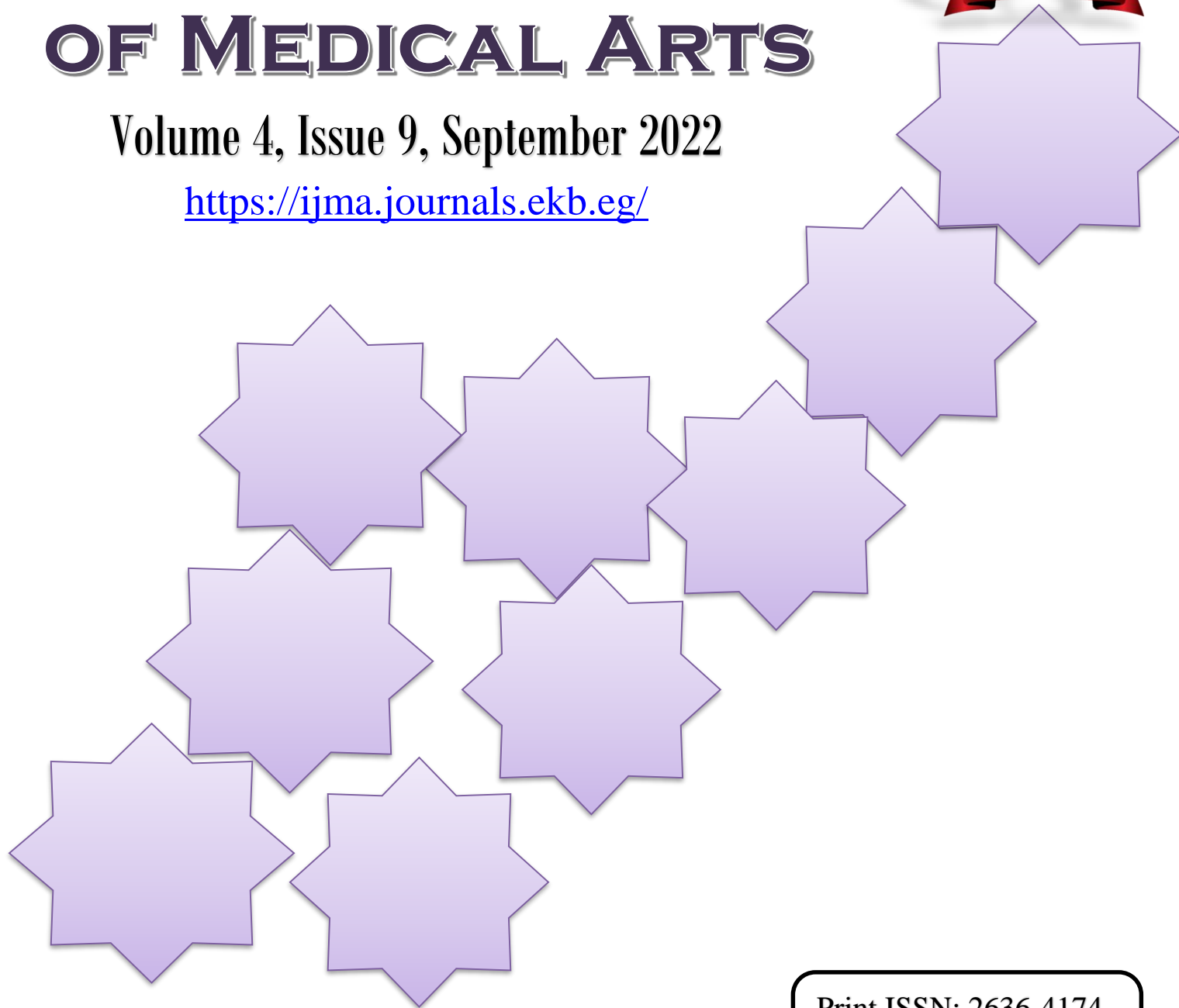


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## Original Article

# One Stage Versus Two Stages Surgery in The Management of Left Colorectal Emergencies

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## ABSTRACT

### Article information

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**Background:** Traditionally, primary colonic anastomosis is not performed in an emergency, however, there is a current tendency toward primary anastomosis in order to avoid a second hospitalization and a second operation to reestablish intestinal continuity

**Aim of the work:** This study aimed to evaluate the surgical results of one-stage versus multiple-stage surgery in patients with left colorectal crises.

