

A Systematic Review on Clinical Presentations, Etiology, Treatment and Complications of Ileal Perforation

Author: Dr Eesha Ashok, Junior Resident, Department of General Surgery,
Rajendra Institute
of Medical Sciences, Ranchi

Corresponding author: Dr Eesha Ashok, Junior Resident, Department of
General Surgery,
Rajendra Institute of Medical Sciences, Ranchi

Keywords: ileal perforation, stoma, resection and anastomosis, fecal fistula,
typhoid,
tuberculosis.

Date of Submission: 10-02-2025

Date of Acceptance: 20-02-2025

I. Introduction:

Perforation is the full-thickness involvement of the bowel wall which leads to contamination of the peritoneal cavity by the bowel contents. Ileal perforation peritonitis is regarded as the 5th most common cause of abdominal emergency being a major cause of morbidity and mortality in the surgical disciplines.^[1] Enteric fever is the leading cause of ileal perforation and in various studies, it has been observed to be responsible for 20-70% of cases.^[1-5] Tuberculosis was found to be associated with ileal perforations in 3% of cases by Wani et al and 79.6% of cases by Dasgupta et al.^[3,6] In developing countries, typhoid and tuberculosis remain the most common cause of ileal perforation.^[4] Various other causes of perforation include radiation enteritis, foreign body, trauma, etc.^[1-3]

The terminal ileum is known to possess the lymphoid aggregates known as Peyer's patches which harbor different infectious agents.^[7,8] Necrosis of Peyer's patches is responsible for intestinal perforation and bleeding.^[9] Ulcers of tuberculosis are transverse and those of typhoid are longitudinal.^[7] There is known variation in the incidence of perforation during different seasons with some emphasizing its maximum occurrence between May – September according to some studies and August to November in others.^[10,11]

Over the years, the management of perforation has changed from being conservative to surgical as conservative management is associated with higher mortality.^[4,12] The various surgical modalities available for treatment of ileal perforations include primary repair, resection and anastomosis, repair of the perforation with ileo-transverse anastomosis, ileostomy, single layer repair with omental patch. Stoma is a controlled iatrogenic fistula. Types of stoma are loop ileostomy, end ileostomy, and double barrel ileostomy. The complications associated with stoma include prolapse, retraction, ischemia, stenosis, parastomal hernia, bleeding, and fistulation.^[13] The risk of fistula formation increases when suturing is done in an aseptic environment at the same time, management of stoma remains a challenge in developing nations with most patients presenting with peristomal excoriation.^[14]

The most common complication post-surgical intervention in ileal perforations is wound infection occurring in the range of 10.7%-71.4%^[14,15]. Other complications include wound dehiscence, burst abdomen, residual abscess, fecal fistula, reperforation, septicemia, paralytic ileus, respiratory complications, bed sores, peritonitis, incisional hernia, electrolyte imbalance, mortality.^[1,4-6,10,11,14-18]

The degree of contamination, general condition of the patient, and delay in presentation determine the procedure undertaken in ileal perforation treatment and suggest that fecal fistula is more common in primary closure group compared to resection and anastomosis group. The author emphasizes the priority of ileostomy over repair in the presence of heavy contamination.^[15]

II. Review Of Literature

Diseases of the small intestine:

Causes of ileal perforation:^[1,19-33]

Table 3: Causes of ileal perforation

Immune-mediated	Crohn's disease Celiac disease Graft vs host disease
Infections	Viral: Cytomegalovirus, human immunodeficiency virus Bacterial: salmonella typhi, mycobacterium tuberculosis, Yersinia Parasites: ascariis lumbricoides, E. vermicularis, E histolytica. Fungal: Histoplasma
Congenital	Meckel's diverticulum Ileal diverticulum Jejunal diverticulum
Drugs	NSAIDs, anti-inflammatory drugs: aspirin, paracetamol, mefenamic acid, ibuprofen
Neoplasm	Non-Hodgkins lymphoma, secondaries, lymphoma
Other causes	Wegener's granulomatosis

Complications of stoma creation include:

- 1) Skin irritation
- 2) Prolapse: after dissection the redundant bowel is trimmed and the new end is fixed. In the case of loop stoma division of the loop and creation of end stoma can be tried.
- 3) Retraction: in the first two weeks is due to separation of skin from mucosa. It is due to tension on the afferent loop. The bowel may become edematous making re-exploration difficult. Conservative management can be tried in minor degrees but is associated with stenosis. The skin is excised similar to stoma closure and the stoma is redone.
- 4) Ischemia
- 5) Stenosis: skin is incised circumferentially and the stoma is mobilized till the abdominal fascia. The stenosed end is cut and a fresh mucocutaneous junction is made.
- 6) Parastomal hernia- it is associated with difficulty in application of stoma bag. This can be treated by mobilizing the stoma and excising the sac. Sutures can be taken to reduce the defect and a fresh stoma can be created by fixing the edges to the skin. Another technique is to create a stoma at a fresh site. Sometimes this can be approached from an incision away from the stoma site. Dissection can be done and mesh placement is done.
- 7) Bleeding
- 8) Fistulation^[13]

