

## STUDY OF PROGNOSTIC FACTORS AND OUTCOMES IN ILEAL PERFORATIONS

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### ABSTRACT

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#### BACKGROUND

Ileal perforations are a common occurrence in our hospital setup with a majority of cases having an aetiology of typhoid. The aim of this study is to assess the presentation and management of ileal perforation with special reference to typhoid, nonspecific and traumatic perforations. The study also aims to assess the outcomes in these patients and the factors affecting prognosis.

#### MATERIALS AND METHODS

Fifty cases of ileal perforation were included in this study from the period between August 2013 to February 2015. Factors were tabulated and statistically analysed to study their contribution.

#### RESULTS

Typhoid was the most common cause of ileal perforation in this study followed by nonspecific perforations. Patients presented primarily in the second and third decades of life with a male preponderance. Patients had a 68% complication rate with wound infection and dehiscence and faecal fistula. Mortality was 14% with fistula and septicaemia being the commonest causes.

#### CONCLUSION

We found typhoid fever as the most common aetiology for ileal perforation. Ileal perforations have a significant morbidity and mortality despite adequate operative intervention and postoperative care. Age, lag period, typhoid perforations and hypoalbuminaemia were found to be significantly contributing to morbidity. Mortality was influenced by age and shock on presentation.

#### KEYWORDS

Typhoid, Intestinal Perforation, Prognosis, Small Intestine.

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#### BACKGROUND

Ileal perforation is a common problem seen in tropical countries. The commonest cause being typhoid fever. In western countries, the causes are malignancy, trauma and mechanical aetiology in the order of frequency.<sup>(1,2,3)</sup> Better antibiotics, aggressive surgery and the elimination of conservative treatment, better preoperative and postoperative care have all significantly contributed to the improvement in patient outcome.<sup>(4,5)</sup> It is true that outcomes have improved, but still cases of ileal perforation cause a significant morbidity and mortality that persists despite the significant changes in healthcare over the years. The aims to study the aetiology, presentation, management outcome and the factors influencing prognosis and outcome in ileal perforations. The present study includes 50 patients of ileal perforation with emphasis on typhoid, nonspecific and traumatic perforations and the factors influencing outcome.

#### AIMS AND OBJECTIVES

The aims and objectives of this study are:

- To study the presentation and management of patients admitted with ileal perforation.
- To study the outcome of these patients.
- To study the factors influencing the outcome in these patients.

#### METHODOLOGY

This study consists of patients admitted from August 2013 to February 2015. 50 patients of ileal perforation admitted to Meenakshi Medical College, Kanchipuram, during this period were included in the study. A study of clinical features, investigations, operative procedures performed, postoperative morbidity and mortality and outcome was done. Jejunal, caecal, appendicular, gastric or duodenal perforations were excluded from the study. History with special reference to presence of fever, pain, vomiting, abdominal distension, constipation and treatment prior to admission was taken. Vital signs, hydration, abdominal distension, tenderness, guarding and presence of free fluid were noted. Systemic examination of cardiovascular, respiratory and central nervous system was done. The following investigations were done as a routine haemoglobin, bleeding and clotting times, blood sugar and urea and serum creatinine, chest x-ray, electrocardiogram,

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peritoneal fluid culture, pus culture in case of wound infection.

In patients where in a resection was done, the specimen was histopathologically examined. In all nontraumatic perforations- Widal test. Blood culture were done. All patients were resuscitated preoperatively with intravenous fluids and antibiotics. All patients underwent laparotomy under general anaesthesia. Most of the surgeries were performed by trainee surgeons under supervision of a consultant surgeon. Midline or paramedian incisions were employed. The amount and type of peritoneal contamination, number, site and size of perforations and procedure employed were noted. The following procedures were employed- simple two layer closure, closure with free or pedicled omental patch, resection and anastomosis. For both closure and anastomosis, the inner all coats layer was performed with polyglactin 910 and the outer layer with silk. Antibiotics were routinely given for 5-7 days unless the diagnosis was typhoid in which case antibiotics were continued for up to 10 days. A diagnosis of typhoid was made only if Widal test was positive or Salmonellae were isolated from blood or urine and if histopathological evidence of typhoid perforation was found. The various parameters were recorded in a proforma and tabulated. Analysis was done using SPSS software V.10. The various tests used for statistical analysis were chi-square, ANOVA and binary logistic regression.

