



Research Article

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**Management of Abdominal Trauma at Al-Gamhouria General
Modern Hospital- Aden- Yemen from 1STJAN 2013 -31STDEC 2014**

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Abstract

Background: Abdominal injury is relatively common in both civilian and military casualties and is a leading cause of morbidity and mortality.² The abdomen is the third most commonly injured anatomic region following the head and extremities.³ Abdominal trauma is among the leading causes of morbidity and mortality in all age groups worldwide. Aim: The main objectives were to identify the epidemiological and clinical characters of the injured patients, mechanisms of injury, types of trauma and types of provided treatment. Patient and method: This is a cross-sectional prospective, hospital based study in Al-Gamhouria Modern General Hospital, from 1st Jan 2013 up to 31st Dec 2014. Study involved 70 patients who were diagnosed as abdominal trauma and admitted to emergency department of the hospital during the study period. Data was collected directly from the patients, relatives and files of admission by the author herself and the duty emergency resident. Hospital follow up, results of preoperative, operative and postoperative notes and investigations were collected by the author. Result: The total number of included patients with abdominal trauma, in this study was 70. male patients were predominantly more than female, 65 (92.9%) vs.5 (7.1%). Abdominal trauma involved young people with the mean age was 31.3 ± 13.9 years; most of them were from Aden. The gunshots as the most common causes of penetrating abdominal. Operative intervention was the therapeutic option for most patients with abdominal traumas 47(77.0%). Complications occurred in 25(35.7%) patients with wound infection was the most common complications 10(14.3%) followed by UTI and DVT 5(7.1%) for each. Conclusion: Penetrating injuries were more prevalent compared to blunt injuries, as the mechanism of injury was mostly due to gunshots and stab actions. The most frequently injured abdominal organ includes ilium, followed by liver, and stomach. Operative intervention was the therapeutic option for most patients with abdominal traumas.

Keyword: abdominal injury, clinical presentation, complication, Yemen.

Introduction

Trauma is a major worldwide public health problem and one of the leading causes of death and disability in both industrialized and developing countries. Trauma remains the most common cause of death for all individuals between the ages of 1 and 44 years and is the third most common cause of death regardless of age. It is also the number one cause of years of productive life lost. (1)

Abdominal injury is relatively common in both civilian and military casualties and is a leading cause of morbidity and mortality. (2) The abdomen is the third most commonly injured anatomic region following the head and extremities. (3)

Abdominal trauma is among the leading causes of morbidity and mortality in all age groups worldwide. Men tend to be affected slightly more than women, (4) while a male predominance is reported in Africa. (5,6)

Historically, blunt abdominal trauma (BAT) is more frequently encountered in the emergency department (ED) than penetrating abdominal trauma, and usually results from a motor vehicle collision (MVC).² When combined with pedestrian versus auto accidents, these types of abdominal traumas account for up to 75% of cases seen, while direct abdominal blows and falls comprise the remainder. The spleen is the most often injured organ and may be the only intra-abdominal injury in over 60% of cases. Liver and hollow viscus injuries follow in decreasing incidence. (2,7)

Penetrating trauma is increasing because of the growth of violence in our society. Stab wounds are encountered three times more often than gunshot wounds, but have a lower mortality because of their lower velocity and less invasive tract. As a result of their greater force and extensive missile tract, gunshot wounds account for up to 90% of the mortality associated with penetrating abdominal trauma. Injury to the bowel (small, then large) is most often found, followed by hepatic injury, regardless of type of penetrating injury. Currently, some researchers have advocated laparotomy only in selected patients as some of the of the patients with an abdominal injury could be managed conservatively. (8,9)

Mortality was found to be associated with the number of organs injured, vascular injury, the need for damage control surgery, and emergency department thoracotomy. The damage control surgery has been used with some success in the management of patients with extensive abdominal trauma, it's associated with significant morbidity, including sepsis intra-abdominal abscess or gastrointestinal fistulas. (10)

In Yemen, although trauma is one of the major causes of morbidity and mortality seen in our hospitals, there is a limited number of researches concerning trauma in general (incidence, causes, patterns, and management) and abdomen trauma in particular. This study was conducted in order to provide a detailed analysis of one of the major components of trauma, abdomen trauma. It was hold up on Yemeni patients with abdomen trauma who were admitted to the main referral hospital in the east-southern governorates, Algamhouria Council Aden Hospital.