According to **Kim et al in 1975**, the bacilli of typhoid fever are not destroyed by the gastric acid and reach the bloodstream by penetrating the intestinal mucosa and causing bacteremia. During the third week of the disease, the ulcerations occur on the antimesenteric part of the bowel. Diagnosis of typhoid perforation was made by clinical and operative findings. Male to female ratio was 2.4:1. They highlighted the seasonal prevalence of the disease with 64% of cases occurring in autumn or summer. More than 50% of cases were explored after 24 hours of the onset of symptoms. 80.7% of patients had generalized peritonitis. 86% of perforations were in the terminal 60 cm and 72% were in the terminal 40 cm. 31% of patients had multiple perforations. The diagnosis in endemic areas is easier to make with history of fever of 1-4 weeks duration and culminating in the picture of acute abdomen. Widal may be negative due to the administration of antibiotics. More than 75% were found to be positive with titers of dilution more than 1:80. No cases of sealed perforation were recorded in this study. A mortality of 9.9% was noted. **The mortality was related to the delay in operation. Patients undergoing resection and anastomosis had lesser mortality as compared to those who underwent primary closure despite higher contamination.**^[34]

Khanna et al **1984** evaluated 100 patients of typhoid perforations, 46 of which had perforations in the second week. According to them the onset of pain and distension was taken as time of perforation. Widal test was positive in 58 patients (58% but the titer taken was more than 1/80 dilution). The peak age was in the third decade. The peak incidence occurs in the summer season with 74% of patients presenting between May and September and 26% presenting between October and April. On histological examination, the edge of the perforation showed mononuclear cells and non-specific perforation. Postoperative complications were wound infection, septicaemia, wound dehiscence, paralytic ileus, respiratory complications, burst abdomen, bed sores, subphrenic abscess, fecal fistula and intestinal obstruction. **Mortality increased with delay in presentation, but surprisingly the mortality decreased to 40% in presentation after ten days as compared to 83% in patients who presented between 4-10 days.** The diagnosis was made by a history of remittent fever, headache, and abdominal pain. 38 patients developed severe pain after enema administration. **Free gas under the diaphragm was found in 34% of cases suggesting absorption of gas due to delay in presentation.**^[10]

Kapoor et al **1985** in their article typhoid enteric perforations evaluated 45 patients. All patients underwent primary closure and even in cases with multiple perforations resection of bowel was not done. **According to him Widal (showing only 35% positivity, with titer of more than 1/320 dilution considered positive) and blood tests are of little value in diagnosing typhoid.** In one case presenting late, perforation

was not apparent. In 20% cases, fecal fistula developed which closed spontaneously. Male to female ratio was 8:1. **Mortality was related to delay in presentation.** Mortality in those who presented within 72 hours was 3% compared to 36% mortality in those who presented after 72 hours. In developing countries, typhoid is the commonest cause of enteric perforation. **Most perforations occurred in the second week of the disease.** Diagnosis was mainly clinical with a history of headache and fever followed by abdominal pain. **Operative management is the gold standard for treatment as conservative management is associated with high mortality.** complications include wound infection, burst abdomen, respiratory complications, fecal fistula etc.^[17]

Singh et al in 1995 evaluated 46 cases of typhoid ileal perforations with male: female ratio of 3:1.44 patients were Widal positive and half of the patients developed perforation in the third week. There were single perforations in 91% of cases. **Mortality in conservative management is as high as 70%.** They concluded that double-layered closure reduced the chance of suture line leaks.^[35]

Kapoor et al 1998 suggests that the abdomen is involved in 11% of cases of extrapulmonary tuberculosis. Abdominal tuberculosis occurs due to the reactivation of a dormant focus. This focus could have been acquired due to hematogenous spread from a pulmonary focus or due to swallowed bacteria that cross the Peyer's patches and reach the mesenteric lymph nodes. **Reactivation occurs in states of immunosuppression like diabetes, alcoholism, malnutrition, chronic kidney disease, and seropositivity.** Mostly mycobacterium tuberculosis is isolated from patients with abdominal tuberculosis instead of mycobacterium bovis. **50% of patients with AIDS with tuberculosis have extrapulmonary involvement compared to only 10-15% of patients who are not retropositive.** Tuberculosis in AIDS patients is associated with greater dissemination, rapid progression, and a higher mortality. Multidrug resistance is encountered more frequently in patients of AIDS. Abdominal tuberculosis includes the involvement of GIT (in 65-78 % of patients), lymph nodes, peritoneum, and visceral involvement like liver, and spleen. **The ileum and ileo-caecal region are the most common sites involved in GIT followed by the colon and the jejunum.** The types of involvement include ulcerative, hypertrophic, and stricturous. Arterial changes produce ischemia which leads to the formation of strictures. Ulcerohypertrophic and ulcero-stricturous types can coexist. The lesions in the small intestine are ulcerative or stricturous and those in the large intestine are ulcero-hypertrophic. The involvement of the colon is usually associated with the involvement of the cecum but isolated colonic involvement can also occur. The peritoneum and lymph node involvement can occur in the presence or in the absence of gastrointestinal tract involvement. **Peritoneal involvement can be ascitic or plastic.** Lymph nodes in the retroperitoneum and mesentery are involved and can caseate and calcify. Disseminated tuberculosis is associated with colonic involvement according to Chen et al and tuberculous hepatitis according to Essop et al. **A higher incidence is noted in females.** In children with abdominal tuberculosis, the lymph nodes and peritoneum are more commonly involved (90%) as compared to GIT involvement (10%). Tuberculous involvement could be acute, chronic, or acute on chronic. Perforation has been reported in 8-12% of cases. **A normal chest X-ray does not rule out the diagnosis of abdominal tuberculosis but positive findings on an X-ray of active or healed disease can help with the diagnosis of tuberculosis. Chest X-ray is more likely to show findings in case of ulcerative or ascitic type of tuberculosis.** Barium studies can help with diagnosis with signs such as mucosal irregularity and rapid emptying suggestive of ulcerative, flocculation and fragmentation suggestive of malabsorption. Dilated and strictured loops can be visible. Other findings could be a lymph node causing displacement of loops and adherent loops due to adhesive peritoneal disease. The ileocaecal region is commonly affected and the following distortions can be noted:

- 1) Shortened ascending colon
- 2) Deformed cecum which could be narrowed and shortened
- 3) The ileocecal valve can become deformed and incompetent
- 4) Dilated ileum
- 5) Increase in the ileocecal angle making it obtuse from acute

Ultrasound as an imaging modality can help in making diagnosis by commenting on the presence of ascites, enlarged lymph nodes, etc. CT can show adherent loops, thickening of omentum, and presence of lymph nodes with caseation.