**RESULTS**

Fifty patients of ileal perforation admitted between August 2013 and February 2015 were included in this study. Patients have been grouped into aetiological categories, namely typhoid, nonspecific, trauma and miscellaneous.

**Aetiology**

The commonest cause of ileal perforation was typhoid. 15 patients had nonspecific perforations. 10 patients had traumatic perforations. One patient was diagnosed to have gastrointestinal tuberculosis with ileal perforation. The distribution is shown in Table 1.

Diagnosis	Frequency	Percent
Typhoid	24	48
Nonspecific	15	30
Trauma	10	20
Tuberculosis	1	2
<b>Total</b>	<b>50</b>	<b>100</b>

**Table 1. Aetiology of Ileal Perforation**

**Age and Sex Incidence**

Symptoms	Typhoid n=24	Nonspecific n=5	Trauma n=10	Tb n=1
Abdominal pain	24	15	10	1
Fever	23	7	0	1
Vomiting	15	7	6	1
Constipation	13	7	3	0
Diarrhoea	3	0	0	0
Signs				
Dehydration	19	11	2	1
Tenderness	24	15	10	1

The age of patients ranged from 15 to 84. Perforation commonly occurred in the second and third decade of life with 60% of patients between the ages of 20 and 40. The male-to-female ratio was 4:1. Typhoid perforation commonly occurred in the second and third decades with 62% of cases in that age group. Male-to-female ratio was 3.8:1. Nonspecific perforations occurred commonly in a similar age group. Traumatic perforations were commoner in males (2.3:1). The distributions of age and sex in all cases and aetiology specific distributions are shown in tables 2 and 3.

Age	Male	Female	Total	Percent
10-20	2	0	2	4%
20-30	15	4	19	38%
30-40	9	3	12	24%
40-50	9	1	10	20%
50-60	4	1	5	10%
60-70	1	0	1	2%
70-80	0	0	0	0%
80-90	0	1	1	2%
<b>Total</b>	<b>40</b>	<b>10</b>	<b>50</b>	<b>100</b>

**Table 2. Age and Sex Incidence in Ileal Perforation**

**Symptoms and Signs**

Most of the patients presented with symptoms and signs of peritonitis. The commonest symptoms were abdominal pain, fever and vomiting. The commonest signs were abdominal tenderness, guarding, intraabdominal free fluid and dehydration. Most patients of typhoid gave a history of fever. 12% of patients were in shock. Symptoms and signs are shown in Tables 3 and 4.

Symptoms	Number	%
Abdominal pain	50	100
Fever	31	62
Vomiting	29	58
Constipation	23	46
Diarrhoea	3	6
Signs	Number	%
Dehydration	33	66
Tenderness	50	100
Guarding	44	88
Distention	27	54
Free fluid	31	62
Shock	6	12

**Table 3. Symptoms and Signs in Ileal Perforations**

Guarding	24	11	8	1
Distention	15	8	3	1
Free fluid	17	7	6	1
Shock	3	1	1	1

**Table 4. Symptoms and Signs in Typhoid, Nonspecific, Trauma and Tubercular Perforation**

**Surgical Procedures**

Simple 2-layer closure was the commonest procedure done (64%). Closure with omental patch was done in 24% and resection and anastomosis in 8% of patients (Table 5).

Procedure	Ileal	Typhoid	Nonspecific	Trauma	Tb
Two layer closure	32-64%	16-66.7%	10-66.7%	6-60%	0-0%
Omental patch	12-24%	6-25%	5-33.3%	1-10%	0-0%
Resection/Anastomosis	6-12%	2-8.3%	0-0%	3-30%	1-100%
<b>Total</b>	<b>50</b>	<b>24</b>	<b>15</b>	<b>10</b>	<b>1</b>

**Table 5. Surgical Procedure**

Number and site of perforation- multiple perforations occurred in 20% of patients mostly in typhoid and traumatic perforations (Table 6). Over 90% of perforations were within 2 feet (60 cms) from the ileocaecal junction and 62% within 30 cms.

