

ORIGINAL ARTICLE

Exploratory laparotomy findings in Polytrauma victims with chest and abdominal injury

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Abstract:

Background: Poly trauma have the highest incidence of mortality among trauma patients that is now posing a serious public health problem. Prompt diagnosis along with appropriate management is essential for better outcome.

Objective: This study was aimed to evaluate pattern of abdominal injury and to investigate factors influencing the management of patients suffering from polytrauma with abdominal injury.

Methods: This prospective observational study was conducted in the Department of Casualty and Department of Surgery in Mehalatye District Hospital, Botswana from January 2012 to June 2012.

Results: 40% of the patients were between ages 21 & 30 years while 85% were males. 60% trauma was caused by penetrating injury and 33% by non-penetrating injury. 55% could reach the hospital within 6 hours and 55% did not receive any primary resuscitation before admission. 54% were haemodynamically unstable of which 37% were in shock when received. 95% presented with abdominal pain and indications for urgent laparotomy were present in more than half of the cases. 84% had associated injuries. 90% were offered operative management in the form of laparotomy. 55% had bowel injury. 33% of the operated patients had uneventful recovery while 66% had complications. Total mortality in the study was 12%.

Conclusion: Abdominal injury inflicted by assailant penetrating injury is more severe which needs to be addressed promptly by urgent laparotomy. Both gunshot injury and blunt abdominal trauma from Road Traffic Accident (RTA) usually affect multiple regions of the body.

Key words: polytrauma , penetrating injury , laparotomy

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Introduction:

Trauma remains the most common cause of death for all individuals between the ages of 1 and 44 years and is the 3rd most common cause of death regardless of age and also the number one cause of years of productive life lost.¹ Traditionally, death from trauma has had a 'trimodal' distribution, with 50% of deaths occurring in the

pre-hospital environment, 30% during the 'golden hours' and the remaining 20% occurring later. With the advent of better pre-hospital care at present some 50% of deaths occur in the early in-hospital environment.²

A central component to the statistical analysis of trauma care is the probability of survival model,

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which predicts outcome of the trauma event taking into account various anatomical and physiological factors. ³One of the key input information to the survival model is the injury score which forms the cornerstone of trauma epidemiology. There are many scoring systems currently in use, and the Injury Severity Score (ISS) as the anatomical component of the injury in the probability of survival model is a widely used one.³ Polytrauma is defined via an Injury Severity Score ISS ≥ 17 , describing a person being subjected to more than one traumatic injuries.²

In polytrauma patients, abdomen arguably presents the greatest diagnostic and therapeutic challenge as manifestations from injuries over other parts of the body are more obvious and early, that demands for accurate diagnosis and definitive therapy.⁴ 39% of all trauma deaths can be attributed to major haemorrhage, usually from torso injury.² To date unrecognized abdominal injuries continue to be the prime cause of preventable deaths after truncal trauma⁵.

Methods:

This prospective observational study was conducted in the Department of Casualty and Department of Surgery in Mehalatye District Hospital, Botswana from January 2012 to June 2012, on 100 trauma victims who were consecutively diagnosed as a case of 'polytrauma' with associated abdominal injury being potential candidates for possible urgent laparotomy owing to the gravity of abdominal injury. Patients dying pre-operatively and with head injury were excluded. Simultaneous assessment according to ATLS guideline and resuscitation of the patients were done after arriving in the hospital. Provisional diagnosis of the patients were mainly based on history of trauma, clinical presentation, and repeated physical examination, supplemented only by some baseline investigations within our limited resources. Indeed in almost half of the patients need for an urgent laparotomy was evident at the initial presentation reduced the need of an accurate preoperative diagnosis.

Operative treatment was offered on the basis of history of impact on abdominal wall, clinical symptoms and signs of peritonitis. Patients who needed massive transfusion and those who had poor haemodynamic conditions despite vigorous resuscitation were operated upon. Almost all of

them had exploratory laparotomy. Out of 100 polytrauma patients 90 patients in total were operated upon. There was no negative laparotomy.

The patients were carefully followed up in the post-operative period and if had any complication developed were treated accordingly. Data was collected by structured data sheet, edited in tabulated format and was manually evaluated.

Results:

Table-I

Demographics of the Trauma Patients: (N=100)

Age	Number of Patients
0-10	2
11-20	11
21-30	40
31-40	25
41-50	14
51-60	5
>60	3
Sex	
Male	65
Female	35

The male to female ratio was 5.67: 1

Table-II

Nature of trauma, causes, time elapsed and hemodynamic status during admission and preadmission resuscitation of the Trauma Patients: (N=100)

Nature of Trauma	Number of Patients
Penetrating injury	60
Non penetrating injury	33
Blast injury	4
Crush injury	3
Causes of Injury	
Assault	42
Road Traffic Accident	55
Compression	3
Time Lapsed (Hours)	
0 – 6	55
7 – 12	30
13 – 24	15
Hemodynamic Status	
Normal	6
Stable	40
Unstable	54
Resuscitation before admission	
Received	45
Did not receive	55

