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Demography and Presentation of Abdominal Injury in a Tertiary Care Polytrauma Centre in South Tamil Nadu

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Abstract: ***Introduction: Abdominal injury in polytrauma ranks third among the most frequently injured body region and quarter of them need exploration. 10% of trauma related deaths are due to abdominal injury. It requires early resuscitation in the "golden hours", high index of suspicion of visceral injury, proper investigation and early surgical intervention in required patients and non-operative management (NOM) for appropriate patients to avoid morbidity and preventable mortality in abdominal trauma patients. Aim: It is a retrospective observational study conducted for three years from 1st January 2014 to 31st December 2017 at Institute of Orthopedic Research and Accident Surgery, Madurai, at Devadoss Multispecialty Hospital, a private tertiary teaching polytrauma institution at Madurai, South Tamil Nadu, India. Analysis is based on the method of presentation to emergency department, mode of injuries, demography, associated injuries, non-operative management, surgical management, pattern of injuries at laparotomy, hospital stay and overall outcome in patients of abdominal injury in polytrauma. Materials and Methods: 111 patients were included in this study period of three years. Patients who left the hospital against medical advice and aged below 12 years were excluded from the study. Detailed history, clinical examination, appropriate investigations done and various treatment modalities followed including surgeries, intra-operative findings, non-operative management, hospital stay and outcome recorded in the case sheet were analyzed by statistical methods. Result: Study showed road traffic accidents were the commonest mode of injury. Age group most commonly involved is middle age. Males were affected more than female. Spleen was the commonest solid viscera injured and small bowel was the commonest hollow viscera injured in our study. Non-operative management was followed in haemodynamically stable patients with solid organ injury. All hollow visceral injury underwent laparotomy. Conclusion: In recent years, high speed road traffic accidents are drastically increasing in number and magnitude because of fast moving vehicle in four track roads. Educating the traffic rules to everyone and strictly following them will definitely reduce the incidence of accidents. Our study insists on the steps to be taken in the golden hours and the importance of early surgical intervention in time in the needy cases to reduce the morbidity and preventable mortality.***

Keywords: Demography, presentation, Abdominal injuries, polytrauma

1. Introduction

Polytrauma remains a major public health problem not only in developed countries but also developing countries irrespective of socioeconomic status (1). Abdominal trauma ranks third in frequency involving body parts next to head and extremities (1). In polytrauma, the cause of injury may due to blunt or penetrating trauma. 90% injuries are due to blunt abdominal trauma (1, 2). The cause of blunt injury in polytrauma includes road traffic accidents, fall from height, physical violence (3). The causes of penetrating injuries are stab injury, bullgore injury, impalement injury in road traffic accidents, gunshot injuries.

2. Methodology

Our study is a retrospective observational study conducted from available data at database and case sheets from January 2014 to December 2017 at Institute of Orthopedic Research and Accident Surgery, Madurai, in Devadoss Multispeciality Hospital at Madurai, South Tamil Nadu, India. All patients admitted with abdominal injury due to blunt or penetrating mode of injury were studied. Patients who left the hospital against medical advice and aged below 12 years were excluded from the study. All polytrauma patients were initially resuscitated at emergency room as per advanced trauma life support guidelines. Abdominal CT scan was performed in all patients who were suspected to have abdominal injuries. Screening of abdominal injuries by FAST (Focused Assessment with Sonography for Trauma) done for all suspected patients and head injury patients who were drowsy. Detailed history, clinical examination, appropriate investigations done and various treatment modalities followed including surgeries, intraoperative findings, hospital stay and outcome recorded in the case sheet were studied. Some patients who had conservative NonOperative Management (NOM) for solid organ injury in spite of radiologically proven organ injury were studied in detail. The study was compared with other studies by review of literature.

3. Observations

Total cases admitted with polytrauma at our centre during the study period was 1966. Out of which, conscious patients complaining of abdominal pain and those with head injury and those with altered sensorium and suspected abdominal trauma were 111. In them, 63 patients had nonspecific compliants in abdomen were observed and managed conservatively. 17 patients who had radiological signs of abdominal visceral injury underwent nonoperative management (NOM) and all these patients had solid organ injury. Remaining 31 patients underwent laparotomy out of which, the cause of injury was blunt injury in 26 cases and penetrating injury in 5 cases (Fig. 3). Peak age incidence of injury was middle age group ranging from 21-40 (Table. 1).