**Patients and methods:** This prospective study was conducted on 30 patients. Fifteen patients agreed to have a one-stage primary anastomosis subtotal colectomy [group A]. Hartmann's technique was performed on the remaining 15 patients [group B]. Inoperable colorectal cancer and severe septic shock were exclusion criteria.

**Results:** Males outnumbered females in both categories. Colorectal cancer was the most prevalent cause in both groups, accounting for 16 cases. Postoperative complications in group A were two [10%] cases of wound infection, three [20%] cases of prolonged ileus, two [13.3%] cases of chest infection, two [13.3%] cases of anastomotic leakage, which were managed conservatively, and closed without the need of intervention within 3 weeks, whereas in group B, there were 11 [73.4%] cases with no complication, two [13.3%] cases had wound infection, and two [13.3%] cases anastomotic leakage after Hartman's reversal, which was also treated conservatively and closed without the need of intervention within 5 weeks. The operating time in group A was substantially less than in group B [ $161.87 \pm 28.015$  vs.  $252.53 \pm 28.648$  min;  $P < 0.001$ ]. Group A patients had a considerably shorter hospital stay than group B patients [ $10.53 \pm 1.959$  vs.  $19.93 \pm 4.114$  days;  $P < 0.001$ ]. There is no mortality in group A, but there is one instance in group B.

**Conclusion:** A one-step surgical technique Subtotal colectomy for left colonic crises eliminates the inconvenience of a phased operation Hartmann's technique while reducing morbidity and mortality and offering a shorter operational time and hospital stay overall.

**Keywords:** Hartman's procedure; Primary anatomists; Colorectal emergencies.



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## INTRODUCTION

Left-side colonic emergencies include obstruction, perforation, or bleeding in splenic flexure, descending, sigmoid colon, and rectum. The perforation is caused by either pathological [malignancy or inflammatory] or traumatic [1]. Large bowel disease complications account for 47 percent of gastrointestinal crises. Colon cancer presents as an emergency in around 30% of all patients [2]. Large bowel obstruction [LBO] is responsible for over 80% of colorectal cancer emergencies, with perforation accounting for the remaining 20%. The sigmoid colon is the most common location for colorectal cancer obstruction, as 75% of the tumors are distal to the splenic flexure. Roughly, 70% of perforations happen distal to tumor site, while 30% are proximal [2].

Colorectal cancer-induced obstruction and perforation of the colon and rectum is challenging to manage due to clinical severity, diagnostic and therapeutic options, and septic and oncologic consequences. Focused guidelines are generally confined to small areas within the broader colon and rectal cancer guidelines due to a lack of evidence and consensus [3,4].

The benefit of final therapy must be weighed against the risk of anastomotic leakage if suture lines are established under less-than-ideal conditions. Alternatively, while using an end colostomy necessitates a second procedure, an exposed suture line with the risk of breakdown is avoided. Numerous major retrospective and prospective investigations have now clearly proven that primary repair is safe and successful in almost all penetrating wound patients. Colostomy is still suitable in a few individuals, but the present quandary is determining which patients should get the operation [5].

Currently, decision-making is guided by the patient's overall physiologic condition rather than local considerations. Patients with severe left colon injuries that require damage control have a leak rate of more than 40% and may be candidates for a temporary colostomy. Another option for these high-risk individuals is to replace the ileostomy with a colostomy [6]. There are numerous approaches to managing a left colonic emergency, including resection with primary anastomosis [one step], resection with end colostomy [Hartmann's surgery], and emergency ileostomy [three stages] [7]. The best

surgical strategy for complex left colonic illness is still debatable. Hartmann's technique is becoming more popular as an alternative to the traditional three-stage process [8]. The patient benefits from this stepwise surgery. A second hospitalization and operation are necessary to restore intestinal continuity; a considerable number of individuals may never undergo Hartmann's procedure reversal [8]. One-stage resection and anastomosis offer various advantages, including saving time and money in the hospital, avoiding a second operation, and avoiding psychological problems and shame caused by a stoma [9]. The ideal therapeutic alternative would be a single stage operation that gives final therapy while avoiding the disadvantages of Hartmann's method [10].

