

Role of Ileostomy in Ileal Perforation and its Complications

Kamlesh Tharwani, R.P. Bharaney

Abstract

Introduction: Enteric perforations have been seen as a common problem in tropical countries. Over a period of time the trend of the enteric perforations, its treatment, disease progression and prognosis has changed.

Aims and Objectives:

- I. To define indications of ileostomy in management of enteric perforation.
- II. Current status of ileostomy in enteric perforation, its complications and limitations.
- III. To study complications of Ileostomy closure.

Materials and Methods: The study of 75 cases of Enteric perforations treated and underwent ileostomy as a treatment modality between time period of May 2010 to July 2016 were included in the study. Patients having enteric perforations but did not undergo ileostomy were excluded. Traumatic ileal perforations were also excluded from the study.

Results: In the study conducted the commonest cause of Enteric fever was non-specific ileal perforations. Perforations occurred in second week after onset of fever with mean of 10.5 days. Perforation commonly occurred in second and third decade of life with 48% of patients between ages 11-30. The mean age of the patients was 33.72 years. Male preponderance with male to female ratio 5:1 was observed. Pneumoperitoneum in chest and erect abdominal X-Ray was seen in 84% of the patients. Time between onset of pain and surgical intervention (Lag Period) was between 10 to 96 hours with mean of 43.44 hours. Single Ileal perforation was seen in 84% of the cases with 72% of the perforations being located within 30 cm from IC junction. Majority of the perforations were located within 60 cms from ICJ (96%).

Conclusion: Nonspecific enteric perforation (48%) was the commonest cause of enteric perforation. Ileostomy as a treatment modality carried a mortality rate of 2.66%. Chest X-Ray is a useful diagnostic tool. Ileostomy closure carried an overall complication rate of 68%. Small bowel obstruction, wound infection and ECF were commonly seen complications. Small bowel obstruction occurred in 12% of cases and was managed conservatively.

Key words: Enteric perforation; ileal perforation; ileostomy; typhoid fever; ileostomy closure

Introduction

Typhoid fever is the commonest cause of ileal perforation in India. Typhoid fever is one such disease, which is caused by *Salmonella enterica* serovar Typhi. *S. enterica* is a Gram-negative intracellular pathogenic bacterium which infects humans. *S. enterica* includes 2500 serovars, most of which have been described as human pathogens

but only a few are of public health importance. However, some serovars are highly specific viz. *S. Typhi* or *S. Paratyphi*. This disease can also spread through consumption of raw fruits and vegetables grown in fields irrigated with sewage water and fertilizers. The incubation period of the disease is usually 10-14 days may vary considerably from 8 to 15 days, but it may also be as short as 5 days and as long as 30 or 35 days depending upon the inoculum size and the state of host defense. Occurrence of the disease has to be confirmed by the presence of the pathogen either *S. Typhi* or *S. Paratyphi* in patient, which requires isolation of the bacteria from blood, stool or bone marrow. The sensitivity of the test decreases with increased duration of fever. Another method is Widal test, which identifies the presence of antibodies against *Salmonella* specific O (somatic) and H (flagellar) antigens in the serum, which appear only in the 2nd week after the disease onset. Typhoid fever caused by *S. Typhi* or *S. Paratyphi* is a major health problem with global incidence of 21 million cases

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and 200,000 (1-4% death worldwide) deaths per year [1]. Serious complications occur in about 10% of cases requiring hospitalization [2].

The diagnosis of Typhoid Perforation is seldom confirmed and in the majority of cases of enteric perforation, only a conjectural diagnosis is based on the circumstantial evidence of terminal ileal, antimesenteric perforation in an adult running fever for two weeks or more. Widal test, although done routinely, has been found to be non-specific and difficult to interpret in areas where typhoid fever is endemic. The majority of the patients present with sudden onset of abdominal pain and abdominal signs. As most of the patients come from rural areas and reach the average delay of 2-3 days after onset of acute illness, there is a high mortality associated with these cases [3]. A high index of suspicion is essential to diagnose hollow viscous perforation early as significant mortality and morbidity results from diagnostic delay.

