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ORIGINAL ARTICLE

A Retrospective Research on Intestinal Damage Due to Blunt Abdominal Trauma

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Abstract

Background: The main cause of morbidity and death is blunt abdominal trauma. Blunt abdominal injuries may initially be difficult to detect if there are no evidence of exterior damage or alterations in the patient's vital signs. A considerable amount of blood loss can occur without the abdomen changing noticeably. Blunt trauma can cause solid organ rupture and visceral injury, which can lead to hemorrhage, peritonitis, and associated pelvic injuries. The most commonly wounded organs are the spleen, small intestine, and liver. **Objectives:** To find out the etiology, manifestation, anatomical distribution, diagnostic method, management and outcome of intestinal injuries from blunt abdominal trauma. **Methodology:** The study comprised nearly 59 patients who underwent laparotomies over a three-year period to address intestinal damage brought on by acute abdominal trauma. The etiology, presentations, anatomical distributions, diagnostic methods, associated injuries, treatment regimens, and deaths of the patients were all investigated in a retrospective analysis. **Results:** There were about 60 major bowel and mesentery lesions from blunt abdominal injuries in about 59 people. The male to female ratio was 5.5:1, and the average age was 36.78 years. Approximately 60 persons suffered severe injuries. In addition, there were 12 significant seromuscular injuries, 7 mesentric, 11 colonic, and 1 duodenal injuries, and 50 small intestinal injuries, including 48 perforations. Car accidents resulted in injury to 33 people. The most common damage was a perforation at the antimesentric boundary of the small bowel. Treatment for colonic perforations involved anastomosis, healing of the perforation, and protective colostomy following resection. Ten (16.9%) people encountered serious issues, and two (3.38%) deaths were reported. **Conclusion:** Even though it may be difficult, early diagnosis of intestine injuries after severe abdominal trauma is essential due to its enormous infectious potential. Intestinal perforations are commonly associated with severe damage, which are probably the decisive variables in survival.

Keywords: infectious potential, injury, abdominal trauma, external trauma

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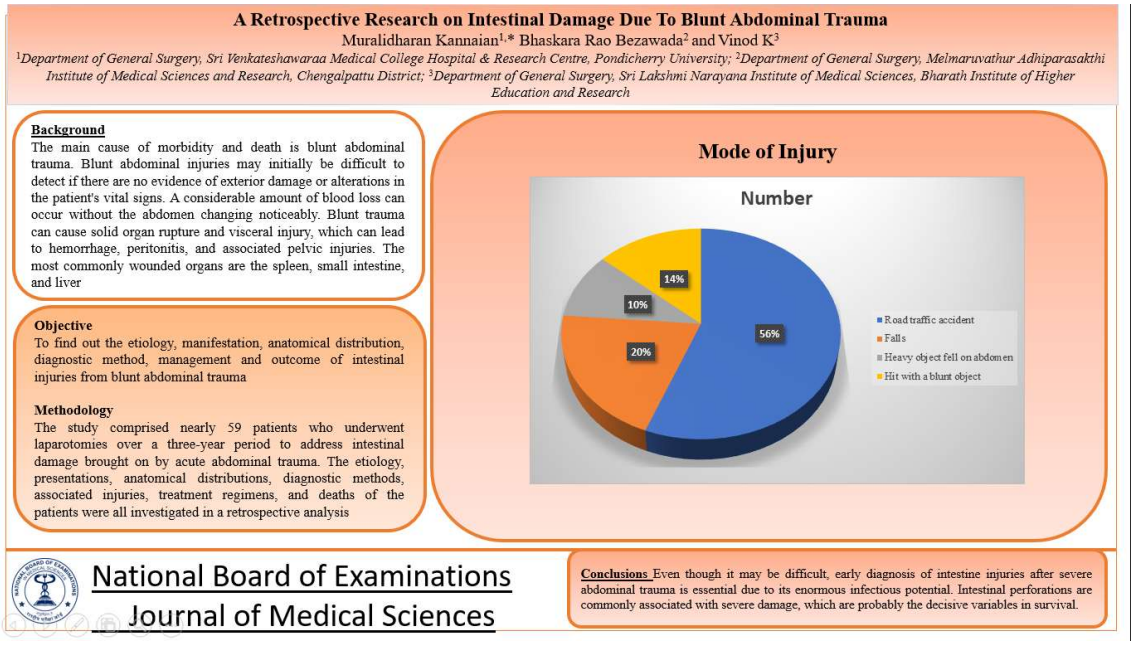
Graphical Abstract



