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Full Length Research Paper

Abdominal trauma: A five year experience in a military hospital

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Trauma is a leading cause of death in the age group 1-50 years. Most of the usual causes outlined in the published literature include road traffic accidents, stab wounds, falls from height, gunshot wounds etc. The abdomen is traumatized in about 10-15% of trauma cases and this is probably because of its large surface area when compared with the other parts of the body. This retrospective study was carried out over a period of five years from January 2003 to December 2007. It highlights the incidence, gender distribution, available modalities of investigation and methods of improving management and prognosis of abdominal trauma in our hospital. There were 99 purely abdominal trauma patients involved in the review over this five-year period. Penetrating injuries were seen in 15 patients (15.2%) and non-penetrating in 84 patients (84.8%). Gunshot injuries and fall from heights were (2.02%) and (3.05%) of the injuries respectively. The overall ratio of non-penetrating to penetrating injuries was approximately 6:1. Wound sepsis was the most common complication of those patients that had surgical exploration. Mortality rate was 10.1%. The major cause of death was irreversible hypovolaemic shock due to severe blood loss either prior to arrival in hospital, or uncontrollable haemorrhage in the operating room and extreme coagulopathy in the immediate post-operative period. We advocate rapid transportation and prompt resuscitative measures, availability of modern technological investigations as well as surgical and intensive therapy skills, in improving the outcome for victims of abdominal trauma whatever the aetiology. Trauma being a preventable disease we also recommend health education for drivers and road users, conspicuous display of vehicle speed limits as well as identification of known accident black spots. Awareness of road users of the major factors in the causation of vehicular accidents will play a significant role in the prevention of abdominal trauma.

Keywords: Review, Trauma, Abdomen

INTRODUCTION

Trauma remains the leading cause of death in the 1-50 year age group (Ghulam et al., 2001; Ong et al., 1994). It is of paramount importance to address the issue of trauma in our catchment area which houses mainly young population and able-bodied military personnel who travel outside the military base to visit their relatives and also because of the location of our health institution on a major highway in the Northern Area of Saudi Arabia serving as exit points to other Arab Countries.

The abdomen is traumatized in about 10-15% of

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trauma cases probably because of its large surface area compared with other parts of the body (Ponifasio et al., 2001; Udoeyop and Iwatt, 1991). The abdomen therefore bears the brunt of major injury and the severity of visceral damage tends to escalate with increased frequency of high speed travel and possible rising social violence (Bates, 1973; Mnguni et al., 2012; Helmi et al., 2001).

Prominent among the causes of abdominal trauma that have been documented in published literature is road traffic accident (El-Sadig et al., 2002; Saidis and Kahoro, 2001).

According to the finding of World Health Organization (WHO) Global Burden of Disease Project 2002, it was estimated that the road traffic accident (RTA) mortality rate (per 100,000 populations) in the Middle East ranged from 19.1 to 28.3 (WHO, 2004).

This stresses the enormity of the part played by RTA and the subsequent economic drain on the national economy.

Other causes of abdominal trauma include fall from heights, gunshot wounds etc.

Blunt abdominal trauma poses a great difficulty in diagnosis and accounts for its higher mortality, so it is of utmost importance for medical personnel to be well versed with the assessment, resuscitation and surgical management of these victims (Ng et al., 2002).

Abdominal injuries should never be under estimated. Thorough initial assessment and repeated re-evaluation with appropriate investigations are of prime importance for detecting damage to viscera like spleen and liver that are of immediate threat to life because of severe blood loss if the injuries are missed (Ohanaka et al., 2001; Colucciello, 1993).

Intra-abdominal injuries carry a high morbidity and mortality because more often they are not detected or their severity is under-estimated especially in the non-penetrating varieties with few or no external signs (Edna et a., 1989; Maurice et al., 2012).

Prompt pre-hospital transportation, initial assessment, thorough resuscitative measures and correct diagnosis are of paramount importance for subsequent good outcome.

The policy of prioritization (proper triage) requires a regimented approach (Maxwell-Armstrong et al., 2002), identifying the victims who require immediate and precise care according to the principles of Advanced Trauma Life Support (ATLS).

In view of the importance attached to this type of trauma resulting in high morbidity and mortality if not detected early and managed aggressively; with its subsequent severe socio-economic impact on the society; this is why we decided to carry out this retrospective study of ninety nine (99) cases of purely abdominal injuries treated in our hospital from January 2003 to December 2007.