Review of literature

A. History

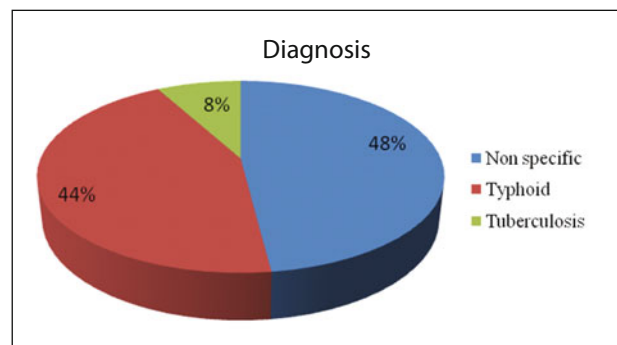
- *Hippocrates* first used the term Typhus (Greek: Cloudy) in 460 B.C. [4].
- In the *Sushruta Samhita*, intestinal perforation by sharp objects such as a fish bone or a thorn has been described.
- *William Cullen* coined the term 'peritonitis' in 1776 [5].
- Benjamin Travers did the first successful closure of an intestinal perforation [6].
- In 1829 *Louis* used the term *Typhoidae* and described 150 cases with intestinal perforation, hemorrhage, splenomegaly, rose spot and mesenteric lymphadenopathy.
- *Karl Joseph Eberth* discovered the typhoid bacillus in 1880.
- In 1884 *Gaffkey* first isolated and cultured *Salmonella Typhi*.
- *Widal* described the test to detect agglutinins in serum of patients suffering from typhoid fever in 1896.
- *Almroth Edward Wright* developed an effective inactivated whole-cell typhoid vaccine that was introduced in 1896. Due to side-effects its usage was eventually discontinued.
- The first vaccine for human use against Typhoid was made by *Pfiffer* and *Kalle* in 1896 [7].
- Fluoroquinolones when first introduced in early 1990's were very effective in the treatment of typhoid. They emerged as the drug of choice for the treatment of typhoid [8].
- In India, since 1990, Chloramphenicol was generally replaced by Ciprofloxacin as the drug of choice for Typhoid Fever. Ciprofloxacin was used rampantly not only for Typhoid fever but also for other infections [8].

Results and analysis

75 patients of Ileal perforation admitted between May 2010 and July 2016 were included in the study. Patients have been grouped into etiological categories namely Typhoid, Non Specific and Tubercular origin.

Etiology

The commonest cause of perforation was Non Specific perforations. 33 out of 75 had Typhoid perforations. Six had perforation of Tubercular origin.



Graph 1. Etiology of Enteric Perforation.

Age and sex incidence

The age of patients ranged from 6 to 75. The Mean age of the patients was 33.72 years. Perforations commonly occurred in the 2nd and 3rd decade of life with 48% of patients between ages 11 -30. The male to female ratio was 5:1.

Typhoid perforation commonly occurred in the 2nd and 3rd decade with 52% of cases in that group. Male to female ratio was 4:1 to 5:1. Non Specific perforations oc-

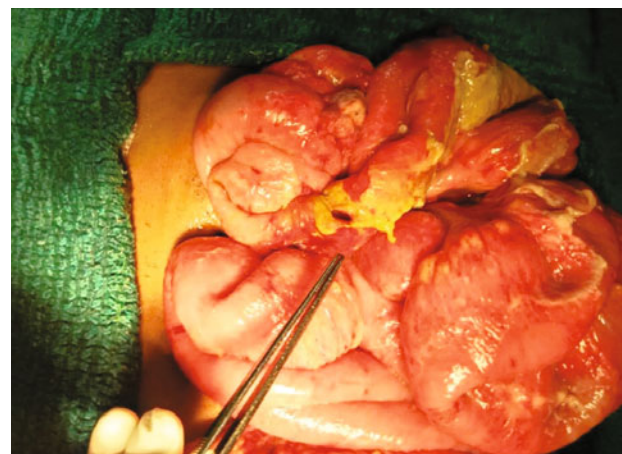


Figure 1. Ileal perforation 30 cm from Ileo caecal junction with moderate peritoneal contamination.

Table 1. Age and Sex incidence of Enteric Perforations.

Age	Male	Female	Total	Percent
0-10	2	1	3	4%
11-20	15	3	18	24%
21-30	17	4	21	28%
31-40	8	2	10	13.33%
41-50	9	2	11	14.66%
51-60	5	1	6	8%
61-70	4	0	4	5.33%
71-80	2	0	2	2.66%
Total	62	13	75	100

curred commonly in a similar age group. The distributions of age and sex in all cases and etiology are shown in table 1.

