Comparing the Efficacy of Primary Anastomosis versus Diverting Stoma in the Management of Acute Colonic Perforation

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Abstract

This study was done for comparing the Efficacy of Primary Anastomosis versus Diverting Stoma in the Management of Acute Colonic Perforation.

The study was a prospective, randomized comparative study. It involved all eligible patients fulfilling the inclusion criteria of the study. It was conducted at in the period from 2021-2024. A total of 50 patients were recruited into the current study and divided into two groups after resection of perforation part: stoma group and anastomosis group. Overall, 50 cases had a mean age of 52.9±5.4 years, with the range of 39.0– 76.0 years. It included 33 (66%) males and 17 (34%) females. The leakage rate was significantly higher in the anastomotic group (9 cases), whereas it was experienced only in 1 (4%) cases in the other group (P<0.001). Consequently, postoperative mortality was higher in the same group (nine cases) (P=0.025).

In conclusion, the diverting stoma appeared to be a safer procedure to perform in perforated colon with respect to morbidity and mortality rates but needs a strict nutritional, psychological, and special home care to enhance quality of life.

Keywords: *Colonic perforation, stoma, Anastomosis*

Introduction

Perforation of the colon is defined as a disruption of the continuity of the duct wall digestive system, as a result of which food contents and air enter the cavity peritoneum [1]. Perforation is covered with a condition in which adjacent structures occur in the abdominal cavity, to the place of disruption of the gastrointestinal wall, thus limiting it inflammation in the peritoneal cavity [2].

The most common causes of perforation include: cancer (36%), iatrogenic perforation e.g. during endoscopy (20%), or diverticulitis (19%) [3] [4].

There is also a proven risk in inflammatory bowel diseases such as Crohn's disease or ulcerative colitis [2] [3]. Also decreased perfusion organ caused by a thromboembolic event may result in ischemia and fullwall perforation of the intestine [3] [4].

The literature contains other less common risk factors, such as: trauma, presence foreign body, endometriosis, connective tissue diseases or condition after radiotherapy [4] [5] [6] [7]. Situations of spontaneous disruption of the intestinal wall, i.e. perforations, have also been described spontaneous. This group includes spontaneous perforation caused by fecal stones and

idiopathic perforation. The mechanism of spontaneous perforation associated with residual masses stools consist in the pressure of accumulated hard stools against the intestinal wall, leading to it ischemia, necrosis and perforation. Idiopathic perforation is a very rare situation clinical, as it concerns the unaffected intestinal wall [8,9,10].

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Patients and methods

This study compared two groups prospectively using a randomised design. Following a thorough description of the procedure, reasonable expectations, and potential periprocedural problems, an informed consent document was completed in every instance. All patients who met the study's inclusion criteria were a part of it.

Inclusion criteria

The following were the inclusion criteria:

- Patient with acute abdomen with clinical, laboratory, and radiological signs of acute colonic perforation.
- Hemodynamically stable patients.
- Albumin level more than 2.5 g/dl.

Exclusion criteria

The following were the exclusion criteria:

- Hemodynamically unstable patients.
- Patients with acute colonic perforation with no signs of gangrene.
- Evidence of intestinal perforation such as gas under diaphragm, intra-abdominal intestinal content, or intra-abdominal pus.
- Serum albumin level less than 2.5 g/dl.

A total of 50 patients fulfilling the intraoperative inclusion criteria, admitted to our ED with surgically acute abdomen, were involved into the current study and divided into two groups after treating of perforated part: stoma group and anastomosis group. The stoma group included the patients with uneven numbers and the anastomosis group included the patients of even numbers. These were done in private hospital at Baghdad city at a period of 2021-2024.

Preoperative evaluation It included the following:

- Clinical history and thorough physical examination.

- Routine laboratory tests in addition to serum amylase, D-dimer LDH level, and arterial blood gases.
- Chest radiograph with diaphragm and abdomen radiograph with erect and supine positions.
- Abdominal ultrasound with comment on free fluid, duplex us on arterial and venous mesenteric tree, and CTA if possible.