The main objectives were to identify the epidemiological and clinical characters of the injured patients, mechanisms of injury, types of trauma and types of provided treatment. Moreover, analysis of morbidity, mortality and hospital stay and their relations to the other variables related to the patients, type of trauma, type of treatment and management were performed.

Patient and method:

This is a cross-sectional prospective, hospital based study in Al-Gamhouria Modern General Hospital, from 1st Jan 2013 up to 31st Dec 2014.

The study involved 70 patients who were diagnosed as abdominal trauma and admitted to emergency department of the hospital during the study period. They were followed up at Surgical Department wards of Al-Gamhouria Modern General Hospital.

Inclusion criteria:

All patients admitted to the hospital with diagnosis of abdominal trauma. The clinical diagnosis was done at the time of the admission by clinical history, physical examination, and investigations (lab. investigation, radiological investigation, and ultrasound), and/or confirmed during operative intervention.

Exclusion criteria:

Pediatric patients with abdominal trauma who were less than 13years old. Patients with trauma of reproductive system. Pregnant women with abdominal trauma. Major abdominal vascular trauma and neurological trauma.

Data collection and processing:

Data was collected directly from the patients, relatives and files of admission by the author herself and the duty emergency resident. Hospital follow up, results of preoperative, operative and postoperative notes and investigations were collected by the author.

Data analysis was done after data interpretation by computerized system "SPSS program" and analysis in to frequency and percentage distribution that were represented in statistical tables and graphs. The tests used were chi square test, independent samples test, with the level of significance was at or less than 0.5%.

Result

The total number of included patients with abdominal trauma, in this study was 70.

Table (1) described the demographic features, male patients were predominantly more than female, 65 (92.9%) vs.5 (7.1%).

The age ranged from 13 to 65 years with a mean age of 31.3 ± 13.9 years. The peak age for abdominal trauma was in the third decade of life; 24 (34.3%) then the fourth decade; 15 (21.4%). Students and those with private works were more affected 24 (34.3%) and 22 (31.4%) respectively.

| Item | (n=70) | |
|-------------------------|-----------------------|------|
| | No | % |
| - Sex: | | |
| Male | 65 | 92.9 |
| Female | 5 | 7.1 |
| - Age groups: | | |
| < 20 | 13 | 18.6 |
| 20 – 29 | 24 | 34.3 |
| 30 – 39 | 15 | 21.4 |
| 40 – 49 | 8 | 11.4 |
| ≥ 50 | 10 | 14.3 |
| Mean ± SD (Min. – Max.) | 31.3 ± 13.9 (13 – 65) | |
| - Occupation: | | |
| Student | 24 | 34.3 |
| Private clerical worker | 22 | 31.4 |
| Farmer | 7 | 10.0 |
| Soldier | 6 | 8.6 |
| Teacher | 6 | 8.6 |
| House wife | 5 | 7.1 |
| - Residence: | | |
| Aden | 50 | 71.4 |
| Lahj | 14 | 20.0 |
| Abyan | 6 | 8.6 |

Table 1. Demographic Characteristics of the Studied Patients with Abdominal Trauma

Most of the abdominal traumas, occurred in residents at Aden governorate 50 (71.4%) Table (2) showed the clinical and laboratory data at presentation penetrating abdominal trauma were more than blunt trauma in the studied patients, 53 (75.7%) vs.17 (24.3%).

The common mechanism of abdominal trauma was gunshot abdomen 41 (58.6%) followed by RTA 9 (12.9%) and stab wound 9 (12.9%) for each of them.

The majority of patients were presented within < 6 hours of abdominal trauma occurrence; 61(87.1%) and only 7 (10.0%) were presented after 12 hours of trauma. Hemodynamically, most of patient with abdominal trauma were presented in stable state; 50 (71.4%).

The mean total hemoglobin and total hematocrit were (11.8±2.3) and (36.1±7.1) respectively.

