Pattern and Outcome of abdominal gunshot wounds in El-Fashir Teaching Hospital

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Abstract

Background: Abdominal gunshot wounds (GSWs) are important cause of morbidity and mortality worldwide in both military and civilian settings. They are commonly encountered in the western states of Sudan where the civil war and tribal conflicts are prevalent.

Objectives: To describe the pattern of presentation and outcome of abdominal gunshot wounds and to assess the factors that predict morbidity and mortality at El-Fsahir Teaching Hospital, Northern Darfur.

Patients and Methods: It is a retrospective, analytical, hospital- based study. Data were collected by retrospective review of hospital records of patients with abdominal gunshot wounds who presented between January 2006 and December 2012.

Results: A total number of seventy four patients were included. Male to female ratio was 5:1. The majority of patients 67 (90%) were below the age of 40 years. More than half of the patients 39 (52.7%) had a delayed presentation to the hospital (after eight hours since the time of injury). About one-fourth of patients 18 (24.3%) were shocked at the initial presentation. Surgical exploration was performed in all patients. The most commonly injured organs were: the small intestine 43 (57.1%), the colon 33(44.6%), the stomach and the liver 9(12.2% each). Negative exploration was encountered in six (8.1%) patients. Associated extra-abdominal injuries were found in 24 (33.1%) patients. They were mainly in the extremities 17 (23%), the chest seven (9.5%) and the pelvis four (5.4%).The overall morbidity was 44.6% (n=33). They were mainly: surgical site infections (SSI)followed by septicemia. Colonic injuries are associated with a higher risk of SSI and septicemia. The mortality rate was 21.6% (n=15). The commonest causes of death were septicemia and hypovolemic shock.

Conclusion: There was a high incidence of morbidity (44.6%) and mortality (21.6%) among patients with abdominal gunshot wounds in El-Fashir Hospital in comparison to the literature. This can be explained by various reasons including: the lack of appropriate pre-hospital trauma management; the delayed presentation to the hospital (as a result of insufficient ambulance services and lack of adequate security) and the shortage of well-trained staff. Presence of colonic injuries, increasing number of injured intra-abdominal organs and associated extra-abdominal injuries are predictors of poor outcome in patients with abdominal gunshot wounds in El-Fashir hospital.

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Introduction

Trauma continues to be a significant cause of morbidity and mortality worldwide[(1)]. Gunshot wounds are now more than in the past and result in a profound morbidity and a significant mortality[(1)]. The causes of gunshot injuries in Africa and developing world include communal clashes, military violence, armed robbery and political conflicts [(2)]. Gunshot wounds (GSWs) to the abdomen are still classically treated with surgical exploration. This approach of management can be explained by a relatively higher

incidence of intra-abdominal injuries and a lower rate of negative exploration when they compared to stab injuries to the abdomen [3]. It was found that negative laparotomy ranged from 23 to 53% for patients with stab wounds to the abdomen, in contrast to a range of 5.3 to 27% for those with abdominal GSWs [3].

Patients and Methods

This is a retrospective, analytical, hospital- based study. Data were collected by a retrospective reviewing of medical records of patients who presented to El-Fashir Teaching hospital, Northern Darfur State, with abdominal gunshot wounds in the period 2006- 2012.The study was approved by the Ethical Committee of Sudan Medical Specialization Board (SMSB).Demographic data were obtained, the time elapsed between the injury and arrival to hospital was recorded. Associated extra-abdominal injuries were reported.

All patients were examined using the standard techniques of examining the abdomen. Haemodynamic stability and signs of peritoneal irritation were evaluated. There were no specific protocols for applying investigations and diagnostic techniques and only plain X-rays were used.

All patients underwent an exploratory laparotomy after adequate resuscitation through a midline incision under general anesthesia. Preoperative antibiotics were given to all patients. Number of injured intra-abdominal organs was recorded. Diverting colostomy was performed in patients with colonic and rectal injuries. Non-suction drains were inserted in all patients and removed after three to ten days postoperatively. The hospital stay for all patients was measured. Morbidity and mortality were recorded.Morbidity encountered during hospital stay included :surgical site infection (SSI), septicemia, hemorrhage and wound dehiscence. SSI was defined as any infection that involved the skin or subcutaneous tissues at the site of incision with the following signs: local swelling and redness, pain or tenderness or purulent discharge. Wound swabs for culture and sensitivity were not taken in all cases due to financial constraints and clinical diagnosis was made in the majority of cases. Septicemia was defined as presence of systemic inflammatory response (SIR) signs (pulse rate is >90 bpm, respiratory rate >20 breathes per minute, fever >38 or hypothermia <36 and total WBCs of more than >12,000/mm³ or less than 4,000/mm³) in the presence of an infection site. Due to abovementioned constrains, the blood cultures were not taken in all suspected patients.