MATERIALS AND METHODS

Between January 2003 and December 2007, ninety nine (99) patients presented to our hospital diagnosed as having purely traumatic abdominal injury.

Data collection was by patients' medical record number, sex, age, clinical presentation, type of trauma inflicted on the abdomen, information also gathered include ancillary investigations such as diagnostic peritoneal lavage (DPL), abdominal ultrasound and abdominal computerized tomography (CT) scan carried out on the patients.

Data was initially documented on a special data collection form before being transferred to a data field program of Microsoft excel before the analysis was carried out.

The files were reviewed regarding the history at presentation. The usual diagnostic pathway of taking history, physical examination and special investigations were not followed in some cases because of the urgency of presentation.

Causes of the trauma such as road traffic accidents with or without seat belts, stabs, fall from heights, and blunt trauma with heavy objects falling on the abdomen were also extracted from the files.

The findings on the abdomen and lower chest wall, anterior or posterior, regarding evidence of bruises, lacerations, impressions of seat belts or vehicle wheels, penetrating wounds, entry and exit wounds were also all recorded.

The presence of abdominal rigidity, percussion or cough tenderness as indicators of visceral injury was also recorded from the files.

Too much reliance was not paid to the initial bowel sounds, but digital rectal examination was found useful especially to ascertain the integrity of the rectal wall or the presence of blood denoting large bowel injury or organ damage within the pelvis.

Clinical presentation

Clinical presentations in this study are as outlined on table 1 of which haemo-peritoneum resulting in agonizing abdominal pain was the most common mode of presentation.

Careful evaluation of the clinical signs of peritoneal irritation is frequently rewarding; however analysis of these figures at times as shown on the table call for caution since the most constant signs and symptoms may on some occasions be absent.

Table 1. Clinical Presentation of Abdominal Trauma.

Presentation	Number of Patients Total Cases n (99)
Died	10 (8 males 2 females) Closed 9 (9.1%) Penetrating 1 (1.01%)
Abdominal pain	n (90)
Shoulder tip pain	n (75)
Tenderness	n (70)
Guarding	n (50)
Rigidity	n (40)
Abdominal distention	n (20)
Vomiting	n (65)
Rectal bleeding	n (2)
Evisceration	n (1)

Investigations

The investigations done included baseline complete blood count (CBC), biochemistry, blood grouping and cross matching were recorded and subsequent values were compared with the base-line values.

Other ancillary mode of investigations done included plain radiographs of cervical spine, chest, and pelvis X-ray; urgent abdominal ultrasound in the emergency room and diagnostic peritoneal lavage (DPL) as the case may be.

Plain X-ray in many cases does not provide much help in the diagnosis of abdominal trauma. However two (2); 2.02% of our patients had evidence of pneumo-peritoneum on radiograph with gas under the diaphragm.

Abdominal imaging such as ultra-sonography and computed tomography are not usually available for routine diagnosis in some emergency departments, but these were readily available in our hospital. The abdominal ultrasound in the series had a reliability of about 90% especially in detecting splenic trauma cases.

Ultrasound in the form of Focused Assessment with Sonography for trauma (FAST) was also performed immediately after the primary survey of the patient.

The extended FAST (eFAST) was carried out in some of the highly unstable patients and this allows for the examination of both lungs. This allows for the detection of a pneumothorax and possible tension pneumothorax a deadly complication if not treated immediately at the bedside.

Computed tomography was not used routinely except for stable cases that did not need immediate laparotomy and in the diagnosis of suspected pancreatic and other retroperitoneal injuries. Sometimes spiral CT scan abdomen was also carried out if the patient did not require immediate laparotomy.

Four quadrant abdominal paracentesis that has a high level of accuracy in some developing countries without portable ultrasound machine was carried on five (5) of our patients (5.1%). They had suspected visceral injury without any external wound.

Diagnostic peritoneal lavage (DPL) was carried out in 6 cases (6.1%) that had equivocal signs, or cases with co-existing head injury.

One case had diagnostic laparoscopy in the present study when the ultrasonographer could not completely rule out the presence of haemo-peritoneum.

RESULTS

The total number of abdominal trauma cases reviewed from the period January 2003 till December 2007 were 99 cases out of which 84 (84.8%) were non-penetrating and 15 (15.2%) were penetrating with a ratio of 6:1. See figure 1a below.

The annual incidence of abdominal injuries is as outlined on Figure 1 b below.

This shows a tendency to increase over the years.

Figure 2 below shows the age and sex distribution of the cases.