Since the lesions are submucosal, biopsies may not reveal granulomas.^[36]

Kouame et al in 2004 shared their experience of 64 ileal perforations, highlighting the various complications. **They suggested that the mortality and morbidity do not depend on the surgical technique but on the general condition of the patient. It is advised to resect the last 60 cm of the ileum as this harbours a higher concentration of Peyer's patches which is a source of infection.** In contrast to other studies where septicemia remains the cause of high mortality, in this study the **fecal fistula was responsible for the major mortality.** According to the author, the fistula can occur due to
a) anastomotic leak

b)unnoticed fistula

c)new perforation on unresected ileum^[14]

Na'aya et al **2004** on the basis of 467 patients that they managed for typhoid fever of which 43 patients(9.2%) had perforations, suggests that pregnancy is associated with increased mortality. Also, multiple perforations that required resection and anastomosis were associated with high mortality(100%) The diagnosis was made by blood, stool, urine cultures or rising widal titres. The mean age was 15.9 years. Male to female ratio was 1.4:1. Gas under the diaphragm was present in 17% of the perforation cases.

Table 6: predictive values of various fluid cultures in typhoid

Tests	Positive value
Blood culture	86%
Stool culture	69.8
Urine culture	27.9

Widal test ranged from 1/160-1/640 dilution. Complications included wound dehiscence, wound infection and abscess. No cases of reperforation or fecal fistula. Preterm labour occurred in two patients at 20 and 32 weeks. Most perforations occurred within two weeks of symptoms. Much of the damage is done as the response of the immune system to the organism as the perforation occurs even during treatment for salmonella. Early perforation in West African patients is proposed due to hypersensitivity of the peyer's patches. All cases of multiple perforations died in this study. The toxemia and the morbidity associated with surgery might be responsible. **The occurrence of fever and pain abdomen in cases of pregnant women should be taken seriously as these patients are associated with high mortality.**^[16]

Shukla et al in **2004**, evaluated single-layer and double-layer closure for typhoid perforations. 100 patients were included in this study, single layer closure was done by one surgeon and double layer closure was done by the other surgeon. 46 patients underwent single layer closure and 50 patients underwent double layer closure. 65% of cases presented between July and October, showing a seasonal predominance. Peritoneal contamination, preoperative blood transfusion, and shock correlated with mortality. The mean hospital stay was 8 days and 10 days in the two groups. **In India, the incidence of typhoid perforation is 0.9%**. Most patients had perforation in the second week of illness. The perforation occurs on the antimesenteric border. mortality is as high as 20-40%. Previous studies showed decreased mortality in double-layered closure compared to single-layered closure. **The author concludes that better closure of the perforation instead of the technique i.e single or double-layered closure decreases mortality.** It is difficult to perform double-layered closure in the edematous bowel. **Single-layered closure takes less time and hence less exposure to anesthesia.**^[18]

Effendi et al in **2006**, evaluated the various surgical procedures in 112 patients of typhoid ileal perforation. The major determinants of the choice of procedure were:

- 1) The degree of contamination
- 2) The general condition of the patients
- 3) Delay in presentation to the medical facility

Ileostomy was associated with less duration of hospital stay and was the procedure of choice in moribund patients. Marked dehydration and features of toxemia were noted in patients with late presentations. 15.17% of patients needed blood transfusion preoperatively. 30.35% of patients needed resuscitation due to severe dehydration and hence the surgical intervention was done after 24 hours in such patients. In 57.14% of patients there was heavy contamination in the peritoneal cavity.

Table 7: Complications in various surgical groups by Effendi et al

complication	Ileostomy	Primary closure	Resection and end to end anastomosis
Wound infection	9.25	12.5	11.11
Wound dehiscence	3.7	17.5	5.55
Fecal fistula	1.85	17.5	16.66
Mortality	1.85	12.5	11.11
Septicemia	1.85	5.0	5.55
Intraabdominal abscess	1.85	7.5	5.55
Post operative chest infection	3.70	12.5	11.11

The incidence of fecal fistula was about 8 times more common in the primary closure and resection and anastomosis group. The incidence of respiratory complications were four times as common in the resection and primary closure group. The incidence of wound dehiscence was 5 times as common in the closure group but was equivocal in the ileostomy and resection group emphasizing the importance of removing the disease and contaminated part. The incidence of wound infection was comparable in the three groups implying other factors at play. **The intraabdominal abscess had the highest incidence in the primary closure group emphasizing the repercussions of leaving the diseased segment inside the abdominal cavity.**

Of the 8 patients that died, 6 died subsequent to the development of a fecal fistula which is thus considered the most deadly complication. Maximum duration of hospital stay was in the group that underwent primary closure (21-35 days). **The author emphasized on prioritizing ileostomy creation in presence of heavy contamination and poor physiological status of the patient.**^[15]