The mean hemoglobin and hematocrit concentrations were slightly higher among patients with penetrating traumas when compared to those with blunt abdominal traumas (12.0±2.3 vs 11.2±2.0) and (36.9±6.7 vs 33.5±7.4) respectively, but these differences were not found statistically significant (p>0.05).

The mean total leucocytic count was (10.2 ±4.6) There was significant increase in the mean total leucocytic count of patients with blunt abdominal trauma when compared to penetrating trauma (12.8±5.7 vs. 9.4±3.8 X10⁹/L); (p<0.01).

The common causes for penetrating abdominal traumas were gun shot in the majority of the patients; 41 (77.3%), followed by stab wound; 9 (17.0%) and then injury by sharp objects; 3 (5.7%). While the common causes for blunt abdominal traumas were RTA in most of patients ;10 (58.8%), followed by boxing;4 (23.5%) and falling down; 3 (17.7%).

Ultrasound examination of abdomen was performed in 16 (22.9%) patients. Most of these, were patients with blunt abdominal trauma; 15 (94%) (RTA 9, boxing 4 and falling down 2) and one patient (6%) with penetrating abdominal trauma (stab wound). Among these patients; fluid collection was detected in 10 (62.5%) and organ injury in 5 (31.3%). The injured organs were 1 (6%) hepatic contusion, 1(6%) hepatic hematoma, 1(6%) splenic contusion and 2(12%) splenic lacerations.

| Item | (n=70) | |
|----------------------------------|--------|------|
| | No | % |
| - Type of abdominal trauma: | | |
| Penetrating trauma | 53 | 75.7 |
| Blunt trauma | 17 | 24.3 |
| - Mechanism of abdominal trauma: | | |
| Gun shot | 41 | 58.6 |
| Stab wound | 9 | 12.9 |
| RTA | 9 | 12.9 |
| Boxing | 4 | 5.7 |
| Sharp object | 4 | 5.7 |
| Falling down | 3 | 4.3 |

- Presentation time (hrs):

| | | |
|----------------------|----|------|
| < 6 | 61 | 87.1 |
| 6 – 12 | 2 | 2.9 |
| > 12 | 7 | 10.0 |
| - Hemodynamic state: | | |
| Stable | 50 | 71.4 |
| Unstable | 20 | 28.6 |

Table 2. Clinico-Laboratory Characteristic of the Patients with Abdominal Trauma

| Laboratory measurement | Abdominal traumas | | | Paired t-test (p-value) |
|--|---------------------------|--------------------------|--------------------------|-------------------------|
| | Penetrating trauma (n=53) | Blunt trauma (n=17) | Total (n=70) | |
| | Mean ± SD (Min. – Max.) | Mean ± SD (Min. – Max.) | Mean ± SD (Min. – Max.) | |
| Hemoglobin concentration (g/dl) | 12.0 ± 2.3 (5.7 - 16.6) | 11.2 ± 2.0 (8.6 – 15.3) | 11.8 ± 2.3 (5.7 – 16.6) | 0.237 |
| Hematocrit (%) | 36.9 ± 6.7 (14.6 – 49.1) | 33.5 ± 7.4 (22.6 – 45.3) | 36.1 ± 7.1 (14.6 – 49.1) | 0.078 |
| Total leukocytic count (X10 ⁹ /L) | 9.4 ± 3.8 (3.4 – 25.4) | 12.8 ± 5.7 (6.5 – 22.5) | 10.2 ± 4.6 (3.4 – 25.4) | 0.006* |

* Statistically highly significant.

Table (4) detailed the operative findings during operations. There were fluid collection among 9(14.8%) patients and no fluid collection among 52(85.2%) of them. Among the 9 patients with intraoperative fluid collections; 2 had urine fluid around the kidney, 6 had hemoperitonium (blood collection) and one with blood plus bile collection.

There were 7(11.5%) patients with intraoperative organ injury. Of these 3 had hepatic injuries (tear and laceration), 2 splenic lacerations, one with left kidney subcapsular hematoma and one with right kidney devascularization. Two patients (3.3%) developed intraoperative viscus perforation (perforated jejunum and ileum).

| Intraoperative finding | (n=61)* | |
|--------------------------------------|---------|------|
| | No | % |
| - Intraoperative fluid collection: | | |
| Yes | 9 | 14.8 |
| No | 52 | 85.2 |
| - Intraoperative organ injury: | | |
| Yes | 7 | 11.5 |
| No | 54 | 88.5 |
| - Intraoperative viscus perforation: | | |
| Yes | 2 | 3.3 |
| No | 59 | 96.7 |

* Excluding 9 patients who were managed by non-operative methods.

