

An Audit of Management of Cases of Blunt Trauma Abdomen Resulting in Solid Organ Injury in a Tertiary Hospital Mumbai

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Abstract

Background: In an age of speeding, road rage and increasing traffic accidents the incidence of trauma as a whole and subsequently blunt abdominal trauma, is on the rise. It's a major cause of mortality and morbidity in the 15-44 years age group. Identification of serious intra-abdominal pathologies many times requires a high index of suspicion and appropriate, timely investigation as they may not manifest during initial period of injury.

Methodology: This was a prospective study of blunt abdominal injuries conducted during the period from May 2011 to October 2013 at KEM Hospital Surgery Department. All the cases visited during this period formed the sample. Initial data - the history in detail, clinical examination and investigation results were recorded as per the case record form. Line of management of the patient- whether operative or conservative - was according to the decision and clinical discretion of the on-call/managing surgical unit. The patient was followed up till discharge/death.

Result: Majority patients were in the age group of 21-40 years, accounting for 61%. 46% of blunt abdominal trauma from road traffic accident, 36% were due to fall from height. Out of the 82 who were conserved, 5 required nonoperative intervention. 16.67% with splenic trauma patients and 10.5% of liver trauma patients needed surgical intervention, the rest being successfully conserved.

Conclusion: Most cases of blunt abdominal trauma were from road traffic accident and fall injuries. Most of the patients had associated injuries. Spleen was the most common organ involved followed by liver. Computed tomography is the gold standard for diagnosis of abdominal injuries in patients of trauma.

Key words: Audit, Blunt, Mumbai, Solid organ injury, Trauma

INTRODUCTION

In an age of speeding, road rage and increasing traffic accidents the incidence of trauma as a whole and subsequently blunt abdominal trauma, is on the rise. It's a major cause of mortality and morbidity in the 15-44 years age group.¹ Identification of serious intra-abdominal pathologies many times requires a high index of suspicion

and appropriate, timely investigation as they may not manifest during initial period of injury.

Blunt trauma secondary to motor vehicle accidents, motorcycle accidents, falls, assaults, and striking of pedestrians are the most frequent mechanisms of abdominal injury.²

The solid organs of the abdomen are the liver, the spleen, the kidneys, and the pancreas. As a result, they tend to fracture, tear or rupture when struck with significant force. These tears have a tendency to bleed primarily or secondarily due to increased blood supply to these organs or due to avulsion of vessels within.

The management of blunt trauma abdomen has undergone a paradigm shift from imminent explorations, as was the

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dictum, to a conservative and more selective management today due to the better intensive monitoring of patients aided by noninvasive technology. In modern trauma centers in the 21st century, advances in noninvasive technology such as ultrasound and computed tomography (CT) have improved the evaluation and management of trauma victims. Furthermore, development of newer therapeutic modalities - such as embolization of bleeding vessels, ultrasound or CT guided drainage and advances in critical care management have increased the scope of nonsurgical management.

Selective nonoperative management (NOM) of solid organ injuries has become the standard of care today, as there is reduced surgical intervention and consequently reduced transfusions, lower morbidity, and shorter length of stay. Patients eligible for this line of management include those who remain hemodynamically stable and who do not have associated injuries that require laparotomy. Furthermore, necessary is the availability of intensive monitoring. The patient is strictly observed by serial physical and radiological examinations. Operative interventions need to occur expeditiously in hemodynamically unstable patients. This study was conducted to know the patterns of organ injury due to blunt abdominal trauma presenting to a tertiary care center and also to study the factors affecting the outcome of significant blunt trauma abdomen involving solid organs.

METHODOLOGY

This was a prospective study of blunt abdominal injuries conducted during the period from May 2011 to October 2013 at KEM Hospital Surgery Department. All the cases visited during this period formed the sample of the study which amounted to 100. All new as well as referred cases with blunt trauma abdomen admitted to our surgical emergency >12 years old, with proven solid organ injury were included in the study. Patients with death within 2 h of admission or arrival to the hospital, blunt trauma abdomen leading to hollow viscus injury and isolated hemoperitoneum without any evidence of solid organ injury till the end of patient's hospital stay were excluded from the study sample. Ethical clearance was obtained from Institutional Ethical Clearance Committee. Primary survey and resuscitation were done as per clinical condition of the patient. After securing the airway, breathing, and circulation, secondary survey was carried out as per guidelines. Institution of intravenous fluids with a wide bore line, insertion of Foley's urinary catheter and nasogastric tube and endotracheal intubation was done as per clinical necessity.