Number	Ileal	Typhoid	Nonspecific	Trauma	Tb
1	40	19	14	7	0
2	8	4	1	2	1
3	1	1	0	0	0
4	1	0	0	1	0
<b>Total</b>	<b>50</b>	<b>24</b>	<b>15</b>	<b>10</b>	<b>1</b>

**Table 6. Number of Perforations**

**Complications**

Complications occurred in 34 (68%) of all cases (Tables 7, 8, 9). Fecal fistula was seen in 13 (26%) of cases. The cause was reperforation in 4 patients, anastomotic leak in 4 patients. The cause was indeterminable in 5 patients. The highest complication rate was seen with simple closure and the least with resection and anastomosis, though this difference was not statistically significant. Patients with typhoid had a complication rate of 83.3% with fecal fistula occurring in 9 patients. The cause was reperforation in 2 patients, leak in 3 and indeterminate in 4 cases. Pus culture from patients with wound infection was done in all 16 cases and yielded growth in 12 cases. Of these, 5 had Staphylococcus aureus, 2 had E. coli and proteus and 3 had normal skin commensals.

Complications	Simple Closure n=32	Omental Patch n=12	Resection Anastomosis n=6	Total n=50
Wound infections	9 (28%)	4 (33%)	3 (50%)	16 (32%)
Wound dehiscence	9 (28%)	3 (25%)	0 (0%)	12 (24%)
Abd. collection	3 (9.4%)	3 (25%)	1 (16.7%)	7 (14%)
Faecal fistula	7 (22%)	4 (33.3%)	2 (33.3%)	13 (26%)
Reperforation	2 (6.3%)	1 (11%)	1 (16.7%)	4 (8%)
Respiratory	8 (25%)	1 (11%)	1 (16.7%)	10 (20%)
Mortality	5 (15.6%)	1 (8.3%)	1 (16.7%)	7 (14%)
Patients with complications	22 (68.8%)	8 (66.7%)	4 (66.7%)	34 (68%)

**Table 7. Surgical Procedures and Their Complications**

Complications	Simple Closure n=16	Omental Patch n=6	Resection Anastomosis n=2	Total n=24
Wound infections	5 (31.3%)	3 (50%)	1 (50%)	9 (37.5%)
Wound dehiscence	5 (31.3%)	1 (16.7%)	0 (0%)	6 (25%)
Abd collection	1 (6.3%)	2 (33.3%)	0 (0%)	6 (25%)
Fecal fistula	5 (31.3%)	3 (50%)	1 (50%)	9 (37.5%)

Reperforation	1 (6.3%)	1 (16.7%)	0 (0%)	2 (8.3%)
Respiratory	4 (25%)	0	0 (0%)	4 (16.7%)
Mortality	4 (25%)	1 (16.7%)	0 (0%)	5 (20.8%)
Patients with complications	13 (81.3%)	5 (83.3%)	2 (100%)	20 (83.3%)

**Table 8. Surgical Procedures and Their Complications in Typhoid Perforations**

Complications	Simple Closure n=10	Omental Patch n=5	Total n=15
Wound infections	2 (20%)	0	2 (13.3%)
Wound dehiscence	4 (40%)	2 (40%)	6 (40%)
Abd collection	2 (20%)	1 (20%)	3 (20%)
Faecal fistula	2 (20%)	1 (20%)	3 (20%)
Reperforation	1 (10%)	0	1 (6.7%)
Respiratory	2 (20%)	0	2 (13.3%)
Mortality	1 (10%)	0	1 (6.7%)
Patients with complications	7 (46.7%)	2 (40%)	9 (60%)

**Table 9. Surgical Procedures and Their Complications in Non-specific Perforations**

**Operating Time and Hospital Stay**

The average operating time was 104 minutes. Resection and anastomosis took a longer time than the other procedures, but the difference was not statistically significant. Median hospital stay was twenty days. There was no significant difference in the hospital stay of patients undergoing different surgical procedures (Table 10).

