Ghost Ileostomy Versus Conventional Loop Ileostomy in Patients Undergoing Low Anterior Resection for Rectal Cancer

Original Article

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ABSTRACT

Background: Ghost ileostomy, which may be opened with a quick surgery in the event that there are any indications of anastomotic leak. Several cases won't receive a "real" stoma as a result of this approach, but in cases who are experiencing anastomotic leakage, early conversion of the ghost ileostomy into a loop ileostomy is thought to be able to reduce the anastomotic leakage clinical effects to a level equivalent to that of a standard protective ileostomy.

Patients and methods: Randomized controlled study at the colorectal surgery unit at Ain Shams University Hospitals from November 2022 till November 2024 Simple Random Sampling of 20 cases for each group underwent elective Low Anterior Resection.

Results: Leakage occurred in 10% of cases in both groups without significant distinction between them. All cases in Group A (control group) 'conventional loop ileostomy' required another operation (Closure of ileostomy), whereas Group B 'ghost ileostomy' only included two cases, resulting in a highly significant distinction (*p-value* less than 0.001). With a very significant (*p-value* less than 0.001), the median hospital stay for cases in Group B was substantially longer at 8 days (IQR: 79-) than for those in Group A, which was 5 days (IQR: 56-). Group A saw a significantly greater rate of readmission to the emergency room (15%) than Group B (0%).

Conclusion: With no discernible distinction in postoperative morbidity or mortality, ghost ileostomy is a suitable alternative to conventional loop ileostomy for individuals receiving elective low anterior resection.

Key Words: Ghost ileostomy, low anterior resection, rectal cancer.

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INTRODUCTION

In terms of cancer-related fatalities globally, colorectal cancer continues to rank among the top three cancer locations. Because of its anatomical and physiological characteristics, the rectum is the main site of 30% to 40% of all colorectal carcinomas, necessitating particular therapeutic approaches[1]. Oncological resection, which is carried out as a sphincter-sparing technique in terms of low anterior resection with entire mesorectal excision whenever possible, continues to be the cornerstone of the multimodal treatment for rectal cancer.

Nevertheless, this procedure has the danger of anastomotic leakage, a potentially fatal consequence that has been documented to occur between 3% and 23% of the time in the scientific literature[2]. Anastomotic breakdown's aetiology is up for debate, and it is impossible to predict which cases will have this consequence. So some writers advise creating a protective ileostomy for individuals who are deemed "at risk".

To avoid or lessen the effects of anastomotic leaking, the majority of surgeons favor—and some guidelines even require—the creation of a diverting stoma[3]. However, the decision to routinely use a diverting ileostomy in all cases undergoing low anterior resection with total mesorectal excision must take into account stoma-related complications, such as peristomal abscess, parastomal hernia, or dehydration due to high-output stoma that results in acute kidney injury, as well as the necessity for a second operation, stoma reversal[4]. Additionally, an ostomy may affect long-term anorectal function and quality of life[5]. Four out of five cases undergo a loop ileostomy without a compelling necessity or perhaps needlessly, assuming a 20% anastomotic leakage frequency. Therefore, there is an urgent need for solutions for a more selective practice to minimize creating diverting ileostomies in these individuals.

For the first time, *Sacchi et al.* (2007) reported their "virtual ileostomy" approach, which is a pre-stage ileostomy that may be opened with a quick surgical

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operation if there are any indications of anastomotic leakage[6]. In contrast, early conversion of the "virtual" or ghost ileostomy into a loop ileostomy is thought to be able to reduce the clinical consequences of anastomotic leakage comparable to a routine protective ileostomy. As a result, a significant number of cases will not receive a "real" stoma.

METHODOLOGY

From November 2022 to November 2024, this Randomized controlled study was carried out at the Ain Shams University Hospitals' colorectal surgery unit. Cases who have had elective low anterior resection for colorectal cancer must be among the ages of 18 and 70, have written informed permission, and be able to comprehend the nature of the trial and its personal repercussions.

Ultralow rectal cancer (tumors necessitating intersphincteric resection, transanal coloanal anastomosis or colon pull through), the patient is not fit for operation and presence of multiple medical risk factors (cardiac problems, liver cirrhosis, renal failure and any medical problems with need of therapeutic anticoagulations) were excluded. Conventional Sample of 20 cases for each group were selected using Simple Random Sampling.