Relevant blood investigations, importantly hemoglobin level with pack cell volume (PCV)/hematocrit, serum

creatinine, electrolyte, and blood sugar values were obtained on an urgent basis from the 24 h functioning e-lab at our center. Grouping and cross-matching of adequate units of blood and transfusion as and when necessary were done in the meantime.

Once the patient was clinically stable necessary precautions to stabilize spine were taken and relevant imaging such as chest and erect abdominal X-rays with regional X-ray of suspected bone injury sites and sonography of chest, abdomen, and pelvis in the FAST format were obtained. If and when indicated, CT brain/chest/abdomen-pelvis was done.

Initial data - the history in detail, clinical examination and investigation results were recorded as per the case record form. Line of management of the patient - whether operative or conservative - was according to the decision and clinical discretion of the on call/managing surgical unit. Indications for any managerial decision were recorded. Further course with all details was recorded in the pro forma. The patient was followed up till discharge/death.

Ultrasonography was done with the curvilinear 5.0C50 (3-5 MHz) and linear 10-5 (5-10 MHz) transducers on sonoline G50 model of Siemens.

Hemoglobin, PCV and other parameters of complete blood count were obtained on the fully automated hematology analyzer (PCE-210 of Erma Inc.) with a capacity of 60 samples per hour and which functions on the principle of volume impedance.

CT scan was performed on the Philips Brilliance 64-slice CT scanner and was reported by the resident doctor on call.

RESULTS

Most of the cases, i.e., 92 were males. Majority patients were in the age group of 21-40 years, accounting for 61% of the cases (Table 1). 77 patients presented within 24 h of trauma, 30 of who presented within 6 h, and 37 within 12 h of injury. The rest 23 patients presented up to 3 days of trauma except two patients who presented after 25 and 45 days after being treated elsewhere, referred for complications. Table 2 depicts the mode of injury of the mentioned cases.

Among the 31 patients who had either tachycardia or hypotension, only 10 patients had isolated abdominal solid organ injury. Hemoglobin at presentation ranged from 7.1 to 15 g%. Average Hb was 11.31 g% (Table 3).

The overall mean duration of stay was 19.21 days whereas, for patients with isolated solid organ injury, it was much

lesser, i.e., 7.69 days. Pancreatic injuries had a mean stay of 38.4 days. Overall 29 required whole blood/PCV for resuscitation initially or later in the course. Majority could be successfully conserved and only 18 needed surgery during their course. Out of the 82 who were conserved, 5 required nonoperative intervention (Table 4). Out of the 18 patients operated, 11 (61%) were emergency splenectomies for splenic injuries, 4 (22%) were for liver injuries, and 2 (11%) for pancreatic injury. All renal injuries were conservatively managed.

Complications of NOM included infected splenic hematoma requiring pigtail insertion in 1 case, bilious collection requiring drainage in 1 case, significant delayed bleeding requiring intervention (1 case managed by vascular intervention and 4 cases managed with laparotomy), pancreatitis and its complications of pancreatic necrosis and fluid collection in 3 cases of pancreatic injury, 2 of which eventually needed surgery and 1 required drainage.

There were four deaths, none in the operated group. Causes were acute respiratory distress syndrome due to polytrauma, MI and mass effect secondary to cerebral compression due to a head injury.

DISCUSSION

Majority of cases were males (92%), mean age being 32 years. This is in conformity with most other studies as in that by Maurice *et al.* were mean age was 27 years.³ It is known that men being more susceptible to road traffic accidents and forceful assault, are more commonly involved in trauma of any form.

Table 1: Distribution according to demographic variables

Variables	Description	Number
Sex	Females	08
	Males	92
Age	<20	17
	21-30	34
	31-40	27
	41-50	13
	51-60	06
	61-70	01
	71-80	02

Table 2: Distribution based on mode of injury

Mode of injury	Number of patients (n=100)
Road traffic accidents	46
Fall from height	33
Assaults	9
Others	12

Although majority (67%) presented to our hospital within 12 h of injury, 30% presented within 6 h and 23% patients presented up to 3 days after injury. This could be attributed to the fact that KEM Hospital is one of the major tertiary referral centers to which patients are referred from all over Maharashtra. Primary care in such cases was given elsewhere. In some cases, patients were referred to multiple other centers before they came to this center.

