were moist fighters, polices and civilians. Such spinal injuries in military persons were dealt by Military hospital.

Preoperative and postoperative neurological status was measured by Frankle's grading system. All patients were subjected for plain X-Ray and CT scan of spines after resuscitation and hemodynamic stabilization. Follow up period ranged from 2 to 10 years.

Results

There were 12 males and 1 female and age ranged from 13 to 58 years.

On admission, 10 patients had complete cord injury (Frankle grade A) and 3 patients had incomplete cord injury (Frankle grade B to E).

3 patients had sustained cervical, 9 thoracic and 1 lumbar spine injuries. Plain X-Rays followed by CT scan of involved spines were carried out in all patients after maintaining the hemodynamic stability. All the patients had stable spines preoperatively. All the patients underwent surgical intervention. Aims of surgery were decompression of neural elements, removal of foreign bodies, watertight dural repair and preservation of facet joints to maintain stability of spines. All patients had intravenous antibiotics for 4 to 6 weeks. 6 patients (46.2%) developed postoperative complications. Among postoperative complications, 3 patients had developed chest infection, 2 patients had wound infection and 1 patient had neuralgic pain **(Table 1)**.

One patient died due to respiratory failure who had high cervical cord injury.

Postoperative radiological study showed stable spines in all patients.

Preoperatively 10 patients had Frankle grade A, 1 had B, 1 had C and 1 had E. Postoperatively prior to discharge 9 patients had Frankle grade A, 1 had C, 1 had D and 1 had E **(Table 2)**.

No further neurological recovery was observed in followed up period of 2-10 years.

Chest infection	3
Wound infection	2
Neuralgic pain	1
Death	1

Table 1: Postoperative complications

Discussion

War time experience of the management of missile injuries to the spine has shaped how they are now dealt with.[1,4,16] In world war I the rationale was to perform delayed surgery, only on those with incomplete injuries whose neurological status determinating.[13]

In World War II the perception changed to operation on all patients to decompress and debride in order to improve neurological status and minimize the risk of infection.[13,11,14]

By Korean War the emphasis had barely changed with decompression and debridement for all after definitive management of their other injuries.[18]

The experience of the Vietnam War was that with rapid evacuation to aggressive resuscitation and definitive surgical care. Morbidity and mortality improved but no neurological function, with or without surgery. The outcome continued to reflect the neurological status at presentation.[5] In the Iran-Iraq war it was felt that surgical exploration did not improve outcome, indeed surgery increased complication rates.[1] Recent Balkan experience, where evacuation time to definitive surgical facilities were similar to those in the Vietnam War, showed no startling improvements, despite the availability of modern imaging techniques.[16] Lebanon experience found that the most important factors for determining outcome were an early assessment of neurological status and a thorough rehabilitation programme.[4]

Each war therefore led to further refinements in the management of these injuries, however, there is still a continuing debate on the management, with views ranging from conservative to aggressive surgical debridement.

In fact various authors have reported on decompression in this scenario. Kahraman reported on 106 patients, where 60% were operated on. There was similar recovery in both surgically managed group and conservatively managed group.[7] However, Benzel et al showed root improvement in incomplete injuries as opposed to conservatively managed cases. The incomplete cord injury and Cauda equina injury group showed improvement irrespective of decompression.[2] This has been echoed by other authors.[4,9]

Our management for gunshot wound to spine has been aggressive and we operated on all the 13 patients after resuscitation and making all the patients haemodynamically stable.

We carried out plain X-Ray of involved spine and CT scan to assess accurately the location and extent of bone injury and degree of spinal cord and neural elements damage.

Ten (77%) patients had complete cord injury and 3 (23%) patients had incomplete cord injuries in our series. Previous studies have shown that majority of gunshot injury to spine had complete cord injury and our findings were not different from theirs. In Bhatoe's series of 22 cases, there were 18 (82%) complete cord injury and 4(18%) in complete cord injury.[3] Similarly, LE Roux's series of 49 cases 38 had complete and 8 had incomplete cord injury.[10]

Frankle'grade	preoperative neurology (no. of patients)	Postoperative neurology (no. of patients)
A	10	9*
B	1	0
C	1	1
D	0	1
E	1	1

*1 patient died

Table 2: Preoperative and postoperative neurological status.

Literature review reveals that most common level of spine involved in gunshot injury are thoracic, cervical followed by lumber spines.

In Yashon's series of 35 patients, there were 6 cervical and 29 thoracic spines.[20] There were 37.5% cervical, 57.8% dorsal and 4.7% lumbar spine injuries due to gunshot in Hammoud's series.[4] Likely, Bhatoe reported 6 cervical, 12 thoracic and 3 lumbar spine involvement of missile injuries in his study.[3] Our results also reveal the similar findings: there were 3 cervical, 9 thoracic and 1 lumbar spine injuries due to gunshot.

In our series there were no patients with unstable spine which required instrumentation for stability. Many studies in the past have revealed that majority of the spinal injuries due to gunshot are stable. No unstable spine was found in Bhotoe's series of 22 cases.[3] Out of 21 cases, one patient had unstable spine in Splavski's series, which required instrumentation. In 15 month's follow up period there was no radiological sign of postoperative spinal instability.[16] Hammoud recommends that in blunt spinal cord injury protocols such as ATLS are well established for treating such injuries as if they are unstable, however, on the battlefield such management, may not be necessary as it is generally felt that war missile injuries to the spine do not result instability.[4]

Postoperatively we observed no neurological recovery in 10 patients who had complete cord injury due to gunshot, one died and 9 patients had Frankle's grade A. There were some neurological improvement postoperatively in two patients who had incomplete cord injuries; one improved from Frankle grade B to C and one improved from Frankle grade C to D. Remaining one patient who had normal neurology remained same after surgical decompression. Most of the previous studies on gunshot wound to spine had similar findings and they observed no neurological recovery in patients with complete cord injuries, however, some neurological improvement were noticed in patients with incomplete cord injury.

Between 1965 and 1966 at Neurosurgical treatment centre in Saigon, Jacobs and Bering operated on all 32 patients with gunshot wound of spine, but had dismal short term outcomes- none of the patients with complete cord injuries improved and only 2 patients with incomplete cord injuries showed any improvement.[5]

Between 1966 and 1973, Stauffer treated 185 patients with gunshot wounds of spine, 106 with complete lessons and 79 with incomplete lesions. None of the patients with complete lesions showed any improvement regardless of whether they underwent laminectomy of the patients with incomplete lesion 71% showed measurable neurological improvement after a laminectry compared with 76.5% who did not have surgery.[17]

Yashon et al also concluded that the final neurological outcome was most closely related with the initial neurological status than with surgery.[20] Hammoud also commented in a similar way.[4]

Conclusions

This study suggests that Majority of gunshot injuries to spine are stable and do not require instrumentation. Neurological recovery after surgical decompression in patients with complete cord injury due to missile is unlikely, where as incomplete cord injury may have some neurological improvement after surgical decompression.

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