



COMPARATIVE STUDY OF THE OUTCOMES OF PRIMARY REPAIR VS REPAIR WITH PROXIMAL DIVERSION IN CASES OF INTESTINAL PERFORATION

General Surgery

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ABSTRACT

Intestinal perforation is a life-threatening gastrointestinal emergency which needs surgical intervention on an urgent basis. The present study aimed to assess and compare various outcomes after primary repair and repair with proximal diversion for intestinal perforations. Various parameters were analyzed included sociodemography, etiology, intra-operative details, and post-operative outcome. Traumatic etiology was higher in the primary repair group. The postoperative course was followed for 15 days. There was a statistically significant incidence of complications including fever, infection at the operation site, and dehiscence of wounds in Group A (Primary Repair) as opposed to Group B (Proximal Diversion). Most of the cases in Group B had longer days of hospitalization, with only a little variation among those staying in the ICU. It concludes that proximal diversion results in lower postoperative complications and reoperation rates, thus being favorable for certain indications. These results offer important evidence for the re-evaluation of standard treatments, particularly in resource-limited settings. Further research is encouraged to confirm this result in a variety of populations.

KEYWORDS

Intestinal perforation, Ileostomy, Life-threatening.

INTRODUCTION

Intestinal perforation or bowel perforation is an acute medical emergency resulting from a loss of continuity of bowel wall, resulting in leakage of contents into the sterile peritoneal cavity (Hafner et al., 2023). Erosion, tumors, infections and hernias, foreign bodies, obstruction, iatrogenic factors, and trauma are common causes of small intestinal perforations; tumours (usually malignant or involving the colon) diverticulitis and colitis (superficiality) stimulate large intestinal perforations. (Tanner et al., 2018). Management includes immediate operative repair of the perforation or clean the abdominal cavity, use of broad-spectrum antibiotics to prevent and treat infection, as well as particular supportive care for pain relief, rehydration and electrolyte rebalancing. Prompt and vigorous treatment is key to avoiding complications such as septic shock and achieving the best possible outcome (Ugwu et al., 2018).

Infections like typhoid fever and tuberculosis, leading to intestinal perforation, is a major life-threatening gastrointestinal emergency affecting mainly low- and middle-income countries like India. Studies indicate that the incidence rates of these perforations are very heterogeneous, reported between 0.8% to 18% (Garrido-Serrano and Fernandez-Alvarez 2019; Chalya et al., 2012). Mortality rates of typhoid intestinal perforation (TIP) is reported to be high, ranging from 5% to 62%, which signifies the severity and potential danger of this condition (Lee et al., 2012).

The morbidity related to intestinal perforations is substantial, with patients facing potential prolonged intra-abdominal infections, development of hernias from surgical interventions, and an increased risk of thromboembolic and cardiopulmonary complications. The treatment of intestinal perforations typically necessitates comprehensive resuscitation measures alongside surgical interventions, which are critical to managing this serious condition (Cooper et al., 2018; Mittal et al., 2014). The surgical approach taken largely depends on the nature and location of the perforation. Techniques range from a basic primary repair of the perforation site to more complex procedures such as the installation of an ileotransverse colostomy or a primary ileostomy. Other surgical options include utilizing an omental patch in single-layer repairs, executing a resection followed by anastomosis, and other procedure variations that might be indicated based on specific case factors (Singer and Nelson 2002).

The study is intended to be conducted at a tertiary care surgery department in North India, where it will assess the efficacy, safety, and

patient outcomes of these two surgical techniques in a local context, providing valuable data that could influence future treatment protocols (Singer and Nelson 2002).

MATERIALS AND METHODS

Study Design: Comparative, prospective cohort study. The study duration was 2023-2024 (12 months)

Study Population: All patients who were admitted at the Surgery department of BRD Medical College with intestinal perforation due to any cause.

