Original Article

Small bowel perforation a paradigm shift?

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Abstract

Small bowel perforation is a common surgical emergency all over the world. Prompt surgical intervention is necessary to reduce morbidity and mortality. Earlier, studies have reported non-traumatic perforations to be common etiology of small bowel perforation. This article presents the experience of 50 cases of jejuno-ileal perforation treated at government medical college and P.V.P.G. Hospital, Sangli. The aim is to give an analysis of jejuno-ileal perforation with a review of methods of management. All patients were resuscitated and underwent emergency laprotomy. On laprotomy cause of perforation peritonitis was found and controlled. Incidence was more in economically productive age group of 2-4th decade. Mean age of presentation was 38.66yrs. Majority were males with male: female ratio of 3.54:1. Pain in abdomen was the commonest symptom followed by fever and abdominal distension. Majority of cases had guarding and rigidity at presentation (96%), absent bowel sounds (86%), obliteration of liver dullness(72%).Gas under diaphragm was found in 36 cases. Simple closure was the most commonly done surgical procedure. The most common post operative complication was wound infection seen in 54%. 26% mortality was recorded in our study. Mean duration of hospital stay was 18.5 days. Ileum was the commonest site (76%) of perforation whereas only 24% had jejunal perforation. The present study showed trauma (36%) as the most common cause of small bowel perforation, other common etiologies being typhoid (32%), tuberculosis (10%) , and non specific (10%). We also came across some rare causes as small bowel GIST, enterobious vermicularis infestation, Meckel's and mesenteric ischemia. This could be a reflection of changing etiologic patterns of spectrum of perforation owing to increase in number of road traffic accidents, better roads and infrastructure, increase in automobiles and consequent decrease in the incidence of infectious diseases, due to prompt diagnosis and early treatment.

Key Word: Small bowel.

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INTRODUCTION

Small bowel perforation is a common surgical emergency. It is reported to constitute 5th commonest cause of abdominal emergencies due to high incidence of enteric fever and tuberculosis in developing countries [1]. Despite the availability of modern diagnostic facilities and advances in treatment regimens, this condition is still associated with high morbidity and mortality [2]. The causes of small bowel perforation are many and some are so rare, that no surgical unit can be expected to have come across all of them [3,4] . The present study was carried out to assess the changing etiologic patterns and treatment of intestinal perforation in the developing society. Causes of small bowel perforation in developing countries are clearly different from those in developed countries. Patients often present late with purulent peritonitis and poor general condition, as a result serious complications such as leak from repaired intestines, superficial wound infection, and wound dehiscence are common. Infection is the commonest cause of perforations in developing countries. This includes typhoid fever and tuberculosis. In industrial countries, non infectious etiologies predominate. Clinical presentation in bowel perforation is non-specific. The diagnosis is mainly clinical, supported by radiological finding of free gas under diaphragm. Laboratory investigations are not useful in all cases. Further, no single investigation has a high diagnostic accuracy. Intestinal perforation is associated with high mortality if early and proper management is not initiated. Preoperative resuscitation, placement of nasogastric tube and intravenous antibiotic are important. Furthermore the general condition of the patient, the number of perforations, the condition of the intestine and surgeons experience define the operative procedure, prognosis and outcome. A decision of laprotomy was made on clinical grounds supplemented by investigations. At laprotomy,

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operative findings were noted. Intestinal perforation was managed by one or more of the following procedures: primary closure with and without patch, resection of unhealthy segment of intestine was done followed by end to end anastomosis. Peritoneal cavity was thoroughly lavaged with normal saline. Tube drains were placed in pelvis and paracolonic gutters. Postoperative antibiotics were used. Attention was paid to major complications such as wound infection, wound dehiscence, residual intra abdominal abscess and enterocutaneous fistula.