Surgical techniques Under general anesthesia (UGA)

Patients were placed in the supine position and operated under complete aseptic technique via midline exploratory laparotomy incision. Full exploration of the whole abdomen was performed, including small and large bowel, with addressing of the gangrenous parts of small bowel, and a sterile ruler or the equivalent length of vicryl thread was used to measure the perforated part from D-J junction and the length of gangrenous segment. Then gangrenous part was resected with wide margin 5 cm from both ends. Then after resection, anastomosis was done by hand sewing technique or double barrel stoma was matured on the abdomen. Finally, abdominal drains were left in the abdomen followed by closure of anterior abdominal wall in layers[11].

Postoperative care and follow-up

All patients were monitored in the recovery room and transferred to the ward or to the intensive care unit if needed. LMW heparin was administered 6 h postoperatively b.i.d. according to body weight. Oral anticoagulant was given as early as possible with monitoring till optimizing the serum therapeutic level and then the patients were discharged.

Oral intake was initiated upon stoma was functioning or after good bowel motion in case of anastomosis group. Patient with stoma were discharged on high-protein and electrolyte regimen after organizing close follow-up with a dietitian. Patients were followed at OPD after discharge at 1, 2, 4, 12, and 24-week intervals, and stoma was closed after 8–10 weeks from discharge.

Data collection

- Preoperative data included the following:
    - Name, age, sex, and comorbidity, as well as time of onset of symptoms and risk factors.
    - Serum albumin, serum Na, and serum K.
- Intraoperative data included the following:
    - Arterial or venous occlusion were based on data [11] shown in Table 1.
    - Length of part resected, distance of gangrenous part from D-J junction, and anastomosis or stoma.
- Postoperative data:

- Fasting days and hospital stay and postoperative mortality and morbidity. o Serum albumin in POD 1 and 5 days after starting oral feeding. o Serum Na^+ and K^+ in POD 1 and 2 days after starting oral feeding.
- Anastomosis-related complications such as intestinal leakage, septicemia, and septic shock.
- Ileostomy-related complications such as excoriation, stomal retraction, gangrenous stoma, stomal detachment, prolapse, and parastomal hernia.
- Wound infection and midline incisional hernia. o QOL assessed by Cleveland Global Quality of Life score [12] after 1 month from anastomosis, ileostomy, and closure of ileostomy.

Statistical analysis was done by using SPSS version 23.

Table 1 Difference between arterial and venous occlusion

	Arterial	Venous
Arterial pulsation	Absent	Usually preserved
Bowel wall	Thin and floppy	Thick and edematous
Mesentery	Thin	Thick

Results

Demographic data

Regarding the demographic characteristics of the included 50 cases, the mean age was 52.9±5.4 years, with the range of 39.0–76.0 years. The study included 33 (66%) males and 17 (34%) females. These data are illustrated in the following table. When comparing the study groups regarding demographics, neither age nor sex, was found to be statistically significant between the two groups (Table 2).

Table 2 Comparison of sociodemographic characteristics between cases with anastomosis and stoma operations

	Stoma [n (%)] N=25	Anastomosis [n (%)] N=25	Test of significance	P value
Age (years) (mean±SD)	54.01±2.35	54.96±3.46	t=1.04	0.32
Sex			χ^2=0.11	
Male	17±68.0	16±64.0		0.65
Female	8±32.0	9±36.0		

Table 3 Distribution of comorbidities among studied cases

Comorbidity	N=50 [n (%)]

Cardiac (AF, MI, and valvular heart disease)	11 (22)
DM	18 (36)
Hepatic	20 (40)
Hypertension	18 (35)

AF, atrial fibrillation; DM, diabetes mellitus; MI, myocardial infarction.

