

# Challenges in Management of Abdominal Trauma in Sohag University Hospital

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## ABSTRACT

**Background:** Abdominal injuries both blunt and penetrating have been associated with considerable morbidity and mortality.

**Objective:** This study aimed to evaluate the pattern of abdominal trauma patients and their management at the Emergency Department in Sohag University Hospital.

**Patients and methods:** This prospective clinical study was carried out on 236 patients, with abdominal trauma. Patients were divided into two groups based on pattern of injury: Group A (blunt) and group B (penetrating). These were further divided into two groups according to hemodynamic stability.

**Results:** Cases with blunt and penetrating abdominal injuries, intensive care unit admission was required in 12 and 4 cases respectively. Abdominal ultrasonography was done in 130 (Blunt group) and 106 (Penetrating group) cases and showed hemoperitoneum in 130 and 46 cases respectively. Solid organ injury in 68 and 8 patients respectively. Erect X-ray abdomen and chest radiograph showed air under diaphragm in 2 and 5 cases respectively. Out of total 130 and 106 patients, based on their clinical condition 109 and 68 patients were taken for conservative management, selective non-operative management, of which 2 and 1 patients failed. Out of 236 cases, 200 cases had uneventful course on hospital and discharged home in good general condition. Complications were encountered in 27 cases, while mortality, related to septicemic shock, hypovolemic shock and acute respiratory distress syndrome, was seen in 9 cases.

**Conclusions:** The primary objective in the treatment of abdominal injuries is immediate resuscitation after an accurate clinical and radiological evaluation. Patients fared better when there was less time between trauma and intervention. It is well-established that patients were hemodynamically stable and those who had isolated, low-grade solid organ injuries benefit most from non-operative management.

**Keywords:** Challenges, Abdominal trauma, Sohag University Hospital, Blunt abdominal injuries.

## INTRODUCTION

Any physical harm to the body brought on by sudden exposure to forces greater than one's tolerance level, or by a shortage of O<sub>2</sub> or warmth, is referred to as trauma [1]. Trauma can cause a wide range of injuries and issues that require quick assessment and treatment in order to preserve life and avoid irreversible impairment [2]. It is widely acknowledged that trauma is the primary cause of death for individuals under 45 and one of the factors contributing to morbidity and mortality in developing nations [3].

Both blunt and penetrating trauma result in significant morbidity and death due to abdominal injuries [4]. Abdominal injuries can be penetrating or blunt. Stabbing wounds from piercing tools or gunshots can result in penetrating abdominal trauma (PAT). Blunt injuries account for the majority of abdominal injuries [5].

Damage to internal organs such the liver, spleen, kidneys, intestinal lining, and big blood arteries, followed by intra-abdominal bleeding, is typically linked to abdominal injuries. Signs of hemodynamic instability, such as a weak pulse, low blood pressure, or shock, can accompany severe bleeding [6].

People who are at risk of suffering a significant abdominal injury cannot be reliably identified by an initial physical examination [7]. Assessing individuals who have experienced abdominal trauma has always been difficult from a diagnostic and treatment standpoint. Although exploratory laparotomy must be regarded as the gold standard for the assessment and

care of these patients and must be taken into account when evaluating them, it is evident that not all patients need this surgery [8]. X-rays of the erect abdomen, CT, diagnostic peritoneal lavage, US focused assessment using sonography for trauma (FAST), and diagnostic laparoscopy are among the diagnostic procedures used to evaluate abdominal trauma [9].

The aim of this work was to evaluate the different patterns of abdominal trauma patients and their management at the Emergency Department in Sohag University Hospital.

## PATIENTS AND METHODS

This prospective clinical study was carried out on 236 patients, with abdominal trauma. Patients were divided into two groups based on pattern of injury: Group A (blunt) and group B (penetrating) these were further divided into two groups according to hemodynamic stability, from March 2023 to February 2024.

**Inclusion criteria:** All patients presented with abdominal trauma.

**Exclusion criteria:** Patients with extra abdominal injuries.

Patients hemodynamic status at presentation was evaluated by current advanced trauma life support (ATLS) protocols.

All patients were subjected to complete history taking, clinical examination, laboratory investigations

[complete blood count (CBC)] and radiological investigations [abdominal US, chest and erect X-ray abdomen].

