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Original Research Article

Evaluation of complete profile and outcome of gunshot injuries in tertiary care centre

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ABSTRACT

Background: Gunshot injuries are range from minor superficial pellet injuries to devastating soft tissue and visceral injuries. The objective of study was to evaluate complete profile and outcome of gunshot injuries in tertiary care centre.
Methods: This study was a prospective study. All gunshot injury patients who admitted in Department of Surgery, Moti Lal Nehru Medical College, Allahabad were included in study.
Results: Result were analysed in terms of age, sex, rural-urban and religion wise distribution, etiology of injury, arms and ammunition, time elapsed in first aid, site of injury, associated injury, organ involved, Glasgow coma scale, injury severity score, revised trauma score, various blood and radiological investigations, treatment and complications.
Conclusions: Gunshot injury was common in male patients, age group 21-30years, Hindu community and in rural areas. Most patients received injury by shotgun. Assault was most common cause followed by accidental injury. Majority of patients had Glasgow coma scale between 13-15, injury severity score below 20 and revised trauma score more than eight. Mortality and morbidity were more common in patients with high injury severity score, low revised trauma score and Glasgow coma scale below 8. Abdomen was most common site involved in gunshot injury. Most of the patients were managed conservatively as these patients had external body surface injury. Laparotomy was done for intra-abdominal injury. Wound infection was the most common complication.

Keywords: Arms and ammunition, Gunshot

INTRODUCTION

Gunshot injuries are range from minor superficial pellet injuries to devastating soft tissue and visceral injuries. Reason for the wide range of clinical injuries is related to ballistics of the missile, which in turn is dependent on type of arm and ammunition, distance and many other factors. Based on the theories of wound ballistics, it is very important to identify the type of bullet and the type of gun in order to disclose essential information regarding the severity and extent of injury. According to Wasserberger J et al, knowledge of ballistics is very important to identify the type of bullet and gun used in order to disclose essential information regarding the severity and extent of injury and prognosis of the patient.[1]

Knowledge of commonly used arms and ammunition and their ballistics in a particular region, combined with detailed history, physical examination and investigation, it is possible for a traumatologist to predict an appropriate

diagnosis of extent of trauma and to workout procedures to be considered and likely outcome of the management. Various types of arms and ammunition used in different parts of the world have different protocol of management from the concept of mandatory laparotomy by Sherman RT et al, to completely conservative management of type I injury (pellet scatter >25cms) as suggested by Glezer JA et al.[2,3]

The objective of study was to evaluate the complete profile and outcome of gunshot injuries in tertiary care centre, identifying the prognosis and probability of survival and grade them into various categories based on existing scores model which was Glasgow coma score, revised trauma score, injury severity score and abbreviated injury score.

METHODS

This study was a prospective study. All patients with gunshot injury from July 2009 to August 2010 who were admitted in the Department of Surgery, Swaroop Rani Nehru Hospital, Moti Lal Nehru Medical College, Allahabad were included in study. All patients who brought dead or died soon during resuscitation were excluded from the study.

All the patients presenting with gunshot injuries were examined in the emergency reception room of S.R.N. hospital according to ATLS protocol.

After initial resuscitation with control of airway and breathing bony injuries and possible haemostasis in the emergency room, they were shifted to emergency ward for further assessment of injuries which includes duration of time of injury (i.e. time lapsed) to the time of first attendance in the SRN hospital, type of weapon used, detailed description of injury with emphasis on location of entry and exit wounds with possible path of missile, scorching, blackening, tattooing, evisceration, haemorrhage, signs of peritonitis shock, associated neurological deficits, per rectal examination, Ryle's tube content, signs of thoracic and other injuries were done.

Detailed physical examination was done by using injury severity score, abbreviated injury score, revised trauma score and Glasgow coma scale.

Injection Tetanus toxoid and broad-spectrum intravenous antibiotics were administered. After initial resuscitation the patient was shifted for ultrasonography or CT scan for haemodynamically stable patients.

Result were analysed in terms of age, sex, rural-urban and religion wise distribution, etiology of injury, arms and ammunition, time elapsed in first aid, site of injury, associated injury, organ involved, Glasgow coma scale, injury severity score, revised trauma score, various blood and radiological investigations, treatment and complications.

RESULTS

This observational study was comprised of 70 subjects. Table 1 shows that most of the patients were of younger age groups of 21-30years (31.43%). Out of 70 cases, 57 (81.43%) were males and 13(18.57%) patients were females. Maximum females were injured in assault 7 (10%). No female was injured in suicidal attempt. Out of 70 cases, 46 (65.71%) were from rural area and 24 (34.29%) patients were urban dwellers. Most of the patients with gunshot wound were Hindu people 53 (75.71%). Maximum cases 46 (65.71%) were due to assault because of various reasons in which property disputes were highest 18 (39.13%). Accidental gunshot wound was the second most common cause most patients 45 (64.29%) received pellet injuries while 25 (35.71%) patients got injured by shotgun bullets.

