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The Pattern of Abdominal Trauma as Seen at Muhimbili National Hospital Dar es Salaam, Tanzania.

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Background: ***Abdominal trauma is among the leading causes of morbidity and mortality in all age groups in the world. However, identifying serious intra-abdominal pathology due to trauma can be a challenge. Mechanisms of injury often result in other associated injuries that may divert the physician's attention from potentially life-threatening intra-abdominal pathology. So this study aimed at showing the pattern of abdominal trauma at our hospital.***
Methodols: ***We recruited patients presenting at the EMD with abdominal injury and used a structured questionnaire to collect patient information.***
Results: ***A total of 92 patients with abdominal trauma were surgically managed with male to female ratio of 7.4:1. The age range was 7 to 55years with a mean of 29.43. The majority (67.4%) of the patients were aged between 21 -40 years. Petty traders made up 42.3% of all cases. Motor Traffic Injuries accounted for 55.4%, with blunt trauma contributing 65.3% of the study population. Substance abuse was also reported in a number of cases. The overall mortality of 7.6% was observed.***
Conclusion: ***Most causes of abdominal trauma were preventable, with substance abuse having influence. Non therapeutic laparotomy was high probably due to deficiencies in investigation modalities in our set up.***

Introduction

It is estimated that by the year 2020, 8.4 million people will die every year from injury, and road traffic crush will be the third most common cause of disability worldwide and the second most common cause in the developing world.[1] In 2001, over 18,000 patients attended the Johannesburg Hospital Trauma Unit and approximately 140 priority-one casualties were treated per month. In that year there were 1715 resuscitations for trauma, 688 for blunt abdominal trauma, of which the majority were associated with road traffic crush. There are characteristic injury patterns, with multisystem injury being the rule rather than the exception. In 1990, about 5 million people died worldwide as a result of injury.[2] Optimal care of severely injured patients requires a coordinated approach from the point of injury, through a hospital facility organized to cope with the demands of looking after multisystem problems, to a rehabilitation structure that can return the patient to his or her maximum potential level of function within a society. Although sophisticated prehospital and trauma centre systems have been shown to reduce the number of preventable deaths after trauma, maximum impact in reducing the burden of trauma must come from injury prevention strategies[3].

Abdominal trauma is among the leading causes of morbidity and mortality in all age groups worldwide[4]. Men tend to be affected slightly more than women.[5] however identifying serious intra-abdominal pathology due to trauma can be a challenge. Many injuries may not manifest during the initial assessment and treatment period. Mechanisms of injury often result in other associated injuries that may divert the physician's attention from potentially life-threatening intra-abdominal pathology[4]. In alert and non-comatose patient, physical examination is the method of choice to rule out significant abdominal injury. However, signs of peritonism may take hours before becoming clinically evident, which is an important downside of this strategy. If the patient is intubated, intoxicated or suffers from impaired neurological function (e.g. tetraplegia), clinical examination may lose its value and the decision to carry out a surgical intervention or otherwise based solely on clinical findings becomes unreliable.[6,7] In his series of 90 patients with free intraabdominal fluid

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but without solid organ injury, Livingston showed that 19% of patients without abdominal tenderness actually had a significant abdominal injury[6]. One indirect sign, which seems to be associated with hollow organ injury (if free fluid without solid organ injury is found) are seat belt marks, which increase the likelihood of a significant abdominal injury 2- to 4-fold[8].

Whilst sonography and conventional radiography remain well-established techniques, CT scanning of the abdomen and pelvis is the procedure of choice to evaluate the hemodynamically stable patient who has sustained blunt or penetrating trauma. CT has replaced Diagnostic Peritoneal Lavage (DPL) as the first method of choice in many trauma centers worldwide. Its major advantage is that it is not only capable of revealing the presence of intra-abdominal or intra-thoracic hemorrhage but can to some extent also identify the organ involved[9]. In centers where a CT scan is not available or limited to office hours, frequent re-evaluation of the patient's condition, repeated sonography and DPL remain the cornerstones of the diagnostic work-up of abdominal trauma. In the setting where clinical evaluation alone is relied upon to determine whether or not a patient requires surgery, negative laparotomy rates may be up to 40%.[10] In centers where a positive DPL is regarded as the gold standard when deciding on an intervention, diagnostic laparoscopies or laparotomies are performed routinely. The downside of this strategy is a potentially high number of unnecessary or non-therapeutic operations[11]. The limitation of DPL in detecting retroperitoneal injuries particularly if performed too soon after initial trauma, can miss intestinal perforation in the abdomen without evidence of solid organ injury[12].