It is immediately obvious that abdominal injuries and possibly multiple injuries for that matter are predominantly an affliction of the young males reaching the peak in twenty to fifty year age group.

This is the most productive age of these males in the society and wastage of this age group from such injuries if not tackled well, means a great drain on the national economy.

The other notable feature is the overall incidence of male cases (86) 86.9% to female (13) cases 13.1% with a ratio of about 7:1

This shows a reflection that the males are more vulnerable to trauma since culturally, shopping and running around are done by males in the society.

Splenic rupture 48 cases (48.5%) topped the list of specific organ damage in abdominal trauma (table 2) delayed rupture of the spleen was not seen in this review.

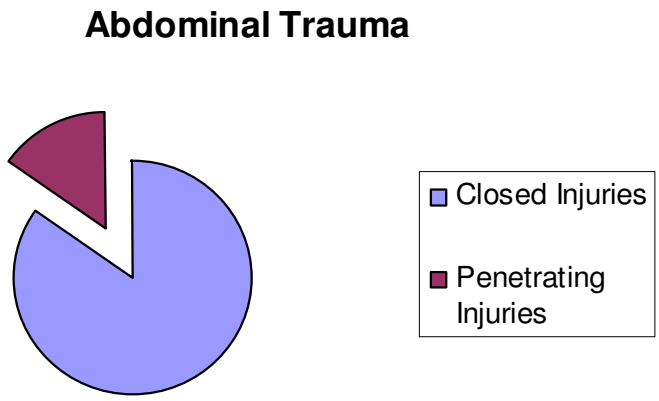

Figure 1a. showing incidence of closed and penetrating injuries.

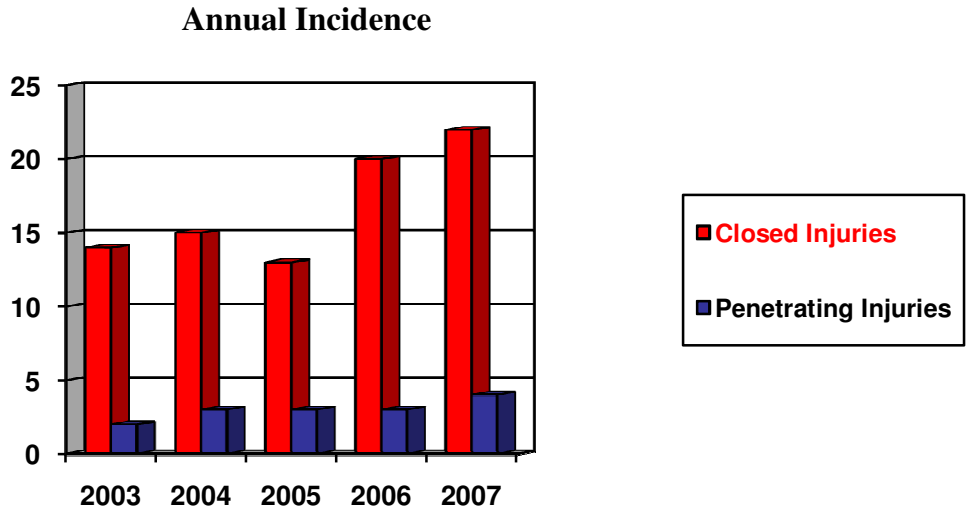

Figure 1b. showing annual incidence of abdominal injuries.

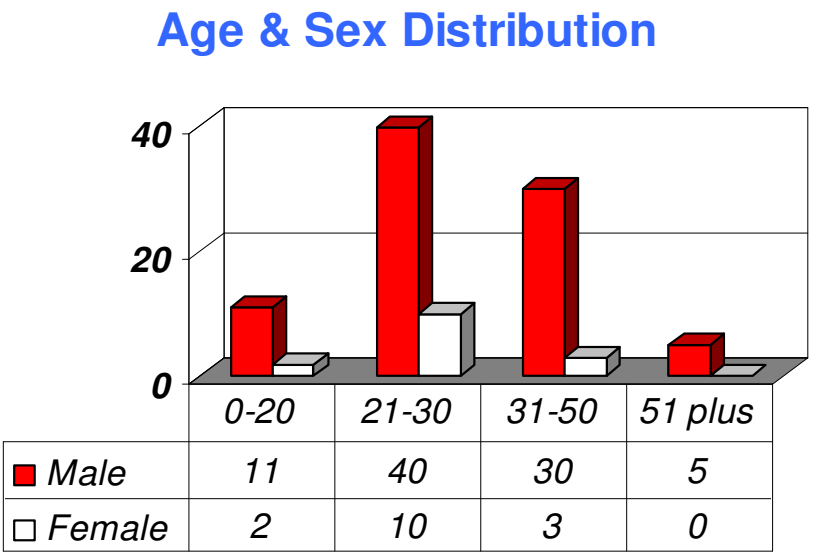

Figure 2. shows the age and sex distribution of the cases.