Inclusion Criteria:

- With a diagnosis of intestinal perforation
- Eligible for the procedure (Primary repair/Diversion)

Exclusion Criteria:

- Women who are pregnant and lactating
- Patients with intestinal perforations in the duodenum and proximal jejunum
- Patients who died during the surgery

Sample Size: Based on the findings of Fouda et al study who reported complication rates of 54% and 87.6% among the primary repair and diversion groups, respectively, for an alpha error of 5%, power of 80%, and a loss to follow-up rate of 10% sample size was calculated as per the formula.

$$n = \frac{\left[z_{\alpha} \sqrt{(1 + 1/m)p(1 - p)} + z_{\beta} \sqrt{p_0(1 - p_0)/m + p_1(1 - p_1)} \right]^2}{(p_0 - p_1)^2}$$

$$\bar{p} = \frac{p_1 + mp_0}{m + 1}$$

- **POWER:** probability of detecting a real effect.
- **ALPHA:** probability of detecting a false effect
- **P0:** probability of event in diversion group.
- **P1:** probability of event in primary repair group.
- **M:** number of patients in diversion group per primary repair patient (1)

The sample size came to be 39 in each group i.e. 39 patients in primary repair and 39 patients in diversion.

Data Collection: The principal investigator used a semi-structured,

interviewer-administered questionnaire to collect data on the socio-demographic details, pre-existing comorbidities, personal habits, and clinical characteristics of the patients. Outcomes and complications of the patients following the procedure were recorded in the proforma. Post-operative complications were observed.

Study Procedure: Patients who were eligible for the study were observed under their respective surgery groups. They were labelled as group A if they underwent primary repair and group B if they underwent repair with proximal diversion.

- **Group A:** Primary repair
- **Group B:** Repair with proximal diversion

The inclusion, flow and follow-up of the patients has been depicted in Figure 1.

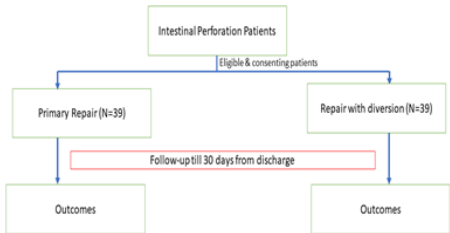


Figure 1: Patient inclusion, procedure and follow-up protocol in the study

Data Analysis: Analysis was conducted in SPSS 26.0. The outcomes of the patients were expressed in frequencies and proportions. A p-value of <0.05 was considered statistically significant.

RESULTS

- 1. **Socio-Demographic Profile:** The study found that the majority of patients were aged 15-45, predominantly working-age adults, with a slightly higher male majority in Group A. Rural residents were more prevalent, indicating limited healthcare access in these areas.
- 2. **Clinical Features at Admission:** All patients in both groups presented with abdominal pain, emphasizing its ubiquity as a symptom of intestinal perforation. Additional common features included abdominal distension (92.3% in Group A and 94.9% in Group B), fever (59.0% in Group A and 61.5% in Group B), and obstipation, which was slightly more frequent in Group B (64.1%).

Table 1: Etiology Of Perforation

Etiology of Perforation	Group A (Primary Repair)	Group B (Proximal Diversion)
Infectious	23 (59.0%)	26 (66.7%)
Traumatic	16 (41.0%)	13 (33.3%)
Total	39 (100%)	39(100%)

- 3. **Etiology Of Perforation:** The etiology of perforations varied significantly between groups as mention in the table no.1. Infectious causes predominated in both groups, but were higher in Group B (66.7%) compared to Group A (59.0%). Conversely, traumatic causes were more common in Group A (41.0%) than in Group B (33.3%).

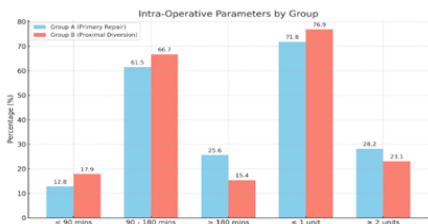


Figure 2: Intra-Operative Parameters

- 4. **Intra-Operative Parameters:** The figure no.2 presents a comparison of intra-operative parameters between two groups: Group A (Primary Repair) and Group B (Proximal Diversion). The majority of patients in both groups had surgeries lasting 90-180 minutes, with 61.5% in Group A and 66.7% in Group B. Less than 90 minutes or more than 180 minutes were reported. Blood infusions were primarily received by 71.8% in Group A and 76.9% in Group B.