Patients exhibiting pneumoperitoneum on radiography and presenting with indications of peritonitis were immediately subjected to exploratory laparotomy. Contrast-enhanced computed tomography (CECT) of the abdomen and pelvis was used to assess hemodynamically stable patients, who were then divided into those with solid organ injury and those with hollow viscus injury. The World Society of Emergency Surgery's (WSES) grading system was used to treat the first. Grade IV was surgically handled, whereas Grade I through III were provided selected non-operative treatment (SNOM). Patients who had failed SNOM were referred for surgery, while the latter group received surgical treatment. Patients who were hemodynamically unstable received resuscitation. Stable post-resuscitation patients were assessed using abdominal and pelvic CECT and treated as previously mentioned. Surgery was considered for those who remained unstable even after resuscitation. Indication of emergency laparotomy in our center was hemodynamic instability signs of peritonitis pneumoperitoneum on radiograph. Patients with WSES grade IV solid organ injury and multi organ injuries.

**Ethical approval:** This inquiry has been approved by Sohag Faculty of Medicine's Ethics Committee. In writing, each participant confirmed that they were willing to take part in the study. The study adhered to the Helsinki Declaration during its execution.

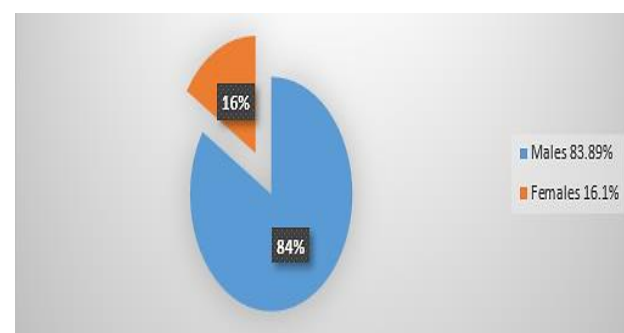
#### Statistical analysis

SPSS version 26.0 was utilized for the information management and statistical analysis procedure. Numbers and percentages were employed to summarize category data.

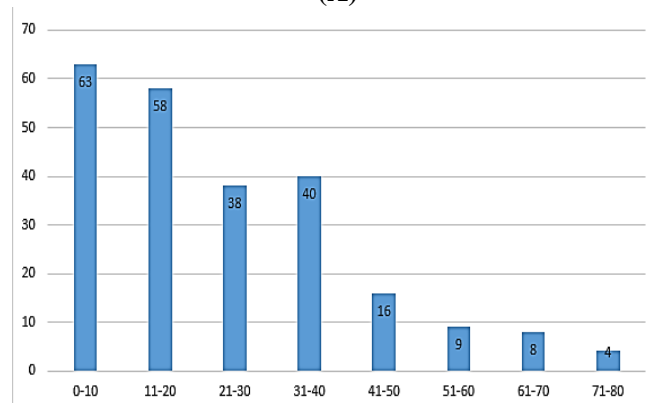
## RESULTS

There were 236 patients with abdominal injuries, with 198 (83.89%) being males and 38 (16.1%) being

females. The male: female ratio was determined to be 5.2:1 (Figure 1).



(A)



(B)

**Figure (1):** (A) Male to female ratio and (B) age involvement in abdominal trauma.

#### Epidemiological factors:

When evaluating the cause of abdominal trauma in patients, the following findings were found blunt abdominal injuries were found in 130 cases and penetrating abdominal injuries were found in 106 cases.

#### Blunt abdominal injuries:

Observed in 130 cases inflicted by the following mechanisms. Road traffic accidents (RTA), fall from height, assault by blunt object and animals kick the following results were obtained (Table 1).

**Table (1):** Mode of injury in blunt abdominal trauma

Blunt injury 130 cases (55% of total cases)			
Mode of injury	Number	Percentage of blunt injury cases	Percentage of total cases
Road traffic accidents (RTA)	67	51%	28%
Fall from height	47	36%	19.9%
Assault by blunt object	12	9%	5%
Animal kick	4	3%	1.6%

Time of presentation, 129 patients arrived to hospital during the first four hours. Only 1 patient presented 4 days after the trauma was inflicted. Intensive care unit (ICU) admission was required in 12 cases. Imaging, abdominal US was done in 130 cases, Erect X-ray abdomen and chest radiograph was done in most cases and CECT abdomen and pelvis was done in 85 hemodynamically stable and showed the following results (Table 2).