Every patient gave their written informed consent, all data were kept private, no patient's name appeared in any published paper, and cases had the freedom to refuse to be part of the investigation or to withdraw at any point without compromising their eligibility for traditional therapy. The ethical committee's approval was also obtained.

Study Procedures:

1. **Preoperative:** by evaluating the cases' age, sex, laboratory profile, and abdominal and pelvic imaging, such as MRI pelviabdomen, CT abdomen triphasic, basal tumour markers, and metastatic workup, which may include a whole body PET scan or a CT chest and bone scan. On the day before surgery, cases in the two groups had mechanical bowel preparation using polyethylene glycol solution based on local guidelines.

2. **Postoperative:** include the resumption of an oral diet following surgery, early mobilisation, and early oral intake beginning with liquids. Postoperative clinical treatment included scheduled blood tests on postoperative days one, three, five, seven, and nine, as well as on-demand testing dependent on the clinical course, and daily ward follow up with clinical evaluation. Depending on the cases' clinical progress, additional diagnostic procedures (such as CT scans and PAUS) were carried out as needed.

Postoperative leakage was suspected by tachycardia, hyperthermia, tachypnea, oliguria and mental status changes. Routine laboratory investigations may also reveal leukocytosis or increasing C-reactive protein.

Imaging was used to confirm leakage as PAUS can detect pelvic collection or pelvic abscess.

CT scan offers the advantage of defining the anatomy to allow for management planning. Intravenous contrast can be very helpful in identifying abscesses. Rectal contrast can be very useful in evaluating the colorectal anastomosis.

Surgical Approach:

Laparoscopy was used to get access to the abdomen. Bowel continuity reconstruction by descendo-rectostomy following low anterior resection with complete mesorectal excision was carried out in compliance with regional requirements.

The distal end of the descending colon's perfusion was evaluated by looking for obvious pulsing perfusion or pulsatile haemorrhage. The proper size of transanal circular stapling (29, 31 or 33 mm) was used to create a double-stapling anastomosis. Transanal air insufflation was used to assess the anastomosis's integrity after it was created. A patient will be randomly assigned to either ghost ileostomy or traditional loop ileostomy (control group) only if there is no technical issues during the surgery and no indications of leakage.

The terminal ileum was used to produce a ghost ileostomy twenty to thirty centimeters from the ileocecal valve. A vessel-loop has been used to hang up the terminal ileum loop through small window in the mesentery done carefully to avoid injury of feeding vessels just near to the ileal loop, and non-absorbable serosal stitch was used to identify the efferent ileal loop just distal to the mesenteric window. Next, the vessel-loop was sewn to the skin after being exteriorised through the stoma site, which is typically where a 5-mm trocar is inserted as seen in (Figure 1). To prevent clogging the lumen, care was used to gently draw the bowel loop along the abdominal wall.

Fig. 1: Ghost ileostomy.

Data Management and Analysis: The statistical software for social science (SPSS 27) has been utilized to update, code, tabulate, and present the gathered information on a computer. For each parameter, data was given and

appropriate analysis has been conducted according to the collected information type.

I. **Descriptive statistics:** For parametric numerical data, there are mean, standard deviation (± SD), and range; for non-parametric numerical data, there are median and interquartile range (IQR), as well as percentage and frequency of non-numerical data.

II. **Analytical statistics:** The statistical significance of the distinction among two study group means has been evaluated utilizing the Student T Test; the statistical significance of the distinction of a non-parametric variable between two study groups was evaluated using the Mann Whitney Test (U test); the relationship between two qualitative variables was examined using the Chi-Square test; and the relationship between two qualitative variables when the expected count is less than 5 in more than 20% of cells was examined using Fisher's exact test.

P- value: level of significance

- *P*>0.05: Non significant (NS).

- *P*< 0.05: Significant (S).

RESULTS

With regard to the type of ileostomy, 40 cases with colorectal cancer who had elective low anterior resection were split equally into two groups (Group A (control group): "Conventional loop ileostomy" and Group B: "Ghost ileostomy"). (Table 1) displays the gender distribution of the two groups; Group B has a slightly higher percentage of females (60%) than Group A (55%) as seen in (Figure 2), but the distinction is statistically insignificant (*p-value* equals 0.749). At 50.8 ± 11.46 years old, the mean age in Group A was somewhat younger than that of Group B, which was 54.55 ± 8.8 years old; nevertheless, the distinction was statistically insignificant (*p-value* equals 0.253).

