Research Article

Gastrointestinal perforation following blunt trauma abdomen: a study of 78 cases

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Abstract

Background: Blunt trauma to the abdomen leading to bowel injury is one of the major causes of death in the society. The most important problem associated with gastrointestinal perforation following blunt abdominal trauma is that they frequently remain undetected or are diagnosed too late despite advances in medical imaging.

Objective: To evaluate gastrointestinal perforation following blunt abdominal trauma, their anatomical distribution, diagnosis, management, and outcome.

Materials and Methods: The study was a prospective observational study conducted at the Department of General Surgery, SMS Medical College and Hospital, Jaipur, from April 2012 to October 2013 on 78 patients undergoing surgery for gastrointestinal perforation following blunt abdominal trauma. The study variables included sociodemographic data, radiological findings, perforation-surgery interval, intraoperative findings, and surgical procedure performed. Postoperative outcomes in terms of recovery, postoperative complications, and mortality were studied.

Results: Of 78 patients, 76 were male and only 2 were female subjects. The incidence was more in the young age group (maximum in 21–30 years age group) with road traffic accident being the most common causative factor. Free gas under diaphragm in chest X-ray was found in 51 (65.4%) patients, while remaining of them was diagnosed by USG abdomen (20 patients) and in CT abdomen (7 patients). Jejunum was the most common site of perforation followed by ileum. Among the surgical procedures, simple closure with peritoneal lavage was the most commonly performed surgery. Postoperative complications were seen in 38 (48.7%) patients, with chest infection being the most common. Ten (12.8%) patients died in the postoperative period with a higher mortality rate in patients with delayed admission in hospital and increasing age (> 50 years).

Conclusion: Posttraumatic gastrointestinal perforation most commonly involves the small intestine and can usually be managed by simple closure. Early surgery is associated with a good recovery. Risk of mortality increases with age > 50 years and delay in admission in hospital.

KEY WORDS: Blunt trauma, gastrointestinal perforation, morbidity, mortality

Introduction

Bowel injuries may be caused by either a blunt or penetrating abdominal trauma and injuries as a result of blunt trauma is one of the major cause of death in our society.[1] Blunt trauma causes injuries by either compression or by deceleration. Compression forces can lead to transient rise in intraluminal pressure leading to rupture, especially of the small bowel. Following blunt abdominal trauma, deceleration injuries lead to small bowel injuries typically to happen where mobile and fixed segments are attached and are vulnerable to shear force injury, that is, the proximal jejunum near the ligament of Treitz or at the distal ileum near the ileocecal junction.[2,3] Munns et al.[4] showed that following blunt trauma, the most common small bowel injury was "blowout" perforation on the antimesenteric border of the bowel (55.5%), while the most common colonic injury was a serosal tear/bruise

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(62.2%).[4] The most important problem associated with gastrointestinal tract lesions following blunt abdominal trauma is that they frequently remain undetected or are diagnosed too late despite advance in medical imaging with techniques such as focussed abdominal sonography for trauma (FAST), computer tomography, and magnetic resonance imaging.[5,6] The present trend towards conservative management of hemodynamically stable trauma patients may be increasing the risk of delay in the diagnosis of traumatic gastrointestinal perforation following blunt abdominal trauma. This study evaluates gastrointestinal perforation following blunt abdominal trauma, their anatomical distribution, diagnosis, management, and outcome.

Materials and Methods

A total of 78 patients underwent surgery for perforation following blunt abdominal trauma at the Department of General Surgery, SMS Medical College and Hospital, Jaipur, during the period from April 2012 to October 2013. The study was a prospective observational study conducted with the permission of the research and review board of the hospital. The patients included were those presenting with features of peritonitis following blunt trauma, with isolated injury to abdomen and found to exhibit gastrointestinal perforation on exploratory laparotomy. Patients in whom perforation was not detected at surgery were excluded from the study. Moreover, patients with penetrating abdominal trauma were not included in the study. As soon as the diagnosis was made, resuscitation was started with large volume of crystalloids (blood transfusion if necessary), nasogastric suction, urethral catheterization, and administration of broad spectrum antibiotics, and patient was immediately posted for surgery. As is the protocol in our hospital exploratory, laparotomy was performed by a midline incision. The decision regarding the procedure to be done was based on the discretion of operating surgeon. Thorough peritoneal lavage was done in every case with warm normal saline (3–5 L). Data of each patient were entered into pro forma prepared for the study. The study variables included sociodemographic data, clinical presentation, radiological findings, perforation-surgery interval, intraoperative findings, and surgical procedure performed. The variables studied in the postoperative period were postoperative complications and mortality. The development of complications was noted in postoperative period till the time of discharge, and, after that, the patients were called for follow-up every 2 weeks up to 3 months. The statistical analysis was performed using IBM-SPSS software, version 20.