Table-III*Clinical presentation of polytrauma victims with abdominal injury (N=100)*

Clinical Features	Number of Patients
Abdominal pain	95
Vomiting	13
Dyspnoea	22
Dehydration	39
Hypotension	43
Anaemia	37
Haematuria	02
Abdominal distension	52
Abdominal rigidity	71
Abdominal tenderness	95
Obliteration of liver dullness	41
Absent bowel sound	65
Evisceration	17
Extra-abdominal injuries	
Thoracic Injury	22
Pelvic Fracture	2
Long Bone Fracture	6
Soft Tissue Injury	54

Table-IV*Nature of organ Injury types and operative procedure done*

Organ (Number of injury)	Operative Procedure	Number of Patients
Stomach (3)	Simple repair	2
	Partial Gastrectomy	1
Small intestine (37)	Simple repair	21
	Resection and anastomosis	16
Large intestine (18)	Simple repair	3
	Right hemicolectomy	7
	Left hemicolectomy	3
	Hartmann's Procedure	5
The mesentery (3)	Simple repair	3
Liver (11)	Repair of laceration	10
Spleen (9)	Splenectomy	5
	Repair of laceration	4
Pancreas (2)	A Roux loop with pancreas with gastrojejunostomy	1
	Drainage	1
Kidney (4)	Nephrectomy	1
Urinary bladder (2)	Primary repair with suprapubic drainage	2
	Observation	5
RetroperitonealHaematoma (5)	Observation	5
Vascular injury (6)	Repair of Portal vein	1
	Resection & anastomosis for mesenteric vessel injury	3

Table-V
Outcome of the Patients following surgery (N=90)

Outcome	Number of Patients
Uneventful	40
Wound infection	14
Wound dehiscence	06
Intra-abdominal abscess	03
Anastomotic leakage	01
Enterocutaneous fistula	02
Intestinal obstruction	01
Colostomy related complications	02
Pulmonary complications	02
Pyrexia	09
Others e.g. phlebitis, jaundice, UTI etc.	08
Post operative bleeding	05
Death	12
Mode of Death (N=12)	
Major vessel injury	5
Liver injury	1
Post operative bleeding	1
DIC	1
Sepsis	3
Electrolyte imbalance	1

Table-VI
Time interval between accident and operation with its outcome. (N=90)
90% of the Polytrauma victims with abdominal injury required laparotomy.

Time interval (hrs)	No of patients operated	Uneventful recovery	Morbidity	Mortality
0-6	20 (22.2%)	13 (65%)	05 (25%)	01 (05%)
7-12	35 (38.8%)	10 (28.57%)	23 (65.7%)	04(11.4%)
13-24	35 (38.8%)	2 (5.71%)	26 (74.28%)	07(20%)

Discussion

Out of the 100 polytrauma victims the highest incidence (40%) was noted in the age group 21-30 years, the most active period of life then decreasing with age indicating that those who are most involved in outdoor activities and are much active in the working places are more subjected to trauma in their daily life. The sex predominance is also towards male (65%) with a Male: Female of 1.85 : 1. This is due to the fact that males are more involved in outdoor activities hence are more vulnerable to road traffic accidents and occupational accidents and also are more prone to physical assaults.

In this series the majority (60%) of the patients had penetrating abdominal injury whether by sharp instruments or by gunshot injury. 33% patient had non penetrating abdominal injury. 42% of the cases of documented penetrating abdominal trauma were due to gunshot/ bullet injury (10%), followed by stab injury (32%). This indicates urgent need of law and order enforcement. Road Traffic Accident (RTA) was the major (50%) cause of polytrauma with abdominal injury and most common cause of blunt abdominal trauma. In a previous study done in our country by Quader F et al.⁶ showed RTA as a major cause of non-penetrating abdominal injury which is also supported by this study.

Only 55% of the patients in the study reached DMCH within 6 hours of the incident. This is quite different from the result in study by *Biswas N⁷* performed in Barisal in 2004 and by *Maniruzzaman M.⁸* performed in Rajshahi in 2000, where the percentage of people arriving before 6 hours was 19%. But *Quader F et al.⁶*, who also performed the study in DMCH, showed that the average time lapse is 5 hours. The reason may be due to Dhaka being the capital with better communication system available. Also, this study included patients with polytrauma that needed urgent transfer to a designated trauma center i.e. DMCH.

Transportation time has a direct impact on the outcome of management of traumatic gut injury.^{9,10} The patients who were operated between 13-24 hours had the highest morbidity and mortality (74.28%, 20%) and the lowest in those who were operated within 6 hours of the incident (25%, 5%). The result clearly shows that the time taken to start the definitive treatment adversely influences the outcome of management of traumatic gut injury. So, receiving surgical treatment without delay gives better outcome in terms of morbidity and mortality.