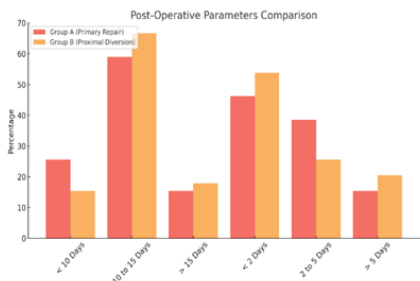


Figure 3: Post-Operative Parameters

- 5. **Post-Operative Parameters:** The post-operative analysis (figure no.3) compared Group A (Primary Repair) and Group B (Proximal Diversion) showed differences in hospital and ICU stays. In Group A, 25.6% of patients had stays under 10 days, while 66.7% of Group B patients had stays between 10 to 15 days. ICU stays were similar between the groups, with Group A having 38.5% and Group B having 20.5%.

Table 2: Post-Operative Complications (Day-5)

Complications	Group A (Primary Repair)	Group B (Proximal Diversion)	P-value
Fever & Cough	14 (35.9%)	9 (23.1%)	0.321
Surgical Site Infection	12 (30.8%)	8 (20.5%)	0.437
Wound Dehiscence	3 (7.7%)	1 (2.6%)	0.608
Intra-Abdominal Abscess	4 (10.3%)	3 (7.7%)	0.61
Enterocutaneous Fistula	1 (2.6%)	0 (0%)	0.95
Need for Reoperation	1 (2.6%)	0 (0%)	0.95
Mortality	1 (2.6%)	0 (0%)	0.95

Table 3: Post-operative complications (Day 10)

Complication	Group A (Primary Repair)	Group B (Proximal Diversion)	p-value
Fever & Cough	12 (30.8%)	7 (17.9%)	0.291
Surgical Site Infection	7 (17.9%)	3 (7.7%)	0.31
Wound Dehiscence	5 (12.8%)	3 (7.7%)	0.709
Intra-abdominal Collection/Abscess	6 (15.4%)	2 (5.1%)	0.263
Entero-cutaneous Fistula	3 (7.7%)	1 (2.6%)	0.615
Need for Re-operation	2 (5.1%)	0 (0.0%)	0.494
Mortality	2 (5.1%)	1 (2.6%)	0.98

Table 4: Post-Operative Complications (Day-15)

Complications	Group A (Primary Repair)	Group B (Proximal Diversion)	P-value
Fever & Cough	5 (12.8%)	2 (5.1%)	0.428
Surgical Site Infection	4 (10.3%)	4 (10.3%)	0.98
Wound Dehiscence	2 (5.1%)	2 (5.1%)	0.98
Intra-Abdominal Abscess	2 (5.1%)	0 (0%)	0.474
Entero-cutaneous Fistula	1 (2.6%)	0 (0%)	0.9
Need for Reoperation	1 (2.6%)	0 (0%)	0.98
Mortality	2 (5.1%)	1 (2.6%)	0.86

- 6. **Post-Operative Complications (Day-5) (Day-10) (Day-15):** The postoperative outcomes were evaluated across Day 5, Day 10, and Day 15 to analyze the differences in complications among patients undergoing primary repair (Group A) versus proximal diversion (Group B). Over these intervals, key metrics such as fever and cough, surgical site infections, wound dehiscence, intra-abdominal abscesses, entero-cutaneous fistulae, reoperation requirements, and mortality were monitored to assess short-term recovery and the effectiveness of each surgical approach.

This comprehensive evaluation provides insights into the progression of complications and highlights patterns of recovery or challenges encountered in the immediate postoperative phase, contributing to a nuanced understanding of the comparative efficacy of the two surgical methods.

The detail findings of Post-Operative Complications across Day 5, Day 10, and Day 15 are mention in table no 2, 3, 4.