Table 1: Distribution of Age

Serial no.	Age	Number of patients
1	13-20	1
2.	21-30	11
3.	31-40	11
4.	41-50	5
5.	51-60	1
6.	>60	2
	TOTAL	31

In 31 cases, 5 were females and rest was males (Figure. 1). Male dominance was due to outdoor activity.

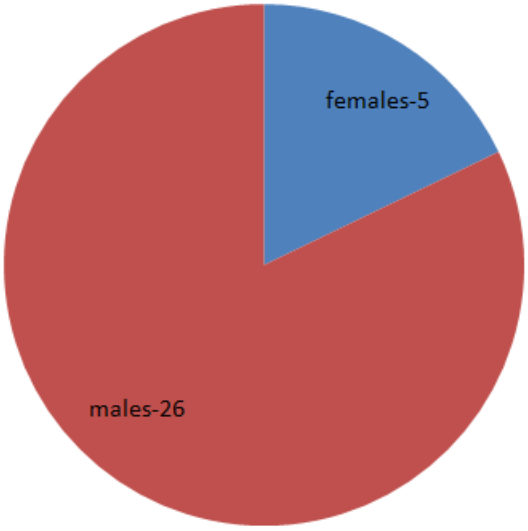

Figure 1: Sex ratio

Road traffic accident ranked the top priority in the mode of injury. Out of 31 cases who underwent laparotomy, injury due to road traffic accident were 24 cases (77. 4%), next was fall from height 3 cases (9. 67%), stab injury 2 cases (6. 45%), bullgore injury were 2 cases (6. 45%) (Figure. 2)

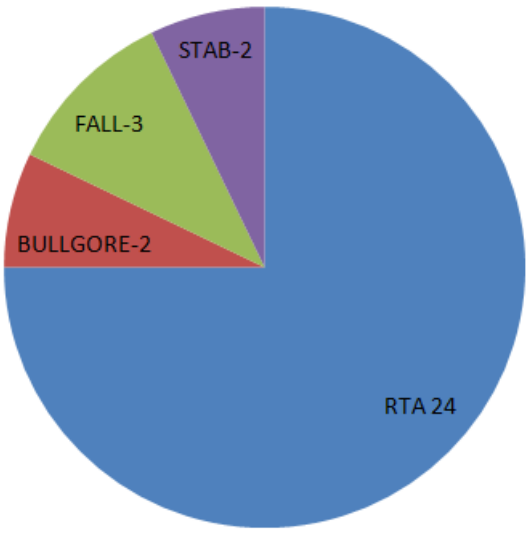

Figure 2: Mode of injury

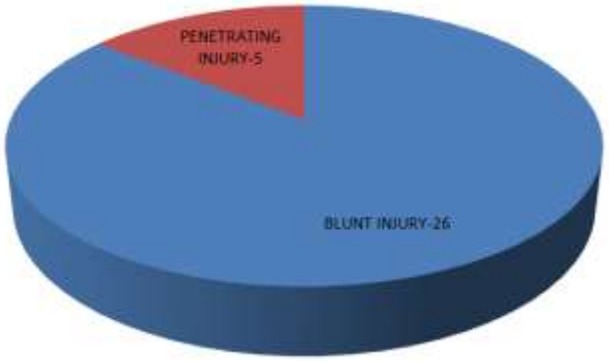

Figure: 3. Pattern of injury Pattern of injury

Associated injuries in patients with abdominal trauma were fracture involving spine, pelvis, head, rib cage and long bones out of which fracture of pelvis and long bones ranked highest (Table. 2)

S. No	Associated injuries	Number of patients
1.	Pelvis	11
2.	Spine	5
3.	Head	8
4.	Long bones	11
5.	Rib cage	5

Table 2: Associated injuries

Among 111 cases of suspected abdominal injuries in polytrauma, upon evaluation and observation, 63 did not have any injury. 17 cases having radiological signs of intraabdominal organ injury were managed by NOM. 31 cases underwent laparotomy (Table 3).