Table 4 Risk factor distribution among the studied cases

Risk factor	N=50
History of liver cirrhosis and portal hypertension	20
History of splenectomy	22
History of hypercoagulable state	10
History of intestinal angina	2
History of atrial fibrillation	3
History of myocardial infarction	1

Table 5 Comparison of arterial, venous, and time of presentation between cases with anastomosis and stoma operations

	Stoma [*n* (%)] *N*=25	Anastomosis [*n* (%)] *N*=25	Test of significance	*P* value
Arterial	2 (8.0)	3 (12.0)	χ^2=0.42	0.52
Venous	23 (92.0)	22 (88.0)	χ^2=0.41	0.50
Time of presentation (days) (mean±SD)	3.19±0.36	3.12±1.17	*t*=0.23	0.77

Table 6 Type of surgery among studied cases

Anastomosis	25 (100.0)
Stoma	25 (100.0)

Comorbidities' distribution among the studied cases

The most frequent medical comorbidities faced in the study cases (Table 3) were hepatic diseases (20 cases) followed by diabetes mellitus (18 cases). Hypertension was present in 18 study cases, whereas cardiac comorbidity (such as atrial fibrillation and myocardial infarction) was positive in 11 cases.

Risk factors of mesenteric ischemia

When it comes to risk factors (Table 4) that were present in the cases, previous splenectomy was the dominant one (22/50 cases), Pathology and time of presentation between the study groups.

Pathology and time of presentation between the study groups

The mean of days of presentation to the ED was about 3.16 days, ranging from 1 to 6 days. The majority of our cases experienced ischemia of venous origin in 45 (90%) cases, whereas the remaining 5 (10%) cases had a pathology of arterial origin. The mean of days of presentation of the stoma group was 3.19 days, whereas it was 3.12 days for the primary anastomosis group (Table 5).

Types of surgical intervention

The operations that were done for the study cases (Table 6) were resection with primary anastomosis or resection with double barrel stoma, with 25 (50%) cases for each.

The perioperative variables between the study groups

Compared to the stoma group, the anastomosis group required a longer amount of time for the operation (97.01 vs. 60.94 min). In addition, compared to the other group, it demonstrated a significant delay in the beginning of oral feeding (3.80 vs. 1.73 days). Statistical analysis revealed a difference between the two groups with respect to the amount of time it took to complete the operation and the initiation of the oral diet. Intestinal length determined by D-J flexure and length of the resected portion were not significantly different between the two groups of patients. Table 7 shows that compared to the anastomosis group, the stoma group had a much shorter hospital stay (9.19 vs. 16.1 days).

Differences in postoperative complications between the research groups

In the anastomotic group, there were 9 instances of leakage, which is much more than in the other group where it occurred in just two cases (4%). This difference is statistically significant ($P<0.001$). As a result, there was an increased risk of postoperative death in the same group, with nine instances ($P=0.03$). According to Table 8, there was no significant difference in the rates of postoperative wound infection and incisional hernia between the two groups.

stoma Complications

The stoma complication most often reported was excoriation, with 14 occurrences, followed by electrolyte disruption with 10 cases. Two patients (8% of the total) had a parastomal hernia, one patient had stomal retraction and prolapse, and one patient had stomal gangrene (Table 9).

Differences in serum albumin levels among trials

After 5 days after beginning oral feeding, the anastomosis group had substantially higher albumin levels (2.94 vs. 2.69 g/dl − $P<0.001$), even though there was a significant difference between the groups at admission or at POD1. Table 10 shows that blood albumin levels dropped

significantly in both groups after the procedure, but rose significantly in the anastomosis group once oral intake began.

Table 7 Comparison of the perioperative variables between both groups

Mean±SD	Stoma N=25	Anastomosis N=25	Test of significance	P value
Operative time (min)	60.94±5.07	97.01±11.23	t=17.58	<0.001*
Length of part resected (cm)	72.15±8.91	72.07±13.59	t=0.19	0.73
Length from DJ (cm)	243.01±7.02	244.27±13.24	t=0.89	0.34
Postoperative fasting (days)	1.73±0.92	3.80±0.81	t=10.93	<0.002*
Hospital stay (days)	9.19±1.31	16.1±3.67	t=7.99	<0.002*

*P-value < 0.05.