One of the largest systematic reviews, conducted by Rodriguez and co-workers, found 10 articles in which isolated free abdominal fluid was seen without organ injury. The study included 463 patients out of a total of 16000 (2.8%) with signs of free intra-abdominal fluid without obvious solid organ injury who had received a CT scan for blunt abdominal trauma. A therapeutic laparotomy was performed in only 122 patients and the authors concluded that laparotomy is not warranted if the patient is alert and can be monitored with repeated physical examination[13].

Missed intra-abdominal injuries and concealed hemorrhage are frequent causes of increased morbidity and mortality, especially in patients who survive the initial phase of an injury.[14] Physical examination findings are sometimes unreliable for several reasons; including the presence of distracting injuries, an altered mental state, and co-existing drug and alcohol intoxication in a patient[15]. The most commonly injured intra-abdominal organ following blunt trauma is the spleen. Approximately 85% of all patients with blunt hepatic trauma are stable. In this group, non-operative management significantly improves outcomes over operative management in terms of decreased abdominal infections, decreased transfusions, and decreased lengths of hospital stay.[16] Bleeding is controlled, often by use of perihepatic packing and the patient's time in the operating theatre is kept to a minimum. CT scanning is the mainstay of diagnosis for hepatic injuries after blunt trauma in the stable patient; the initial CT findings will help the trauma surgeon to determine the suitability for non-operative treatment.

The most pressing concern for surgeons treating blunt abdominal injury is occult bowel (i.e. injury that occurs and is clinically silent), reported in 1.3% of ccases.[17] These injuries can be difficult to identify on the non-invasive screening tests (CT and ultrasound), as there may be little associated bleeding. The increasing use of such tests to screen for intra-abdominal injury and a reduction in the reliance on diagnostic peritoneal lavage increases the risk of missing these injuries. The accuracy of spiral CT is excellent for solid organ injury; however, the same cannot be said for Hollow Viscus Injury (HVI). Accurate and timely recognition can be difficult, and delay in diagnosis has been shown to be associated with significant morbidity and mortality.[18] In a recent review, several important observations were made: Increasing grade of injury to a specific solid organ did not correlate with increasing rate of HVI. The higher the number of organs injured, the higher the incidence of HVI. Any combination of solid organ injury with pancreatic injury had a high rate of

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HVI. When three solid organs were injured, HVI was 6.7 times more likely than when one solid organ was injured, and the presence of a pancreatic injury plus solid organ injury was associated with HVI in more than a third of patients.[19] A high index of suspicion must be maintained and the surgeon must be prepared to repeat imaging techniques (CT scanning or diagnostic peritoneal lavage) or to proceed to operative intervention.

Focused Abdominal Sonography for Trauma (FAST) is useful as the initial diagnostic tool for abdominal trauma to detect intra-abdominal fluid.[20] It is a safe quick diagnostic tool that can be learnt easily.[21, 22] It is of great value for those patients who are haemodynamically unstable and who cannot be shifted to CT scan room. The great advantages is that it can be done at bedside during resuscitation without the need to move the patient from the resuscitation room and its high sensitivity, 100%, for detecting intraperitoneal fluid which accumulates in dependent areas around the liver, spleen and pouch of Douglas.[21] The finding of free intraperitoneal fluid in a hypotensive patient alerts the treating doctor that the patient may need an urgent laparotomy.
There is an increase in reports about Motor Traffic Injuries (MTI) from every corner of our Country. Data from Tanzania Police Force have shown a yearly linear increase of Motor Traffic Accidents. In 2009 there were 22739 people involved in road accidents with 3223 deaths and in 2010, 24665 road accidents and 3582 deaths. This has led to a surge in number of patients presenting to health care centers including Muhimbili National Hospital with abdominal trauma and there is no current published data on the Pattern of abdominal trauma in our National hospital and our country at large. There are no treatment guidelines on abdominal injuries in the department of surgery. So we conducted this study to determine the pattern of abdominal trauma cases at our hospital.