Symptoms and signs

The majority of the patients presented with symptoms and signs of peritonitis. The commonest symptoms were abdominal pain, vomiting and fever. The commonest signs were abdominal guarding, generalized tenderness, abdominal distention and dehydration. Most of the patients of typhoid gave history of fever. Symptoms and signs are shown in the Table 2.

Moderate peritoneal contamination was seen in 5 patients and massive peritoneal contamination was seen in 28 patients of Typhoid fever, whereas in case of Non Specific Perforation, moderate peritoneal contamination was seen in 10 patients and massive peritoneal contamination was seen in 26 patients in this study. The patient with tubercular perforation had massive peritoneal contamination.

Investigations

X-Ray- Pneumoperitoneum in chest and erect abdominal X-Ray was seen in 84% of the patients. Intestinal obstruction with dilated bowel loops with multiple air fluid levels was seen in 16% of the patients. Complete Blood Profile: Hemoglobin less than 9 g/dl was seen in 8 (32%) of the patients. Biochemistry: Blood urea of >45mg/dl and S. creatinine > 1.8 mg/dl was seen in 28% of the cases. S.Widal was done routinely in all the patients and 33 out of 75 were tested positive (44%)

Histopathology: Pathological examination of ulcer edge biopsy was done in all cases.

Surgical Procedures

Informed and written consent was taken prior to each surgery and patients relatives were explained about the

Table 2. Symptoms and signs of Ileal perforations.

Symptoms	Number	%
Abdominal Pain	75	100%
Vomiting	68	90.66%
Fever	38	50.66%
Constipation	51	68%
Diarrhea	5	6.66%
Signs	Number	%
Guarding	70	93.33%
Distention	65	86.66%
Tenderness	53	70.66%
Shock	6	8%
Dehydration	15	20%

Table 3. Peritoneal contamination.

Peritoneal Contamination	Typhoid	Non- Specific	Tuberculous
Moderate	5	10	2
Massive	28	26	4
Total	33	36	6

disease prognosis. Midline Laparotomy with ileostomy was performed in all the patients. Ileostomy was supported with K-90 drain.

Complications

Complications occurred in fifty one patients, out of which forty nine patients developed wound infection, wound dehiscence, and two of the patient expired. Sixteen patients of Typhoid perforations had wound infections and

**Figure 2.** Ileostomy created in Right lumbar region.

Table 4. Commonest site and number of perforation with relation to various etiologies.

Site of perforation	Typhoid (no. of patients)		Non Specific (No. of patients)		Tubercular	
	Single Perforation	Multiple Perforation	Single Perforation	Multiple Perforation	Single Perforation	Multiple Perforation
0-30 Cm from IC junction	7	15	16	8	4	1
31-60 Cm from IC junction	5	8	6	4	1	0

six developed wound dehiscence. Whereas in Non Specific perforations eighteen patients developed wound infection and four patients had wound dehiscence. Skin excoriation was seen in twenty four patients of typhoid perforations, twenty six patients of Non-Specific Perforations and three cases of tuberculous perforation.

Hospital Stay

The average operating time was fifty minutes. Median hospital stay was sixteen days. Lowest number for hospital stay was twelve days. The highest number of hospital stay was twenty one days.

Mortality

The mortality rate was 2.66% overall. The mortalities in case of Typhoid perforations were present. Septicemia and respiratory complications were the cause of the death.

Lag Period

The time between the onset of pain and the surgical intervention was between 10 to 96 hours with average of delay of 43.44 hours. There was no difference between the mean lag period of typhoid and non-specific perforations.

Table 5. Peritoneal contamination vs. Lag period.

Lag period	Moderate	Massive
0-24 hrs	18	0
25-48 hrs	3	24
49-72 hrs	2	22
73-96	0	6

In Typhoid perforations there was a relatively high morbidity rate in terms of wound contamination and wound dehiscence, while in case of Non Specific Perforations, no significant wound contamination was noted. In Typhoid perforations two mortalities were recorded. However in

Non Specific perforations there was a no mortality noted. The mortality was due to significant septicemia and massive peritoneal contamination.