MATERIALS AND METHODS

The study is a prospective study of 50 patients admitted to GMC Miraj hospital from October 2013 to September 2015. Typically the patients were admitted to the emergency room because of abdominal pain and a systemic inflammatory response. After the patient was admitted, a detailed history of the patient was taken and signs and symptoms were recorded along with a variety of information as, pain- time of onset, mode of onset of pain, site of pain, character of pain; vomiting- vomiting in relation to pain, frequency of vomiting, amount, colour, and content; bowels- last evacuation, constipated/normal; distension- duration, location, relation to pain, whether accompanied by borborgymi. In addition personal and family history and any significant past history was also recorded. A thorough physical examination was done with special emphasis on abdominal signs. A local examination including contour of the abdomen, movement with respiration, visible peristalsis, umbilicus and hernia orifices was recorded. In addition palpation (temperature, tenderness, muscular rigidity, abdominal girth), percussion (obliteration of liver dullness, shifting dullness), and auscultation (bowel sounds) were also noted. Laboratory investigations including blood, urine and stool were also done for each patient. Total counts and differential counts were also performed. Radiological examination was conducted in all cases to detect pneumoperitoneum. A plain X- ray of the abdomen was taken in erect posture to detect presence of gas under diaphragm. Ulcer edge biopsy was taken from all cases and subjected to histopathological examination. The preoperative preparation essentially consisted of correction of dehydration, overcoming shock if present, nasogastric decompression of bowel, parenteral broad spectrum antibiotics. The treatment to be adopted in each case was decided based on the status, necessity and health condition of the patient.

RESULTS

Among 50 surgically proven perforation peritonitis patients, 78 %(39) were males and 22 %(11) were females. Males were significantly affected with a male to female ratio of 3.5:1. The mean age at presentation was 38.6 years. 76 %(38 patients) of patients had ileal perforation, 24 %(12) had jejunal perforation.

Figure 1 depicts the various etiologies of bowel perforation recorded in our study, the most common being trauma(36%) followed by typhoid(32%), tuberculosis(10%), non specific perforation(10%) and rare causes as small bowel GIST, perforated meckel's diverticulam, worm infestation and iatrogenic perforation accounting 2% cases each. Etiologies of jejunal and ileal perforation are depicted in table 2 and table 3 .Trauma was the most common cause (83.34%) of jejunal perforation, whereas of ileal perforations were typhoid fever. (42%)

The highest incidence (34%) was observed in age group 21 to 30 years followed by 31-40 yrs(26%). Figure 2 describes the analysis of symptoms and signs. All the classical symptoms of acute abdomen were seen in our study with pain in abdomen being the commonest presenting symptom in almost 49 (98%) of patients followed by vomiting in 35 (70%), fever in 23 (46%) patients, distension of abdomen in 22 (44%) and constipation in 20 (40%) of the patients. Cardinal signs of perforation peritonitis, were seen as tenderness and guarding at presentation in 96-98% of patients, bowel sounds could not be recorded in 43 (86%) of patients, whereas 72% patients had obliteration of liver dullness. Plain X-ray of the abdomen in the erect posture indicated that 72% of cases had gas under diaphragm.

Operative Procedures

All patients underwent exploratory laprotomy under general anesthesia. Midline incision was employed. The degree of peritoneal contamination, general health status of the patient, number and location of perforation were the main deciding factors for selecting the type of surgical operations. When there was minimal peritoneal contamination, general good health of the patient, and perforation away from the ileo- caecal junction, simple closure was preferred. We used variety of operative procedures keeping three fundamental principles in mind

1. To eliminate the source of infection- by closure, exclusion or resection of the infection focuses.
2. To purge the infected abdominal cavity- intraperitoneal lavaged with saline was regularly performed to reduce the degree of bacterial contamination and to remove blood and necrotic tissue.
3. To prevent persistent or recurrent infection- intra abdominal drains were used.

Overall the commonest procedure performed was simple closure in 60% of patients the type of procedure employed and their common complication are depicted in figure 4.

