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Research Article

AN ANALYSIS OF CASES OF FIREARM INJURY TREATED IN A TERTIARY CARE CENTRE IN ASIA

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ABSTRACT

Aim: Firearm injury is usually a fatal injury where by the recipient organ determines the gravity of the situation. We have tried to study the various parameters in case of patients of firearm injury treated in a tertiary care centre in Asia. We have tried to see the various areas where improvement can be made.

Material and methods: All patients treated for firearm in jury in the hospital from July 2016 to july 2017 with resultant injury to brain or spinal cord were listed. There files were analysed.

Results: In total record of 63 patients of firearm injury who were treated for brain or spinal cord were found in one year. Out of them 16 had contusions, 11 had isolated depressed fractures, 9 had brain matter coming out through scalp wound, 6 had spinal trauma with paraplegia, 21 had multiple entities. In addition there were other many patients had sustained pellet injury to scalp, who were not included in the study.

Conclusion: Firearm injuries need to be prevented primarily. Also these injuries are to be treated by proper protocol. Low GCS and bilateral injuries have poorer prognosis. Many deaths can be prevented if they are treated by a comprehensive algorithm all over the world. Special alarm is needed.

INTRODUCTION

Firearm injury or also called as bullet injury is a very important cause of death. Also it is an important cause of morbidity which needs to be further discussed in medicine so that protocols are developed in future for management.

MATERIAL AND METHODS

The records of all patients of bullet injury to brain or spine treated from july 2016 to july 2017 were analysed. For every patient CT scan was analysed and GCS was assessed. First recipient department was noted. At what stage neurosurgery department was seen to get involved. All these findings were noted.

RESULTS

In total 63 patients had sustained bullet injuries to spine or brain. 45 patients had associated general surgical problems. 18 had purely neurosurgical problems. the associated surgical problems were hemothorax, hemoperitoneum, gut perforation, fractures, etc. on analyzing the neurosurgical problems it was found that out of 63 patients 16 had contusions, 11 had isolated depressed fractures, 9 had brain coming out through scalp wound, 6 had spinal trauma with paraplegia, 21 had multiple entities. In addition many patients were brought dead which were not part of the study. Also many patients were cases of pellet injuries which were not included in the study.

Table 1 showing number of FAI patients belonging to two categories

Catgory	Number (percentage)
A=pure neurosurgical wounds	18(28)
B= associated general surgical wounds	45(72)
Total	63(100)

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Table 2 showing pattern of various injuries in patients of firearm injury

Various neurosurgical injuries	Number(percentage)
Contusion	16(25)
Depressed fracture	11(17)
Brain matter coming out from scalp wound	9(14)
Spinal trauma causing paraplegia	6(9)
Various injuries in one patient	21(33)

Table 3 showing the number of patients received by various groups of staff on duty.

Reciepient team (first team who received the patient)	Number(percent)
Anesthesia and surgery technicians	18(28)
General surgery physician	18((28)
Neurosurgery physician	18((28)
Anesthesia physician	9(16)

Table 4 showing GCS in various number of patients.

GCS (Glasgow coma scale)	Number (percentage)
Less than 3	5
3-8	31
8-15	27

Table 5 showing the site of injury with number (percentage) in patients of firearm injury to brain

Site of injury	Number (percentage)
Frontal lobe	14
Temporal lobe	14
Parietal lobe	9
Occipital lobe	4
Orbital region	4
Multiple sites	9

Table 6 showing the number of bullet injury patients who developed infection

Type of injury	Number(percent) of patients who got infected
Brain injury due to firearm=57	6(10.5)
Spine injury due to firearm=6	3(50)
Total=63	9(14)

DISCUSSION

Traumatic Brain Injury caused by gunshot wounds is one of the most common causes of death and disability in warfare. This is becoming an issue of growing concern in modern warfare, in which rapid surgical interventions are effective in saving the lives of soldiers with severe head injuries. Although much of the literature on craniocerebral gunshot injuries is derived from military experience, civilian gunshot wounds are extremely common in certain populations. In the United States, for example, Traumatic brain injury due to firearm injury is an epidemic health problem(1).In addition wars have added to brain injuries eg according to the Defense and Veterans Brain Injury Center, a research and treatment agency run by the Pentagon and Veterans Affairs Department, 64% of injured troops have suffered brain injuries (2). In contrast to most forms of traumatic death, in which death occurs immediately after the traumatic event, a large percentage of brain trauma fatalities occur days or weeks after the primary trauma (3). Radiological assessment of traumatic brain injury caused by gunshot wounds usually differs from that of closed head injuries, mainly because of the nearly universal involvement of multiple anatomic levels, including the scalp, skull, orbit and cranial vault. It is obvious that specific pathophysiologic lesions such as scalp lacerations, skull fractures, hemorrhages, and contusions are not unique to gunshot wounds and carry the same clinical and radiographic implications individually as they do in closed head injuries. Regardless of whether or not clinical evidence of penetration exists, all patients with traumatic brain injury should undergo CT scan (4).