Table 1: Distribution of patients on the basis of age, sex, rural-urban and religion wise distribution, etiology of injury, arms and ammunition.

Characteristics	No. of patients			%
Age and sex	**Males**	**Females**	**Total**	
5-20	11	3	14	20
21-30	18	4	22	31.43
31-40	13	1	14	20
41-50	5	4	9	12.86
51-60	3	1	4	5.71
61-70	6	-	6	8.57
>70	1	-	1	1.43
Rural urban distribution				
Rural	46			65.71
Urban	24			34.29
Religion wise distribution				
Hindu	53			75.71
Muslim	17			24.29
Etiology of injury				
Assault	46			65.71
Accidental	16			22.86
Caught in crossfire	6			8.57
Suicidal	2			2.86
Arms and ammunition				
Pellet country made	33			47.14
Pellet factory made	12			17.14
Bullets country made (0.315)	12			17.14
Bullets factory made (0.315)	6			8.57
Bullets factory made (0.32)	6			8.57
Carbine	1			1.43

Table 2 shows that out of 70 cases, 32 (45.71%) patients reached the emergency department between 2-3hour after gunshot injury. Only 32 (34.29%) patients had received first aid before arrived at emergency maximum number of patients had abdominal gunshot wound 18 (25.71%)

followed by chest injury 13 (18.57%). Small bowel (14.29%) was the most commonly involved organ in abdominal gunshot wound. Patients with gunshot injury had some associated minor injuries in other parts of body. Lower limb (40%) was most commonly involved in association with primary site. One (1.43%) patient with abdominal gunshot wound had associated diaphragm injury along with stomach injury.

Table 2: Distribution of patients on the basis of time elapsed to reach hospital, first aid, site of injury, associated injuries and organ involved.

Characteristics	No. of patients	%
Time elapsed in minutes (min)		
1min-60min	8	11.43
61min-120min	10	14.29
121min-180min	32	45.71
181min-240min	6	8.57
>240min	14	20
First aid		
Received	24	34.29
Not received	46	65.71
Site of injury		
Head and neck region	10	14.29
Chest	13	18.57
Upper extremity	9	12.86
Abdomen	18	25.71
Chest and abdomen	7	10
Lower extremity	9	12.86
Multiple body parts	4	5.71
Associated injury		
Head	8	11.43
Neck	6	8.57
Face	10	14.29
Upper limb	16	22.86
Lower limb	28	40
Organ involved in abdominal wound		
Stomach	2	2.86
Small bowel	10	14.29
Spleen	4	5.71
Spleen and kidney	3	4.29
Diaphragm	1	1.43

Table 3 shows that sixty-two (88.57%) patients with gunshot wound had Glasgow coma score between 13-15. In present study, 69.99% of patients had injury severity score equal to or less than 20. The lowest score obtained was 1 and highest score was 64. Majority of patients (85.71%) in present study had revised trauma score more than eight.

Table 4 shows that majority (54.29%) of patient had hemoglobin level between 7-10gm% and (65.71%) had random blood sugar between 60-100mg%. In this study, plain X-ray was done in all patients. Ultrasonography was done in 42.86% of cases admitted with gunshot injury over abdomen. CT scan was done in 21.43% of patients, out of which 8 patients had head injury. Both ultrasonography and CT scan was done in 4 patients.

Table 3: Distribution of patients on the basis of various injury scores.

Injury scale	No. of patients	%
Glasgow coma scale		
13-15	62	88.57
9-12	4	5.71
6-9	2	2.86
4-6	1	1.43
3	1	1.43
Injury Severity Score		
0-5	15	21.43
6-10	18	25.71
11-15	4	5.71
16-20	12	17.14
21-25	11	15.71
26-30	5	7.14
31-35	2	2.86
36-40	2	2.86
>40	1	1.43
Revised trauma score		
1	1	1.43
2	2	2.86
3	0	0.0
4	1	1.43
5	3	4.29
6	2	2.86
7	1	1.43
8	3	4.29
9	6	8.57
10	16	22.86
11	15	21.43
12	20	28.57

Table 5 shows that most of the patient, 44 (62.86%) in present study were managed conservatively, debridement was done in 5 (7.14%) patients. Laparotomy was done in 16 (22.86%) patients with abdominal trauma. Both laparotomy and inter-costal drainage was done in 6 (8.57%) patients, who had abdominal injury associated with chest injury. In patients with injury over chest, inter-costal drainage was done in 6 (8.57%) patients. One patient with intracranial injury was found in which hematoma drainage was done. Mandibular plating was done in one patient with mandible fracture.