Procedure	Mean
Simple Closure	23.78
Omental Patch	23.92
Resection Anastomosis	21.83
<b>Total</b>	<b>23.58</b>

**Table 10. Surgical Procedure and Hospital Stay**

p>0.05 Mortality

The mortality rate was 14%. Mortality in patients of typhoid and nonspecific perforations was 20.8% and 6.7%, respectively. No patients of traumatic perforation died and 1 patient of tubercular perforation expired. The differences in mortality were not found to be statistically significant. Septicaemia, faecal fistula and respiratory complications were the commonest causes of death (Tables 11, 12, 13).

	Simple Closure n=32	Omental Patch n=12	Resection Anastomosis n=6	Total n=50
Mortality	5 (15.6%)	1 (8.3%)	1 (16.7%)	7 (14%)
Patients with complications	22 (68.8%)	8 (66.7%)	4 (66.7%)	34 (68%)

**Table 11. Surgical Procedures and Morbidity and Mortality**

Complications p>0.05. Mortality p>0.05.

Aetiology	Number	Death	Percent
Typhoid	24	5	20.80%
Nonspecific	15	1	6.70%
Trauma/Tb	11	1	9%

**Table 12. Mortality Rates in Various Aetiological Factors**

Typhoid/Nonspecific/Misc. p>0.05

Cause	Typhoid n=5	Nonspecific n=1	Trauma n=0	Tb n=1	Total n=7
Fecal fistula	2	-	-	-	2 (28%)
Anastomotic leak	1	-	-	-	1 (14%)
Reperforation	-	-	-	-	-
Indeterminate	1	-	-	-	1 (14%)
Septicaemia	2	-	-	-	2 (28%)
CVS/RS	1	1	-	1	3 (43%)

**Table 13. Cause of Death in Ileal Perforation**

### Lag Period

Most patients presented with peritonitis of greater than 24 hours duration. Increasing lag period was associated with increasing mortality and complication rate. The relationship of increasing lag period to both mortality and morbidity in ileal perforations was found to be significant with  $p < 0.05$ . This was also significant in patients of typhoid perforations with  $p < 0.05$  for both mortality and complications. In nonspecific perforations, lag period showed only a trend towards significance, but was not statistically significant.

Lag Period	Number of Cases	Complications	Death
<24	14 (30%)	6 (42.9%)	0
24-48	27 (54%)	19 (70.4%)	2 (7.4%)
49-72	7 (12%)	7 (100%)	4 (57.1%)
>72	2 (4%)	2 (100%)	1 (50%)
<b>Total</b>	<b>50</b>	<b>34 (68%)</b>	<b>7 (14%)</b>

**Table 14. Relation of Lag Period to Mortality and Complications**

### DISCUSSION

The commonest cause of ileal perforation in the series was typhoid fever accounting for 48% of cases. Typhoid fever accounted for 56.6% of cases of ileal perforation in the series by Karmakar.<sup>(1)</sup> Mechanical causes and lymphomas accounted for 40.7% of perforations in the series by Dixon.<sup>(2)</sup> Malignancy was the commonest cause in the series by Orringer.<sup>(3)</sup> There were no cases of typhoid perforations in either series.<sup>(2,3)</sup> When the aetiology of the perforation was not identified, it was termed nonspecific perforation. Nonspecific perforation was the second commonest cause in this study accounting for 30% of cases. Seven patients of nonspecific perforation had fever prior to onset of abdominal symptoms. Widal test, blood culture and histopathology were not suggestive of typhoid. These cases maybe undiagnosed cases of typhoid. Nonspecific perforations were the commonest cause of small bowel perforation in the series by Dixon and Bhalerao.<sup>(2,6)</sup> Trauma accounted for 20% of cases of ileal perforation in this series. 8.25% of ileal perforations published by Karmakar were due to trauma.<sup>(1)</sup> The rising rate of road traffic accidents and civil violence has contributed to this increased incidence of traumatic perforations.