Wani et al in 2006 evaluated 79 patients of non-traumatic terminal ileal perforation. The edge biopsy of the perforation or resected specimen was subjected to histopathological examination. The procedure was decided based on the operative findings and delay in presentation was calculated from the onset of severe exacerbation of the symptoms. Out of 94 cases of ileal perforation, 15 were traumatic which had been excluded from the study. 35.4% of patients had a positive Widal test. Single perforation was seen in 62% of cases. 5 patients underwent reexploration was fecal fistula in whom ileostomy was done. even with perforation, no peritoneal collection was found in 8% cases. In typhoid fever, after ingestion of the salmonella typhi bacteria, their multiplication occurs in the reticuloendothelial system for a duration of 1-14 days subsequently causing fever, sepsis etc. In the peyer's patches, there occurs necrosis and capillary thrombosis. Perforation occurs on the antimesenteric border, usually during the 3rd week. The terminal 60 cm of the small intestine is edematous and friable. **Mortality was related to a delay in operation of more than 48 hours, multiple perforations, and intraperitoneal feculent or purulent collections.** These causes are also related to the occurrence of fecal fistula. Morbidity and mortality were not related to the procedure undertaken. Resection and anastomosis was associated with high morbidity and mortality in this study. **Considering the difficulties encountered in the management of stomas, the author advises ileo-transverse anastomosis to be done in their setting.**^[3]

Atamanalp et al in 2007, in view of typhoid perforations, suggested that intestinal bleeding and perforation are the most lethal complications of typhoid fever. No conclusive data is present regarding the choice of procedure. **The delay in presentation, resuscitation, fecal peritonitis, number of perforations, and duration of surgery have been found to affect prognosis.** The diagnosis of typhoid as a cause of perforation was done on the basis of history and clinical findings along with the presence of perforation on the antimesenteric border. Postoperatively, the diagnosis was confirmed with a histopathological examination of the tissue from the edge of the perforation. The extent of peritoneal contamination was regarded as severe when more than 1000ml was drained from the peritoneal cavity and was regarded as moderate and mild when the amount was 500-1000 and less than 500 respectively. In case of multiple perforations, resection was done but was avoided in case of friable bowel or massive abdominal contamination. In 85.4% of cases, the perforation was within 60 cm and was beyond 60 cm from the ileocecal junction in the rest. Mortality was higher in patients with age more than 50 years and in females compared to males. The lag period between the onset of symptoms and surgical intervention was related to increased mortality. The number of perforations did not correlate with mortality. Mortality was higher in perforations located from than 6 cm from the ileocaecal junction. The ileostomy group was associated with higher mortality. The incidence of ileal perforation in typhoid ranges from 0.8-18%. severe peritoneal contamination is associated with a higher mortality. The incidence of fecal fistula is higher in patients with multiple perforations. The author concludes that the distance from ileo-caecal junction does not affect mortality directly but indirectly by affecting the choice of procedure. An ileostomy is regarded as a life-saving procedure even though it is expensive to maintain.⁽⁵³⁾

Dasgupta et al in 2009 evaluated 56 patient of abdominal tuberculosis who required surgical intervention. AFB positivity was seen more commonly in cases of perforation. **Dasgupta et al says that tuberculosis is quite common in cases of ileal perforation accounting for approximately 79.6% cases.**^[39]

Ansari et al in 2009 evaluated 44 patients of typhoid ileal perforation. Typhoid caused by salmonella typhi has varied presentations according to the duration of the disease.

Ulcers occur on the antimesenteric border with maximum of them localised in the terminal 45 cm. The necrosis of peyer's patches is responsible for intestinal perforation and bleeding. Previously there has been a significant reduction from 100% mortality associated with typhoid ileal perforations to the current 1-39%, which is still high compared to other diseases. The patients included in their study were positive for blood culture or typhidot or both. A uniformity was achieved with respect to resuscitation, antibiotic coverage, peritoneal toileting, closure of the abdomen, drain removal, and introduction of feeds. **All the ulcers were located within last 60cm of the small intestine.** The incidence of typhoid perforation varies from 33% in Africa to 3 % in Egypt. **The author advises in case of less contamination and healthy bowel, primary closure of the perforation whereas resection is to be done in case of grossly unhealthy bowel and moderate peritoneal contamination.** According to the author the mortality is dependent on the general condition of the patient, delay in intervention and virulence of the organism instead of the surgical technique undertaken. Fecal fistula could be due to anastomotic dehiscence, or new missed synchronous or metachronous perforation. Ileostomy even though difficult to manage in low-resource countries offers the advantage of avoidance of surgical suturing in septic and inflamed bowel. Pain due to peristomal ulceration limits food intake leading to cachexia and malnutrition in patients. Fecal fistula is the most dreaded complication according to the author. Several complications like stoma prolapse retraction and incisional hernias had been documented.^[9]

Abdullah et al **2011** suggests that in a significant number of cases, the cause of the perforation could not be ascertained. Such cases are known as non-specific ileal perforation. In developing countries, typhoid and tuberculosis remain the most common cause of ileal perforations. Conservative treatment that was advised after the introduction of chloramphenicol is associated with significant mortality thereby making surgery the treatment of choice in typhoid ileal perforations. Widal was considered positive for dilution greater than 1/320. Ultrasonography showed distended loops in 88% patients and X-ray showed gas under the diaphragm in 63% of patients. Widal test was positive in 48% of patients. mortality was seen in 8% of cases.^[4]