Table 4. Operative Findings in the studied Patients with Abdominal Trauma

Table (5) described the injured organs and associated injury. The commonly involved organs in the patients with abdominal trauma were ileum 17 (24.3%), liver 16 (22.9%), and stomach, jejunum, and colon 10 (14.3% for each), then spleen 8 (11.4%).

There were 25(35.7%) patients presented with associated injuries. These include injuries chest injuries 13 (52.0%), pelvic injuries 7 (28.0%), lower extremity injuries 6 (24.0%) and head injuries 3 (12.0%).

| Item | (n=70) | |
|----------------------|--------|------|
| | No | % |
| - Involved organs: | | |
| Ileum | 17 | 24.3 |
| Liver | 16 | 22.9 |
| Stomach | 10 | 14.3 |
| Jejunum | 10 | 14.3 |
| Colon | 10 | 14.3 |
| Spleen | 8 | 11.4 |
| Kidney | 4 | 5.7 |
| Urinary bladder | 4 | 5.7 |
| Diaphragm | 2 | 2.9 |
| Cecum | 2 | 2.9 |
| Rectum | 2 | 2.9 |
| Duodenum | 1 | 1.4 |
| Sigmoid | 1 | 1.4 |
| Mesentery | 1 | 1.4 |
| - Associated injury: | | |
| Yes | 25 | 35.7 |
| No | 45 | 64.3 |

- Type of associated injuries:*

| | | |
|------------------------|----|------|
| Chest injury | 13 | 52.0 |
| Pelvic injury | 7 | 28.0 |
| Lower extremity injury | 6 | 24.0 |
| Head injury | 3 | 12.0 |
| Upper extremity injury | 2 | 8.0 |

* percentages were calculated from the total associated injuries (n=25)

Table 5. The Involved Organs and Associated Injuries in Patients with Abdominal Trauma

Table (6) recorded the variable operative interventions performed in the studied patients with abdominal trauma. Bowel repair was the most performed surgical procedure in injuries of small bowel and stomach, in colon injuries, bowel repair was used in 6 and stoma in 4. The common operative interventions in 16 patients with liver injury were 14 hepatic repair and 2 were treated conservatively, while 8 spleen injury were treated by 5 splenectomies, splenorraphy 1, and conservatively in 2 patients. The most urinary tract injured organs were kidney 4 were treated by 2 nephrectomies, 2 kidney repair, and 4 bladder injury patients were treated by bladder repair.

| Involved organ | Nº | Operative intervention | Nº |
|-----------------|----|--|----|
| Ileum | 17 | Bowel repair | 15 |
| | | Stoma | 2 |
| Liver | 16 | Hepatic repair | 14 |
| | | Conservative (contusions) | 2 |
| Stomach | 10 | Bowel repair | 10 |
| Jejunum | 10 | Bowel repair | 8 |
| | | Stoma | 2 |
| Colon | 10 | Bowel repair | 6 |
| | | Stoma | 4 |
| Spleen | 8 | Splenectomy | 5 |
| | | Splenorrhaphy | 1 |
| | | Conservative (contusions & Laceration) | 2 |
| Kidney | 4 | Nephrectomy | 2 |
| | | Kidney repair | 2 |
| Urinary bladder | 4 | Bladder repair | 4 |
| Diaphragm | 2 | Diaphragmatic repair | 2 |
| Cecum | 2 | Bowel repair | 2 |
| Rectum | 2 | Bowel repair and Stoma | 2 |
| Duodenum | 1 | Bowel repair | 1 |
| Sigmoid | 1 | Bowel repair | 1 |
| Mesentery | 1 | Mesentery repair | 1 |

Table 6. Operative Intervention based on the Involved Organs in the Patients with Abdominal Trauma

Table (7) reported the outcome of patients with abdomen trauma is regard to morbidity, mortality and hospital stay

Complications were found in 25(35.7%) of the studied patients with abdominal traumas. The common complications were wound infection 10 (14.3%), urinary tract infection and deep vein thrombosis 5 (7.1% for each). Empyema, Intestinal obstruction and pulmonary embolism developed in 3 (4.3%)for each. While paralytic ileus, seroma, jaundice and pneumonia developed in 2 (2.9%) for each. The hospital stay ranged from 1 to 100 days, in 29 (41.4%) of the studied patients, the stay was 1 – 2 weeks and in 21 (30.0%) the stay was less than 1 week.