Introduction

Blunt abdominal trauma is the leading cause of morbidity and death across all age groups. Blunt abdominal injuries may initially be difficult to detect if there are no evidence of exterior damage or alterations in the patient's vital signs. A considerable amount of blood loss can occur without the abdomen changing noticeably. Blunt trauma can cause solid organ rupture and visceral injury, which can lead to hemorrh age, peritonitis, and associated pelvic injuries. The most commonly wounded organs are the spleen, small intestine, and liver. Shearing damage caused by improperly fitted seatbelts is one kind of crush injury that can exhibit a recognizable seatbelt pattern of bruising [1].

Evaluation of serious intraabdominal pathology might be challenging. Although acute trauma from a variety of sources can produce intestinal disturbances, auto accidents are the most common aetiologic factor [2]. Blunt abdominal injuries are more common in rural areas, whereas penetrating injuries are more common in metropolitan areas [4]. Two forms of penetrating abdominal injuries that require different treatment strategies are stabbing wounds and gunshot wounds [5]. To lower mortality in cases of abdominal injuries, risk factors for death must be thoroughly identified and examined. In recent years, research has established a number of risk factors, including sex, the interval between an abdominal injury and surgery, shock at admission, and brain damage [3]. The experiences with blunt intestine injuries at a teaching hospital in Puducherry, India, are documented in this article.

Methodology

This retrospective study was conducted at a Puducherry-based private medical college. About 59 of the 284 patients treated for acute abdominal trauma throughout the course of the last three years (2020–2022) underwent laparotomies to

repair their intestinal and mesenteric lesions. Every patient with a blunt abdominal injury was included. Those with serosal tears that did not need to be removed or mesenteric injuries without intestinal ischemia were not included in our analysis. Following ethical permission, this retrospective study looked at the patients' age, sex, injury etiology, presentation, location, associated injuries, treatment, death, and morbidity. In our study we categorised the injury in to mainly two types - major and minor. Major injuries included: 1) bowel perforation or transection 2) ischemic bowel caused by a mesenteric injury that necessitated resection; and 3) seromuscular bowel wall injuries that also required resection.

Results

78 of the 284 patients who required laparotomies over a three-year period were hospitalized for serious abdominal injuries. In 59 people, there were significant mesentery and intestinal damage. 36.78 years old was the average age. The distribution of study participants by age group is shown in Table 1. The ratio of males to women was 5.5:1, with 50 men and 9 women.

Table 1. Age and Sex distribution of Patients with Intestinal Injury from Blunt Abdominal Trauma

Age (in Years)	Male	%	Female	%	Total	%
Below 20	4	6.78	0	-	4	6.78
20-30	11	18.64	1	1.69	12	20.34
30-40	23	38.98	6	10.17	29	49.15
40-50	9	15.25	0	-	9	15.25
50-60	2	3.39	2	3.39	4	6.78
60 Above	1	1.69	0	-	1	1.69
Total	50	84.75	9	15.25	59	100.00