Road traffic accidents formed the majority (46%) but less than half of cases in this study. In most studies as by Velmahos *et al.*⁴ and Raza *et al.*,⁵ this was 77% and 92%, respectively. Fall from height also contributed a significant proportion. This finding might call for preventive measures

Table 3: Classification on the basis of their presentation

Variables	Number of patients (n=100)
Vital signs	
BP <110(S), no tachycardia	5
Pulse ≥100, no hypotension	9
Both tachycardia and hypotension	18
Neither	68
Abdominal signs	
Soft	17
Localized tenderness	57
Generalized tenderness without guarding/rigidity	16
Tender-guarded abdomen	10
Abdominal distension	05
Organ(s) involved	
Spleen alone	53
Liver alone	23
Kidney alone	7
Pancreas alone	1
Liver and spleen	12
Liver and pancreas	3
Spleen and pancreas	1

Table 4: Characterization based on type of management

Intervention done	Number of patients
Nonoperative management cases	
Expectant observation alone	55
Blood/blood products	18
Drains placement/pigtail of collection	4
Vascular intervention (angioembolization)	1
Octreotide injection	4
NJ feeding	3
Total	85
Surgically managed cases	
Splenectomy	11
Distal pancreatectomy with or without splenectomy	2
Hepatorrhaphy	1
Laparotomy and lavage (negative)	2
Pancreatic necrosectomy	1
Diagnostic laparoscopy and drain placement	1
Total	18

at construction sites and tall buildings apart from safe traffic policies. Assault and other forms of domestic blunt trauma contributed to the rest (21%) of the cases. Hence, the modes of injuries which can lead to significant blunt abdominal trauma are varied. 17% of patients had no abdominal signs. In a collected series of 955 patients, Powell *et al.* reported that clinical evaluation alone has an accuracy rate of only 65% for detecting the presence or absence of intraperitoneal blood.⁶

Spleen was the most common organ (66%) involved followed by liver (38%). It was noted that after advent of CT scan, liver is the most common organ involved in blunt trauma,⁵ but this was not corroborated in our study despite 100% use of CT scan.

Comparing our findings with Velmahos *et al.*,⁴ 66% versus 50% had a splenic injury; 38% versus 48%, a liver injury; 7% versus 19%, a renal injury; 15% versus 11%, 2 organs injured; an 0% versus 7%, all 3 injured.

The pancreas was not included in the studies alongside other solid organs which are unique to our study. 5% had pancreatic involvement, with only one isolated pancreatic trauma. Indeed in blunt trauma to abdomen, pancreas is rarely involved alone.⁵

Conservative management was successful in majority of patients (82%). Rate of primary operative intervention was the highest with pancreas (20%) followed by spleen (10.6%). 7 of the 18 patients were operated because of failure of NOM. The highest rate of failure was with pancreas (50%) and spleen (6.8%). With liver, it was 2.8%, i.e., only one case out of 35 conserved cases. This is in accordance with the study results which have concluded that splenic injury of higher grade is a risk factor for failure of NOM.⁴

One patient of delayed splenic bleeding due to ruptured pseudoaneurysm on the 8th day of trauma underwent splenic artery embolization which was successful. This

calls for more active application of vascular interventional procedures in patients with bleeding solid organs due to trauma, so as to avoid a laparotomy as studies have shown them to be quite effective even in hemodynamically unstable patients.^{7,8}

Duration of stay was much higher in the operated group (17.17 days in operated group vs. 8.06 days in nonoperative group) due to higher grades of trauma, hence more associated injuries, and also failure of conservative management after a period of time. Of importance is the pancreatic injury whose average duration of stay was 38.4 days, way more compared to other isolated solid organ injuries. This is attributed to the fact that the process of traumatic pancreatitis and pancreatic ductal injury are inherently much more morbid in their pathophysiology owing to the biochemical composition of the pancreas as compared with liver, spleen or kidney whose injury poses bleeding (resulting in hemoperitoneum) as the most important effect.

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