Table 3: Pattern of injuries

S. No.	Categories of patients	No. of cases
1.	Total patients with polytrauma	1966
2.	Suspected abdominal injuries	111
3.	Ruled out abdominal injuries following evalution	63
4.	With radiological signs of Abdominal injuries managed conservatively	17
5.	Patients underwent laparotomy	31

63 patients had symptoms like abdominal pain, vomiting, dyspepsia, bloating, not passing flatus (Table. 4). On detailed evaluation with clinical history, radiological examination and critical observation thereafter, these patients showed evidence of fracture pelvis, spine, head injury, emotional stress, referred pain, anxiety, minor form of injury to abdominal contents and abdominal wall not revealed by radiological methods which became normal after few hours of observation. These group of patients needed critical care and observation because these patients might have delayed presentation with signs of peritonitis or shock. If abdominal injuries are not diagnosed promptly, a worse outcome is associated (4). Delayed treatment is associated with an especially high morbidity and mortality if perforation of the gastrointestinal tract is involved (5).

Of the 48 case of abdominal injuries, cases with following clinical features like abdominal pain, vomiting, abdominal distension, guarding, tenderness, absent bowel sounds were studied.

Table 4: Clinical features

S. No	Clinical features	No. of patients
1.	Pain	70
2.	Vomiting	30
3.	Distension	44
4.	Guarding	42
5	Tenderness	22
6.	Absent bowel sounds	35

Out of 48 cases, commonest symptoms were pain followed by distension and tenderness. Others include vomiting, giddiness, absent bowel sounds.

Table 5: Pattern of organ injury at laparotomy (31 cases)

S. No	Organ injured	Cases	Percentage	Severity of injuries
1.	Spleen	9	29%	Haematoma to shattered spleen
2.	Liver	8	25. 8%	Haematoma to Grade 4 injury
3.	Retroperitoneum	15	48. 38%	Haematoma to slight bleed
4.	Mesentry	9	29. 03%	Haematoma to tear (Fig. 6)
5.	Small bowel	8	25. 8%	Serosal tear, perforation, transection (Fig. 7)
6.	Duodenum	1	3. 2%	Transection of 3rd part of duodenum
7.	Large bowel	6	19. 35%	Serosal tear, perforation, transection
8.	Pancreas	5	16. 1%	Haematoma, transection
9.	Diaphragm	2	6. 45%	Diaphragmatic hernia
10.	Anorectum	3	9. 67%	Deep perineal injury, levator injury

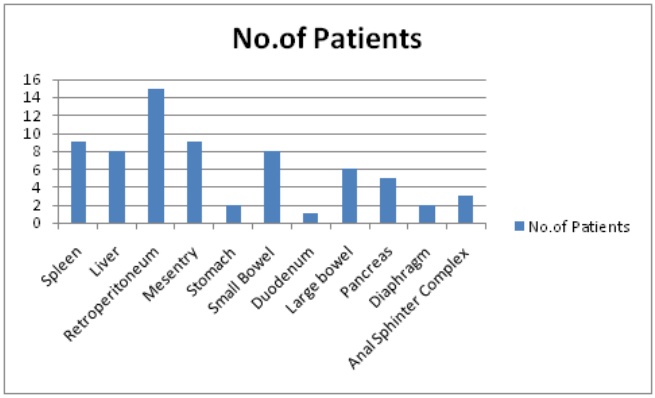

Figure 4: Pattern of organ injury at laparotomy (combined blunt and penetrating injury) 31 cases