Ugochukwu et al in **2013**, evaluated 86 typhoid ileal perforations, of which **most patients had a history of symptoms for 1-6 weeks before the occurrence of the disease** and most had presented 24 hours after the occurrence of symptoms of acute abdomen. **Patients with early presentation had a mortality of 11.5% compared to 50% mortality in patients with late presentation.** Incidence in Africa ranged from 15-33%. With the use of antibiotics, the mortality in these regions has decreased significantly. Sixty percent cases occurred between August – November. 74% patients had hypokalemia, whereas the mean TLC was 4200. **Widal of dilution more than 1:160 was considered positive. Stool culture was positive in 2 patients.** Of the 66.3% patients subjected to ultrasound, 97% had free fluid in the peritoneal cavity. 80% of the perforations were located within 60cm of ileo-caecal junction. In 3.8% patients, **perforations occurred in second week and there was preponderance for early perforation with data present was early perforation occurring in African region.** This early occurrence of perforation could be regarded as a result of **hypersensitivity of peyer's patches or the occurrence of more virulent strains of salmonella in Africa.** **The use of chloramphenicol has also been regarded as a cause of increased perforation along with anemia and malnutrition.** The widespread use of antibiotics has led to a variable presentation with doughy abdomen and mild tenderness which makes the diagnosis difficult leading to delayed intervention and increased mortality and morbidity.

Mortality in various groups were:

Procedure	Mortality(%)
Simple closure and drainage	11.5
Resection and anastomosis	27.7
Ileostomy and drainage	28.6
Primary suture with ileo-transverse anastomosis	20
Limited right hemicolectomy	50

Overall mortality was 18%.^[11]

Chirantan et al in **2013**, wrote regarding his experience of 9 patients suffering from Crohn's who ended up with ileal perforation. **Crohn's affected the distal ileum with strictures and fistulas being the most common presentations followed by hematochezia.** Male to female ratio was 8:1, with the mean age being 41.8 years. 8 of these were not known cases at the time of perforation. In 4/9 cases resection and anastomosis was done and in 5/9 cases end ileostomy was made. The incidence of Crohn's has increased due to the dietary changes and the modern lifestyle. **It is rare before 6 years of age and the peak incidence occurs between 15-25 years.** Diagnosis in all the cases was made on histopathological examination characterized by non-caseating granulomas, Langhans giant cells and absence of mycobacterium. In this study the only patient who was previously diagnosed with Crohn's before perforation occurred was abstaining from medications at the time of perforation. 6/9 had single perforation whereas 3/9 has multiple perforations. 1 out of 9 patients demonstrated creeping mesenteric fat intra operatively.^[6]

Mittal et al in **2014**, evaluated 60 cases of ileal perforation. Ileal perforation peritonitis is regarded as the 5th most common cause of abdominal emergency due to the high prevalence of typhoid and tuberculosis in the Indian subcontinent. Patients were randomized into primary repair and ileostomy. Perforation causes gram negative aerobic and anaerobic infection which cause peritonitis. **This study compared ileostomy and primary repair in cases of ileal perforation with respect to cost burden, morbidity, mortality and complications.** No preoperative criteria was used in the patients. Patients were taken up for surgery with clinical and radiological suspicion of perforation and included in study if there was ileal perforation present intra operatively. Randomization was done by senior surgeons. All the procedures were done by hand sewn method. In primary closure the inner layer was closed with vicryl 3-0 and outer layer was closed with silk 3-0. In contrast to all the studies that were done previously, this study also enumerated the complications that occurred post closure of stoma.

Complication	Percentage
Wound infection	20
Anastomotic leak	6.67
Intraabdominal collection	6.67
Wound dehiscence	13.33
Reoperation	6.67

The average duration of stay in primary closure was 14.3 days and 21.53 days in ileostomy patients (the duration of stoma closure was included in this). The average duration of closure of stoma was done at 208.1 days. The delay in presentation is considered an important prognostic marker. The morbidity was higher in ileostomy group compared to primary closure. Ileostomy related complication occurred in 60% patients and repair related complication occurred in 23.3% patients. **The author emphasizes on the role of ileostomy as a life saving procedure in case of leaks post primary repair.** Whenever a leak is suspected in case of primary repair, urgent exploration along with exteriorization of the bowel should be undertaken without delay. Temporary ileostomy decreases the incidence of complications like fecal fistula.^[1]

Saini et al in **2014**, evaluated 40 patients with stoma for the complications related to stoma and the mental and social consequences of it. The study accepts stoma to be a life saving procedure but at the same time describes the physical mental and emotional changes related to it. Patients with permanent ileostomy, and fistulae were excluded from the study. Flatus and odour were noted in 57.5% patients. Patients were concerned about the loosening of bag and soiling during sleep, staying outdoors for long duration and social embarrassment. Primary repair is considered impossible in cases of delayed presentations or the presence of pus in the peritoneal cavity along with malnourished status of the patient. The complications are related to the age of the patient, associated comorbidities, the nutritional status and the surgical technique and experience.

Dermatitis can develop due to:

- 1) Leak of stoma contents
- 2) Ill-fitting bag
- 3) The aperture cut in the bag is larger than the stoma
- 4) Inappropriate stoma site
- 5) Improper pouting of stoma
- 6) Contact dermatitis due to material of the stoma bag

The author advises application of stoma immediately postoperatively, changing of bags by residents. Colostomy bags with straps keep the bag in place and absorption in the straps leads to excoriation in these places. The author advises diet modification with increased leafy vegetables and avoidance of aerated drinks. The limitation in the activities by patients was noted to be due to the fear of trauma to the stoma and leakage of contents. The sexual life of the patients also gets affected due to stoma.^[2]

Babu et al in **2016**, enumerated the complications of ileostomy. Though creation of stoma is a rescue procedure in case of moribund patients and delayed presentations, the maintenance of stoma brings with itself another set of complications. **The various treatment strategies over the years have developed from conservative management to surgical procedures like ileostomy, wedge resection, omental patching, diversion ileostomy, resection and anastomosis.** The factors which decide the procedure undertaken include:

- 1) Age of the patient
- 2) General condition of the patient
- 3) Lag period before surgery
- 4) The degree of intra abdominal contamination
- 5) Number of perforations
- 6) Condition of the gut
- 7) Distance of perforation from the ileo-caecal junction

Primary anastomosis is associated with increased chances of leak but the stoma is in itself associated with various complications.