Antibiotics were routinely given for 5-7 days unless the diagnosis was typhoid in which case antibiotics were continued for up to 14 days. A diagnosis of typhoid was made only if Widal test was positive or salmonella were isolated from blood or urine and if histopathological evidence of typhoid perforation was found. Likewise a diagnosis of tuberculosis was based on histopathological examination with other corroborative evidences of tuberculous infection. Overall the commonest post operative complication was wound infection in 27(54%) cases. Mortality in this series was 26%. In patients of typhoid perforation it was 37.5% whereas in traumatic perforation it was 16.67%.

Table 1: Etiology of small bowel perforation

Cause	Number of patients	Percentage
Trauma	18	36
Typhoid	16	32
Tuberculosis	5	10
Non specific	5	10
Mesenteric ischemia	2	4
Others (malignancy, Meckel's diverticulam, worm infestation, iatrogenic)	4	8
Total	**50**	**100**

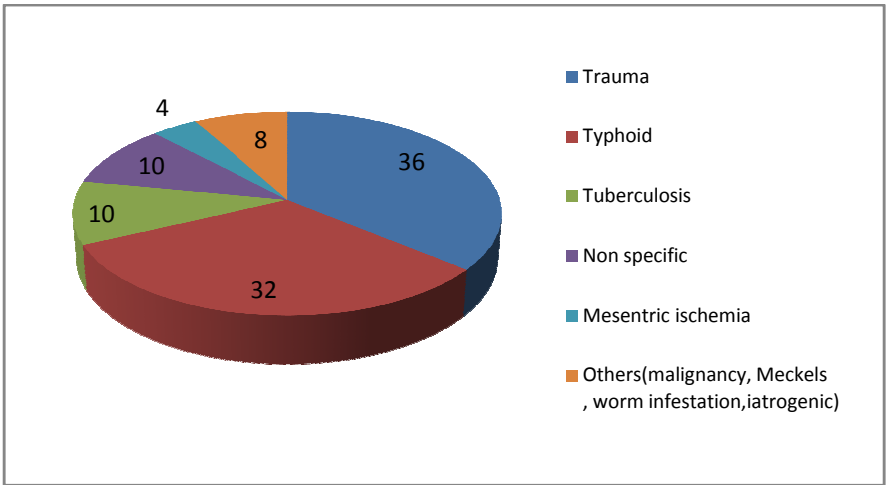


Figure 1: Etiology of small bowel perforation

Table 2: Etiology of Jejunal perforation

Etiology	Number of patients	Percentage (%)
Trauma	10	83.34
Tuberculosis	2	16.66
Total	**12**	**100**

Table 3: Etiology of Ileal Perforation

Etiology	Number of patients	Percentage (%)
Typhoid	16	42.10
Trauma	8	21.06
Non specific	5	13.16
Tuberculosis	3	7.9
Mesenteric ischemia	2	5.26
Malignancy	1	2.63
Meckel's Diverticulam	1	2.63
Worm infestation	1	2.63
Iatrogenic	1	2.63
Total	**38**	**100**