There was a male preponderance with the male:female ratio in this study being 3.8:1. This preponderance was seen in typhoid, nonspecific and traumatic perforations. Published literature also shows a similar finding with reported ratios from 2.3:1 to 6.1:1.<sup>(5,7,8,9,10,11,12,13)</sup> Typhoid perforations as reported by Eggleston occurred in the second and third decades of life. In this study, 60% of cases were in a similar age group. 6 patients were in shock on admission. Eggleston reported that most patients had fever, malaise and sudden increase in abdominal pain in typhoid perforation.

Examination revealed signs of toxemia and acute abdomen.<sup>(14)</sup> Gibney and Gulati reported pneumonia, cholecystitis, gastrointestinal bleed, osteomyelitis and intestinal perforation in patients with typhoid perforation.<sup>(15,16)</sup> Perforation was commonly seen to occur in the second week following onset of illness.<sup>(17,8,12,13)</sup> Keenan reported that 88% of patients perforated in the second week.<sup>(17)</sup> Lizzaralde reported that 54.2% of patients perforated in the second week.<sup>(13)</sup> In this series, the perforation was earlier with a majority occurring within a week of onset of fever. Free gas was seen under the diaphragm in 78% of perforations and in 75% of typhoid perforation. Pneumoperitoneum has been reported in 52% to 82% in studies by Hadley, Archampong, Tacyildiz and Vaidyanathan.<sup>(17,18,10,19)</sup>

Widal was positive in 55% of tested cases and in 91% of patients of typhoid perforation. Widal was reported positive in 30% of patients with typhoid perforation by Kaul and in 46.1% of patients by Santillana.<sup>(8,20)</sup> It was reported positive in 75.5% of cases by Jarrett and in 73% by Vaidyanathan.<sup>(15,19)</sup> Four-fold increase in titres is considered more significant.<sup>(21)</sup>

Salmonella typhi was grown in 3 (10% of tested) patients with ileal perforation in whom blood cultures were done. Hadley reported positive cultures in 22.2% and Santillana in 48% of patients.<sup>(17,8)</sup> Prior antibiotic therapy was probably responsible for the low isolation study.<sup>(17,18,21)</sup> Tuberculosis was diagnosed definitively by histopathology. Histopathology was suggestive of typhoid in three patients (20% of tested). The presence of erythrophagocytosis virtually confirms the diagnosis of typhoid perforation.<sup>(22)</sup> Two cases had both Widal and histopathology confirming the diagnosis whereas one did not have Widal positivity.

Of the other eight specimens examined, one showed tuberculosis and the rest only inflammatory changes. Widal was found positive in six of the remaining cases. Though all the tests are complimentary in the diagnosis of typhoid, Widal is the most useful. It is easily available and is less susceptible to prior therapy when compared to blood culture. This usefulness was confirmed by Jarrett.<sup>(23)</sup> In this study, most patients of confirmed typhoid were treated with ciprofloxacin and metronidazole. The rest had a third generation cephalosporin (cefotaxime) and metronidazole. In the management of typhoid perforation, some authors advocated conservative management.<sup>(24,25,26)</sup> Presently, there is no such controversy in the treatment of typhoid perforation with the current recommendation being surgical management.<sup>(27)</sup> The various methods in use are local drains, simple closure, closure with omental patch, wedge resection, resection and anastomosis, ileotransverse anastomosis and ileostomy.<sup>(13,18,21,26,27,28)</sup> In this study, patients underwent simple closure, omental patch repair or resection anastomosis or Loff recommended debridement and closure in patients of traumatic perforation where the injury was small and resection anastomosis in patients with large wounds or multiple perforations.<sup>(29)</sup>