Table 8 Comparison of complications between anastomosis and stoma operations

Complications	Stoma [n (%)] N=25	Anastomosis [n (%)] N=25	Test of significance (χ^2)	P value
Leakage	1 (4.0)	9 (36.0)	8.0	<0.002*
Wound infection	6 (24.0)	10 (40.0)	3.02	0.07
Postoperative Morbidity	6 (24.0)	5 (20.4)	0.20	0.7
Mortality	1 (4.0)	6 (24.0)	4.99	0.03*
Incisional hernia	3 (12.0)	5 (20.0)	1.20	0.3

*P-value < 0.05.

Table 9 Stoma complications in the stoma group patients

Stoma complications	*N*=25 [*n* (%)]
Excoriation	14 (56)
Parastomal hernia	2 (8)
Stomal retraction	1 (4)
Stomal gangrene	1 (2)
Electrolyte disturbance	10 (40)
Stomal prolapse	1 (4)

Table 10 Comparison of serum albumin between stoma and anastomosis operations

Serum albumin	Stoma (N=25)	Anastomosis (N=25)	test	Significance P value
At admission	2.89 ±0.19	3.11±0.18	t=1.09	0.23
1st day postoperative	2.71 ±0.23	2.78±0.21	t=0.50	0.62
5 days after oral intake	2.69 ±0.17	2.94±0.29	t=4.31	<0.002*

Discussion

Acute colonic perforation has a significant mortality rate (50–90%) that varies with factors such as origin, severity and duration of an ischemic portion, co-morbidities, and duration between the beginning of symptoms and the final diagnosis [4]. A surgical laparotomy is necessary in cases with suspected or confirmed intestinal gangrene. After resecting the diseased section with a 5-10 cm margin of safety, the remaining portion is either anastomosed or channeled to the anterior abdominal wall as an ileostomy [7].

It is usually necessary to completely remove the necrotic tissue when there is small bowel ischemia and subsequent alterations in the intestinal wall's morphology. It is recommended to use the main anastomosis whenever feasible. Since the same pathogenic process might impact some distant regions, relying only on stoma viability while creating a stoma could be deceiving.]13[

Infections at the surgical site, intra-abdominal collections, anastomotic failure, wound dehiscence, and death are among the postoperative consequences that are becoming more common after urgent surgeries. The progression of the illness, the site of the planned anastomosis, and the patient's health all have a part in the occurrence of a leak (tobacco, alcohol, and ASA; scores of 3 or more). There may be more weight if the risk factors are combined. Known risk factors for anastomotic failures include urgent surgeries and peritonitis.]15–13[

Proximal diverting stomas have a contentious track record when it comes to efficacy. Anastomotic failure prevention by proximal diversion has been the primary focus of most research investigations. Some have noted that proximal diversion just lessens the clinical impact of failures, rather than preventing them altogether [16]. Montedori et al. [17] conducted a comprehensive evaluation that indicated proximal diverting stoma should be considered a key component in preventing anastomotic failure and emergency reoperations.

After an emergency small bowel resection, stomas of the small intestine may be necessary in cases of intestinal ischemia, inflammation, or trauma. Quick and safe surgery that preserves as much intestinal length as feasible is required in these circumstances due to the clinical environment. Significant morbidity is associated with small intestinal stomas, mostly due to nutritional, electrolyte, and fluid imbalances. On top of that, reestablishing intestinal continuity

often necessitates a fresh anastomosis and careful dissection of the efferent and afferent portions.]13[

In this research, 50 instances with acute colonic perforation were included. The goal was to examine the care of these patients following removal of the gangrenous bowel segment using primary anastomosis and diverting ileostomy. Each patient was assigned to one of two groups: 25 patients had primary anastomosis and 25 patients had temporary diverting ileostomy.

The patients' average age was 53 years, and males made up the majority (33 instances, or 66% of the total). The features of patients with acute colonic perforation were the subject of another investigation. There were 117 reported instances, with 85 men and 32 women affected. Among them, 53 was the median age [18]. Concerning age and sex as risk factors, the current research found no statistically significant difference compared to the prior ones.