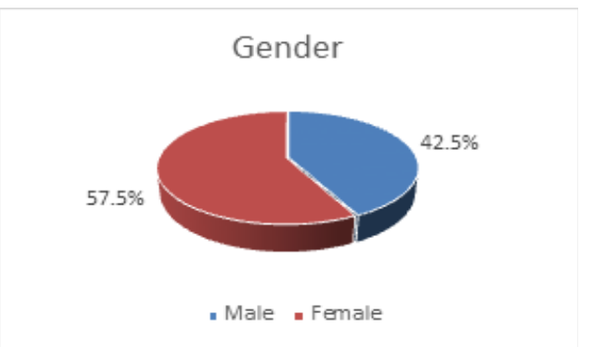

Fig. 2: Shows gender distribution among the whole study group.

Table 1: Demographic characteristics among two study groups.

		Total cases (Number = 40)	Group A (Conventional loop ileostomy) (Number = 20)	Group B (Ghost ileostomy) (Number= 20)	Test of significance		
		Number (%)	Number (%)	Number (%)	Test value	*p-value*	Sig.
Age	Mean ± SD	52.68 ± 10.26	50.8 ± 11.46	54.55 ± 8.8	t= -1.161	0.253*	NS
	Range	(26 - 68)	(26 - 68)	(36 - 66)			
Gender	Male	17 (42.5%)	9 (45%)	8 (40%)	X^2= 0.102	0.749**	NS
	Female	23 (57.5%)	11 (55%)	12 (60%)			

*Student t-test (t); **Chi-Square test of significance (X^2).

(Table 2) shows post-operative feeding between two study groups. A significant distinction in post- operative feeding was observed. All cases started with fluids on Day 1, but 90% of Group A transitioned to a free diet by Day 2, while none of Group B did. By Day 4, 90% of Group B were on a free diet as seen in (Figure 3).

Table 2: Post-operative feeding among two study groups.

		Total cases (Number = 40)	Group A (Conventional loop ileostomy) (Number = 20)	Group B (Ghost ileostomy) (Number = 20)	Fisher's Exact test		
		Number (%)	Number (%)	Number (%)	Test value	*p-value*	Sig.
Oral fluids	1st day	40 (100%)	20 (100%)	20 (100%)			
	2nd day	18 (45%)	18 (90%)	0 (0%)			
	3rd day	1 (2.5%)	1 (5%)	0 (0%)			
Free diet	4th day	19 (47.5%)	1 (5%)	18 (90%)	FE	<0.001*	S
	5th day	1 (2.5%)	0 (0%)	1 (5%)			
	6th day	1 (2.5%)	0 (0%)	1 (5%)			

*Fisher's Exact test of significance (FE).

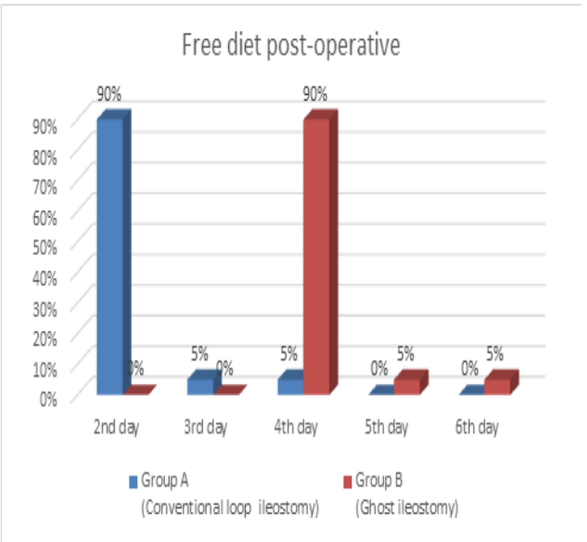

Fig. 3: Shows free diet post-operative among two study groups.

(Table 3) presents post-operative complications between two study groups. Leakage occurred in 10% of cases in both groups without significance distinction between them. However only one patient in group A required surgical intervention to manage leakage but in group B both cases developed leakage required surgical interventions.

Table 3: Post-operative complications among two study groups.