Figure: 5. Shattered Spleen

Figure: 6: Mesentric laceration

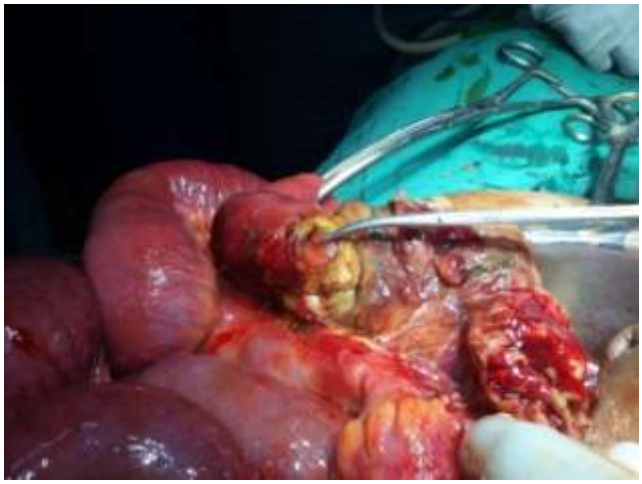

Figure: 7. Traumatic transection of small bowel

Selective nonoperative management (NOM) of abdominal visceral lesions is the most important and challenging changes that occurred over past 20 years. It has the advantage of avoiding unnecessary or non-therapeutic laparotomy. Studies have shown more than 95% of blunt injuries may be nonoperatively managed with a morbidity similar to or even lower than operative treatment (6, 2). Patients with radiological signs of injury managed conservatively by NOM in our study were due to injury to solid organs like spleen, liver or pancreas in haemodynamically stable young patients without comorbid illness observed in ICU setup (Table. 6).

Table 6: Frequency of organs involved in blunt injury abdomen managed by NOM

s. no	Organ injured	No. of patients
1.	Liver	8
2.	Spleen	12
3.	Pancreas	7
4.	Kidney	7
5.	Retroperitoneum	9

Length of hospital stay varied widely with polytrauma patients. Usually isolated abdominal injuries in polytrauma patients who underwent laparotomy were discharged once they take soft solids and passed motion without significant complications from 8^{th} to 12^{th} postoperative day. Other patients with multiple organ system injury who were on staged procedure in neuro, orthopaedic, ENT, dental and spinal injuries required longer hospital stay.

Table 7: Outcome of abdominal injury in polytrauma

S. No	Mode of treatment	No. of patients	No. of death
1.	Non-operative management (NOM)	17	Nil
2.	Laparotomy	31	2

4. Discussion

Advanced technology, urbanization, rapid mode of transport, cultural changes and industrialization in past two to three decades has superseded the growth and development in past two to three centuries. Among the causes of polytrauma in the modern world, irrespective of socioeconomic status, road traffic accidents ranks first, followed by fall from height, physical violence, bullgore injuries machinary injuries at factory. This is a retrospective observational study of polytrauma patients with abdominal injuries from data collected from database and case sheets in our hospital.

The aim of the study is to find causes of injuries, domography, mode of injuries, pattern of injuries, system involved, presentation at causuality, organs injured, various indications for laparotomy and its outcome and preventable measures of the injuries. Currently, the resuscitation of the trauma patients can be divided into two periods: the 10 platinum minutes and the golden hour. During the 10 platinum minutes, the prehospital trauma team should address the airways; control the bleeding, transport the patient to hospital. During the golden hour, the hospital trauma team should identify all the trauma lesions and address all the life-threatening injuries (7, 2).

In our study, out of 111 cases of suspected abdominal injuries in polytrauma, upon evaluation and observation, 63 did not have any injury and all these patients recovered well after a period of observation. 17 cases had radiological signs of intraabdominal organ injury were managed by nonoperative management (NOM). 31 cases underwent laparotomy. Among 31 cases who underwent laparotomy, 26 had blunt injury abdomen and 5 patients has penetrating injury. Most vulnarable age group was middle age between 21-40 years. Studies have shown higher incidence in patients below fourty years of age (8). Another study of 51 patients the common age incidence was 2nd and 3rd decade of life (9), reason being active lifestyles and more outdoor activities. Males were more affected than females for the same reason. Of the 31 cases who underwent laparotomy, males were 26 cases and females were 5 cases. Several other studies have reported similar lower incidence in female (10, 11).