Results

During the study period, 78 patients underwent surgery for perforation following blunt abdominal trauma. Of them, 76 were male and only 2 were female subjects leading to a male to female ratio of 38:1. The incidence was more in younger age group with most patients between age group of 20 and 40 years [Table 1]. Only nine (11.5%), patients presented age > 50 years. Regarding the mechanism of injury: 42 (53.8%) showed history of road traffic accident (RTA), 19 (24.4%) patients received injury owing to fall from height, in 10 (12.8%) patients injury occurred as a result of heavy object hitting the abdomen, and remaining 7 patients had a history of assault. Sixty-five patients reported to hospital within 48 h of trauma, with more than 80% reporting within 8 h of injury. Remaining 13 patients reported late with one patient reporting after 5 days traumatic event. Thirty patients were chronic smokers, while 16 revealed a history of chronic alcohol abuse.

Perforation was detected by presence of free gas under diaphragm in chest X-ray in 51 (65.4%) patients. In the remaining patients, ultrasonography (USG) abdomen was done. The features suggestive of perforation include fluid in peritoneal cavity, no solid organ injury, and dilated fluid-filled loops of bowel not exhibiting peristalsis. Twenty (25.6%) patients showed positive USG findings and were posted for exploratory laparotomy. In the remaining seven patients, computed tomography (CT) abdomen revealed the presence of perforation.

All the patients were posted for surgery following adequate resuscitation, and exploratory laparotomy was performed. Jejunum was the most common site of perforation in the study subjects followed by ileum [Table 1]. Among the procedures performed, simple closure of perforation with peritoneal lavage was the most commonly performed procedure in 42 patients (53.8%). Resection anastomosis was done in 25 cases, while stoma was fashioned in 11 patients.

Thirty-eight patients developed complications in the postoperative period with chest infection being the most common [Table 1]. Three patients developed fecal fistula, of which one had to be reoperated. Ten patients died in the postoperative period leading to mortality rate of 12.8%. Mortality was more in patients reporting late to the hospital (6 of 13 patients). Moreover, of nine patients with age > 50 years, four patients died in the postoperative period. Both the female subjects had an uneventful recovery, and all deaths were reported in male subjects.

Discussion

Blunt abdominal trauma is one of the leading causes of morbidity and mortality among all age groups. Identification of serious intraabdominal pathology is often challenging.[7] The most common cause of blunt injury abdomen leading to perforation was RTAs, followed by fall from height. Similar observation has been reported by others.[1,8,9] As with other studies, trauma was observed more in male in comparison to female subjects, although the male: female ratio was very high at 38:1.[7,8]

Most patients were relatively young male subjects exposed to a relatively increased risk of trauma commonly owing to RTAs. One-sixth of our patients reported to the hospital from 2 days after to up to 5 days after the traumatic event

Table 1: Various variables evaluated in the study

Variables	Number (%)
Demographic data	age groups (in years)
11–20	15 (19.2)
21–30	25 (32.0)
31–40	18 (23.1)
41–50	11 (14.1)
51–60	7 (8.9)
61–70	2 (2.7)
Distribution of site of perforation	
Stomach	3 (3.9)
Duodenum	13 (16.7)
Jejunum	28 (35.9)
Ileum	21 (26.9)
Colon	9 (11.5)
Rectum	4 (5.1)
Postoperative complications	
Chest infection	28 (35.9)
Superficial wound infection	17 (21.8)
Abdominal collection	8 (10.3)
Wound dehiscence	6 (7.7)
Fecal fistula	3 (3.9)

with peritonitis. The reason for such delay includes a relatively feeble initial peritoneal irritation induced by the nearly neutral intestinal content, particularly those with perforation between the duodeno-jejunal flexure and the ileocecal junction;[10] in small perforations, the mucosa may prolapse through the hole and partly seal it making early signs misleading,[10,11] and occurrence of a delayed perforation by an evolving injury where an initial contused bowel wall at the time of trauma ultimately gives way after a variable period with resultant peritonitis.[12] Moreover, it has been clearly demonstrated that delay in presentation even as little as 8 h adversely affects outcome following small bowel injury.[13]