		Total cases (Number= 40)	Group A (Conventional loop ileostomy) (Number = 20)	Group B (Ghost ileostomy) (Number = 20)	Test of Significance		
		Number (%)	Number (%)	Number (%)	Test value	*p-value*	Sig.
Leakage	No	36 (90%)	18 (90%)	18 (90%)	FE	1.00*	NS
	Yes	4 (10%)	2 (10%)	2 (10%)			
Imaging	No	36 (90%)	18 (90%)	18 (90%)	FE	1.00*	NS
	Yes	4 (10%)	2 (10%)	2 (10%)			
Need for another operation	No	18 (45%)	0 (0%)	18 (90%)	X^2= 32.73	<0.001*	S
	Yes	22 (55%)	20 (100%)	2 (10%)			

Regarding post-operative imaging only 10% of cases had a positive finding.

All cases in Group A required another operation (Closure of ileostomy), while only 2 cases in Group B did yielding a highly significant distinction (*p-value* less than 0.001) as seen in (Figure 4).

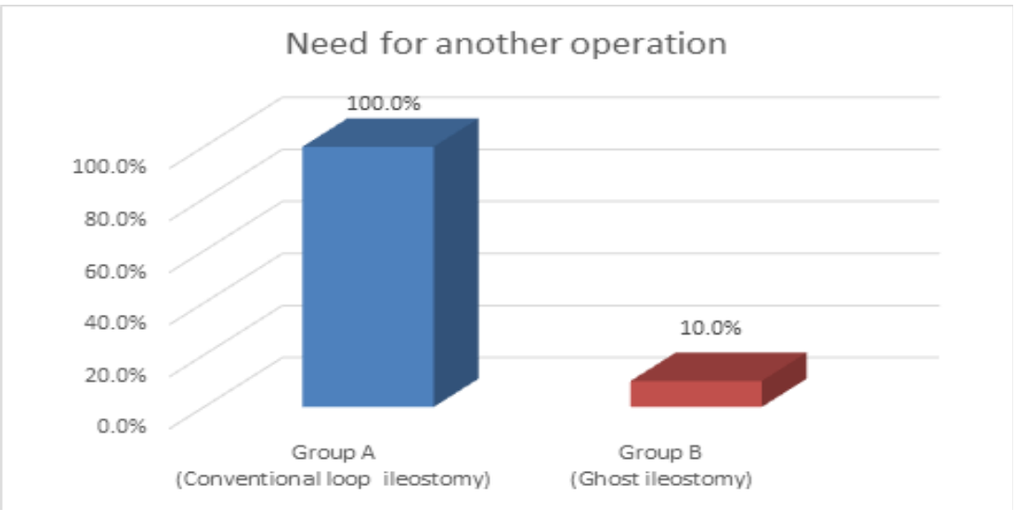

Fig. 4: Shows need for another operation between two study groups.

Hospital stay (days) and ED readmissions for the two research groups are shown in (Table 4). With a very significant (*p-value* less than 0.001), the median hospital stay for cases in Group B was substantially longer at 8 days (IQR: 7-9) than for those in Group A, which was 5 days (IQR: 5-6). This implies that cases in the ghost ileostomy group spent more time in the hospital than those in the covering ileostomy group. Regardless of whether there was leakage, cases in group A stayed in the hospital for 6–8 weeks, while those in group B stayed for 2 weeks.

Table 4: Hospital stay (days) and readmission to emergency department between two study groups.

		Total cases (Number = 40)	Group A (Conventional loop ileostomy) (Number = 20)	Group B (Ghost ileostomy) (Number = 20)	Mann-Whitney test		
					Test value	*p-value*	Sig.
Hospital stay (days)	Median (IQR)	7 (5 – 8)	5 (5 - 6)	8 (7 - 9)	-4.417	<0.001*	S
	Range	(5 - 56)	(5 - 56)	(7 - 14)			
Readmission to emergency department	No (N, %)	37 (92.5%)	17 (85%)	20 (100%)	FE	0.231**	NS
	Yes (N, %)	3 (7.5%)	3 (15%)	0 (0%)			

*Mann-Whitney test

Readmission to the emergency department was slightly higher in Group A (15%) compared to Group B (0%), but this was statistically insignificant distinction (*p-value* equals 0.231).