Atrial fibrillation, rheumatic valvular heart disease, infective endocarditis, and prosthetic valves are the known risk factors for embolic occurrences. Generalized atherosclerosis, hyperlipidemia, diabetes mellitus, and hypertension are among the most frequent risk factors for thrombotic events [19]. An additional list of risk factors includes being elderly, having chronic obstructive pulmonary disease (COPD), having had a splenectomy in the past, having issues with blood clotting, and using illicit drugs such as methamphetamine and cocaine.]20[

Patients with acute perforation in an Indian study also had a higher rate of comorbidities. Hypertension (28%), coronary artery disease(21%), and diabetes mellitus (17%) were among the comorbidities experienced by 66 individuals, or 56% of the total. cited as.]18[

In addition to the aforementioned comorbidities, this research also found instances of cardiovascular disease (43%), diabetes mellitus (40%), liver disease (40%), and hypertension (35%). There was no statistically significant difference in the frequency of these risk variables between the two groups when comparing them.

Between 25 and 30 percent of patients with perforation had acute arterial emboli, 20 to 30 percent had nonocclusive mesenteric ischemia, 6 to 9 percent had mesenteric venous thrombosis, and the other cases were caused by arterial thrombosis.]21[

Compared to the anastomosis group, the diversion group had significantly lower operating times ($P<0.001$). In addition, there was a shorter hospital stay and early oral intake in the diversion group ($P<0.001$). When compared to primary anastomosis, diversion permits early oral feeding and reduces hospital stay, according to several studies [18]. This is particularly true in cases of distal gastrointestinal anastomosis.

The most prevalent consequence for ostomates is peristomal cutaneous excoriation. Dermatologic issues are most prevalent in the immediate postoperative period while the ostomate learns how to properly care for their stoma, however skin irritation may happen at any point over the stoma's duration. Peristomal dermatitis affects as many as 70% of newly implanted ostomates, and it generally goes unnoticed by the patient. Parastomal hernias are thought to occur 30–50% of the time; however, different diagnostic methods, lengths of observation, and criteria make it difficult to determine the actual number.]24–22[

In diversion instances, the late-term stenosis and retraction of the stoma might approach 22%, even in situations of modest long-term ischemia. Patients with poorly mobilized stoma conduits or who are overweight may have nonischemic stomal retraction. Stomal stricture and/or retraction of varying degrees may be caused by necrosis and atrophy of the intestinal conduit, similar to ischemic colitis; the severity of the symptoms determines if surgical revision is necessary .]24[

Skin excoriation occurred in 14 instances (56%) of the ileostomy group, parastomal hernia in 2 cases (8%), stomal retraction and prolapse in 1 case (4% each), and stomal gangrene in 1 case (4 %). The two groups did not vary significantly with respect to postoperative wound infection or incisional hernia.

Researchers found that in situations of peritonitis, surgeons could do a primary resection and anastomosis with a commendable leak rate of 5.7% without resorting to proximal diversion. In addition to patients who were unstable or had impaired immune systems, individuals with fecal peritonitis were also not included in the study. Anastomotic failures were not thought to be independently correlated with peritonitis [25]. By lowering the failure rate and the need for reoperation, proximal diversion further lessens the therapeutic impact of failures. Proximal diversion adds morbidity, which is unfortunate. The readmission rate is 18%, with complications ranging from electrolyte problems and dehydration to mechanical issues, which may reach 30%. Ostomy closure also comes with a risk of complications, which may range from 15-20%.]17[

Electrolyte abnormalities often occur in 0.8 to 16.7 percent of cases. It usually takes 1–3 days after surgery for osteomates to start working. In addition to the persistence of bowel edema, excessive volume output may result from impaired fluid absorption over the mucosal surface. The bowel needs a few days to a few weeks to adjust after surgery. Patients are more vulnerable between the third and eighth day after surgery, when they are usually already home from the hospital [26].

Conclusion:

Surgeons and doctors have a difficulty when it comes to acute colonic perforation: how to identify the condition quickly and treat patients appropriately, particularly after surgery. After infarcted bowel resection, the surgeon must make the life-or-death choice of stoma or anastomosis, taking into account the patient's psychological and quality of life condition in the long run.

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