More than half of the patients (55%) did not receive any resuscitation before admission and as a result of this and lack of pre-hospital care 54% patients reaching DMCH were haemodynamically unstable and 20% patients were in a state of shock. This is due to lack of operating 'trauma system' as in developed countries.

Haemodynamically unstable patients had worse outcome than those who were stable. 5% among who were in shock at the time of admission died during operation. The overall mortality in the series was 6%. The Massachusetts General Hospital series study by *Claude E.W. et al (1950)¹¹* reported that shock is a grave finding and implies extensive concealed haemorrhage contaminated by gastrointestinal contents.

95% patients complained of abdominal pain except those (5%) that had altered consciousness owing to shocked status. The pain was diffuse and was moderate to severe in intensity. 13% had vomiting and 3 patients had hematemesis and 2

patients had haematuria, both having pelvic fracture with associated urinary bladder injury. 17 patients of penetrating injury (32.08%) presented with evisceration of bowel, omentum or both. On examination 39% patients were dehydrated, 43% hypotensive and 37% were anemic. Majority of the patients had abdominal tenderness (95%), abdominal rigidity was present in 71% of cases and abdominal distension was present in 42% of patients; upper border of liver dullness was obliterated in 41% cases. Bowel sound was absent in 65% of patients. In a study by *Hall and Angels¹²*, 100% of patients had abdominal pain, 89.3% had tenderness, obliteration of upper border of liver dullness was found in 23.30% of penetrating group and 60% of non-penetrating group, and in all such cases on laparotomy, it was found to have intra-peritoneal gut injury; there were also a good number of cases without obliteration of upper border of liver dullness. These findings are very close to that of our study.

More than half of the patients (84%) had an associated extra-abdominal injury. This finding differs from that of the western series. *Fitzerald, Crawford and DeBakey¹³* found 97% cases to have associated other injuries. All of the RTA patients and bomb blast injury patients had associated injury which is supported by the previous study and also a recent study done by *Miklosh Bala et al¹⁴*.

In this study 90% patients in total were operated upon. There was no negative laparotomy. In our study 55 patients had gut injury whereas only 26 patients had solid organ injury. This indeed supports recent study by *Miklosh Bala et al¹⁴*. Among 100 patients in the study 37% had injury in small intestine. One case of duodenal injury had associated injury in ascending colon. Large bowel was injured in 18% cases. 2 sigmoid colon injury was associated with pelvic fracture. 10 patients had both small and large bowel injury. Liver was injured in 11 cases from solid organs injured. Among other injuries urinary bladder was found to be injured in 2 cases and all of them had pelvic fracture. 9 patients had splenic injury. Only one was isolated splenic injury while another had associated rib fracture. 7 other had associated gut injury among which 1 also had

associated left renal injury. 4 patients had renal injury. 3 patients had stomach injury, Pancreas was found to be injured in 1 case at its body with duodenal injury; another at the tail. Retroperitoneal hematoma was noticed in 5 cases, 3 having associated retroperitoneal hematoma and 2 having gut injury also. 6 Patients had injury of the major vessel. 1 had injury in the abdominal aorta, 1 at the right renal artery, 3 patients had mesenteric vascular injury and the last patient had injury of the portal vein. It is evident that hollow viscus and liver among the solid organs are most commonly injured organs which shows similar pattern described by *Miklosh Bala et al*¹⁴.

33.3% of operated patients had uneventful recovery. Wound infection and wound dehiscence (22.2%) comprised majority of the post operative complications related to surgical site. Poor nutritional status, absence of asepsis in the hospital environment, excessive handling during operation especially by trainee surgeons - all accounted for the high rate of infection and infective complications.

Mortality rate was high (12%). In a recent review article by *H. Bonatti, and J. F. Calland*¹⁵ showed the mortality among polytrauma victims to be the highest. In our study 6 patients died intraoperatively, 5 having injury of the major blood vessels (1 abdominal aorta injury, 1 renal artery injury, 2 hepatic vein injury, 1 inferior mesenteric artery injury) and 1 having a severely injured liver. Although these patients were taken early for laparotomy but probably due to already compromised hemodynamic status, lack of appropriate speciality and inavailability of huge amount of blood products, lack of needed facilities; an unfavorable ending could not be avoided. Mortality and morbidity was also high in the patients with polytrauma cases described by *Miklosh Bala et al*¹⁰.

Conclusion

Better outcome of polytrauma patients warrants for a systemic multimodal approach that we lack in our country. Abdominal trauma is often missed and frequently under-estimated in patients with polytrauma as manifestations suffering from injuries over other parts of the body are more obvious and early. This unrecognized injury or

uncontrolled bleeding from solid organs or injured vessels is the major cause of high mortality rate. Enforcing law and order to reduce assaults and homicidal injuries ,strict abidance to traffic rules, ensuring fitness of vehicles , improving condition of the plying roads along with increasing awareness is a must to combat the condition.

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