In 10 (14.29%) patients of small bowel injury, primary repair was done in 4 patients. In 4 (5.71%) patients ileostomy was made. Resection and anastomosis were done in 2 (2.86%) patient. Omentopexy of gastric perforation was done in 2 (2.86%) patients. Diaphragm injury repair was done in one patient with gastric injury. Out of 22 (31.43%) patient in which laparotomy was

done, splenectomy was done in 4 (5.71%) patient, both splenectomy and nephrectomy were done in 3 (4.29%) patient. Most common complication in 5 (7.14%) patients with gunshot injury was wound infection. Mortality among gunshot victims were seen among 5 (7.14%) patients. These patients had injury over abdomen, chest and head.

Table 4: Distribution of patients on the basis of blood and radiological investigations.

Investigations	No. of patients	%
Hemoglobin (gm%)		
<7	13	18.57
7-10	38	54.29
>10	19	27.14
Random blood sugar (mg%)		
<60	4	5.71
60-100	46	65.71
100-140	11	15.71
>140	9	12.86
Serum urea		
20-30	42	60
30-40	22	31.43
>40	6	8.57
Serum Creatinine		
0.6-1.2	39	55.71
1.2-1.5	27	38.57
>1.5	4	5.71
Radiological investigations		
X-ray	70	100
USG	30	42.86
C T Scan	15	21.43
USG+CT scan	4	5.71

Table 5: Distribution of patients on the basis of treatment and complication.

Characteristics	No. of patients	%
Treatment given		
Conservative	44	62.86
Laparotomy	16	22.86
Intercostal drainage	6	8.57
Laparotomy+intercostal drainage	6	8.57
Debridement	5	7.14
Intracranial hematoma evacuation	1	1.43
Mandibular plating	1	1.43
Complications		
Fecal fistula	1	1.43
Broncho-cutaneous fistula	3	4.29
Wound infection	5	7.14
Pelvic abscess	2	2.86
Subphrenic abscess	2	2.86
Death	5	7.14

DISCUSSION

In this study, total number of gunshot injury patients were 78, incidence being 2.46% of all admission in emergency surgery ward. In this study, 8 patients died soon after arrival. They were not included in study.

Maximum registered firearms were of shotgun variety which fire low velocity pellets with low kinetic energy resulting in moderate lethality of the weapon. Most of the country made firearms were handguns using 0.315mm bullet resulting in moderate lethality.

In this study, maximum number, 22 (31.43%) of cases were in age group of 21-30years followed by age group of 31-40years. This coincide with statistics of Pyper PC of Northern Ireland who has shown maximum age group 21-30years followed by 31-40years, while Morcus NA has given an average age of 24years.[4,5] Male (81.43%) were commonly injured in present study as compared to females (18.57%). In the present study, gunshot wound was most common in two major communities that are Hindu and Muslims. Large numbers of cases of gunshot injuries were Hindus that was 75.71% admitted for treatment while only 24.29% of patients were from Muslim community.

Incidence of gunshot injuries were from the rural areas (65.71%) is more as compared to urban area (34.29%). Assault was most (65.71%) common cause in the present study, followed by accidental injury (22.86%). Similar report was found by Cornwell EE.[6]

In this study, majority of gunshot injuries were inflicted by low velocity weapon (country made piston and shotgun). Only 35.71% of gunshot wound were inflicted by high velocity weapon that was rifle and revolver injury. Results were poor with high velocity bullet injuries because high velocity weapons cause more devastating injury.

Most of this gunshot victims were brought hospital in two to three hours because majority of gunshot injuries were from rural areas and poor availability of transport facility also make these patients to reach the hospital late. Becker DP et al, reported an average time from injury to exploratory laparotomy was 9.6hour (range 6-13hour).[7] Majority of cases of gunshot injuries were coming to hospital without taking any first aid. In the present study, 25.71% of gunshot injuries were on abdomen. Thirteen (18.57%) patients had injury over chest and 7 (10%) patients had injury both on chest and abdomen. Nasrullah M et al. studied the fire arm injury in total 286 patients presenting to a tertiary care hospital of Karachi and found that lower limb was the most affected part (30%) followed by abdomen pelvis (27%).[8] In present study, small bowel was the most frequently (14.29%) injured organ followed by spleen (5.71%). Arandelovic S et al, had reported that injuries were predominant in lower limb

(64.70%) then injury of head neck region (17.90%) in a series of 64 patient of gunshot injuries over chest.[9]

In present study, 88.57% patients with gunshot injury had Glasgow coma scale between 13 to 15 and 5.71% had 9-12, 2.86% of patients had GCS score 9-6 and 2.86% patients had GCS score below 6. Mortality was seen in two patients with score below 6. This showed that no mortality was seen in patients with GCS score more than 8 and demonstrated that higher the GCS score better the survival.