Road traffic accidents ranked the top priority in the mode of injury. Out of 31 cases who underwent laparotomy, injury due to road traffic accident were 24 cases (77. 4%), next was fall from height 3 cases (9. 67%), injury due to physical violence were 2 (6. 45%), bullgore injury were 2 cases (6. 45%). Several other studies show similar high incidence of road traffic accidents (12). Deceleration injury, crush or compression injury are the three

mechanisms involved in the cause of blunt injury abdomen (13).

Blunt injuries were more common than penetrating injuries and more difficult to diagnose early particularly in patients with head injury and shock. Out of 31 cases of laparotomy, 26 cases (83. 87%) were due to blunt injury and 5 (16. 12%) were due to penetrating injury. In abdominal injuries in polytrauma, single organ or multiple organ injury depends on following factors like blunt or penetrating, mode of injury, magnitude of injury, direction of injury, amount of intraluminal content. Various patterns of organ injuries are as shown in table 5 and Bar chart Fig. 4. In our study, out of 26 cases of blunt injury abdomen, 20 had multiple organ damage and 4 cases of isolated organ injury. In solid organ injuries, spleen is the commonest organ and in hollow visceral injuries, the small bowel is the commonest organ involved.

Some polytrauma patients initially present with mild abdominal pain and with stable vital parameters particularly young adults and develop features of peritonitis or shock later in the course of the illness. Hence repeated physical examination by the same clinician and close monitoring of the patient is very important to avoid missing of the injury in the early stage and thereby reducing morbidity and mortality.

In our study, one patient with splenic injury with multiple organ system injury died due to Acute Respiratary Distress Syndrome (ARDS) on eighth postoperative day. One patient with massive haemoperitoneum due to avulsion of mesentry with active bleed expired due to intraoperative cardiac arrest (Table. 7). Studies have shown that massive intraabdominal haemorrhage was identified as the frequent cause of early mortality following multiple trauma (14).

In our study, 17 patients with blunt injury abdomen with radiological signs of injury were managed by nonoperative management (NOM). Nonoperative management is an established and accepted management protocol for solid visceral injuries in haemodynamically stable patients (15). It consists of admission to Intensive Care Unit, strict bed rest, analgesia, hydration, broad spectrum antibiotic, monitoring of vital physiological parameters, urine output, abdominal girth and basic required laboratory investigation at adequate intervals. Haemodynamically unstable patients with frank sign of exsanguinations underwent urgent laparotomy (16). In haemodynamically stable patients, organ injuries treated by NOM include liver, spleen, pancreas, kidney and retroperitoneum. Advantage of NOM includes decrease in the length of hospital stay and morbidity of surgery. Missing of bowel and vascular injury and delay of diagnosis are few risk factors involved in nonoperative management.

Splenic injury of grade IV –V were takenup for surgery (Figure. 5). In our study all renal injuries were managed by NOM. Most of the liver injuries of grade less than grade lll were managed by NOM. Studies has shown that in upto 86% of the liver injuries, the bleeding have stopped by the time the surgical exploration is undertaken (17). Pancreatic injury without complete transaction of main pancreatic duct with or without splenic injury were managed by NOM. Retroperitoneal injury in the form of hematoma which were found associated with fracture spine, pelvis and renal injuries were managed by NOM.

Outcome of the patient depends on mode of injury, age of patient, co-morbid illness, time lag between the injury and resuscitation and the necessary surgical procedure, development of complications like sepsis, acute respiratory distress syndrome, multiple organ failure.

5. Conclusion

Repeated clinical examination by same clinician along with appropriate investigation and early intervention helps to reduce the morbidity and mortality. Road traffic accidents were the commonest mode of injury. Middle aged people were commonly affected. Male were affected more common than females. Strict traffic rule, awareness and implementation, following of the rules by the common man without deviation reduces accidents and hence reduce the preventable cause of death. Safety measures for high building construction areas and safety education of the men at work, using good quality products at work, work done under supervision of safety trained personals and making availability of the first aid measures at the site of building construction should be followed. Strict safety rules and perfect fencing of the fields at 'Jallikattu" a brave sport in south India would reduce the incidence of polytrauma. Physical violence may be reduced by reducing emotional stress by performing yoga, meditation, life style modification, tolerance towards others.

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