Ileostomy is usually regarded as a rescue procedure in cases of:

- a) Matted bowel loops
- b) Gross unhealthy bowel
- c) Multiple perforations

It allows for early introduction of oral feeds thereby enhancing the nutritional status and thus the recovery of the patient. But nonetheless, the cost burden of ileostomies should be kept in mind along with the complications like stoma prolapse, retraction, necrosis, skin excoriation and electrolyte abnormalities. All the cases were operated after proper resuscitation and electrolyte correction. Decompression in the form of a nasogastric tube was done and a urinary catheter was introduced in all cases for urine monitoring. Peritoneal fluid was collected in all cases for culture sensitivity and the edge of the perforation was subjected to histopathological analysis. No randomization was done and the choice of the procedure was taken intra operatively after assessing all the factors. All the patients who were explored for fecal fistula underwent an ileostomy. 32.8% patients presented in shock and 19.2% received blood transfusion. 96.5% cases demonstrated gas under diaphragm.

	Early presentation<48hours	Late presentation>48hours
Stoma	1.04%	7.2%
repair	74.4	17.1

The operative procedure was not found to affect the outcome. The average duration of hospital stay in the primary repair group was 12 days whereas it was 11 days in stoma group along with extra 8 days during the second admission when the stoma was reversed which was done after 8 weeks in all patients. Although some authors prefer closure of stoma in the same sitting, the author emphasizes the fact that since most patients had presented with septicemia, closure after an interval was preferred. In 3 patients of primary repair, re-exploration was needed for reason of fistula in 2 and residual abscess in one. Re-exploration had to be done in one case of ileostomy for intra-abdominal abscess. In 56% of patients who underwent ileostomy, electrolyte imbalance was observed along with 6.25% of incisional hernia and 6.25 % of fecal fistula. In 43% of cases of ileostomy, skin excoriation was seen. **The author concluded that late presentation decides prognosis and the likelihood of stoma creation.**^[5]

Male to female ratio in ileal perforations:

Study	etiology	Male:female ratio
Dasgupta et al	tuberculosis	0.9:1.9
Kouame et al	typhoid	0.93:1
Na'aya et al	typhoid	1.4:1
Khanna et al	typhoid	11.5:1
Kapoor et al	typhoid	8:1
Wani et al	ileal	3:1
Oguchukwu et al	typhoid	3:1
Ansari et al	typhoid	1.75:1
Chirantan et al	Crohn's	8:1
Saini et al	ileal	2.63:1
Effendi et al	typhoid	1.5:1
Shukla et al	ileal	3.4:1
Mittal et al	Ileal	6.5:1
Kumar et al	tuberculosis	1:1.5
Atamanalp et al	typhoid	3.6:1
Singh et al	typhoid	3:1

Symptoms in case of ileal perforations

Symptoms	Na'aya	Abdullah et al	Ugochukwu et al	Ansari et al	Wani et al	Shakil et al	Shukla et al	Mittal et al	Kumar et al
Fever	100	73	50.1	100	57		90.6	60	24.33
Abdominal pain	100	100	90.7	100	100	100	100	100	96.67
Abdominal distension	100	67	75.6	100	54		68.75	83.3	28
Diarrhoea	51.2			11.36			11.4		43
vomiting	46.5	27	70.9	27.27	42	44	46.8	73.3	50
constipation	4.7		54.7	9.09	46		78.1	70	43
dehydration					71		79.1		
Weight loss									50
Menstrual irregularities									12

Duration of symptoms

Duration of symptoms	Na'aya	Ansari et al	Mittal
Pain	5.6 days	5.6	
fever	9.6 days	8days	7.2days

Treatment of ileal perforation

	Abdullah et al	Kouame et al	Ugochukwu et al(2013)	Ansari et al	Chirantan et al	Saini et al	Effendi et al	Babu et al	Shukla et al	Atamanalp et al
Simple closure	60	48.5	60.5	72.72			35.71	57.2	100	39
Resection and end to end anastomosis	25.6		21	9.09	44.5		16.07	34.3		11
Loop ileostomy	6		8.1	18.18		47.5	48.21	1.5		4.9
Resection and ileotransverse anastomosis	3.6		5.8							
Right hemicolectomy			4.7							
Side to side anastomosis	3.6									
Resection+ileostomy		51.5			55.5			6.7		32
End ileostomy						35				34.1
Divided loop/end with mucus fistula						17.5				

Single vs multiple perforation

	Abdullah et al	Kim et al	Kouame et al	Na'aya	Ugochukwu et al	Ansari et al	Wami et al	Chirantan et al	Effendi et al	Babu et al	Shukla et al	Atamanalp et al	Singh et al
Single	74	69	67	90.6	71	81.81	62	66.6	87.5	85.8	8.3	81.7	91
multiple	26	31	33	9.4	29	18.18	38	33.3	12.5	4.2	91.6	18.3	9

Complications in ileal perforations:

Complications	Na'aya	Khanna	Kapoor	Abdullah et al	Kouame et al	Ugochukwu et al	Ansari et al	Chirantan et al	Saini et al	Effendi et al	Babu et al	Shukla et al	Mittal et al	Atamanalp et al	Singh et al
Wound infection	48.8	74		12.1	71.4	63.6	68.18			10.7	35.4	17.7	36.67	29.3	28
Wound dehiscence	9.3	42		3.6		15	27.27			8.9		11.4		18.2	15
Burst abdomen		10	9								4.2	7.2			
Residual abscess	11.6	5		7	25.4	10.6	9.09			4.4	4.6			7.3	
Fecal fistula		4	20	7	34.9	3	13.36	11.1		9.8	4.6	6.25			
Reperforation	0													8.5	
septicemia		44			25.2					3.5					
Paralytic ileus		22													15
respiratory		18				4.5				8.03	16.6	6.25			
Bed sores		8										2.08			
Intestinal obstruction		2										2.08			
Persistent peritonitis						7									
Peristomal ulceration					69.7		18		90		3.6		16.66		
Incisional hernia					21.5		36.36				7.2				
evisceration					28.4										
Stoma prolapse					12.1		7		5	1.7			1.66		
Stoma retraction							5		12.5	0.89			6.66		
Stoma hemorrh					39.4		5		10	0.89					

age															
Stoma necrosis									7.5						
Stoma stenosis									0						
Non functioning stoma									0						
High stoma output									22.5						
Electrolyte imbalance										4.6		5			
Stoma edema									17.5						
Parastomal herniation									0						
malnutrition					54.2								6.66		
Renal failure					15.9			11.1							
Acute hepatic failure						3									
mortality	14	47		8		18	13.36	11.1		7.14	7.8			11	11

Causes of terminal ileal perforation

	Wani et al	Abdullah et al	Saini et al	Babu et al	Mittal et al
Typhoid	62	71.95	50	64.5	20
Non specific	26	20.74		24.5	70
Obstruction	5			7.9	
tuberculosis	3		35	3.1	10
Radiation enteritis	1				
Chronic granulomatous lesion		6.1			
Foreign body		1.21			
Bowel ischemia/gangrene			10		
Penetrating injury			5		
trauma					10

References:

- [1] Mittal S, Singh H, Munghate A, Singh G, Garg A, Sharma J. A Comparative Study Between The Outcome Of Primary Repair Versus Loop Ileostomy In Ileal Perforation. *Surg Res Pract* 2014;2014:1–4.
- [2] Saini P, Gaba R, Faridi MS, Agarwal N, Kaur N, Gupta A. Quality Of Life Of Patients After Temporary Ileostomy For Ileal Perforation- A Questionnaire Based Study. *Indian J Surg* 2014;76(1):38–43.
- [3] Wani RA, Parray FQ, Bhat NA, Wani MA, Bhat TH, Farzana F. Nontraumatic Terminal Ileal Perforation. *World J Emerg Surg* 2006;1(1):7.
- [4] Abdullah MS, Rassam RE, Almarzooq TJ. A Study Of 82 Patients Of Non-Traumatic Terminal Ileal Perforation In Al-Kindy Teaching Hospital. *J Fac Med Baghdad* 2011;53(2):147–51.
- [5] Babu RG. Ileostomy For Non-Traumatic Ileal Perforations: Is This The Beginning Of The End? *J Clin Diagn Res* [Internet] 2016 [Cited 2024 May 13]; Available From: [Http://jcd.r.net/article_fulltext.asp?issn=0973-709x&Year=2016&Volume=10&Issue=3&Page=PC23&Issn=0973-709x&Id=7473](http://jcd.r.net/article_fulltext.asp?issn=0973-709x&Year=2016&Volume=10&Issue=3&Page=PC23&Issn=0973-709x&Id=7473)
- [6] Chirantan B, Niladri S, Madhumita M, Sabyasachi S, Sibaji D, Jay K. Crohn's Perforation: Not So Uncommon In The Indian Population. *Indian J Surg* 2013;75(1):28–30.
- [7] O'Connell PR, McCaskie AW, Sayers RD, Editors. *Bailey & Love's Short Practice Of Surgery*. 28th Edition. Boca Raton: CRC Press, Taylor & Francis Group; 2023.
- [8] Drake RL, Vogl W, Mitchell AWM, Gray H. *Gray's Anatomy For Students*. Third Edition. Philadelphia, PA: Churchill Livingstone/Elsevier; 2015.
- [9] Ansari AG, Naqvi SQH, Ghumro AA, Jamali AH, Talpur AA. Management Of Typhoid Ileal Perforation: A Surgical Experience Of 44 Cases. *Gomal J Med Sci* Vol 7 No 1 2009 [Internet] 2004; Available From: [Https://gjms.com.pk/index.php/journal/article/view/174](https://gjms.com.pk/index.php/journal/article/view/174)
- [10] Khanna AK, Misra MK. Typhoid Perforation Of The Gut. *Postgrad Med J* 1984;60(706):523–5.
- [11] Ugochukwu AI, Amu OC, Nzegwu MA. Ileal Perforation Due To Typhoid Fever – Review Of Operative Management And Outcome In An Urban Centre In Nigeria. *Int J Surg* 2013;11(3):218–22.
- [12] Huckstep RL. Recent Advances In The Surgery Of Typhoid Fever. *Ann R Coll Surg Engl* 1960;26(4):207–30.