## AIM OF THE WORK

The goal of this research was to assess the surgical results of one-stage versus two-stage surgery in patients with left colorectal crises.

## PATIENTS AND METHODS

**Study design:** We prospectively included 30 patients presenting with left colorectal emergencies and required colon surgery admitted to the General Surgery Department of Al-Azhar University Hospital in Damietta in the duration from December 2021 to July 2022.

**Study population:** The participants were divided into two groups, with 15 patients in each group: Group A: This group was managed by a one-stage surgical procedure, subtotal colectomy; Group B: This group was managed by a two-stages surgical procedure, Hartmann's procedure.

**Inclusion Criteria:** Age above 14 yrs, Patients with obstructed left colon, Patients with a perforated left colon [traumatic and pathological].

**Exclusion Criteria:** Children, Pregnant patients, Patients with contraindications to general anesthesia, Inoperable colorectal cancer, and Patients' profound septic shock.

**Ethical Considerations:** Before beginning field work, the Research Ethics Committee of Al-Azhar University's Faculty of Medicine authorized the study protocol. All patients provided written informed permission.

**Preoperative assessment:** [1] a complete medical history; [2] a general and systemic examination; [3] measurements: weight, height, BMI, and waist circumference [WC]; [4] Laboratory investigations: [CBC, Liver function test, kidney function test, ABG, INR, and electrolytes]; [5] Radiological assessment: Plain erect abdominal and chest X-rays, Abdominopelvic ultrasound, and computed tomography [CT] when necessary.

**Preoperative preparations:** All patients were assessed regarding general condition, urinary catheter, nasogastric tube, and resuscitated. Before the operation, all patients were assessed according to the American Society of Anesthesiologists [ASA] score. Parenteral Broad spectrum antibiotic therapy will be administrated.

### Surgical techniques

Perioperative anticoagulation and broad-spectrum antibacterial treatment were used during the surgery. Patients were often put in a modified lithotomy posture to allow access to the rectum if necessary. Prior to the incision, the surgeon was concerned about anesthesia and was prepared to provide more fluid resuscitation if necessary. Every laparotomy was conducted through a midline incision. The approach employed for on-table colonic lavage was identical to that reported before [5, 11]. The resected segment of the colon, as well as the splenic and hepatic flexures, were mobilized in the usual manner. In patients who had previous appendectomy, the cecum was linked with a 22-F Foley catheter that was inserted either via the base of the appendix or through an enterotomy in the terminal ileum. The left colon and its mesentery were mobilized and put in a plastic bag outside the abdomen, and a colostomy was performed. Colic irrigation was performed with normal saline serum at 37°C. Gentle colon manipulations make lavage easier. When the effluent was clear, the irrigation was turned off. The rectal stump was irrigated as well. The Foley catheter was then withdrawn, and the appendix stump or enterotomy was closed.

The intestine was anastomosed side-to-end after the distal colic section with the lesion was removed. The anastomotic method was chosen by the operating surgeon [hand suture or staple gun]. Anal insufflation of methylene blue dyed physiological Na Cl solution was used to assess the water tightness of the anastomosis. In HP,

the sigmoid was resected, followed by a rectosigmoid distal closure and construction of a left iliac colostomy. Warm normal saline [mean 10 l, range 7-12] was utilized to perform peritoneal lavage in all patients, and the Douglas pouch was always emptied. All patients were given broad-spectrum intravenous antibiotics before and after surgery. Pus was cultivated, and therapy was occasionally modified based on the results.

**Postoperative follow-up of Surgical outcome parameters:** Operative time, postoperative pain score, postoperative first passage of flatus [ileus], duration of hospital stay, postoperative morbidity and mortality within 30 days after surgery, wound and stoma complications, anastomotic leakage in one stage and its complications, general complications; chest infection, pulmonary embolism, psychological condition of patients.

**Statistical Analysis:** Data was gathered, tabulated, and statistically analyzed using an IBM compatible personal computer running the Statistical Package for the Social Sciences [SPSS] version 23 [SPSS Inc., 2015]. IBM SPSS Statistics for Windows, version 23.0, IBM Corp., Armonk, NY]. Numbers and, whereas quantitative data were expressed as mean [x], standard deviation [SD], and range [minimum-maximum], [2] Analytic statistics, such as the Student's t-test, are used to compare quantitative variables between two groups of regularly distributed data, whereas the Mann Whitney's test is used to compare quantitative variables between two groups of not normally distributed data. The Chi-square test was employed to investigate the relationship between qualitative variables. Fischer's Exact test was employed if any of the anticipated cells were fewer than five. Two-tailed probabilities were used to describe significant test findings. The significance of the observed results was determined at the 5% level [P > 0.05].