Majority of patients (69.99%) had injury severity score below or equal to 20, only 30.01% of patients had score above 20. 1.75% mortality was seen in patients with injury severity score below 20 and 7.02% mortality were seen in patients with score above 20, out of 57 patients who remained in hospital till their treatment, whereas morbidity was 7.14% in patients with score below 20 and 18.57% with injury severity score above 20, out of 70 patients.

Author had found that higher the injury severity score, longer the duration of hospital stays and morbidity among these patients. Bergqvist D et al, reported in their series of 127 blunt abdominal trauma patient that injury severity score below 25, the morbidity risk was minimal and above 25 there was almost linear increase. When injury severity score was 50 the mortality was 50% and when above 70 it was close to 100%.[10]

Majority (85.71%) of gunshot trauma patients had revised trauma score more than 8. 14.29% of patients had score less than eight. Copes WS et al, reported that prognosis was good in patients with high revised trauma score.[11]

Majority (54.29%) of patients in this study had haemoglobin between 7-10gm% that was positive for anaemia because most of the gunshot injury were associated extensive haemorrhage resulting in low haemoglobin percentage. Only 18.57% of gunshot victims had haemoglobin level less than 7gm%. This is because of extensive haemorrhage either following major vascular injury or multiple solid visceral injuries. In this study, most of the patient (81.43%) had normal blood sugar level, only nine patients have blood sugar level more than 140.

Majority of gunshot patient had normal blood urea (91.43%) and creatinine (92.48%). Raised serum urea and creatinine was seen only in those patients who had sustained renal injury and were associated with prolonged hospital stay, morbidity and mortality. Plain X-ray was done in all patient. Ultrasonography was done in 30 patients with gunshot injury over abdomen and Chest. CT scan was done in 15 patients for the localization of bullet.

Most common injury (62.86%) patterns were external body surface injuries as well as injury over extremities requiring medical management and conservative treatment with intravenous fluids, broad spectrum antibiotics and tetanus prophylaxis. Patients with dirty external lacerations and cuts (7.14%) managed by debridement.

Laparotomy was done in 31.43% patients and primary repair of small bowel injury was done in 5.71% patients, ileostomy was made in 5.71% and resection anastomosis was done in 2.86% of patients. Omentopexy of gastric perforation was done in two patients, out of which one patient also involved repair of diaphragm injury. Splenectomy was done in 5.71% and both splenectomy and nephrectomy involved 4.29% of patient. Splenic lacerations respond well to splenectomy and were not related to any complication. Injury of kidney was managed by nephrectomy. In 17.14% of patient underwater seal intercostal drainage done. In one patient intracranial hematoma drainage done and mandibular plating was done in one patient.

Out of 70 patients, 10 patients left against medical advice, 3 patients absconded and 5 patients were expired in the hospital. In remaining 52 patients, wound infection was the most common complication seen in 5 (7.14%) patient, followed by broncho-cutaneous fistula in 3 (4.29%) patient, pelvic abscess and subphrenic abscess in 2.86% each and fecal fistula was seen in 1.43% of patients.

CONCLUSION

Gunshot injury was common in male patients, age group of 21-30 years, Hindu community and in rural areas. Most patients received injury by shotgun. Assault was most common cause followed by accidental injury. Victims were arrived hospital in two to three hour without any preliminary treatment.

Majority of patients had Glasgow coma scale between 13-15, injury severity score below 20 and revised trauma score more than eight. Mortality and morbidity were more common in patients with high injury severity score, low revised trauma score and Glasgow coma scale below 8.

Abdomen was most common site involved in gunshot injury, followed by chest. Small bowel was most common organ involved in abdominal gunshot injury, followed by spleen. Majority of associated injury were seen over extremities Duration of hospital stay was longer in patient with associated injuries.

Patients with raised blood sugar and low haemoglobin level have more chances of complications. Renal injury patients had prolonged hospital stay due to raised serum urea and creatinine.

Most of the patients were managed conservatively as these patients had external body surface injury. Laparotomy was done for intra-abdominal injury. Wound

infection was the most common complication followed by broncho-cutaneous fistula.

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