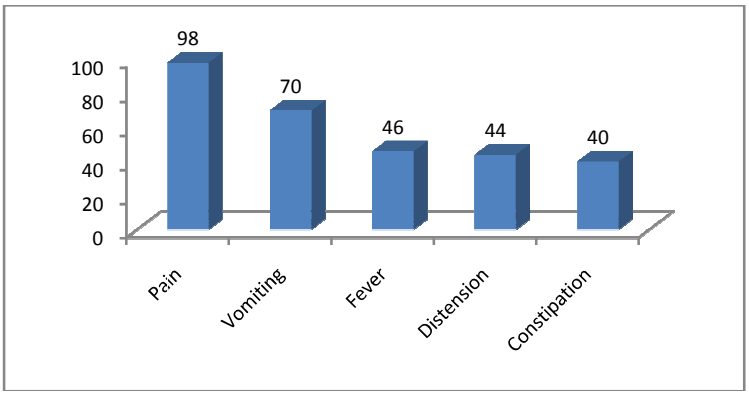


Figure 2: Presenting Symptoms

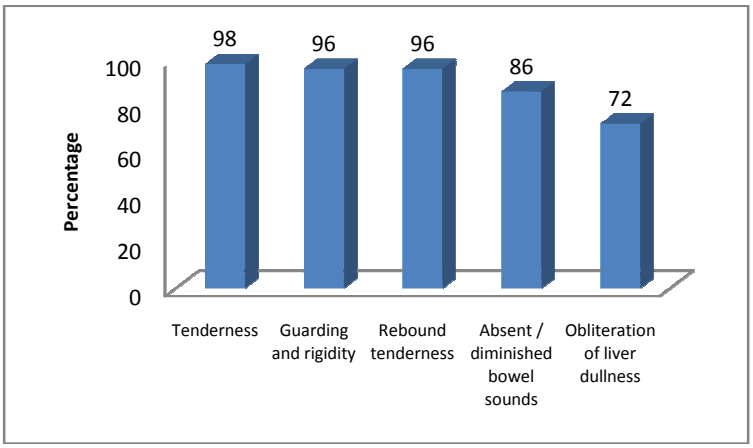
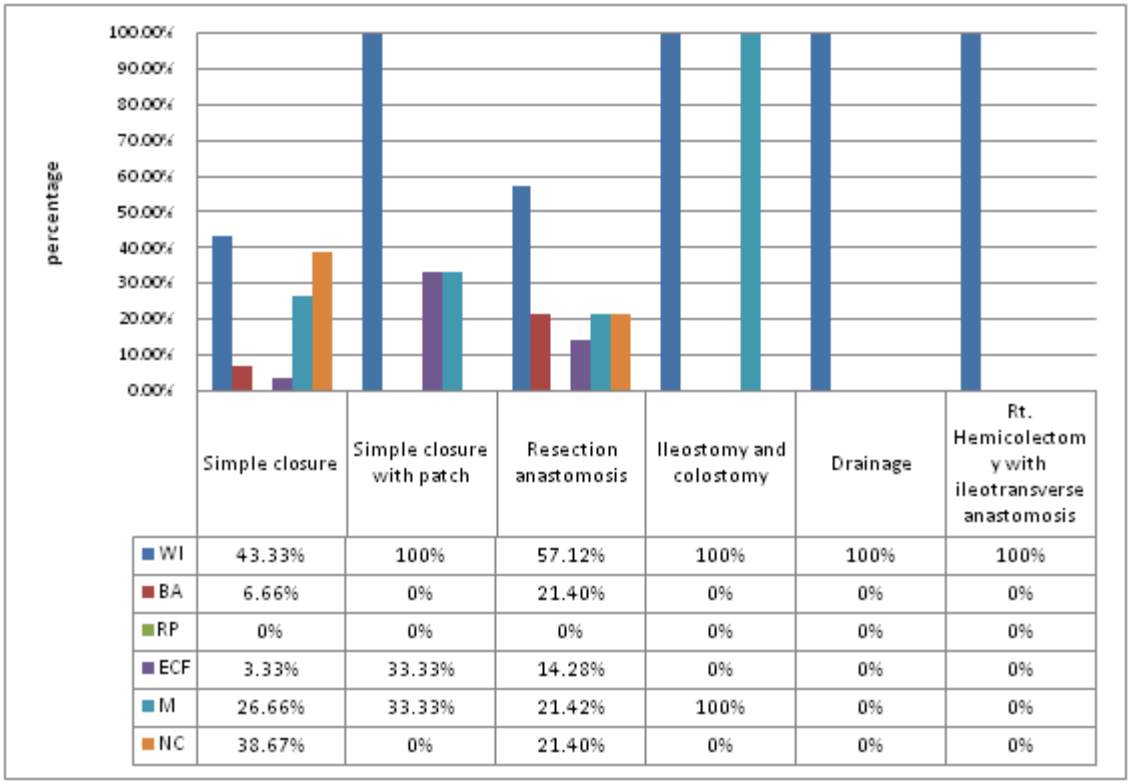