## RESULTS

The median age of Group A was 54, while it was 58 in Group B with no significant difference between the included groups regarding their age [p=0.720]. Among the studied patients, 12 [80%] were males in Group A; while 13 [86.6%] were males in Group B [p=0.624]. Regarding the distribution of patients regarding their pathological type of colonic emergency, both groups A and B consisted of 6

[40%] cases of obstructed left cancer colon, 4 [26.8%] cases of colonic injury, 4 [26.6%] cases of volvulus sigmoid, and 1 [6.6%] cases of complicated diverticulitis. Regarding HB, group A had a mean of  $11.80 \pm 1.521$  g/dl [range: 10–14 g/dl], whereas group B had a mean of  $11.73 \pm 1.387$  g/dl [range: 9–13 g/dl] [ $P = 0.901$ ], with no significant difference between both groups. Regarding albumin, group A had a mean of  $3.73 \pm 0.309$  g/dl [range: 3.3–4.3 g/dl], whereas group B had a mean of  $3.83 \pm 0.285$  g/dl [range: 3.3–4.2 g/dl], with no significant difference between both groups [table 1].

Radiological assessment of the included groups. No significant difference was observed between both groups regarding preoperative x-ray [ $P = 0.543$ ]. In group A, eight [53.3%] cases had multiple air fluid levels, three [20%] cases had bent inner tube sign ‘volvulus sigmoid’, and four [26.6%] cases had air under the diaphragm, whereas in group B, seven [46.8%] cases had multiple air fluid level, four [26.6%] cases had bent inner tube sign ‘volvulus sigmoid’, and four [26.6%] cases had air under the diaphragm. No significant difference between both groups was observed regarding preoperative abdominal US [ $P = 0.901$ ]. In group A, 7 [46.6%] cases had free-fluid collection intraperitoneally, and 8 [53.4%] cases had no free-fluid collection intraperitoneally, whereas in the second group B, 9 [60%] cases had free fluid collection intraperitoneally, and 6 [40%] cases had no free fluid collection intraperitoneally. Preoperative CT was done in a stable patient not diagnosed using radiography or US, with no significant difference between both groups [ $P = 0.935$ ]. In

group A. it was done in 8 cases, with 7 [46.8%] cases showing obstructing left colonic mass, 1 [12.5%] case of complicated diverticulitis, and 1 [12.5%] case of intraperitoneal fluid collection within the pneumoperitoneum. In group B. it was done in 8 cases, with 7 [46.8%] cases showing obstructing left colonic mass, 4 [50%] cases of complicated diverticulitis, and 2 [25%] cases of intraperitoneal fluid collection within the pneumoperitoneum [table 2].

Postoperative complications of the included groups. Postoperative complications in group A were two [10%] cases of wound infection, three [20%] cases of prolonged ileus, two [13.3%] cases of chest infection, two [13.3%] cases of anastomotic leakage, which were managed conservatively and closed without the need of intervention within 3 weeks, whereas in group B, there were 11 [73.4%] cases with no complication, two [13.3%] cases had wound infection, and two [13.3%] cases anastomotic leakage after Hartman’s reversal, which was also treated conservatively and closed without the need of intervention within 5 weeks [table 3].

Operative time and a hospital stay of the included groups and Mortality rate. Group A had a significantly lower operative time compared with group B patients [ $161.87 \pm 28.015$  vs.  $252.53 \pm 28.648$  min;  $P < 0.001$ ]. Hospital stay was also significantly lower in group A compared with group B patients [ $10.53 \pm 1.959$  vs.  $19.93 \pm 4.114$  days;  $P < 0.001$ ]. Group A had no mortality, whereas, in group B, one [6.6%] patient died of pulmonary embolism 6 days after surgery [table 4].

