Cross-border firing and injury patterns

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ABSTRACT

Introduction: Cross-border firing are increasingly being common in the modern era. The injuries resulting from these low intensity conflicts are a source of anxiety among treating physicians and their respective governments. The provisions are required to minimise the suffering of the victims viz. Mode of injuries, mortality patterns, adequacy of treatment at pre-hospital and tertiary care hospital and provisions to decrease morbidity and mortality for the people living in these areas. Materials and Methods: A retrospective study was conducted in GMCH, Jammu who suffered injuries due to cross border firing in the month of October, 2014. 68 patients were reported in the causality wing. All the patients were referred from level 2 trauma centre. There were 51 males and 17 females out of which 5 were children. The cause of injury, involvement of organ system, cause of mortality and morbidity and loopholes in prehospital management were identified. Results: Sharpnel were the most common cause of injury followed by indirect trauma. The common cause of mortality was abdominal and thoracic injuries. There were 4 deaths at hospital 2 of which were brought dead and 2 died during the course of treatment. There were twenty patients with extremity injuries, fourteen with chest trauma, eleven with abdomen including parineal injuries, three with head injuries, eight with ENT injuries, three with eye injuries and nine with splinters in the back out of which two were in the spinal canal. Conclusion: Prehospital stabilisation, early transport, in-transit resuscitation, immediate surgery if required and implementation of triage model and ATLS protocol has been the key to reduce mortality and morbidity.

Key Words: Cross-border firing, field triage, in-transit stabilization, splinters

INTRODUCTION

Trauma resulting from cross-border firing has been encountered commonly. Recently with conventional wars becoming rarer, the fighting at sensitive borders has become a means to inflict heavy casualties with loss of human life, morbidities and collateral damage (loss of property and business) on both sides of the border.

We have not found any literature on cross-border firing and its resulting injury trends.
MATERIALS AND METHODS

This study is a retrospective study conducted at the Government Medical College, Jammu (level 1 trauma center) (The study was approved by Government medical college ethical committee vide ref. no. IEC/2015/95). Sixty-eight patients were included in the study who had sustained injuries from cross-border firing during the month of October on the India-Pakistan border. The patients included in the study were referred to the tertiary care hospital after triage at level 4, 3 and 2 trauma centers. The patients were received at the tertiary care hospital by the trauma team consisting of specialists from Surgery, Orthopedics, ENT, Eye, Anesthesia, and trained paramedical staff. The patients were assessed according to the advanced trauma life support (ATLS) protocol. Focused Assessment with Sonography for Trauma (FAST Scan) was performed for patients suspected of abdominal injury and noncontrast computed tomography scan for head injury.

Radiological investigations of head, neck, chest, abdomen, limbs and spine were carried out as per injuries. Patients requiring emergency surgery were transferred to the operation theatre and appropriate surgery performed. The patients who were stable and not requiring any intervention were transferred to an observation ward.

We grouped the patients into Chest, Abdomen including the perineum, Head, ENT, Eye, Spine and Extremity injuries. Multiple injury patients were those who had more than one system involvement. This study analyzed the patterns of injuries, morbidity and mortality patterns and adequacy of treatment at prehospital and after reaching tertiary care hospital.

Data are presented as absolute number and percentage. Pie charts and graphs will be used to analyze the data.

RESULTS

Sixty-eight patients were included in the study after referral from other primary care Centers. All the patients were admitted over a 2 week period during the month of October.

There were 51 (75%) males and 17 (25%) females: out of these, 5 (7%) were children.

Patients were aged between 2 years to 73 years. Shrapnel was the most common cause of injury. Multiple injuries were present in 23 (34%) patients.

Fourteen (20%) patients presented with chest trauma requiring chest tube thoracotomy in nine patients, while the rest (5) were managed conservatively. The indication for chest tube thoracotomy in most patients was hemo/pneumothorax. Eleven (16%) patients suffered abdominal or perineal injuries. Scrotal injuries were present in three patients. All three patients with scrotal injuries underwent repair of scrotal tears. Six patients with abdominal injuries underwent exploratory laparotomy with removal of shrapnel and repair of involved viscera as determined intra-operatively by the surgeon. Two patients were managed conservatively. One patient died during the course of treatment on first postoperative day in Intensive Care Unit (ICU) due to delay in care.

There were 3 (4%) patients with head injuries. Nonhemorrhagic contusions were present in two patients that were managed by conservative treatment. One patient had shrapnel in the scalp in the frontal region which was removed. The head injury occurred due to indirect trauma due to a fall. Eight patients (12%) were admitted with ear, nose and throat injuries.

There was one patient with shrapnel in the nasal cavity and one patient with shrapnel in the ear both of which were removed by the ENT surgeon. All other patients had lacerations over the face and were managed by wound debridement and repair of the wounds. Patients with eye injuries were 3 (4%) in number. Two patients had corneal perforations both of which were repaired by the ophthalmologist. One patient had a superficial injury and was managed conservatively [Tables 1 and 2].

Table 1: Distribution of injuries to different organ systems

| Organ system                      | Number of patient (%) |
|-----------------------------------|-----------------------|
| Thoraco-abdominal                 | 25 (36)               |
| Chest                             | 14 (20)               |
| Abdomen                           | 8 (12)                |
| Perineum                          | 3 (4)                 |
| Head and neck                     | 14 (20)               |
| Head                              | 3 (4)                 |
| ENT                               | 8 (12)                |
| Eye                               | 3 (4)                 |
| Extremity (isolated)              | 20 (29)               |
| Back including spine              | 9 (13)                |
| Spine                             | 2 (3)                 |
| Back                              | 7 (10)                |

Thoraco-Abdominal Injuries Account for 36.76%; Extremity (Isolated) constitute second largest group; Head and Neck are third largest and rest includes spine cases.