Diagnosis of perforation by free gas under right dome of diaphragm was positive in 65.4% of cases, which is consistent with other studies.[8] In suspicious cases with negative X-ray findings, ultrasonography was done. Ultrasonography is convenient, cheap, and noninvasive. Free peritoneal fluid without solid organ injury detected on ultrasound in a patient with trauma to the abdomen is suggestive of a significant injury requiring exploration.[1] Diagnostic peritoneal lavage (DPL) was the diagnostic method of choice for evaluating blunt abdominal injury in the past but recently has been often replaced by CT imaging.[14] Although DPL is sensitive in identifying hemoperitoneum and associated hollow viscus injury, it has been criticized for its higher rate of nontherapeutic laparotomy.[15] The authors believe that the technique still has an important role in rural areas lacking modern imaging studies facilities.

At our center, it is a protocol to do CT abdomen in doubtful cases of perforation who present with negative X-ray and ultrasound findings. CT findings considered diagnostic for bowel injury are contrast extravasation with or without extraluminal air, small bowel thickening, and dilatation; peritoneal fluid with no visible solid organ injury in a trauma patient is a significant sign of bowel injury.[7,16,17]

In our study, jejunal perforation was more, followed by ileum and duodenum. This finding is in contrast to other studies in which ileal perforations were more common.[8] Moreover, in some others, the incidence of jejunal and ileal perforations was almost same.[1,4]

For hollow viscus perforation, the choice of surgical procedure is simple closure. This was the most commonly performed procedure in our study consistent with all other studies.[1,2,7,8] This is a well-established procedure with minimal complications.[18] For multiple perforations in a small segment, resection and anastomosis is the procedure of choice. In cases of mesenteric injury causing ischemia of the bowel, resection is the treatment of choice. For colonic and rectal perforations, the decision of closure with or without colostomy requires proper consideration. Stoma surgery was done in our study in cases of rectal perforations and colonic perforation, which were either multiple or presented late.

Most patients revealed an uneventful recovery and were discharged with 7 days of surgery. Postoperative complications were seen in 48.7% patients, and most recovered with conservative methods. Although the most common complication in perforation peritonitis is wound infection, it was less commonly seen in this study. The probable reason was that a trauma patient presents within a few hours to the hospital and undergoes an early surgery and, thus, has minimal intraperitoneal contamination leading to decreased rate of wound infection. Seven patients required a second surgery, one for fecal fistula in which an ileostomy was made and six patients for wound dehiscence. Mortality rate in this study was 12.8%. Mortality rates quoted from blunt intestinal trauma range from 10%–30%.[19] The rate is comparable to other studies[2,8] and is lower than the study done by Sule et al.[1] Among the various factors which were found to be associated with mortality were age > 50 years and delayed presentation at the hospital after trauma. Similar observation has been noted by other authors also.[8,13]

Data on female patients are lacking as, during the study period, only two female subjects underwent surgery following blunt abdominal trauma. Moreover, data on other associated injuries as a result of trauma were not included.

On the basis of the results of the study, the authors conclude that delayed hospitalization and increased age (age > 50 years) show a higher risk of mortality in posttraumatic perforation peritonitis. Most perforations can be managed by simple repair and peritoneal lavage. Early surgery following adequate resuscitation in gastrointestinal perforation following blunt trauma abdomen is associated with a very a good outcome.

Conclusion

Posttraumatic gastrointestinal perforation most commonly involve the small intestine and can usually be managed by

simple closure. Early surgery is associated with a good recovery. Risk of mortality increases with age > 50 years and delay in admission in hospital.

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