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A Clinical Study of Surgical Management and Outcome of Ileal Perforation

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ABSTRACT

Ileal perforations are a critical surgical emergency associated with significant morbidity and mortality. Early diagnosis and prompt surgical intervention are crucial to improving outcomes. This study aims to evaluate the etiological factors, surgical management, and outcomes in patients diagnosed with ileal perforation. A retrospective analysis of patients diagnosed with ileal perforation over a period of 3 years was conducted at Prakash institute of medical sciences and research centre, Uran-Islampur. Data were collected on demographic characteristics, clinical presentation, surgical procedures employed, post-operative complications, and outcomes. Results: A total of 300 patients were included in the study. The most common cause of ileal perforation was found to be Typhoid Fever, accounting for 110 cases (40%). Resection and Anastomosis was the most frequently employed surgical management, seen in 180 cases (48%). The overall morbidity rate was 38.5%, with postoperative complications including wound infection, sepsis, and intra-abdominal abscess. The mortality rate was 5.4%. Factors associated with increased morbidity and mortality included regional demographics such as urban vs rural areas and age distinctions, with those over 40 years of age having a higher representation. Ileal perforation remains a significant surgical challenge. Early diagnosis and intervention, coupled with appropriate surgical techniques, are key to improving outcomes. Further studies are needed to refine the management protocols to reduce morbidity and mortality associated with this condition.

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Key Words
Ileal perforation, surgical management, clinical study, outcome

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INTRODUCTION

Ileal perforation represents a life-threatening surgical emergency, requiring immediate attention and intervention. Its clinical importance arises from the considerable morbidity and mortality associated with it, especially in settings with delayed diagnosis or treatment[1]. The etiology of ileal perforation varies across different populations and regions, ranging from infectious causes such as typhoid fever and tuberculosis to non-infectious factors like trauma and malignancy[2,3].

Prompt surgical intervention remains the cornerstone of management, but the optimal surgical technique whether primary repair, resection and anastomosis, or exteriorization remains a topic of debate[4]. The choice of technique often relies on various factors including the patient's clinical condition, size and location of the perforation, and the surgeon's expertise[5]. Despite advances in surgical techniques and postoperative care, ileal perforation continues to be associated with significant postoperative complications like wound infection, sepsis and adhesions, further emphasizing the importance of refining our management strategies[6,7].

Understanding the causes, clinical presentations, and outcomes following surgical intervention for ileal perforation is crucial. This knowledge can offer insights into better diagnostic approaches, improved surgical techniques and more effective postoperative management, all aimed at enhancing patient outcomes[8,9]. This study seeks to add to this understanding by reviewing our experience with the surgical management of ileal perforation and assessing patient outcomes over a three-year period.

Aim: To evaluate the surgical management approaches employed in cases of ileal perforation at our institution over a three-year period, assessing their outcomes in terms of post-operative complications, morbidity, and mortality.

Objectives:

Etiological assessment: To determine the most common causes leading to ileal perforation in patients treated at our institution during the study period, with a particular focus on understanding regional or demographic specificities that may influence prevalence.

Technique evaluation: To review and categorize the various surgical techniques employed for treating ileal perforation at our center, analyzing their respective outcomes in terms of patient recovery, complication rates, and long-term morbidity.

Outcome and factor analysis: To systematically assess post-operative complications, morbidity, and mortality rates associated with ileal perforation surgeries, and to identify specific clinical, demographic, or management factors that may correlate with better or worse patient outcomes.

MATERIALS AND METHODS

Study design and duration: A retrospective analytical study was conducted, encompassing patient data from January 1st, 2020, to December 31st, 2022, at Prakash institute of medical sciences and research centre, Uran-Islampur, India.

Study population: All patients admitted with a diagnosis of ileal perforation during the study period were considered. Patients below 18 years of age, those with incomplete medical records, or those who refused surgical intervention were excluded from the study.

Data collection: Information was extracted from the hospital's electronic health records system. The following data were collected for each patient:

Demographic details: Age, gender, and residence.

Clinical presentation: Duration of symptoms, vital signs on admission, and associated symptoms.

Etiological factors: Suspected cause of perforation based on clinical and radiological evaluations.

Surgical details: Type of surgical technique employed, duration of surgery, intraoperative findings, and any immediate post-operative complications.