Table 6. Closure of Ileostomy site in days

Closure in days	Typhoid (N=33)	Non Specific (N= 36)	Tuberculous (N=6)
31-45 days	6	8	1
46-60 days	12	12	3
61-75 days	13	15	2
>75 days	2	1	0
Total	33	36	6

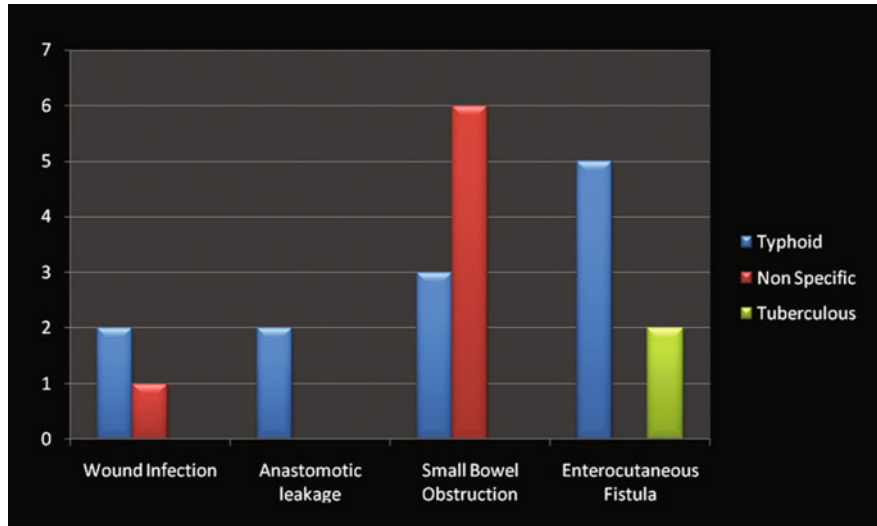
Closure of ileostomy site

The total number of patients who followed up for ileostomy closure was seventy two (88%). One patient did not turn up and was lost in follow-up and two patients had expired. Average duration of ileostomy closure was 55-70 days after primary surgery. However, in those patients who presented late for follow -up, or the patients who had wound infections, ileostomy closure was delayed.

Table 7. Wound complications after Ileostomy closure.

Complications	Typhoid	Non Specific	Tubercular
Wound Infection	2	1	0
Anastomotic leakage	2	0	0
Small Bowel Obstruction	3	6	0
Enterocutaneous Fistula	5	0	2

Post Ileostomy closure complications were commonly seen in Typhoid perforations with 9 (27.2%) out of 33 patients, 2 of which suffered from wound infection and 3 suffered from Small bowel obstruction.



Graph 2. Wound complications following ileostomy closure.

Among patients with Non Specific perforations one patient had wound infection and six patients had small bowel obstruction. None of these patients had anastomotic leakage. Only one patient who had tubercular perforation had late complication of Enterocutaneous fistula. All patients of small bowel obstruction were managed conservatively and responded to antibiotics and nil per oral for four days.

The commonest cause of enteric perforation in the series was Non-Specific ileal perforation accounting for 48% of the cases. Typhoid fever was the second common cause of enteric perforation in 44% of the cases. Nonspecific perforations accounted for 52.94% in study series by Bhalerao[1981]. Whereas typhoid perforation were second common cause of ileal perforations accounting for 23.52% by Bhalerao [9].



Figure 3. Skin excoriation visible around stoma site.

Table 8. Incidence of Typhoid perforations as reported by various authors.

Author	Year	Country	Number
Archampong	1976	Ghana	20.5%
Arigbabu	1980	Nigeria	78.6%
Bhalerao [28]	1981	India	23.52%
Santillana	1991	Peru	7.8%
Wani et al	2006	India	62%

Whenever the etiology of the perforation was not identified, it was termed as Non-specific Perforation. It was the leading cause of enteric perforation in the study. Seven patients of Nonspecific perforation had fever prior to onset of abdominal pain.

A diagnosis of Nonspecific perforation was made when Widal test, stool examination was not suggestive of typhoid. These cases could be undiagnosed cases of typhoid. However according to Capoor et al (2008), enteric fever organisms are not the predominant causative agents of ileal perforations [11].

Typhoid fever accounted for thirty three patients (44% of the cases). It was the second most common cause of enteric perforation in the study. It was diagnosed on the basis of Widal positivity. Typhoid perforations were the second most common cause of perforation in the study by Bhalerao[1981].

Tuberculosis accounted for 8% of the cases of Ileal perforations in this study. 4.9% of intestinal TB undergoes perforation [11]. If treated with higher antibiotics, early start of enteral feeding and anti-tubercular drugs it carries a good prognosis. In this study solitary perforation was found in

5 cases and multiple perforation was found in one case. In 90% of the cases the tubercular perforation is solitary [30]. Multiple Tubercular perforations carry a poor prognosis.