Figure 3: Signs



	Simple closure	Simple closure with patch	Resection anastomosis	Ileostomy and colostomy	Drainage	Rt. Hemicolectomy with ileotransverse anastomosis
WI	43.33%	100%	57.12%	100%	100%	100%
BA	6.66%	0%	21.40%	0%	0%	0%
RP	0%	0%	0%	0%	0%	0%
ECF	3.33%	33.33%	14.28%	0%	0%	0%
M	26.66%	33.33%	21.42%	100%	0%	0%
NC	38.67%	0%	21.40%	0%	0%	0%

Figure 4: Surgical procedures vs Complications

Table 4: Etiology vs. Mortality

Etiology	No. of patients	Mortality	Percentage (%)
Trauma	18	3	16.67
Typhoid	16	6	37.5
TB	5	2	40
Non specific	5	1	20
Mesenteric ischemia	2	1	50
Meckel's diverticulam	1	0	0
Worm infestation	1	0	0
Iatrogenic	1	0	0
Malignancy	1	0	0

DISCUSSION

The wide diversities of etiologies of small intestinal perforation make it unlikely for any one surgeon or institution to amass an extensive experience in managing these patients. Indeed there is no such series where trauma was the most common etiology of jejuno-ileal perforations.

The abdomen is third most commonly injured part of body following trauma. Early recognition of small bowel injury is important in the prevention of morbidity. Seventy five percent of blunt abdominal trauma is caused by motor vehicle accidents. Sammuel Annan [5] in 1837 reported the first case of intestinal rupture secondary to blunt trauma. Hollow viscous injury following blunt abdominal trauma is a dilemma for emergency department physicians. The diagnosis should be based upon mechanism of injury, history and serial physical examinations. The gold standard for assessment of trauma is CT scanning with a sensitivity of 92% and specificity of 94% [6] . Very few studies have recorded trauma as their commonest cause. In our study trauma accounted for 36% of cases of jejuno-ileal perforation. This may be a reflection of changing etiological trends in the spectrum of small bowel perforation owing to increased industrialization, better roads and infrastructure, increase in the number of road traffic accidents and decrease in the incidence of infectious diseases, due to prompt diagnosis and treatment. Similar to Madhumita Mukhopadhyay *et al*[7] who observed that proximal jejunum and distal ileum were more prone to perforation following blunt trauma, v also recorded jejunal perforation(55.56%) followed by distal ileal perforation in(38.88%) of cases. Majority of cases of traumatic perforation(38.90%) in this study were in age group of 21-30yrs similar to J.C Baid *et al*[8] had 40.74% in that age group. Males outnumbered females (5:1) comparable to M.D Tripathi *et al*[9] (4:1) and Alton H Dauterive *et al*[10] (7.5:1). This could probably be due to outdoor nature of occupation, aggressive behavior, poor safety measures and apathetic ignorance of road sense. This study like many others confirms that enteric perforation is a disease of young adults, carries a heavy mortality and equally disturbing morbidity rates. Males account for over 3/4th of cases of typhoid perforation as in our study in 81% cases [11]. Swelling and ulceration of Peyer's patches with subsequent necrosis and perforation occurs and the classical presentation is of acute peritonitis, usually developing during the second or third week of disease. Perforations are predominantly in terminal ileum, over 80% being within 60 cm of the ileo-ceacal valve. 80% of typhoid perforations are solitary [12] . Treatment consists of vigorous peritoneal cleansing and systemic antibiotics. Simple closure of perforation is suitable in majority of cases [13, 14]. However if multiple perforations occur in one segment, resection and anastomosis should be carried out. Exteriorization is advocated for patients with more extensive peritonitis [15]. Post operative mortality rates ranging from 0-100% have been reported by Jean Marie Eustache and David J Kras [16]. Ileal perforation secondary to tuberculosis is extremely rare. Of patient with TB only 1% will have G I involvement and of these perhaps 10% will perforate leading to peritonitis [17]. We also recorded a 10% incidence of tubercular perforation in our study. The clinical picture will be that of a diffuse peritonitis. A chest X ray will often manifest changes of tuberculosis and this can be clue to etiology of acute abdominal process. The most common site of GI involvement is ileum. Bypass of segment can be done but results are so poor that resection should be considered [18] . The decision whether to exteriorize or anastomose will depend on the degree of peritonitis. Antituberculous chemotherapy is mandatory after operation [19] .