In our series the exact figure of mortality was not known because of technical problems. Some patients were admitted for long in SICU and others in neurosurgery and other branches. That is why exact mortality rate cannot be known. Infection can be a good contributor to death. In order to avoid infection our policy was to be moderately aggressive in surgery and also spend less time on surgery. Brandvold etal (5) supported less aggressive methods and reported an infection rate of 11%. In our series the rate of infection was slightly higher, for which we do not know the reason. In all patients we have given antibiotics from the start. In his study of 379 patients wounded during the Iran-Iraq War, Aarabi (6) noted that retained bone fragments increased the risk of CNS infection, but the increase was not statistically significant. Aarabi reported (6) that the longer time to intervention did not increase the infection rate and emphasized that adequate debridement of infected and contaminated necrotic tissues, dural repair, and antibiotic therapy all serve to decrease the infection rate even when intervention time is so long. Penetrating brain injuries involving the ventricular system are more susceptible to intracranial sepsis because the disturbance of CSF flow dynamics makes them prone to CSF leakage, and then infection (7). Administration of antimicrobial prophylaxis should begin as soon as possible after injury and continue for 5 days after surgery. We have also given antibiotics to all the patients from the start. Firarm injury is a vast public health problem that may be escalating further, particularly in children and adolescent age groups. The mean patient age is reported to be 35 years, but this may decline as larger numbers of children and adolescents are involved. Most patients do not survive to receive treatment (8,9,10,11,12). The reason for that being that firearm injuries are very fatal. So in this scenario timing is important as time could play a vital role in decreasing mortalty. Time is one more factor which needs consideration. In our series total time taken by the ambulance to access into the hospital entrance and then for the patient to reach to the Operation Theatre is very long. We mean that operation theatre is the main site for definitive treatment in such patients in our setting. Wedo not have a separate trauma protocol in place. The reason for extra time taken is that like any Government hospital in Asia, we do not have excellent facilities for the in-hospital transportation. In addition the traffic jam outside the entrance (inside the hospital campus) is a big problem which we face. Also our trauma theatre is on the 2nd floor. We have a lift in place but there can be a technical problem at any point of time or the lift operater could be away at this particular juncture for no reason. So the need of hour is to sound a special alarm on the lines of code-blue or fire-alarm which can be called as code-bullet. This siren (code) must be unique and uniform, it should be accepted internationally. There must be a special siren for that so that whole of theatre staff, the lift

operator and physician staff get alarmed. This alarm should call anesthetist, surgeon, neurosurgeon, with anesthetist as the team leader. In addition in our hospital we feel the dire need of a transportation system like car-cable which is specifically meant for trauma patients or especially bullet patients. This car-cable should be able to take patients directly to operation table in the minimum possible time.

Mortality in bullet injury neurosurgical patients is dependant on type of injury as well, for example, penetrating gunshot wounds, especially those that cross the coronal or midline sagittal planes, are usually fatal (8,13). In our series 14 percent patients had frontal lobe injuries and temporal lobe injuries ditto. Contusion was present in 16 patients which means 25 percent. Cerebral contusions are parenchymal bruises, all of which demonstrate some perivascular extravasation and edema on a microscopic level. In our series 11 patients had depressed fracture. In the case of craniocerebral gunshot injuries, contusions are commonly located beneath the site of the missile impact and are caused by inward movement of the skull, with or without fracture, based on the frequent finding of cerebral contusions in superficial and tangential injuries. Violent shock waves or cavitary tissue displacement in which the skull impacts on the brain parenchyma may also cause contusions to form at sites remote from the missile tract (14,15). All patients had been brought to trauma theatre just on entry to hospital. It needs to be mentioned here that in all patients first physician who would see the patient would be the resident of surgery department who was posted in A/E. Then the patient would be shifted to trauma OT. On certain occasions the shifting would be done empirically by the local hospital staff plus the security staff and by the attending mob with the consent of surgical resident. So practically in most of the patients it was usually the theatre staff (surgery and anesthesia staff) who would be the first recipients of these bullet injury patients. Then the staff would immediately convey the message to the physicians from anesthesia or surgery or neurosurgery other departments by phone or in person and then everybody would rush to the patient. The other recipients were anesthesia physicians who were on duty or those in the operating room doing some other cases and incidentally receiving the patient at the same time. The other incidental reciepients were surgery and neurosurgery physician who were operating upon their concerned cases and incidentally received the bullet patients. In our hospital theatre for neurosurgery is a part of trauma-theatre complex. That would make possible for neurosurgeons to see the patient of trauma or firearm injury immediately on arrival to the theatre without wasting much time. The time factor is important in resuscitation of such patients. So again it implies that the strong need of the hour is that there should be a siren or code-bullet which will alarm the concerned staff and force him towards the patient. We have seen that various corridors have been built for the transplant patients in various cities for carrying the organs to the recipient patients in stipulated time. In war zones like ours this idea can be used to transfer patients to the operating suite or CT Scan centre or resuscitation centre on priority basis. That will prevent wastage of time and that will help to improve the outcome of treatment in such patients.

CONCLUSION

In case of firearm injuries low GCS scores and bilateral injuries are correlated with poorer prognosis. Early surgery in association with short transportation time to the hospital could decrease mortality rates. it is immensely important that a unique code for bullet injuries is developed so that alarm is sounded and many deaths can be avoided. This alarm should call anesthetist, surgeon, neurosurgeon, with anesthetist as the team leader. Also a proper algorithm needs to be created to prioritize various entities for management so that a smooth management is ensured.

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