**Table (2):** Investigations performed for abdominal trauma and their results

	<b>Blunt trauma</b>			<b>Penetrating trauma</b>	
Abdominal ultrasonography	130			106	
	Hemoperitoneum		Solid organ injury	Hemoperitoneum	Solid organ injury
	130		68	46	8
Erect plain abdominal radiograph	2 cases showed air under diaphragm			5 cases showed air under diaphragm	
CECT abdomen	85 cases			36 cases (enteral enhanced CT was done in 17 cases)	
		No	Percent		
	Splenic injury	28	32.9%		
	Hepatic injury	23	27%		
	Pancreatic injury	2	2.3%		
	Renal injury	8	9.4%		
	Pelvic hematoma	22	25.8%		
	Pneumoperitoneum	2	2.3%		

Treatment approach, out of total 130 patients, two patients (1.83% of SNOM patients) failed the cautious management SNOM treatment, which was administered to 109 patients (83.84% of all cases) depending on their clinical status. The remaining 21 patients (16.15% of all cases) needed surgery right away and were sent straight to the operating room (Table 3).

**Table (3):** Management approach of blunt abdominal trauma

<b>SNOM</b>	<b>Failed SNOM</b>	<b>Operated Cases</b>
109 (83.84% of total cases)	2 (1.83% of SNOM)	21 (16.15% of total cases)

Intraoperative findings and procedures carried out during surgery, 23 patients (17.69%) were admitted for surgery, including 2 patients (8.69% of operated cases) (1.5% of total cases) who had failed SNOM and 21 patients (16.15% of total cases) who had been admitted for exploratory laparotomy (91.3% of operated cases) (Table 4).

**Table (4):** Intraoperative findings & procedures performed in blunt trauma

<b>Type of organ</b>	<b>Injured organ</b>	<b>No</b>	<b>Procedure done</b>	<b>No</b>
Solid organ	Spleen	14 (Isolated 10 cases)	Splenectomy	14
	Liver	3	Repair and packing	3
	Kidney	3 (none were isolated)	Nephrectomy	1
			Packing	2
	Pancreas	2 (none isolated )	Conserve	2
Gastrointestinal tract	Stomach	1	Repair with omental patch	1
	Jejunum	1	Resection and anastomosis	1
	Transverse colon	2	Exteriorization as colostomy	2
	Descending colon	1	Resection and anastomosis with diverting colostomy	1
Other injuries	Mesenteric tear	2 (isolated in 1 case)	Repair	2
	Diaphragmatic injury	1(not isolated )	Repair	1

Prior to surgery, all patients got preventative injectable antibiotics, and they continued to take them for seven to ten days after the procedure. Patients who had splenectomies received the pneumococcal vaccination twenty-four hours after the procedure, and then the meningococcal and Hib vaccines two weeks later.

### Penetrating abdominal injuries:

Observed in 106 cases inflicted by the following mechanisms: Stab to the abdomen, gunshot and fall on sharp the following results were obtained (Table 5).

**Table (5):** Mode of injury in penetrating trauma

Penetrating injury 106 cases ( 45% of total cases)			
Mode of injury	Number	Percentage of penetrating injury cases	Percentage of total cases
Stab	71	66.9%	30%
Gunshot	24	25.4%	10%
Fall on sharp object	11	10.3%	4.6%

Time of presentation, 103 patients arrived at the hospital in the first four hours. Only 3 patients presented 4 hours after the trauma was inflicted. The dealing with PAT was different from that of blunt injuries due to the greater risk of hollow viscus perforation. 4 cases required ICU admission. Imaging, Abdominal US was done in 106 cases and showed hemoperitoneum in 46 cases and solid organ injury in 8 patients.