A non specific etiology was attributed to small bowel perforation where the perforation couldn't be classified on the basis of clinical symptoms, gross examination, serology, culture and histopathological examination into any disease state as traumatic, enteric fever, tuberculosis, or malignancy or any other cause.

We also came across many rare causes of jejuno-ileal perforation, like GIST of terminal ileum (2%), enterobius vermicular is infestation leading to ileal perforation in 2%, and perforated meckel's diverticulam in one (2%) case and one case of iatrogenic ileal perforation where a woman was being operated for uterovesical prolapsed.

One stage surgery was performed because of following reasons:

Almost all of our patients were toxic, anemic and debilitated. The terminal ileum is a useful segment so we do not recommend its sacrifice without well proven benefits. The multistage operative protocol is not practiced because of problems like ignorance, illiteracy, limited hospital resources. In peritonitis entire gut is inflamed and greater the length of anastomosis the greater will be the chances of leak.

In our study the post operative complications included wound infection (54%), burst abdomen (10%), fistula (8%). S.K Nair *et al*[20] reported wound infection in 52%, fistula in 10%, septicemia in 18%. Wound infection could be justified to be the commonest complication after any bowel surgery, in view of contamination of peritoneal cavity and wound incision by intestinal contents. Unacceptably high incidence of burst abdomen in present study was multifactorial due to delayed presentation, gross contamination of peritoneal cavity, septicemia and may be due to faulty abdominal closure.

Overall mortality in our study was 26%. With high mortality rates among patients with tuberculosis (40%), typhoid (37.5%) and gangrenous bowel perforation (50%). There was 16.67% mortality seen with traumatic perforation. Literature reports 0-100% mortality in typhoid enteric perforations whereas in our study it was 37.5%.In the present study there was 16.67% mortality in traumatic perforations whereas Madhumita mukhopadhyay showed 6.38% and Alton H. dauterive reported 26% in their study. Sweetman and Wise *et al*[21] reported 50% whereas Bhansali S.K. *et al*[22] reported 20% mortality in patients with tuberculous perforation peritonitis whereas it was 40% in our study.

CONCLUSION

A diverse group of causes of small bowel perforation have now been recorded in the literature and list of possible causes is slowly increasing. Once trauma which was considered to be rare cause of bowel perforation, is now on the rise. Regardless of the etiology of small bowel perforation, the clinical syndrome mimics that of many other acute abdominal conditions, making preoperative diagnosis difficult. Most important parameter of prognosis is the interval between perforation and operative treatment. Shorter intervals are associated with best recovery. Surely situations in which peritonitis is minimal will lend themselves to anastomosis whereas in patients with extensive peritoneal soilage, consideration must be given to exteriorization. Patients with traumatic perforation had lesser complications presumably due to healthier bowel than those patients with typhoid , tubercular or non specific perforation. In patients of traumatic perforations outcome was primarily influenced by injury to other organs. Early diagnosis, prompt pre-operative resuscitation, appropriate antibiotics, timely surgical intervention and good post-operative care can bring down the morbidity and mortality.

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