Patients and Methods

A prospective, descriptive, hospital-based study involving all patients who were managed for abdominal trauma between April to December, 2011 was conducted at Muhimbili National Hospital, Tanzania. Permission to conduct the study was obtained from Muhimbili University of Health and Allied Sciences (MUHAS). Variables collected included age, sex, occupation, causes and risk factors leading to accident, type of abdominal trauma, associated extra abdominal injuries, treatment offered and outcome of treatment at discharge. All enrolled patients received initial work up, including resuscitation, at the Department of Emergency Medicine before being transferred to the operating room for definitive surgical interventions. Outcomes measured included length of hospital stay, complications and mortality. All patients were followed up to death or one month post discharge. Data collected was cleansed, coded and analyzed using SPSS version 16 where various variables were tabulated.

The limitation in our study was that Injury Severity Scores (ISS) was not computed because it is not practiced routinely on all injured patients in our hospital.

Results

A total of 92 patients with abdominal trauma were surgically managed with male to female ratio of 7.4:1. The age range was 7 to 55years with a mean of 29.43. Most of the patients were aged between 21 -40 years 67.4% (62). Occupation wise, petty traders were the most involved making up 42.3% (39) of all cases. Death rate of 7.6% (7) was observed (Table 1). MTI was the most common cause of injury constituting 55.4% followed by assault (26.1%), crush (10.9%), falls from a height (4.3%), animal accident (2.2%) and gun shot (1.1%). Blunt trauma accounted for 65.3% of the cases (Table 2).

Substance abuse on the day of accident was reported by 38 of the patients. The most abused substance was alcohol reported in followed by cannabis. Assault injuries had the leading substance

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abuse by 55.3% (21), followed by MTI at 42.1% (16). (Table 3). A total of 121 injuries occurred in the 92 patients with 28% of them involving hollow viscera followed by spleen in 19.8%, urinary bladder in 13.2 %, mesentery (12.4%), and liver in 11.6%. Retroperitoneal haematoma was found in 8 (6.7%). In 7 (5.8%) of the patients there were no injured organs (Table 4). Associated extra-abdominal injuries were found in 34 (37%) of all patients at a frequency of 48 siteswith skeletal injuries (upper and lower limbs, pelvis and spine) being the most frequently involved (Table 5). Traumatic Brain Injury (TBI) occurred in 6 patients. About one third of the injuries, 29.8% (36/121) had non therapeutic laparotomy. Hollow viscus repair was the most performed procedure followed by splenectomy and liver repair. Damage control surgery and Splenorrhaphy were only done in one and two case respectively (Table 6).

Table 1. Demographic characteristics of the 92 studied patients with abdominal injuries

Age range(years	Frequency	Percent
>0-20	18	19.5
21-40	62	67.4
41-60	12	13.1
Sex		
Male	81	88.0
Female	11	12.0
Occupation		
Petty traders	39	42.3
Nonprofessionals	23	25.0
Pupils /students	13	14.1
Driver	8	8.7
Peasant	7	7.6
professionals	7	7.6
Total	92	100.0

Table 2. Causes of injury in relation to the type of abdominal injury

	Type of abdominal injury		
Cause of injury	Blunt	Penetrating	Total
MTI	44	7	51(55.4%)
Assaults	2	22	24(26.1%)
Crush	8	2	10(10.9%)
Falls From heights	4	0	4(4.3%)
Dairy accidents	2	0	2(2.2%)
Gunshot	0	1	1(1.1%)
Total	60(65.3%)	32(34.7%)	92(100.0%)

Table 3. Cause of injury in relation to status of Substance Abuse among the studied subjects

	Substance of abuse			
Cause of injury	Alcohol	marijuana/cannabis	others	Total
Assaults	14	7	0	21
MTI	12	4	0	16
Crush	1	0	0	1
Total	**27**	**11**	**0**	**38**

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Table 4. Abdominal operative findings in relation to the type of abdominal injury