Data were analyzed using the SPSS software package (version 21 Windows). To determine the statistical significance of differences the Pearson test was used and probability test (*P*. value) with $P < 0.05$ was considered significant at 95% confidence interval.

Results

Seventy four patients with abdominal gunshot wounds (GSWs) were included. There were 62(83.6%) males and 12 females (16.4%) with a sex ratio of 5: 1. Sixty seven patients (90.5%) were below the age of 40 years. Thirty nine (52.7%) patients were from El-Fashir City, others were from other cities and towns in Northern Darfur State. The peak incidence of patients was seen in the years 2008 and 2009 (16) patients (21.6% in each).More than the half of patients 39 (52.7%) had a delayed presentation to the hospital (after eight hours since the time of injury), while 35 (47.3%) had presented within the first eight hours of the injury. About one fourth 18 (24.3%) of patients were shocked at the initial presentation.

The most commonly injured organs were: the small intestine 43 (57.1%), the colon 33 (44.6%), the stomach and the liver 9 (12.2% each). About 23(17%) had multi-organ injuries. Negative exploration was encountered in six (8.1%) patients**(Table 1).**More than two-thirds 78.5% (n=11) of those who had postoperative SSI had an associated colonic injury and the majority of deaths (82%) (n=12) had occurred in those with colonic injuries as a result of septicemia. Associated extra-abdominal injuries were encountered in 33.1% (n=24). They were mainly in the extremities 17 (23%), the chest seven (9.5%) and the pelvis four (5.4%).

The mean duration of the hospital stay was 10.2 days. About 33 (45%) patients stayed for more than 10 days.The overall morbidity in our series was 44.6% (n=33). The commonest morbidities were: surgical site infection 14 (43%) and septicemia 11 (33%) **(Table 2).**More than two-thirds 11 (78.2%) of those who had postoperative SSI had an associated colonic injury.The overall mortality rate was 21.6% (n=15). The common causes of death were septicemia in12 patients and hypovolemic shock in three patients. The number of injured intra-abdominal organs is significantly associated with a higher mortality rate, as 73.3% (n=11) of mortality was observed in those who had multi-organ injuries. Furthermore, all of those who died had associated extra-abdominal injuries. There were no associations between age and sex and mortality rate in our series (P values in both were >0.05).

Table 1.Findings of exploratory laparotomy performed for the patients with abdominal gunshot wounds (GSWs) at Al-Fashir Teaching Hospital

Injured intra-abdominal organ*	Number and Frequency (%)
Small intestine	39 (52.7)
Colon	33 (44.6)
Stomach	9 (12.2)
Liver	9 (12.2)
Mesentery	5(6.8)
Duodenum	4 (5.3)
Diaphragm	3 (4.1)
Gallbladder	3 (4.1)
Kidney	2 (2.7)
Spleen	2(2.7)
Rectum	1 (1.4)
No injury	6 (8.1)

***23 (17%) had multi-organ injuries.**

Table 2. Morbidities encountered in patients with abdominal gunshot wounds at Al-Fashir Teaching Hospital (n=33).

The morbidity	Frequency and Percentage (%)
Surgical site infection	14 (43%)
Septicemia	11 (33%)
Hemorrhage	6 (18%)
Wound dehiscence	2 (6%)
Total	33 (100%)

Discussion:

Gunshot injuries constitute major problems worldwide from both medical and economic perspectives[4]. The sex distribution with male predominance is similar to what is reported in other series [5, 6]. In fact, this pattern is typical to other types of trauma[5].

In this series, the majority of the patients 67 (90.5%) were below the age of forty years. This proportion of under-forty patients is slightly higher than that reported by Ogunlusi[7] in a Nigerian Hospital who found about 78.9% were below the age of forty years[7]. This remarkably high incidence among younger age group implies an enormous premature loss of a productive workforce and would have negative socio-economic impacts on both local and national communities. It is interesting to note that the age of the patient with trauma is an important determinant factor in overall outcome, as it was found that the mortality rate increases significantly among the patients who are over 50 years [8]. However, we did not find this association in our series.

The delayed presentation to the hospital (after eight hours since the time of injury) was reported in 39 patients (52.7%) in this series. About one-fourth of patients 18 (24.3%) were shocked at the initial presentation;nearly more than the half of them(ten patients) had a delayed presentation. The delayed presentation is associated with a prolonged time of shock,which would have a negative impact on the

overall outcome of abdominal trauma patients[8]. Availability of well-established trauma services would hopefully minimize the time interval between injury and admission to the hospital and could allow initial resuscitation to be implemented earlier on during the reversible phase of the hypovolemic shock. Britt et al[9] stated that irreversible hypovolemic shock contributes significantly to the mortality and morbidity in patients with abdominal trauma and it's occurrence should be prevented to avoid multi-organ dysfunction syndrome[9].