In our study the mean age was 33.72. (range 6- 75 years). In the study conducted by Kayabali [1990] mean patient age was 35.8. [12]. In another study by Atamanalp [2007] et al, the mean age was found to be 36.3 years (range, 7-68 years) [13].

Typhoid perforations in the case of study by Eggleston reported perforations occurring in second and third decade of life. In the case of our study 52% belonged to the 2nd and 3rd decade of their life. There was a male predisposition with male: female ratio being 5: 1. With typhoid perforations accounting for 4:1 ratio. Young males are the most common sufferers.

The increasing occurrence of typhoid intestinal perforation in this age group in our setting can be explained by the fact that youths are generally more adventurous and mobile and more likely to eat unhygienic food outside the home. There is also high risk of fecal contamination as they visit the toilets at school, or public toilets. High incidence of the disease in this age group has a negative impact on the country's economy because this group represents the economically productive age group and portrays an economic loss both to the family and the nation [14].

Majority of the patients had signs and symptoms of peritonitis. The commonest symptoms were abdominal pain, vomiting and fever. All the patients had chief complain of abdominal pain. 90.66% of patients had vomiting and 50.66% patients had fever. Constipation was present in 68% of cases. Whereas just 6.66% came with complains of diarrhea. It was tough to diagnose the case associated with diarrhea with dilemma of whether to operate or not on basis of clinical finding. But with help of laboratory findings and features of toxemia patients were operated and got the treatment.

Abdominal Guarding was present in 93.33% of cases, abdominal distention in 86.66% of cases. Six patients presented with shock on admission and other fifteen patients were in different degrees of dehydration. Examination showed the signs of acute abdomen and toxemia.

Table 9. Comparison of Signs and Symptoms.

Criteria	Eggleston [15]	Chalya et al [16]	Our study
Fever	93%	100%	50.66%
Abdominal Pain	90%	100%	100%
Vomiting	67%	90%	90.66%
Diarrhea	27%	84.6%	10%
Constipation	24%	76.9%	68%
Abdominal Distention	73%	73.1%	86.66%

Majority of the perforations were located within sixty cms from the IC junction. In fifty one patients (68%) perforation was located within thirty cms from the IC junction. A study by Badejo and Arigbabu (1980) reported location of perforation 20-40 cm from IC junction [16]. Wani et al (2006) also reported operative findings are typical with most

Midline Laparotomy with ileostomy was performed in all the patients. The ileostomy was supported by a K-90 drain to avoid retraction. Wexner et al (1993) also suggest use of supportive rods [17].

In this current study majority of perforation occurred in first week of the disease. Patients who perforate in the first two weeks have a better prognosis. In developing countries cases are reported as early as first week of the disease [14].

Chest X-Ray was useful and reliable investigation to detect the perforation. Free gas under diaphragm was seen in 84% of the patients. Pneumoperitoneum has been reported in 52% to 82% in the studies by Archampong, Vaidyanathan, Hadley, Tacylidiz, Chalya and Chaterjee [23,14,21,22,19,24].

Widal was positive in 44% of the cases. Widal was positive in 30% of patients with typhoid perforation by Kaul and in 46.1% patients as by Santillana [21,22]. Widal test is of little importance in diagnosing cases of Typhoid. In a series of 82 clinically proven cases of typhoid perforation, Atamanalp et al [2007] have found that histopathological findings were nonspecific in mild cases [13]. This could be explained by early blood sampling in these patients at the time of admission.

Salmonella typhi was grown in 4 patient with typhoid ileal perforation in whom blood culture was done. It was not a routine investigation and not sent for every patient. Hadley had reported positive cultures in 22.2% and Santillana in 48% of the patients [22,24].

Tuberculosis was diagnosed on the basis of histopathological report. Patients with tubercular perforation had previous history of tuberculosis and had taken 6-9 months anti tubercular drugs.

In this study all the patients had moderate to massive peritoneal contamination. Seven patients (28%) out of twenty five had moderate peritoneal contamination. Rest of the 72% had massive peritoneal contamination. Hence to reduce the mortality in these patients ileostomy as a treatment modality was chosen. Primary closure is only done when patient presents early and the bowel looks healthy. Sepsis and bowel edema makes suturing hazardous so primary closure should be avoided in patients presenting late [25].