DISCUSSION

The study examined socio-demographic characteristics and clinical presentations in patients undergoing emergency laparotomy, divided into Primary Repair (Group A) and Proximal Diversion (Group B). Variations were observed in age, gender, BMI, education, marital status, and residence. Regarding personal habits, smoking rates were 35.9% in Group A and 33.3% in Group B, with alcohol consumption at 28.2%. These rates were slightly lower than (Chopra et al., 2016) findings of 40% smoking, 35% alcohol consumption, and similar smokeless tobacco use at 25%. Clinically, all patients reported abdominal pain, with vomiting and fever present in 59.0% of Group A and 61.5% of Group B. These findings align with (Gupta and Singh, 2018) who reported 100% abdominal pain and vomiting rates near 50%, highlighting common symptoms in acute surgical conditions. The study found infectious causes as the primary etiology in both groups (59.0% in Group A, 66.7% in Group B), with traumatic causes being lower (41.0% and 33.3%, respectively). These results align with (Rahman et al., 2018) who reported 70% infectious and 30% traumatic etiologies. The study found that surgeries lasting less than 90 minutes occurred in 12.8% of Group A and 17.9% of Group B, with ≤ 1 unit blood transfusions required in 71.8% and 76.9%, respectively, closely aligning with (Singh et al., 2017) findings. Post-operative analysis showed hospital stays under 10 days in 25.6% of Group A and 15.4% of Group B, while ICU stays under 2 days were observed in 46.2% of Group A and 53.8% of Group B, consistent with (Patel and Sharma, 2017) results.

The study analyzed post-operative complications following emergency laparotomy, noting higher rates of fever and cough (35.9% in Group A, 23.1% in Group B) and surgical site infections (30.8% in Group A, 20.5% in Group B) on day 5, with outcomes slightly better than (Chopra and Gupta, 2017) findings. By day 10, fever and cough were more prevalent in Group A (30.8%) than in Group B (17.9%), consistent with (Papadopoulos et al., 2011). On day 15, surgical site infections remained at 10.3% for both groups, while fever and cough rates were higher in Group A (12.8%) compared to Group B (5.1%), aligning partially with (Patel and Raj, 2018) observations.

CONCLUSION

The study concluded that both groups showed a higher prevalence in the 15-45 age range with Group A at 66.7% and Group B at 64.1%. The distribution of BMI categories shows Group A with more participants in the <18 and >25 ranges, while Group B has a higher percentage in the 18-25 category. Smoking and alcohol use are comparatively similar in Group A and B, while smokeless tobacco use is more prevalent in Group B. Both groups report high rates of abdominal pain and distension. Group B shows slightly higher rates of fever and obstipation. Infectious causes are more prevalent in Group B, while traumatic causes are slightly more common in Group A. The majority of both groups had surgery durations of 90-180 minutes. Blood transfusion requirements were almost similar in both groups. Length of hospital and ICU stays were almost similar in both groups with complications such as fever, cough, wound dehiscence and surgical site infections and mortality were more in Group A. Group B had lower rates of major complications like fever, cough, wound dehiscence, and intra-abdominal abscess and need for re-operation between the groups over various post-operative periods.

Recommendations

- Gender-Specific Health Education:** Promote gender-specific health education and preventive measures, given the varying prevalence of conditions and habits like smoking and alcohol use between males and females.
- Nutrition and Weight Management:** Encourage maintaining a healthy BMI through balanced diet and regular physical activity, especially for individuals falling into the underweight or overweight categories.
- Health Literacy:** Increase efforts to enhance health literacy, particularly regarding the benefits of higher education on health choices and outcomes.
- Smoking And Alcohol Use Prevention:** Intensify public health campaigns against smoking and excessive alcohol use, highlighting the associated health risks and promoting available support resources for cessation.
- Chronic Disease Management:** Advocate for regular screening and proactive management of chronic diseases like diabetes and hypertension to prevent complications.
- Preoperative And Postoperative Care:** Provide clear guidelines

on preoperative preparations and postoperative care to minimize complications and enhance recovery times, especially in surgical contexts.

- Informed Surgical Decisions:** Encourage patients to discuss with healthcare providers the potential risks and benefits of different surgical approaches, informed by the comparative outcomes observed in studies.

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