-
- [13] Farquharson M, Hollingshead J, Moran B, Editors. Farquharson's Textbook Of Operative General Surgery. Tenth Edition. Boca Raton, FL: CRC Press; 2015.
- [14] Kouame J, Kouadio L, Turquin HT. Typhoid Ileal Perforation: Surgical Experience Of 64 Cases. *Acta Chir Belg* 2004;104(4):445–7.
- [15] Sadia Effendi And Jan Mohammad Memon AMM. Different Surgical Options And Ileostomy In Typhoid Perforation. 2006 1(2):112–6.
- [16] Na'aya HU, Eni UE, Chama CM. TYPHOID PERFORATION IN MAIDUGURI, NIGERIA. *Ann Afr Med* 2004;3:69–72.
- [17] Kapoor VK, Mishra MC, Ardhanari R, Chattopadhyay TK, Sharma LK. Typhoid Enteric Perforations. *Jpn J Surg* 1985;15(3):205–8.
- [18] Shukla VK, Sahoo SP, Chauhan VS, Pandey M, Gautam A. Enteric Perforation--Single-Layer Closure. *Dig Dis Sci* 2004;49(1):161–4.
- [19] Freeman HJ. Spontaneous Free Perforation Of The Small Intestine In Adults. *World J Gastroenterol* 2014;20(29):9990.
- [20] Muhammad Shakil S M@MS. TYPHOID AND NON-TYPHOID ILEAL PERFORATION: SURGICAL EXPERIENCE OF 50 CASES: *PAFMJ* 60(2):190–3.
- [21] Freeman HJ, Weinstein WM, Shnitka TK, Piercey JR, Wensel RH. Primary Abdominal Lymphoma. Presenting Manifestation Of Celiac Sprue Or Complicating Dermatitis Herpetiformis. *Am J Med* 1977;63(4):585–94.
- [22] Freeman HJ. Free Perforation Due To Intestinal Lymphoma In Biopsy-Defined Or Suspected Celiac Disease. *J Clin Gastroenterol* 2003;37(4):299–302.
- [23] Shaw MT, Spector MH, Ladman AJ. Effects Of Cancer, Radiotherapy And Cytotoxic Drugs On Intestinal Structure And Function. *Cancer Treat Rev* 1979;6(3):141–51.
- [24] White RS, Fuqua WB, Barrett O. The Effect Of 5-Fluorouracil On Small Bowel Mucosa. *J Surg Oncol* 1971;3(5):501–6.
- [25] Weston JT, Guin GH. Epithelial Atypias With Chemotherapy In 100 Acute Childhood Leukemias. *Cancer* 1955;8(1):179–86.
- [26] Davila ML. Neutropenic Enterocolitis: Current Issues In Diagnosis And Management. *Curr Infect Dis Rep* 2007;9(2):116–20.
- [27] Remine SG, McIlrath DC. Bowel Perforation In Steroid-Treated Patients. *Ann Surg* 1980;192(4):581–6.
- [28] Freeman HJ. Colitis Associated With Biological Agents. *World J Gastroenterol* 2012;18(16):1871–4.
- [29] Sadatomo A, Koinuma K, Miki A, Horie H, Yasuda Y. [A Case Of Metachronous Gastrointestinal Perforation Of A Patient With Metastatic Rectal Cancer During Treatment With Bevacizumab-Based Chemotherapy]. *Gan To Kagaku Ryoho* 2013;40(7):943–5.
- [30] Kelemen K, Yu QQ, Howard L. Small Intestinal Angiosarcoma Leading To Perforation And Acute Abdomen: A Case Report And Review Of The Literature. *Arch Pathol Lab Med* 2004;128(1):95–8.
- [31] Tse E, Gill H, Loong F, Kim SJ, Ng SB, Tang T, Et Al. Type II Enteropathy-Associated T-Cell Lymphoma: A Multicenter Analysis From The Asia Lymphoma Study Group. *Am J Hematol* 2012;87(7):663–8.
- [32] Vaidya R, Habermann TM, Donohue JH, Ristow KM, Maurer MJ, Macon WR, Et Al. Bowel Perforation In Intestinal Lymphoma: Incidence And Clinical Features. *Ann Oncol Off J Eur Soc Med Oncol* 2013;24(9):2439–43.
- [33] Park SC, Chun HJ, Kang CD, Sul D. Prevention And Management Of Non-Steroidal Anti-Inflammatory Drugs-Induced Small Intestinal Injury. *World J Gastroenterol* 2011;17(42):4647–53.
- [34] Kim JP. Management Of Ileal Perforation Due To Typhoid Fever: *Ann Surg* 1975;181(1):88–91.
- [35] Singh S, Singh K, Grover AS, Kumar P, Singh G, Gupta DK. Two-Layer Closure Of Typhoid Ileal Perforations: A Prospective Study Of 46 Cases. *Br J Surg* 2005;82(9):1253–1253.
- [36] Kapoor VK. Abdominal Tuberculosis. *Postgrad Med J* 1998;74(874):459–67.
- [37] Atamanalp SS, Aydinli B, Ozturk G, Oren D, Basoglu M, Yildirgan MI. Typhoid Intestinal Perforations: Twenty- Six Year Experience. *World J Surg* 2007;31(9):1883–8.
- [38] Adesunkanmi AR, Ajao OG. The Prognostic Factors In Typhoid Ileal Perforation: A Prospective Study Of 50 Patients. *J R Coll Surg Edinb* 1997;42(6):395–9.
- [39] Dasgupta A, Singh N, Bhatia A. Abdominal Tuberculosis: A Histopathological Study With Special Reference To Intestinal Perforation And Mesenteric Vasculopathy. *J Lab Physicians* 2009;1(02):056–61.