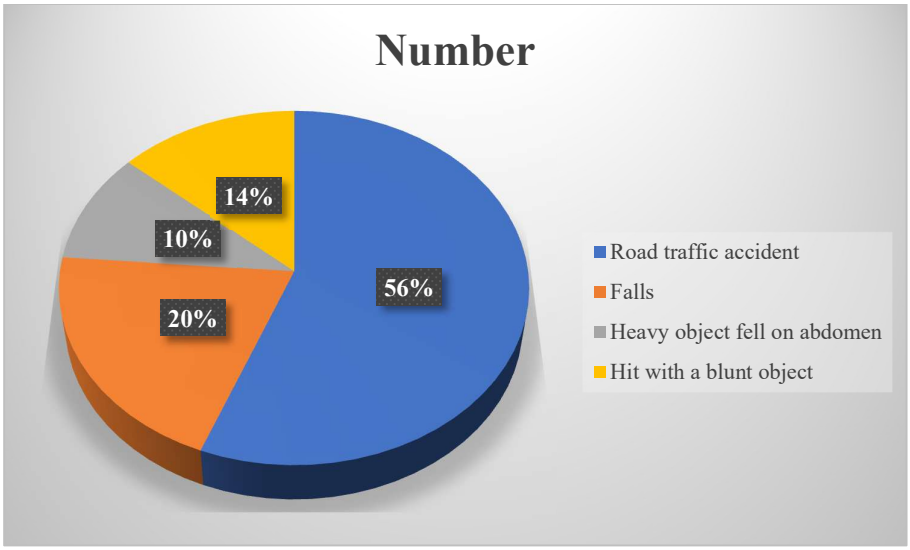


Figure 1. Mode of Injury

Among our study participants majority of about 33 (56%) cases included motor incidents on the roads. The remaining cases were caused by various accidents (Figure 1). Radiography of the plain abdomen and chest showed that 22 out of the 28 patients with 36 intestinal perforations had free peritoneal air. Ultrasonography was advised in five situations. The remaining individuals underwent laparotomies based solely on clinical findings.

Only in seven of the patients whose initial film taken within six hours of the event was negative was pneumoperitoneum found in films taken twelve hours after the injury. Because the injuries were not visible at the initial evaluation, the laparotomy was delayed for almost twenty-four hours in 10 of the cases. The average time from admission to laparotomy was 17.3 ± 21.5 hours. About 60 people were seriously injured, including 59 people. Furthermore, there were 50 small intestine injuries, including 38 perforations, 12 serious seromuscular injuries, and 7 mesentric, 11 colonic, and 1 duodenal injuries. The anatomical location of the injuries is shown in Table 3.

Table 3. Anatomic Location of Small Intestinal Injuries

	Number					
Site	Perforation	%	Serosal injury	%	Total	%
Duodenum	2	4	0	0	2	4
Close to DJ junction	13	26	4	8	17	34
Close to jejunoileal junction	8	16	2	4	10	20
Close terminal ileum	12	24	3	6	15	30
Scattered	3	6	3	6	6	12
Total	38	76	12	24	50	100

Table 4 shows that about 18 patients, or 30.5%, suffered related injuries. Intra-abdominal trauma caused the majority of the liver damage. According to this study, individuals with intestinal injuries were more likely to have liver damage, while those with acute abdominal trauma were more likely to have splenic injury. Most extra-abdominal injuries were related to the skeletal system.

Table 4. Associated Injuries

Site	**Number of patients**
Intra-abdominal	
Liver	6
Pancreas	2
Extra-abdominal	
Skeletal	7
Facio maxillary	2
Intra + extra abdominal	
Liver + skeletal	1

There were 38 perforations in the small intestine, including three in the duodenum. D4 sustained a grade II wound. The duodenal perforation was treated with gastrojejunostomy, feeding jejunostomy, and perforation repair. The numerous perforations and the three isolated holes required anastomosis and resection. The others were treated with primary closure. The small intestine's severe seromuscular injury required resection and anastomosis for treatment. The colon's two holes were repaired mostly. The transverse colon required exteriorization and resection, the sigmoid colon required resection and anastomosis with a protective colostomy, and the ascending colon's seromuscular injuries required resection and anastomosis. Anastomosis and excision were required due to the injury to the mesentery.

Table 5. Major Complications

Complications	**No of patients**	**Procedure done**	**Outcome**
Anastomotic leakage	3	Laparotomy + exteriorization	Survived
Anastomotic leakage + pelvic abscess	2	Laparotomy + abdominal drainage + exteriorization	Survived
Anastomotic leakage	1	-	Expired
Intra-abdominal abscess	1	Laparotomy + drainage	Survived
Burst abdomen + intra abdominal abscess	3	Laparotomy + drainage + closure	Survived

Approximately ten people (16.9%) had significant issues (Table 5). Minor issues like wound infection, chest infection, and prolonged ileus are not included in the table. Two people were killed out of the 59 patients. Deaths were 3.38% of the total. On top of that, both individuals had intra-abdominal organ injury. Immediately following the procedure, two people died. The immediate postoperative mortality were caused by significant blood loss resulting from the attendant organ damage. Two weeks later, the third patient, who also had anastomotic leakage, died.