**Table [1]:** Demographic and clinical characteristics of the study group

Variables		Group A [n=15]	Group B [n=15]	P-Value
Age	Mean	53	54.33	0.720
	Median	54	58	
	Minimum-Maximum	20-69	21-60	
Sex	Female	3 [20%]	2 [13.4%]	0.624
	Male	12 [80%]	13 [86.6%]	
Types of Pathology	Obstructed left cancer colon	6 [40%]	6 [40%]	1.00
	Colonic injury	4 [26.6%]	4 [26.6%]	
	Volvulus sigmoid	4 [26.6%]	4 [26.6%]	
	Complicated diverticulitis	1 [6.6%]	1 [6.6%]	
Hemoglobin	Mean	$11.80 \pm 1.521$	$11.73 \pm 1.387$	0.901
	Range	10-14	9-13	
Albumin	Mean	$3.73 \pm 0.309$	$3.83 \pm 0.285$	0.364
	Range	3.3–4.3	3.3–4.2	

**Table [2]:** Radiological assessment of the included groups

Variables		Group A [n=15]	Group B [n=15]	P-Value
<b>X-ray</b>	Multiple air fluid level	8 [53.3%]	7 [46.8%]	0.624
	Bent inner tube sign [volvulus]	3 [20%]	4 [26.6%]	
	Air under diaphragm	4 [26.7%]	4 [26.6%]	
<b>Ultrasound</b>	Free Fluid collection	7 [46.6%]	9 [60%]	0.901
	No fluid collection	8 [53.4%]	6 [40%]	
<b>Computed tomography</b>	Not Done	7 [46.8%]	7 [46.8%]	0.935
	Obstructing left colon mass	6 [75%]	4 [50%]	
	Complicated Diverticulitis	1 [12.5%]	2 [25%]	
	Fluid collection with air under diaphragm	1 [12.5%]	2 [25%]	

**Table [3]:** Postoperative complications of the included groups

Variables	Group A [n=15]	Group B [n=15]	P-Value
<b>Wound infection</b>	2 [13.3%]	2 [13.3%]	<b>0.036</b>
<b>Prolonged ileus</b>	4 [26.6%]	0 [0%]	
<b>Chest infection</b>	3 [20%]	0 [0%]	
<b>Anastomotic leakage</b>	2 [13.3%]	2 [13.3%]	

**Table [4]:** Operative time and hospital stay of the included groups

Variables	Group A [n=15]	Group B [n=15]	P-Value
<b>Operative time</b>	161.87±28.015	252.53±28.648	<b>&lt; .001</b>
<b>Hospital stays</b>	10.53±1.959	19.93±4.114	<b>&lt;.001</b>
<b>Mortality rate</b>	0 [0%]	1 [6.6%]	0.309

## DISCUSSION

Surgical management of a left-sided large bowel emergency is still debatable. Primary reconstructive surgery is becoming increasingly popular. The fundamental issue continues to be optimal patient selection for primary anastomosis [11]. There are several methods for avoiding colostomy and related complications. With enhanced patient care facilities and antibiotic usage, surgeons are increasing including more primary colon repair [12]. Furthermore, new recommendations appear to favour one-stage treatments for malignant left-sided colonic blockage. As a result, focusing clinical research on the optimization of single-stage procedures is logical and important [13].

This study included 30 patients: 15 treated with primary anastomosis and 15 treated with Hartman's procedure. The median age of the included patients in Group A was 53 years [range: 20 - 69 years], whereas, in Group B, it was 54.33 years [range: 21–60] with no statistical differences between the two groups. This was agreed with the study by **Biondo et al.** [14] who reported that the median age for a left

colonic emergency was 57 years [range: 22–84 years]. It came in agreement also with the study done by **El-Din et al.** [15] who reported a median patients age of  $52.25 \pm 16.74$  years in group A [range: 18 -75 years], whereas, in group B, it was 56.50 [range: 22–80 years]; with no statistical differences between their two groups. So, the age of the patients was not considered an indication for surgery, for either one stage or multiple stages, but these ages in this study explained by that most of our cases suffered from left colonic emergencies which occur often in this age group.

In this study, the number of males patients exceeded the number of females patients in both groups, with 12 [80%] men and three [20%] women in group A, and 13 [86.6%] men and two [13.4%] women in group B, which is consistent with **El-Din et al.** [15] and **Arslan et al.** [16] findings. There was no significant difference in gender between the two groups, which is consistent with the findings of **El-Din et al.** [15]. The most prevalent cause of left-sided emergencies in both groups was colorectal cancer, in 12 [40%] cases and sigmoid volvulus in 8 [26.6%] cases, which is consistent with the findings of **Ibrahim et al.** [17].