Table 2. Specific Organ Injury

Organ Injured	Number of Patients
Spleen	n (48)
Liver	n (17)
Retroperitoneal hemorrhage	n (12)
Small intestine	n (10)
Multiple viscera	n (4)
Kidneys	n (2)
Stomach	n (2)
Colon	n (2)
Diaphragm	n (1)
Bladder	n (1)

Table 3. Postoperative Complications.

Complications	Number of Patients
Wound infection	15 (15.2%)
Paralytic ileus	5 (5.1%)
Wound dehiscence	5 (5.1%)
Disseminated Intravascular Coagulopathy	1 (1.0%)
Irreversible Shock	1 (1.0%) 1 death

Hepatic injuries (17 cases) account for 17.2% of the lesions. A combination of both splenic and hepatic injuries were seen in 2 cases (2.02%) out of which one died (1.01%) on the table from severe uncontrollable bleeding but the other patient survived.

Retroperitoneal haematoma and injuries to small bowel and stomach were seen in 12 (12.1%), 10 (10.1%) and 2 (2.0%) cases respectively in this study.

There were ten deaths in this study 10 (10.1%) (8 males and 2 females). Some of these deaths apart from delay in getting help for early transportation to the hospital probably bled at the accident site and also had associated severe chest and head injuries.

With regards to management three principles emerged regarding these cases, early transportation to the hospital, prompt resuscitation and early laparotomy.

Early blood transfusion has always been a problem and as such most emergencies rely heavily on the use of colloids and crystalloids. Auto transfusion has not been found to be a suitable alternative in abdominal trauma but has succeeded in some cases of splenic trauma.

The decision to operate was based on the clinical evaluation, signs of peritoneal irritation, unexplained shock despite adequate fluid resuscitation, rigid silent abdomen, evisceration, findings from abdominal ultrasound, diagnostic peritoneal lavage (DPL) and abdominal paracentesis.

Delaying operation beyond 24 hours of presentation contributed significantly to the mortality rate.

Postoperative complications seen in this study are as shown on table 3.

Wound sepsis was seen in 15.2%. This is probably related to wound contamination at the time of injury.

The same goes for wound dehiscence (5.1%).

Incidence of paralytic ileus was 5.1%.

DISCUSSION

Abdominal trauma carries a high morbidity and mortality especially if not detected early or if its severity is underestimated (Cox, 1984; Isenhour and Marx, 2007).

Intra-abdominal bleeding should be suspected if there are fractures of ribs five to eleven (5-11) which lie over the liver and spleen (Ohanaka et al., 2001; Iribhogbe and Okolo, 2009), or if there are marks caused by seat belts or vehicular wheels over the abdomen.

Measurement of pulse and blood pressure were particularly unreliable as indices of serious intra-abdominal bleeding. Initial haemoglobin measurement had no relevance to severity of injury. Urinalysis seemed to be a reasonable indication of lower urinary tract injury since most cases of renal trauma showed haematuria or blood at the urethral meatus.

The presence or absence of bowel sounds was also misleading.

The role of the plain radiograph is not so significant in assessing abdominal trauma except when there is rupture of the diaphragm and missiles that lodged in the abdomen.

Ultrasound used to be the ideal initial imaging modality because it can be performed simultaneously with other

resuscitative cares, providing vital information without the time delay caused by radiographs or computed tomography

Although ultrasound is not 100% sensitive for identifying all bleeding, it is nearly perfect for recognizing intraperitoneal bleeding in hypotensive patients who need an emergent laparotomy and for diagnosing cardiac injuries from penetrating trauma (Rozycki and Shackford, 1996; Rothlin et al., 1993; Rozycki, 1995).

This supremacy has been taken over by FAST.

FAST has been used in the evaluation of trauma patients in Europe and United States for more than 20 years. It has now become the initial imaging test of choice for trauma and is part of the Advanced Trauma Life Support (ATLS) protocol developed by the American College of Surgeons.