All patients underwent an exploratory laparotomy. By adopting this policy, we had a proportion of 8.1% (n=6) of negative explorations. This percentage is in the range of the literature that reported a negative exploration rate of 5.3 to 27%[3]. It is fairly similar to a study done by A. A. Kandil[10]at Al-Shifa Hospital in Gaza strip, Palestine, who performed 15 negative explorations out of 230 patients (6.5%) [10]. In fact, the question of whether to explore all patients with penetrating abdominal GSWs or not has been a subject of a great debate in various studies [11]. One study concluded that conservative management should be strictly followed in a selected group of patients, who are heamodynamically stable and have no signs of peritoneal irritation,with availability of advanced diagnostic tools (abdominal CT scan) that have a high sensitivity and specificity to detect minor solid visceral, hollow visceral and retro-peritoneal injuries[11].

The majority of authors still recommend surgical exploration for all patients with abdominal GSWs due to the high possibility of visceral and retro-peritoneal injuries that result from transmitted thermal injury which is produced by penetrating bullets [12]. However, this policy may carry a variable range of negative results[3]adding an undeniable cost of morbidities that are closely associated with unnecessary laparotomies(most notably postoperative respiratory complications and fibrous adhesions) [13]. On the other hand, some workers advocate that local wound exploration (LWE) under local anesthesia in the emergency department can be a good technique to establish whether the peritoneum is breached or not and this would subsequently affect the decision to explore [14]. Nevertheless, this technique is rather employed in stab-penetrating abdominal wounds and has a high failure rate even in the best hands [12].

The pattern of intra-abdominal injuries encountered in our series is in keeping with the literature [15-17]. The small intestine, the colon and the liver were the most frequently injured organs in a large series of abdominal gunshot wounds[18]. About 23 (17%) had multi-organ injuries and we noticed a significant association between the number of injured organs and mortality rate, the majority of patients (75%) (n=11)who died had multi-organ injuries, which is in line with similar studies that proved an association between the number of injured organs and the mortality rates [18-21].

The overall morbidity in our series was44.6% (n=33), with the SSI being the most frequent one. This finding is fairly comparable to similar studies[22]. More than two-thirds 78.5% (n=11) of those who had postoperative SSI had an associated colonic injury and the majority of deaths (82%) (n=12) had occurred in those with colonic injuries as a result of septicemia. This finding supports the presumed association between colonic injury and the increased morbidity and mortality [18].

Septicemia was the second common morbidity encountered. In fact, the literature reported septicemia as a complication of abdominal GSWsin 2.4% to 55.7% of all reviewed cases[22, 23]. It was found that the use of the broad-spectrum preoperative antibiotics in combination with irrigation of the peritoneal cavity with warm saline has contributed to a lower incidence of postoperative SSI following penetrating abdominal gunshot wounds[23].

The mortality rate for this series was 21.6% (n=15) which was remarkably higher than that mentioned in other series that reported a mortality rate of nearly 10%[24]. This can be explained by a wide variety of reasons including :the lack of the appropriate pre-hospital trauma management; the delayed presentation to hospitals (as a result of insufficient ambulance services and lack of security) ;and the

shortage of well- trained staff. It was found that establishing sufficient ambulance services; blood banks and regional trauma centers have decreased mortality rates to almost 9.5%[25] .

The number of injured intra-abdominal organs is significantly associated with a higher mortality, as 73.3% (n=11) of mortality was observed in those who had multi-organ injuries, supporting the findings of previous studies that document a direct relationship between the number of injured organs and the mortality rate [19- 21, 24].

The commonest cause of death in this series was septicemia (12) patients, followed by hypovolemic shock (three) patients, in contrast to others that found hypovolemic shock as the main cause of death[12, 15].

Conclusion: There was a high incidence of morbidity (44.5%) and mortality (21.5%) in patients with abdominal gunshot wounds in this series in comparison to international literature. This can be explained by various reasons including: the lack of appropriate pre-hospital trauma management; the delayed presentation to hospitals (as a result of insufficient ambulance services and lack of adequate security) ;and the shortage of well- trained staff. Abdominal exploration for patients with peritoneal penetration is mandatory. Presence of colonic injuries; increasing number of injured intra-abdominal organs; and associated extra-abdominal injuries are predictors of poor outcome.

Acknowledgment

We would like to thank medical officers and nursing staff in the Accidents and Emergency Department at El-Fashir Teaching Hospital for their kind help and participation during data collection.

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