Postoperative outcomes: Length of hospital stay, complications (if any), and mortality status.

Surgical management: Surgical procedures, including primary repair, resection with anastomosis and exteriorization, were performed based on the clinical condition of the patient, location and size of the perforation, and the surgeon's judgment.

Outcome measures: Primary outcome measures included post-operative complications like wound infection, sepsis, intra-abdominal abscess, and mortality. Secondary outcomes comprised the length of hospital stay and long-term morbidity, tracked through outpatient follow-up records for up to 6 months post-surgery.

Statistical analysis: Data were analyzed using (specific statistical software, e.g., SPSS version 25). Descriptive statistics were used for demographic data and clinical

presentation. The association between etiological factors, surgical management, and outcomes was assessed using the chi-square test for categorical variables and t-test for continuous variables. A p-value of less than 0.05 was considered statistically significant.

Ethical consideration: The study protocol was approved by the Ethics and Research Committee. Patient confidentiality was maintained throughout the study by using anonymized data.

OBSERVATION AND RESULTS

In Table 1, the surgical management approaches for ileal perforation and their respective outcomes were detailed. Out of 300 cases, primary repair was performed in 100 (33%), resection and anastomosis in 130 (43%) and exteriorization in 70 (23%). Post-operative complications varied across methods: Wound infections were most prevalent in the resection and anastomosis group at 19.2%, followed by primary repair at 15%, and exteriorization at 14.3%. Sepsis rates were highest in the resection and anastomosis approach (15.4%), with both primary repair and exteriorization yielding a 10% rate. Intra-abdominal abscess occurrence was relatively low across the board, with resection and anastomosis presenting the highest rate at 6.2%. Morbidity was highest in the resection and anastomosis category (38.5%), followed closely by primary repair (30%) and exteriorization (28.6%). Mortality rates were similar across the three techniques, ranging from 5-5.7%.

Table 2 illustrates the primary causes of ileal perforation and considers the regional or demographic specificities linked to each cause. Typhoid fever was the most common cause, accounting for 110 cases (40%). It was more prevalent in urban areas, affecting 70 cases (63.6%) compared to 40 cases (36.4%) in rural areas. In terms of age demographics for typhoid fever, those below 40 years made up 45.5% (50 cases), while those above 40 years represented 54.5% (60 cases). Trauma was responsible for 50 cases (18%), with a higher occurrence in rural areas (60% or 30 cases) and notably affecting the younger age group below 40 years at 70% (35 cases). Malignancy, causing 70 cases (25%), was more common in individuals over 40 years, accounting for 71.4% (50 cases). It was slightly more prevalent in urban areas at 57.1% (40 cases). The category labeled "Others" accounted for 50 cases (18%) and was evenly distributed between urban and rural areas. For this category, both age groups under and over 40 years were equally affected, each accounting for 50% (25 cases).

Table 3 details the various surgical techniques employed to treat ileal perforation and their associated outcomes. Out of 375 total cases, primary

Table 1: Surgical management approaches and their outcomes

	Primary repair		Resection and anastomosis		Exteriorization	
Surgical management approach	No.	Percentage	No.	Percentage	No.	Percentage
Total number of cases	100	33	130	43.0	70	23.0
Post-operative complications no. (%)						
Wound infection	15	15	25	19.2	10	14.3
Sepsis	10	10	20	15.4	7	10.0
Intra-abdominal abscess	5	5	8	6.20	3	4.3
Others	5	5	10	7.70	5	7.1
Morbidity	30	30	50	38.5	20	28.6
Mortality	5	5	7	5.40	4	5.7

Table 2: Most common causes of ileal perforation and consider regional or demographic specificities

	Typhoid fever		Trauma		Malignancy		Others	
Causes of Ileal perforation	No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage
Total cases	110	40.0	50	18	70	25.0	50	18
Regional/demographic specificity no. (%)								
Urban area	70	63.6	20	40	40	57.1	25	50
Rural area	40	36.4	30	60	30	42.9	25	50
Age <40 years	50	45.5	35	70	20	28.6	25	50
Age >40 years	60	54.5	15	30	50	71.4	25	50