There were 5 deaths during hospital treatment of patients with abdominal traumas, with (7.1%) mortality rate. The causes of death were pulmonary embolism 3 (60%), abdominal abscess 1(20%) and empyema 1 (20%).

| Item | (n=70) | |
|---------------------------------------|--------|------|
| | No | % |
| - Morbidity: Yes | 25 | 35.7 |
| No | 45 | 64.3 |
| -Distribution of complication: | | |
| Wound infection | 10 | 14.3 |
| Urinary tract infection | 5 | 7.1 |
| Deep vein thrombosis | 5 | 7.1 |
| Empyema | 3 | 4.3 |
| Intestinal obstruction | 3 | 4.3 |
| Pulmonary embolism | 3 | 4.3 |
| Paralytic ileus | 2 | 2.9 |
| Seroma | 2 | 2.9 |
| Jaundice | 2 | 2.9 |
| Pneumonia | 2 | 2.9 |
| Others** | 7 | 10.0 |
| - Hospital stay (weeks): | | |
| < 1 | 21 | 30.0 |
| 1 – 2 | 29 | 41.4 |
| 3 – 4 | 10 | 14.3 |
| > 4 | 10 | 14.3 |
| - Mortality: | | |
| Yes | 5 | 7.1 |
| No | 65 | 92.9 |

* Some patients had multiple morbidities at the same time.

** Including anemia (2 patients), abdominal abscess, biliary fistula, enterocutaneous fistula, bowel gangrene and sciatic nerve injury (one patient for each).

Table 7. Outcome of the Studied Patients with Abdominal Trauma

Discussion

The present study aimed to evaluate the outcome and management of abdominal trauma, which is an important health issue in Yemen. The study sample included seventy patients with abdominal trauma admitted to Al- Gamhouria Modern General Hospital that is the largest governmental hospital in Aden.

In the present study the abdominal trauma was more predominant among male compared to their female counterpart, this finding is in agreement with other studies. (11,12)

The age rang of the present study sample was from 13 years to 65 years with a mean age of 31.3 ± 13.9 years. This is comparable with the study sample of Nigerian study¹³ (in which the mean age of the study was 27.8 ± 1.6 years. This age group usually the most active group of the community, they exposed to many types of hazards including traumatic injuries involving abdomen. Our findings are also in consistent with a recent study from Qatar. (14)

The present study found that the penetrating injuries were more prevalent compared to blunt injuries (75.7% and 24.3%; respectively), this finding is comparable to other study¹⁵, in which the prevalence of penetrating abdominal injuries were 68% while the blunt injuries were 32% of their total study sample. This might be related to the mechanism of injury, which in that study sample was mostly due to gunshots and stab actions.¹⁵ The results of the present study showed that the most common mechanism of abdominal injury was the gun shots (58.6%).

In the present study, the admission time was earlier less than 6 hours after abdominal traumas, the time of presentation is an important determent of the survival rate of these cases, and may explained the lower mortality rate of the study sample (7.1%). (16) Hemodynamic status of the traumatic patients in the present study sample was in stable state in most of abdominal traumas (71.4%), this value is lower compared to of that of other study in which (90%) patients were hemodynamically stable.(15)

Hemoglobin and hematocrit concentrations are an important measurement for the cases of abdominal injuries at the emergency departments. In the present study the mean hemoglobin and hematocrit concentrations were slightly higher among patients with penetrating traumas when compared to those with blunt abdominal traumas, but these differences were not found statistically significant. This result is inconsistence with other study in which they found that the mean Hemoglobin was 10.6 ± 1.3 for blunt cases, and for penetration cases mean Hemoglobin was 11.1 ± 0.8 , and they reported a significant difference in both. (17)