The overall complication rate for all patients in this series was 68%. Typhoid perforations are associated with a high morbidity rate with literature reports between 28.5% and 81%. Santillana in his series reported a rate of 71.9% in 96 patients. In this series, typhoid perforations had a complication rate of 83.3%. The common complications were wound infection, wound dehiscence, fecal fistula and respiratory complication, which compare with published reports. Fecal fistula was seen in 37% of these patients (9 out of 24). Of these, 5 were indeterminate and two each due to anastomotic leak and reperforation. Reexploration was done in 4 patients, out of which 2 survived. Of the five patients conservatively managed, four survived, though this difference is not statistically significant. Literature reports a rate of between 3% and 10%. The high fistula rate maybe due to later presentation of patients in this study since most patients presented late. Ihekweba and Shittu recommended early closure of fistula especially in developing countries where resources were low. The mortality rate of patients with fistula is improved with total parenteral nutrition and better antibiotic cover. Patients with traumatic perforations had lesser complications presumably due to a healthier bowel than those patients with typhoid or nonspecific perforations. In patients of traumatic perforations, outcome is primarily influenced by injury to other organs. The mortality in this series was 14%. In patients of typhoid perforation, the mortality was 20.8%.

Though, this rate has been on the decline, reported rates are between 3% and 60%. In nonspecific perforations, the mortality was 6.7%. This difference should trend towards significance on statistical analysis. Typhoid perforations in this study thus showed a poorer prognosis than the other aetiologies. Eggleston reported that the procedure done did not influence outcome. Talwar and Sharma reported that mortality was least with early primary closure and Ameh et

al found mortality was highest with wedge resection and least with resection and anastomosis. Increasing lag period was associated with increased mortality in series by Archampong, Eggleston, Bose and Talwar. In patients of ileal perforation, the significant factors influencing mortality are age greater than 50, female sex, feculent peritonitis, raised blood urea or creatinine as per the Mannheim peritonitis index. In this study, age greater than 50 and shock at presentation were significant factors influencing mortality. Trends were seen with fecal fistula formations, aetiology of typhoid and preoperative azotaemia. Sex, haemoglobin or albumin levels, number of perforations and type of peritoneal contamination were not found to be significant. Archampong reported that urine output prior to surgery, blood urea and serum potassium affected survival in patients of typhoid perforation. Survival was independent of haemoglobin level, shock, sickling status and number of perforations. Mock reported that increasing number of perforations, generalised contamination of the peritoneal cavity and single layer closure influenced survival.<sup>(21)</sup> Eggleston in his series of 78 patients reported the shock, uraemia, encephalopathy, fecal peritonitis and postoperative fecal fistula were predictors of mortality.

## SUMMARY AND CONCLUSIONS

This study was conducted from August 2013 to February 2015. It includes fifty cases of ileal perforation admitted to Meenakshi Medical College in that period. Aetiology, presentation, management and outcome of patients with ileal perforations were studied with emphasis on typhoid, nonspecific and traumatic perforations and the factors that influenced the prognosis.

- Typhoid is the most common cause of ileal perforation followed by nonspecific perforations.
- Patients have a male preponderance and are usually in the second and third decades of their lives.
- Widal serology is a useful test in the diagnosis of typhoid fever. Histopathology is useful in the diagnosis of tubercular perforations, but not very useful in the diagnosis of typhoid.
- Typhoid perforations have a significantly higher morbidity rate than nonspecific and traumatic perforations.
- Mortality in ileal perforations, especially typhoid is high, though the aetiology is not a significant contributing factor.
- Traumatic perforations have a good outcome.
- In the absence of facilities for total parenteral nutrition, fecal fistulae should be surgically closed early with resection and anastomosis or bypass.
- The type of surgical procedure did not influence outcome, either morbidity or mortality.
- Lag period significantly influenced outcome. This was true for cases of ileal perforation irrespective of aetiology and significant when typhoid perforations were separately considered.

- Morbidity was significantly influenced by age greater than 50, hypoalbuminaemia and a diagnosis of typhoid as the cause of perforation.
- Mortality was significantly influenced by age greater than 50 and shock on admission.

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