We found that preoperative HB and albumin in group A had a mean range of  $11.80 \pm 1.521$  g/dl [range: 10–14 g/dl] and  $3.73 \pm 0.309$  g/dl [range: 3.3–4.3 g/dl], respectively, whereas group B had a mean range of  $11.73 \pm 1.387$  g/dl [range: 9–13 g/dl] and  $33.83 \pm 0.285$  g/dl [range: 3.3–4.2 g/dl], respectively. No significant difference between both groups was observed regarding both HB and albumin. This comes in agreement with **El-Din et al.** [15] findings, where he reported a mean range of HB and albumin in group A had a mean range of  $11.74 \pm 1.19$  g/dl [10–13.8 g/dl] and  $3.79 \pm 0.27$  g/dl [3.2–4.2 g/dl], respectively, whereas group B had a mean range of  $11.45 \pm 1.21$  g/dl [8.5–13.5 g/dl] and  $3.57 \pm 0.37$  g/dl [2.9–4.3 g/dl], respectively.

In all cases with volvulus sigmoid, plain radiographs were diagnostic. Plain radiography, however, was not diagnostic in cases of obstructed left colon cancer, which was consistent with **Ibrahim et al.** [17]. He found that plain radiographs were diagnostic in all cases of volvulus but not in cases of obstructed left colon cancer.

In our investigation, CT scanning was only performed on stable patients; CT delivers more information than plain radiography and US. The CT was performed on 16 patients in both groups, and it verified the diagnosis in 13 [81.25 percent] instances, which was virtually identical to **Ibrahim et al.** [17], who found that the CT validated the diagnosis in 91.7 percent of cases.

Leaks were discovered in 13.3 percent of Group A and Group B patients, but no surgical intervention was required. This was in contrast to **Ibrahim et al.** [17], who found the leak in just 6.5 percent of instances. Complications in group A included wound infection in two instances and chest infection in three; this was consistent with the research by **Montiel and Navarro** [18], whereas complications in group B included two cases with Wound infection complications, which was consistent with **Hipolito et al.** [19].

In our investigation, the average operating time in group A was 161.8728.015 minutes, which was close to the time reported by **Montiel and Navarro** [18], who reported a mean operative duration of 133 minutes [range: 90–180 minutes]. The mean operating duration in group B, however, was 252.5328.648 minutes, which contrasted with the research of **Oberkofler et al.** [20], where the mean operative

time was 383 minutes [range: 280–460 minutes]. In our investigation, there was a statistically significant difference between Group A and Group B, which is consistent with the findings of the **El-Din et al.** [15] study.

The hospital stay in our study was 10.531.959 days in group A, which was consistent with many other studies [15, 21, 22]. However, **El Dien et al.** [15] agreed that the hospital stay in group B would be  $18.85 \pm 5.55$  days. In terms of mortality, all patients in group A survived, which was consistent with the findings of **Montiel and Navarro** [18], but just one case [pulmonary embolism] survived in group B, which was consistent with **Park et al.** [21] and **Lengyel et al.** [22].

**Limitations of the study:** this study had some limitations: 1] the limited number of sample size, 2] it is a single-center study, 3] lack of randomization, so, a larger sample size from multicentric studies is warranted for a more definitive decision on management.

**Conclusion:** subtotal colectomy, a one-stage surgical method for left colonic crises, reduces the complexity of a phased operation Hartmann's procedure while raising morbidity and mortality and offering a shorter overall operating time and hospital stay.

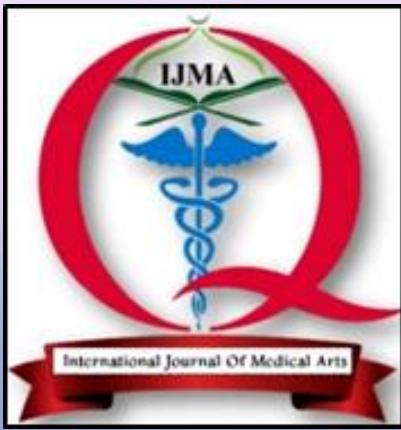
**Conflict of interest and Financial Disclosure:** None

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