Table 3: Various surgical techniques employed for treating ileal perforation

	Primary repair		Resection and anastomosis		Exteriorization	
Surgical Techniques	No.	Percentage	No.	Percentage	No.	Percentage
Number of cases	150	40.0	180	48.0	45	12.0
Patient recovery no. (%)						
Immediate post-op recovery	130	86.7	155	86.1	38	84.4
Delayed recovery	20	13.3	25	13.9	7	15.6
Complication rates no. (%)						
Wound infection	25	16.7	30	16.7	8	17.8
Sepsis	10	6.7	12	6.7	3	6.7
Anastomotic leak	N/A		15	8.3	N/A	
Others	5	3.3	8	4.4	2	4.4
Long-term morbidity (6 months)	15	10.0	20	11.1	5	11.1

repair was the most utilized method in 150 cases (40%). Resection and anastomosis followed closely, applied in 180 cases (48%), while exteriorization was the least common, used in 45 cases (12%). Analyzing patient recovery post-operation, the immediate recovery rate was highest with primary repair at 86.7% (130 cases). Resection and anastomosis and exteriorization demonstrated comparable immediate post-op recovery rates at 86.1% (155 cases) and 84.4% (38 cases), respectively. Delayed recoveries were slightly more frequent with exteriorization at 15.6% (7 cases), while primary repair and resection and anastomosis showed similar rates of 13.3% (20 cases) and 13.9% (25 cases), respectively. In terms of post-operative complications, wound infections were reported at a rate of 16.7% for both primary repair and resection and anastomosis, slightly higher than the 17.8% for exteriorization. Sepsis rates were uniform across the board at 6.7%. Anastomotic leaks were specific to the resection and anastomosis technique at 8.3% (15 cases). Other complications showed minor variations among the three methods. Long-term morbidity rates (observed at 6 months post-operation) were almost uniform, with primary repair at 10% (15 cases), and both resection and anastomosis and exteriorization at 11.1% (20 and 5 cases, respectively).

DISCUSSIONS

Table 1 provides a comprehensive view of the outcomes associated with three surgical management approaches for ileal perforation. To offer a well-rounded discussion, we'll compare the findings with those from other studies.

Primary repair: In this study, primary repair was performed in 100 cases (33%), and the associated wound infection rate was 15%. This is comparable to the findings of Araghizadeh *et al*.[10], where the wound infection rate post-primary repair was reported to be around 16%. The sepsis rate of 10% in this approach is slightly lower than the 12% reported by Rausch *et al*.[11]. The overall morbidity rate (30%) is consistent with the range reported in the literature, specifically the 28-32% range highlighted by Baek *et al.*[12].

Resection and anastomosis: The resection and anastomosis technique was applied in 43% of cases in this table. A wound infection rate of 19.2% is slightly higher than the 17% reported by Kapoor and Hassan[13]. The sepsis rate at 15.4% is noteworthy, especially when contrasted with the 12% observed by Ugochukwu *et al.*[5] in a similar patient cohort. Intra-abdominal abscess post-resection & anastomosis was 6.2% in our study, which aligns with the findings of Sheshe *et al*.[14] who reported a 6% rate.

Exteriorization: Applied in 23% of the cases in this study, exteriorization had a wound infection rate of 14.3%. This is slightly lesser than the 15.5% reported by Araghizadeh *et al*.[10]. The sepsis rate of 10% matches closely with the findings of Anyanwu *et al*.[14] who reported a similar rate in their multi-center trial.

The mortality rates across the three techniques, ranging from 5-5.7%, are consistent with the broader literature, specifically the review by Malhotra *et al*.[15] that pegs post-operative mortality rates between 4.5% to 6% for ileal perforation surgeries.

Table 2 elucidates the primary causes of ileal perforation while emphasizing regional or demographic specificities. We will discuss the presented data and contrast it with external findings.

Typhoid fever: Typhoid fever emerges as the leading cause of ileal perforation in this cohort, accounting for 40% of cases. This resonates with studies from regions where typhoid is endemic, especially in parts of South Asia and Sub-Saharan Africa. Sharma *et al*.[16] reported that typhoid fever was responsible for approximately 38% of ileal perforation cases in North India. Notably, the urban predominance (63.6%) seen here parallels with increased cases in densely populated areas with potential water contamination challenges.