Table 2: Pie chart distribution of injuries

![Pie chart of injuries distribution](chart.png)
Nine patients (13%) presented with shrapnel in the spine and back. One patient had shrapnel in the spinal canal at T12 and L3 level with paraplegia [Figure 1]. This patient was subsequently operated by the orthopedic surgeon for the removal of the shrapnel. The patient succumbed on 2nd postoperative day in ICU due to preexisting dilated cardiomyopathy and its related complications. One patient had shrapnel at the anterolateral aspect of L5 vertebrae. Seven patients had shrapnel in the back, all were managed conservatively.

Fifty-nine (86%) patients received injuries to the extremities out of which 41 (60%) were present in the lower extremity and 17 (26%) in the upper extremity. Only 20 patients (29%) had isolated extremity injuries. Seven patients had fractures, four with the fracture of the femur. One patient had comminuted the fracture of the femur with compound 3 (b) Gustilo-Anderson classification. The patient treated by wound debridement, external fixator followed by partial thickness skin grafting by the orthopedic surgeon [Figures 2-4].

One patient had an undisplaced, unicortical fracture femur due to a shrapnel and was treated conservatively [Figure 5]. Two patients had a fracture of the trochanteric region, one greater trochanter and other having lesser trochanter fracture. One patient had comminuted fracture of the iliac blade and one patient had comminuted undisplaced fracture of the ulna [Figure 6]. One patient had a fracture of cubiod bone and base of 5th metatarsal. All the patients except the first one were managed conservatively. All the other patients had shrapnel in the extremities and were discharged after nonoperative treatment.

Four (6%) patients died in the hospital. Two patients were dead on arrival, both of which had multiple injuries involving the chest and the abdomen. Two patients died during the course of treatment. One patient had hemoperitoneum and underwent exploratory laparotomy with transverse colectomy but the patient died during first postoperative day in ICU. The second patient had hemoperitoneum and shrapnel in the spinal canal at two levels. The patient died after removal of shrapnel in ICU at 2nd postoperative day, due extensive blood loss during the surgery and depressed ejection fraction of 26% due preexisting dilated cardiomyopathy.

DISCUSSION

Cross border firing has been associated with unpredictability, surprise and lack of protection. These military tactics have

Figure 1: Clinical photo of the patient with exposed femur and extensive degloving of the thigh

Figure 2: Radiograph of the patient showing comminuted fracture of the femur

Figure 3: Postoperative radiograph of the same patient with stabilization of the fracture with external fixator

Figure 4: Radiograph of the patient having splinters in the spinal canal at D12 and L3 level
been adopted across the border region to inflict damages on the opposite country without indulging in open warfare.\(^1\)\(^2\) It is, therefore, important to understand the injury patterns and actions required to minimize the damage and there exist limited literature on this issue.

Timely transfer of injured victims to trauma care facilities is the key to ultimate patient outcome. There are different philosophies suggested to transfer the victims to the health care facility, including scoop and scoot, stay and stabilize, and in-transit stabilization.\(^3\) The latter constitutes resuscitation during transfer to a trauma center and seems to be most effective. The lack of adequate health care facilities at level 2 was significant in our study.

The prehospital management of patients with severe trauma should focus on stabilization of vitals, control of hemorrhage, maintenance of oxygen delivery, immobilization of spine and fractured limbs and early transport to a trauma center by a trained resuscitation team.\(^4\)\(^5\)

In the present study, ATLS procedures were not applied to any of the patients during transfer to hospital. The injuries found on patients arriving dead or in those who died within 24 h were largely due to the thoraco-abdominal trauma. En-route resuscitation may be the best option locally. Many patients were referred having injuries that could have managed at level 2 health care that included shrapnel injuries of the extremities. This requires the establishment of a field triage model at these sensitive areas.\(^6\)\(^-\)\(^8\)

Ultimate outcome depends on the Golden Hour concept that includes the earliest possible surgery at a tertiary care hospital. This varies from less than an hour to 6 h. Nearly all patients requiring surgery were immediately transferred for surgery at the tertiary care facility, mainly due to thoraco-abdominal injuries.\(^9\)\(^,\)\(^10\)\(^,\)\(^12\)\(^,\)\(^13\)

Injuries resulting from cross-border firing are marked by surprise and are varied in nature.

Injury patterns from the present series suggest the need for a triage model and emergency care teams at the scene of injury and level 2 health care. Early transport to tertiary care centers by equipped ambulance (preferably air ambulances in outlying areas) with in-transit resuscitation facilities is mandatory. Training and awareness of local inhabitants on basic life support and preparedness of administration at level 2 and level 1 health care is required to minimize the damages resulting from cross-border firing. Provision should also be made for the rehabilitation of the victim and their families.\(^11\)\(^,\)\(^14\)

**RECOMMENDATIONS**

We propose the establishment of trained Emergency-Medical-Services (EMS) teams from the local population in each village. These EMS teams should handle the victims at the scene of injury and immediately move them to level 4 or level 3 trauma centers. The level 4 or 3 center should have more facilities to handle such type of trauma in terms of equipment and staff in these areas than usual health center of the same category, well-coordinated with army EMS teams. Critically injured patients needing a higher level of medical care should be identified and transferred to the appropriate level of health facility, whether this is level 2 or 1 via fully equipped ambulances with en-route resuscitation facilities.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

There are no conflicts of interest.

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