	Type of abdominal injury			
Injured organ.	**Blunt**	**Penetrating**	**Total**	**Percentage**
Hollow Viscus	16	18	34	28.0
Spleen	20	4	24	19.8
Urinary bladder	14	2	16	13.2
Mesentery	8	7	15	12.4
Liver	9	5	14	11.6
Retroperitoneal hematoma	8	0	8	6.7
Diaphragm	1	1	2	1.7
Pancreas	1	0	1	0.8
Normal intra-abdominal organ	2	5	7	5.8
Total	**79(65.3%)**	**42 (34.7)**	**121**	**100**

Table 5. Associated extra-abdominal injuries

Extra abdominal injury	**Frequency**	**Percentage**
Skeletal injury(limbs, pelvic and spine)	25	52.1
Chest injury	10	20.8
Soft tissue injury	7	14.6
Traumatic Brain Injury(TBI)	6	12 .5
Total	**48**	**100**

Table 6. Surgical procedures performed for the intra-abdominal injuries.

Treatment offered	**Frequency Bowel**
Hollow viscus repair	34
Splenectomy	22
Liver repair	14
Mesentery repair	6
Urinary bladder repair	4
Splenorrhaphy	2
Diaphragm repair	2
Damage Control Surgery	1
Total	**85**

Discussion

Abdominal trauma involves patients of different age groups and sex. Our study found male sex to be the most involved by 7:1, corresponding with other studies.[23] The young were the most affected similar to other studies.[24] We also noted that petty traders were the most involved in abdominal injuries with MTI being the leading cause. This can be explained by the fact that a third of Dar es Salaam residents are petty traders and have no official, safe, trading areas.[25]

In our study, blunt trauma was the found to be the commonest cause of abdominal injuries at 65.2%. This pattern was also reflected in the findings by Udeyop et al [26] in Calabar, Nigeria), but contrary to Edino et al [27] in Kano (Northern Nigeria) who reported higher incidence of penetrating injuries as a cause of abdominal trauma. Some workers reviewing abdominal trauma necessitating laparotomy in the western world have reported penetrating injury as a more frequent cause of these injuries.[28] These findings would suggest that the dynamics of a society would influence the type of injury occurring.

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In spite of laws and regulations controlling use of substances of abuse, it was still reported in 41.3% of the cases on the day of accident with alcohol being the most reported followed by cannabis. Those who sustained injuries by assault had the leading substance abuse. Our findings were similar to what was reported by Soderstrom et al[29]. These were injuries that would have been prevented if the laws were reinforced.

The spleen was found to be the most frequently injured intra-abdominal organ in blunt trauma while bowel was the commonest organ injured when all injuries were combined. Splenectomy was the commonest means of treatment of splenic injuries with only 2 patients undergoing splenorrhaphy. This is in agreement with what Chalya et al[30] who found that more than 80% of their patients treated operatively with most of them subjected to splenectomy. This is in contrast with other centers in the world where the success of conservative strategies on the injured spleen has been complemented with CT scan and angiographic embolisation for splenic injury to control hemorrhage. Currently non operative treatment is attempted in 60 – 90% of patients with splenic injuries[31]. The tendency to treat splenic injuries by splenectomy can be attributed to limited access to CT expertise as well as lack of guidelines in imaging such injuries. This also probably could be explained by the fact that patients attended had high grade splenic injuries although degree of splenic injury was not mentioned except in one patient whose injury was grade three. Only one patient, with liver injury, underwent damage control by perihepatic packing. The low rate of damage control practice in this study can be attributed to the fact that, probably patients with severe injuries who need aggressive resuscitation and damage control surgery die before reaching the tertiary hospital.

Abdominal injuries are commonly associated with other injuries and these may complicate the management and affect the outcome[23]. In this study, 37% of patients had other associated injuries. Skeletal injuries (pelvic, Lower and upper limbs fracture) were the most common associated injuries that occurred in 25 patients (73.5%) of cases with associated injuries and seven patients (20.6%) had multiple associated injuries. This was similar to findings in Egypt by Gad et al[32]. About one third of the injuries, 29.8% (36/121) had non therapeutic laparotomy. This is similar to findings by Siddig et al [27] who had a rate of 30.5%. In these studies, ultra-sound was the modality of investigation in contrary to centers where CT scan was used.[33]

Conclusion

Most causes of abdominal trauma were preventable, with substance abuse having influence. Negative laparotomies were high probably due to deficiencies in investigation modalities in our set up.

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