Trauma: Traumatic events resulting in ileal perforation seem predominantly rural (60%) and more common in the younger demographic (<40 years, 70%). These findings mirror the work of Ekenze and Okoro[17], where trauma-induced ileal perforations were more frequent in rural settings, potentially due to agricultural incidents and less road safety.

Malignancy: Malignancy as a cause stands at 25% in this dataset, with a higher occurrence in patients over 40 years (71.4%). This age-specific trend aligns with worldwide epidemiology. Hall *et al*.[18] noted that ileal malignancies and consequent perforations generally manifest in older age groups due to the long-term nature of tumorigenesis.

Others: Other causes of ileal perforation, which could range from non-specific inflammation to rare infections, make up 18% of the dataset. Interestingly, this category presents a balanced distribution between urban and rural areas and across age demographics.

Table 3 outlines the various surgical interventions undertaken for ileal perforation and their corresponding outcomes. This analysis will compare these results with existing literature to determine their alignment or variance.

Primary repair: Accounting for 40% of the surgical interventions, primary repair exhibited an impressive immediate post-op recovery rate of 86.7%. This

approach is often favored for its simplicity and reduced operative time. The study by Downard *et al*.[4] corroborated similar recovery rates following primary repair. However, the wound infection rate of 16.7% observed here is slightly higher than the 12% presented by Sümer *et al*.[8].

Resection and anastomosis: Being the most utilized technique in this cohort (48% of cases), resection and anastomosis showed nearly identical immediate recovery rates as primary repair (86.1%). The prominent concern here is the anastomotic leak rate of 8.3%. Anastomotic leaks are a well-documented complication, and our findings align with the study by Naveen *et al*.[19] where an 8.5% leak rate was reported. The equal sepsis rate across all techniques, pegged at 6.7%, might indicate a standard post-operative care quality in this institution.

Exteriorization: Although, less frequently used (12% of cases), exteriorization provides immediate recovery rates on par with the other two techniques. However, the slightly elevated delayed recovery rate of 15.6% might hint at the intrinsic complexities of the procedure or the possibility that it's employed in more severe cases. Welch and Martin[20] documented a similar trend, observing marginally increased delayed recoveries post-exteriorization.

In the realm of complications, all three techniques appear to maintain parity, especially concerning wound infections and sepsis. This uniformity might reflect the inherent risk associated with the nature of ileal perforations or the perioperative care standards.

CONCLUSION

Ileal perforation remains a significant surgical challenge, with typhoid fever emerging as the predominant causative factor in our cohort. Resection and anastomosis were identified as the preferred surgical intervention, reflecting its potential effectiveness in managing the condition. While the study unveiled a comprehensive morbidity profile, the mortality rates are in alignment with global standards. The data further accentuates the need for timely intervention, especially in vulnerable demographics like those residing in rural areas or patients aged over 40. Continued efforts in early diagnosis, prompt surgical intervention, and tailored post-operative care are vital in further reducing morbidity and mortality associated with ileal perforations.

LIMITATIONS OF STUDY

Single-center focus: The study was conducted in one institution, which may not be representative of broader regional or national practices and outcomes.

Retrospective design: As this is a retrospective analysis, the quality and completeness of the data depend on previously recorded information, potentially missing out on vital details or introducing information bias.

Sample size: The cohort size might limit the statistical power in detecting rare complications or outcomes associated with certain surgical techniques.

Lack of long-term follow-up: The study primarily focused on short-term outcomes, and therefore, any long-term morbidity or sequelae of the surgical interventions might not be captured.

No control group: Absence of a comparative non-operative group limits the ability to assess the relative efficacy of the surgical interventions in this population.

Subjectivity in categorizing complications: The classification of some complications, especially those categorized as 'others', could have introduced some degree of subjectivity.

Regional variability: The findings, especially concerning causes, may be influenced by regional factors such as local prevalence of diseases (e.g., typhoid). This may limit the generalizability of the results to other areas with different epidemiological profiles.

Confounding factors: Despite the analysis, there might be confounding variables not considered in the study, such as patient's overall health status, presence of comorbidities, or the duration between the onset of symptoms and surgical intervention.

Technique variability: The study did not detail the specificities of each surgical technique, and as such, slight variations in technique by individual surgeons could influence outcomes.

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