The FAST exam, per ATLS protocol, is performed immediately after the primary survey of the patient. The concept behind the FAST examination is that many life-threatening injuries cause internal bleeding which should be detected by FAST.

The four classic areas examined during FAST for free fluid are the perihepatic space also called Morison's pouch or the hepatorenal recess, perisplenic space, pericardium, and the pelvis.

With this technique it is possible to identify the presence of intraperitoneal or pericardial free fluid. In the context of traumatic injury, this fluid will usually be due to bleeding.

FAST's diagnostic accuracy generally is equal to that of diagnostic peritoneal lavage (DPL).

Recently, research studies have shown that bedside ultrasound is equivalent to, or better than, chest radiography for identifying a hemothorax or pneumothorax in trauma patients.

For this reason some trauma centers have begun performing an extended FAST examination (EFAST) evaluating for pneumothorax and hemothorax in addition to intraperitoneal injuries. It can also detect tension pneumothorax which is a deadly complication if not treated immediately at the bedside without the need to shift the unstable patient to a radiology suite.

CT scan of the abdomen with and without contrast as the case may be increased the diagnostic work-up of trauma patients with suspected abdominal injuries. A wide range of intra-peritoneal and retroperitoneal organ injuries can be quickly and accurately diagnosed with CT scan of the abdomen (Udekwu et al., 1996).

It should be noted that only haemodynamically stable patients should be transported to the CT scanner and while performing CT scan, close monitoring of the vital signs for clinical evidence of decompensation should be carried out.

The drawbacks of CT scanning is the need to transport the patient from the trauma resuscitation area and the additional time required to perform CT scanning as compared to FAST, EFAST or DPL. The best CT imagery requires both oral and intravenous (IV) contrast.

However today, helical CT technology permits even faster examinations, with improved intravenous contrast opacification of parenchymal organs and vascular structures and reduced CT artifacts caused by patient motion, respiration, and arterial pulsation.

Severely injured and potentially unstable patients, who might not have been able to tolerate the long CT examinations of the past, may be quickly evaluated today with helical CT

Paracentesis abdominis was reported in some series with a sensitivity of 96.6%. Diagnostic peritoneal lavage was done only in six (6) patients (6.1%) in our series (Maxwell-Armstrong et al., 2002; Liu et al., 1993; Cuschieri et al., 1988).

Laparoscopy is still awaiting a true delineation of utility. It will probably be most useful in cases of penetrating trauma where significant intra-abdominal injury cannot be excluded, but appears clinically doubtful (Ahmed et al., 2005; Bokarev et al., 2004).

Laparoscopy gives complete visualization of the peritoneal cavity but retroperitoneal structures are not easy to visualize. Even a small amount of blood in the peritoneal cavity precludes adequate visualization and therefore mandates laparotomy.

The effect of laparoscopy upon intracranial pressure in cases of concomitant head trauma has not been completely delineated.

The significant factors affecting prognosis or final outcome noticed in this study include how rapidly the patient was transported to the hospital (Berner et al., 2003 Anderson et al., 1988).

This could be broken down to the injury admission interval and injury operation interval. Prompt evacuation of the injured and early evaluation and treatment are required to reduce mortality.

Secondly the presence of other associated injuries in addition to abdominal trauma also determine final prognosis. The combination of head and chest injuries with abdominal trauma is particularly undesirable (Munns et al., 1995), while patients with orthopaedic injury have a more favorable course.

The nature of the associated injury may decide outcome but as far as the abdominal lesion itself is concerned early recognition and prompt surgical action are the essential features of successful management.

The lesions liable to be over-looked in patients with multiple injuries who are not subjected to immediate laparotomy are diaphragmatic tear with subsequent hernia, intestinal rupture and subcapsular haematoma of the hollow viscera and these should be especially considered (Sayers et al., 1992; Oyo-Ita et al., 2012; Dubose et al., 2013).

In conclusion, we recommend that prompt evacuation of the injured patient to the hospital, adequate

resuscitation, diagnostic focused abdominal sonogram for trauma (FAST) as well as EFAST, peritoneal lavage (DPL) and other diagnostic modalities, constant monitoring with re-assessment and finally timely surgical intervention all play a key role in the successful outcome of such patients.

Adherence to local Highway Code laws and education in road traffic accident prevention should be encouraged and enforced (Berner et al., 2003).

The concept of teamwork in the management of the critically traumatized patient cannot be over-emphasized and has to be promoted, practiced and established in order to improve clinical outcome.

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