A simple drain was kept for average 48 hours along with the ileostomy site. In this case series all the patients had undergone ileostomy. In the majority of patients (68%) perforations were solitary and 32% patients had impending perforations. Loop ileostomy proved to be beneficial in patients with im-

pending perforations. The majority of patients (84.6%) had single perforations and ileum was the most common part of the bowel affected occurring in 86.2% of cases in the study by Chalya et al [2012] [14]. Karmacharya (2006) in his study also revealed that 65.6% had solitary perforations involving terminal ileum. Mock et al revealed Solitary perforations in 78.5% involving terminal 30 cm of ICJ [15].

The mortality rate in case of Nonspecific perforations was none. There were two mortality cases due to Typhoid perforations. Typhoid perforation therefore carried a poorer prognosis in comparison to other causes of enteric perforation. Typhoid fever remains a major cause of mortality in developing countries, with a case-fatality rate (CFR) of 12%-32%, whereas in developed countries this rate has successfully been reduced to < 2% [26].

Table 10. Mortality Rate in Typhoid Ileal perforations.

Author	Year	Mortality Rate
Badejo [16]	1980	3%
Hadley [20]	1984	9%
Tacyilidiz (prospective) [21]	1995	10%
Kouame et al [27]	2001	6%
Our study	2016	8%

Lag period has a great influence in development of morbidity and mortality. There was no significant difference in morbidity or mortality in these cases. Lag period was however proportional to the degree of peritoneal contamination. Increased lag period resulted in higher degree of peritoneal contamination. Post operatively ileostomy closure has carried no mortality and low complication rate. Overall post-operative complication rate was 24%. In the study conducted by Ihedioha et al [2010] overall complication rate was 18% [28].

Wound infection rate in our study was present in 3 patients (4%) following ileostomy closure. In a study conducted by Mann et al [1991] and Peacock [2012] wound infection rate was between 4.34% to 12%. In this study 12% of patients of ileostomy closure had small bowel obstruction. Similar studies conducted earlier also reveal 12% of patients going into small bowel obstruction [29,30]. All the patients that underwent small bowel obstruction were treated conservatively in this study. Similar studies conducted previously also had 91.66% to 100% of patients being managed conservatively [28,27,17].

Treatment of Enterocutaneous fistula (ECF) required surgical intervention. Recovery of the patient was uneventful. Study by Owen et al [2012] also show successful ECF closure in 83.7% of the cases [30].

Conclusion

- Nonspecific perforations are commonest cause of Enteric fever, followed by Typhoid and tubercular.
- There was a male preponderance with male to female ratio 5:1
- Perforation usually occurred within the first week of illness
- Chest X-Ray is a useful diagnostic tool.
- Widal serology although done routinely is not the sole criteria for diagnosis of the disease.
- Histopathology is useful in diagnosis of tuberculosis. But not useful for diagnosis of typhoid.
- Solitary ileal perforation was seen in majority of the patients.
- Ileostomy in Enteric perforation proved to carry lesser morbidity and lesser mortality rate.
- Two mortality s cases were seen due to Typhoid ileal perforations.
- Increase in Lag period resulted in higher degree of peritoneal contamination.
- Ileostomy closure carried an overall complication rate of 24%.
- Wound infection, Small bowel obstruction and ECF were commonly seen complications post ileostomy closure.
- Small bowel obstruction occurred in 12% of cases and were managed conservatively.
- Treatment of ECF required surgical intervention.
- With the advent of Current antibiotic therapy the rate of Typhoid perforations has gone down. But cases of perforations occurring as early as in first week have become more common. Ileostomy as a treatment to modality carries lower mortality rate due to early start of enteral feeding and nutritional built up but higher rate of morbidity due to increased hospital stay. Exteriorization of the suture line is a superior method of treatment and significantly lowers the mortality [29].
- Temporary loop Ileostomy is the stoma of choice for temporary fecal diversion as most of its complications are managed non operatively.
- Primary closure should be reserved for those patients who present early without gross peritoneal contamination. Patients who present late should be treated by Ileostomy.
- This study concludes that Ileostomy surpasses other procedures in the treatment of Enteric perforations.

Ethical Standards: The studies was approved by the appropriate ethics committee of our Institution and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki. All persons gave their informed consent prior to their inclusion in the study.

Conflict of Interest: *The authors declare that there is no conflict of interest and has full control over all primary data and agree to allow the journal to review our data if requested.*

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