Regarding patients who undergone intervention (except local wound exploration), US showed intraperitoneal collection in 23 cases, out of these 23 cases, 21 cases had either hollow viscus or solid organ injury. However, US was unable to detect organ injury in 8 cases and showed no intraperitoneal collection in 4 negative laparotomies. In five cases, an erect X-ray of the abdomen and chest revealed air behind the diaphragm (29.4% of hollow viscus injury). In 36 instances that were hemodynamically stable, CECT was performed on the abdomen and pelvis (Enteral

enhanced CT was done in 17 cases). Out of these 36 cases 6 cases had intervention immediately, 29 cases did not require intervention, and one case required intervention later. The results of CECT and enteral enhanced CT was reliable except in 1 case, which had negative CT scan and then the patient developed peritonitis and was explored, another case had a CT scan that denoted liver injury and upon exploration patient was found to not have any organ injury.

Treatment approach, selective non operative management (SNOM) was carried out in 68 cases. 61 cases had no clinical or imaging indication for organ injury. 7 cases had radiological evidence of solid organ injury only with little hemoperitoneum with no hollow viscus injury (5 cases with liver injury and two cases with kidney injury). Out of these 68 cases only 1 case failed the SNOM and developed peritonitis after 3 days and had to undergo exploratory laparotomy, which revealed injured gallbladder and cholecystectomy was done. Intraoperative findings & procedures carried out during surgery, 39 patients (36.7%) were admitted for surgery, including 38 patients (35.84% of all cases) who had exploratory laparotomy or diagnostic laparoscopy (97.43% of operated cases) and 1 patient (2.56% of operated cases) who had failed SNOM (0.9% of all cases) (Table 6).

**Table (6):** Management approach in penetrating trauma

SNOM	FAILED SNOM	OPERATED CASES
68 (72% of total cases)	1 (0.9 %)	38 (35.84% of total cases)

Indications for operative management included radiological evidence denoting organ injury (excluding the previously mentioned cases), peritonitis hemodynamic instability and sometimes the mere presence of penetrating injury, which resulted into multiple cases of negative explorations. The intraoperative findings were as followed in table (7).

**Table (7):** Intraoperative findings & procedures performed in penetrating trauma

Type of organ	Injured organ	No	Procedure done	No
Solid organ	Liver	2	Repair and packing	2
	Gallbladder	2	cholecystectomy	2
Gastrointestinal tract	Stomach	5	Repair with omental patch	5
	Jejunum	6	Resection and anastmosis	2
			Repair	4
	Ileum	4	Resection and anastmosis	2
			Repair	2
	Transverse colon	7	Primary repair	5
			Colostomy	2
	Descending colon	2	Repair with diverting colostomy	1
			Primary repair	1
	Sigmoid colon	3	Primary repair	2
			Exteriorization as colostomy	1
Associated injuries	Diaphragmatic injury	5	Repair	5
	Local wound exploration	4	Repair with hemostasis	4
	Ligation of bleeding vessels			3
	Retroperitoneal hematoma	1	Conserve	1
Negative laparotomy				6
Diagnostic laparoscopy	1		Negative	1

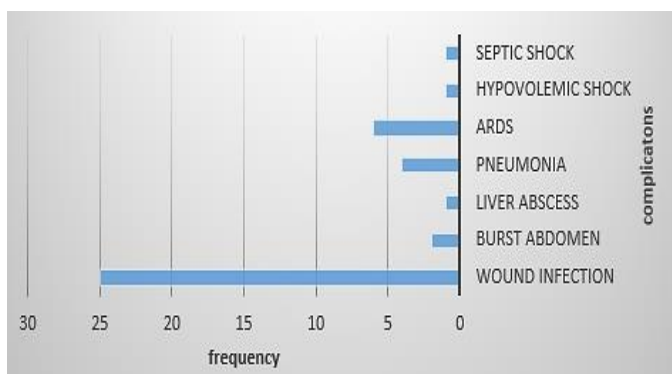
#### Outcome:

Out of 236 cases selected for the study, 200 cases (84.74% of total case) had uneventful course on hospital and discharged home in good general condition.

Nine patients (3.8% of all cases) had death from ARDS, hypovolemic shock, and septicemic shock, whereas 36 cases (15.25%) had complications.

Wound infection in 25 cases. Burst abdomen in 2 cases. Liver abscess in 1 case. Pneumonia in 4 cases. ARDS in 6 cases. Hypovolemic shock in 1 case. Septic shock in 1 case. Out of the 25 patients with wound infection 23 patients responded well to repeat daily dressing and suction irrigation of the wound and was discharged. However, 2 patients developed burst abdomen, which was managed first by vacuum device then secondary closure of the wound prolonging their hospital stay.