Discussion

Injury to the intra-abdominal structures can be classified primarily into two categories: deceleration forces and compression forces.6. Compression or concussive forces can result from direct hits or external compression against a fixed object (like the spinal column or a lap belt). These forces can cause hollow organs to distort and temporarily increase intraluminal pressure, which can lead to their rupture. Deceleration pressures produce linear shearing and stretching between relatively stationary and free objects. As they separate from their mesenteric attachments, bowel loops can result in thrombosis and mesenteric rips,

which can harm the splanchnic vessels. Regardless of the mechanism, early detection of these lesions can be difficult. Unnoticed bowel injuries have a significant risk of infection, making them exceedingly deadly.

Annan recorded the first known instance of intestinal rupture brought on by violent trauma in America in 1837 [7]. According to earlier studies, these injuries are usually sustained by younger people and are usually the consequence of car crashes [7,8]. The latest experiment yielded similar results. Intestinal injury was seen in 20.7% of individuals in this study who had suffered violent abdominal trauma. With a rate of 5–15%, the intestine is the third most often injured abdominal organ in blunt trauma, which is consistent with findings from other series [9,10].

Most of the participants in this study had abdominal pain, discomfort, and distension. However, the features were vague in the initial examinations and weren't made evident until further abdominal examinations. Significant intestinal leakage into the peritoneal cavity or delayed presentation can increase morbidity. This has also been documented in other studies. As in prior investigations [11,12] the most commonly injured organ in this one was the small intestine. This study demonstrated that the distal ileum and proximal jejunum were more prone to perforation. This has also been mentioned in earlier works [13,14]. Nevertheless, certain studies have disproved this theory [15]. In a study with 60 patients, Dauterve et al. found that these zones accounted for fewer than half of the perforations [7]. However, his research does show that mesenteric injuries do occur more frequently at these sites. The results of the current investigation were comparable. Compared to colonic injuries, small intestine injuries were more frequent. This has also been documented in other studies [7,8,9].This is primarily due to its location and lack of redundancy, which prevents closed loops from developing.

Diagnostic testing can be used to evaluate patients who have suffered blunt abdominal trauma. These include computed tomography (CT), diagnostic peritoneal lavage (DPL), diagnostic laparoscopy (DL), and ultrasound (US). Ultrasonography is convenient, affordable, and non-invasive. What is known as a positive test [16] is evidence of parenchymal injury to solid organs or free fluid. For evaluating blunt abdominal injuries, DPL was once the recommended diagnostic method; however, CT imaging has recently replaced it, frequently [17]. DPL is an important adjuvant when intestinal injury is suspected [18]. Despite its sensitivity in identifying hemoperitoneum and associated hollow viscus damage, the increased frequency of non-therapeutic laparotomy associated with DPL has been criticized [16].

Extraluminal air and/or contrast extravasation on CT scans are results that are diagnostic for intestinal damage. The presence of free fluid without solid organ damage and small bowel thickening and dilatation are nondiagnostic but suggestive findings [20]. The presence of peritoneal fluid in the absence of obvious solid organ damage is a significant indicator of bowel damage, as several investigations have confirmed [21,22]. Small intestinal perforation may be diagnosed with CT with a 92% sensitivity and 94% specificity [20]. Laparoscopy's primary function in blunt abdominal trauma cases is diagnostic. Reports regarding therapeutic laparoscopy and the healing of intestinal perforations

have surfaced in recent years [23]. When a patient has acute abdominal trauma and is hemodynamically stable, laparoscopy is a safe and efficient way to identify intestinal damage. The best prognosis is provided by prompt surgical intervention and early identification of these lesions [24].

Treatment options include exploratory laparotomy, septic peritoneal fluid draining, and saline lavage of the wound. Antibiotics for prevention are essential [25]. Simple closure is usually adequate for a single small intestinal hole, but more serious injuries, like multiple perforations and gangrene from mesenteric lesions, usually require resection and anastomosis. Stoma development may be necessary for large bowel injuries, particularly in the left colon [11]. The death rate in this study was 3.38%. Between 10 and 30 percent of deaths are attributed to blunt intestine injury, according to reports [7]. Compared to previous studies, the decreased incidence of associated injuries in our study most certainly contributed to the lower mortality. Reports indicate a correlation between a rise in mortality and the number of connected injuries [11,26].

Conclusion

The study's findings supported the need of early detection and intervention. The most frequent injury, which happens more frequently in the small intestine than the colon, is a hole in the antimesenteric border. The likelihood of survival is often determined by associated injuries.

Statements and Declarations

Conflicts of interest

The authors declare that they do not have conflict of interest.

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