Operative intervention was the therapeutic option for most patients with abdominal traumas in the present study, which account for about (87.1%), this is mostly equal for that percentage reported in the study in England which reported a percentage of 88 % of the cases underwent operative intervention) (18) as well as other study reported, an operations intervention were 84% of their sample patients.(15)

While in Egyptian study by Gad's et al , reported much lower percentage (28.3%) of the abdominal trauma cases received surgical intervention.(17)

This difference of the percentages of surgical intervened cases between studies is due to that the differences in the number of cases with penetrating and blunt traumas, the lower percent of surgically operated cases in Gad's study¹⁷ is related to lower ratio of penetrating trauma to blunt traumas (1:0.4), whereas this ratio for penetrating injuries to blunt traumas in our study was (3.1:1).

In the present study, exploratory laparotomy was performed in 11% of the cases with well-defined indications, this is much lower than that reported in Egyptian study¹⁶ in which Exploratory laparotomy was performed in 27% of the cases. Other author performed an exploratory laparotomy on their study cases (75.6%).¹³ Currently, some researchers have advocated laparotomy only in selected patients as some of the patients with an abdominal injury could be managed conservatively. (19)

The most common associated injury in our study was chest injury which was accounted for 52%, other study found the head injury the most common associated injury (66.6%). (20) This might be explained by that the most common cause of abdominal trauma was the gunshots that mostly targeted to the chest area.

Regarding the involved solid organs during the abdominal traumas, several studies have reported liver to be the most common injured solid organs followed by spleen in blunt abdominal trauma. (21-23) Inconsistently, in our study, the most frequently injured abdominal organ includes illium, followed by liver, and stomach. However, other studies have reported spleen to be the most common injured abdominal organ. (13,20) These disagreements might be due to difference in the sites and types of trauma and its approximations with specific organs.

Complication rate in our study was 35.7% which are higher than that reported by of Idriss et al in Mauritania who reported 12% of their cases had complications.¹⁵ Wound infection was the most common complication in our patients (14.3%), this is comparable with other study²⁴ where the incidence sepsis was 11.3%, this is also agreed with the finding of other study which reported Surgical site infection has been found to be the most common postoperative complication where it accounted for 8.9% of cases in Nigerian study.(13)

Other study was reported a much lower incidence rate of sepsis following abdominal trauma (2%).(25) Many factors can play an important role in the occurrence of sepsis, of which early recognition of the complications, early use of antibiotics and advanced intensive care units in study.¹⁵ Furthermore, the fact that bowel injuries associated with abdominal traumas led to heavy contamination of the peritoneum and consequently, the wound that reported by (Dodiya-Manuel, Jebbin et al. 2015).(13)

The cases of the present study stayed on hospital for period ranged from 1 to 100 days, of them; 41.4% hospital stay was 1 – 2 weeks and 30.0% the hospital stay was less than 1 week. This finding of our

study higher when compared to that of other studies in which Hospital stay ranged from 0 to 7 days in 44 (55%) cases and 8–15 days in 36 (45%) cases in Egyptian hospitals in study.¹⁶ Other study reported a hospital stay of 5.83 days with range of (2 - 19 days).¹⁵ Whereas other author reported a range of hospital stay of (1-410).¹⁴ Difference in hospital stay between studies might be due to the variety in the procedures performed, complications occurred, organs involved, and time of admission. A study concluded that doing unnecessary laparotomy increases the hospital stay period. (26)

Mortality rate of the present study was about 7.1% mortality, this percentage is comparable with that of other studies in which the mortality rate was 10.1% in Aldemir's et al study in Belgica (Aldemir, Tacyildiz et al. 2004)²⁸, 16% in Turkish study by (Karamercan, Yilmaz et al. 2008)²⁰ and 7.25% in Iranian study by (Baradaran, Salimi et al. 2007). (27)

Conclusion

Penetrating injuries were more prevalent compared to blunt injuries, as the mechanism of injury was mostly due to gunshots and stab actions. The most frequently injured abdominal organ includes ilium, followed by liver, and stomach. Operative intervention was the therapeutic option for most patients with abdominal traumas 47(77.0%) in the present study. Wound infection was the most common complications followed by UTI and DVT.

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