These 2 patients then developed incisional hernias and were operated by mesh hernioplasty later. The patient developed liver abscess was managed by ultrasound guided aspiration and drainage and good antibiotics (Figure 2).



**Figure (2):** Complications of abdominal trauma.

#### DISCUSSION

Abdominal injuries are common in our emergency department, and this paper details their causes, clinical presentations, patterns of intra-abdominal organ injuries, current care practices, patient outcomes, and obstacles. Approximately 60.8% of all instances of blunt abdominal trauma requiring exploratory laparotomy were caused by splenic damage. A total of 83.84% of blunt abdominal trauma cases were managed using SNOM, and the failure rate was 1.83 % of SNOM patients and a success rate of 98% which correlates with a study by **Goedecke et al.** [10]

In the majority of instances, penetrating trauma necessitates an emergency surgical intervention. Younger, healthier people are more frequently injured in civilian groups, and they bear a major part in the advancement of society [11, 12]. It is still unclear how best to treat individuals with penetrating wounds in the abdomen. About 60% of patients with penetrating wounds who arrive at the hospital with shock, widespread peritonitis, and evisceration are treated with an immediate laparotomy [13, 14].

SNOM was successful in 67 cases ( 63.2% of total cases), which is similar to study by **Bennett et al.** [15] who found that SNOM was at 84%. The rate of unnecessary laparotomies was 4.3% ( 7 cases), which is compared to **Abdulkadir et al.** [16] who found that it was 6.5% and (56.7%) in a study by **Al Aziz et al.** [17].

The SNOM of penetrating wounds in the abdomen is widely known. A significant disparity between the amount of trauma surgeons deal with and the resources at their disposal led to the creation of SNOM. The results of SNOM have been widely reported in the literature [18]. In line with our findings, **Ramya et al.** [19] concluded that erect films were not a dependable technique for surgical interference and produced

misleading results in 55.2% of cases. As a result, they did not consider it a certain strategy for intervention. According to research by **Al-Ozaibi *et al.*** <sup>[20]</sup>, a positive FAST scan was useful for diagnosing penetration but ineffective for determining which injuries needed medical attention. According to **Shashikala *et al.*** <sup>[21]</sup>, conservative treatment is a recognized standard of care that reduces surgical morbidity and enhances QOL in properly chosen PAT patients.

In our study, of all PAI victims who needed intervention, the small intestines were the most injured organ 10 cases, which is similar to a study by **Abdulkadir *et al.*** <sup>[16]</sup>. While, other studies produced a range of results, most of them concurred that the small intestine is a frequently injured organ in PAT <sup>[22, 23]</sup>.

Regarding the management of PAT. The rate of negative exploration was 15.3% of operated cases, and CECT failed to detect a viscus injury in one case, necessitating further exploration. This emphasized that the main diagnostic method for piercing abdominal injuries is diagnostic laparoscopy.

With a frequency of 10.5% of all patients, wound infection was shown to be the most frequent consequence in this research. In the current study, the hospital fatality rate was 3.8%. The magnitude of hospital death was 8.5%, which is lower than the findings of **Abebe *et al.*** <sup>[24]</sup>.

## CONCLUSIONS

The economic price that trauma places on families and nations is mostly since it disproportionately affects men during their prime earning years. The primary objective in the treatment of abdominal injuries is immediate resuscitation after an accurate clinical and radiological evaluation. Patients fared better when there was less time between trauma and intervention. It is well-established that patients who are hemodynamically stable and those who have isolated, low-grade solid organ injuries benefit most from non-operative management. However, in patients who have suffered blunt trauma, it is essential to evaluate the abdomen quickly and monitor for symptoms of peritonitis and hemodynamic instability to maximize non-operative management and minimize the risks and complications associated with laparotomies.

Although SNOM has mostly supplanted operational care for isolated solid organ injuries, it is still necessary to exercise high suspicion and act swiftly when dealing with hollow visceral injuries due to the increased failure rates of SNOM. In addition, our research showed that our center correctly selected patients for SNOM that the SNOM technique has a low failure rate, and that hospital resources are used efficiently for these patients who had penetrating abdominal injuries. One area that might stand some improvement is the requirement that all patients with penetrating abdominal wounds undergo diagnostic laparoscopy.

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