DISCUSSION

The most significant post-operative complication following colorectal surgery is anastomotic leaking, which may also be regarded as a significant quality indicator of the procedure[7]. Although protective ileostomies are thought to lessen the intensity of related symptoms, they do not considerably lower the leakage rate[8].

Many surgeons use the standard loop ileostomy procedure to minimise the risk of further problems from anastomotic leaking.

Notwithstanding the possible advantages of this strategy, a considerable number of problems arise, necessitating a further ileostomy closure surgery. Furthermore, ileostomy persistence is linked to a higher risk of morbidity. According to several studies, individuals who received ileostomies frequently did not require them[9].

The results of 20 cases who underwent conventional loop ileostomy and 20 cases who had ghost ileostomy have been compared in this investigation. Leakage occurred in

both groups at the same rate of 10%, hence no discernible distinction in morbidity has been observed among both groups.

Anastomotic leakage, which results from a compromised intestinal wall during colorectal anastomosis, is defined as a connection between intra- and extra-luminal components. Furthermore, any pelvic abscess close to anastomosis must be regarded as a leak, according to consensus standards[10].

The most often used diagnostic technique is the CT scan; other methods that might help diagnose leakage include contrast enema, endoscopic examination, and reoperation. On the seventh day following laparoscopic rectal cancer surgery, clinically substantial anastomotic leaking typically happens[11].

PAUS and CT pelviabdomen with contrast were used to identify and monitor leakage, although only 10% of cases obtained favourable results from post-operative imaging.

While surgical intervention is necessary for severe clinically significant anastomotic leakage, conservative measures such as fasting, nutritional support, anti-inflammatory medication, and fluid replacement may often address mild anastomotic leakage[12].

The two groups in our research had different approaches in managing leak. For example, in the instance of a conventional loop ileostomy, only one patient needed a secure line sutures at the leak site, whereas the other patient's leaking resolved on its own with follow-up.

However, the two leaky cases in group 2 needed surgery. One of them needed a ghost ileostomy to be converted to a routine loop ileostomy. Then two weeks later, after the patient's overall health and inflammatory markers improved, the disrupted portion of the stable line was sutured, and the loop ileostomy was closed later. The other one, fasciitis and a severe wound infection developed, necessitating substantial procedures such as drainage and debridement of the fasciitis and Hartman procedure was done. However, the patient did not want to do reversal of Hartman later.

Emile et al. presented the findings of their meta-analysis in 2022; the study's approach and breadth were similar to *Phan et al.'s*. A group of 946 cases was examined by the authors (489 cases had covering ileostomy and 457 cases did not). While there were no changes in death after operation, small intestinal obstruction, or operative site infection, the covering ileostomy group saw a decreased rate of statistically significant overall complications, anastomotic leakage, abscesses, and reoperations[13].

Postoperative fever, wound infection, and vomiting didn’t significantly differ among the two groups in our research.

Regardless of leakage, cases with ghost ileostomy had a prolonged postoperative hospital stay of two to three days.

A diverting stoma has been shown to be a risk factor for higher resource consumption and healthcare costs for cases with rectal cancer by *Floodeen et al.* and *Zenger et al.*[14].

Ghost ileostomy is marginally less expensive than conventional loop ileostomy because all cases who had conventional loop ileostomy needed to have their covering ileostomy closed, along with all associated complications. High-output ileostomies, in particular, could happen in five to twenty-five percent of cases after TME for rectal cancer with diverting loop ileostomy and could be responsible for up to 17% of readmissions after these procedures, which can cost up to $4000 per patient. Additionally, ileostomies can negatively impact a patient's quality of life if they are performed[15].

Vogel et al. recently performed a meta-analysis to determine the frequency of readmissions associated with dehydration after discussing the establishment of ileostomies. According to the authors, one-third of ileostomy cases experienced a readmission to the hospital (six percent) within thirty days, with dehydration being the primary cause[16].

The two groups in our investigation had different postoperative outcomes. For example, 15% of cases who had a typical loop ileostomy had a high output stoma and needed to be readmitted to the hospital.

Additionally, not all cases with typical loop ileostomy have their stoma surgically closed, and some cases need additional surgery, which carries a risk of complications[17]. The median duration to reversal is 30 weeks, and although it is recommended that ileostomies be closed in 10–12 weeks, this is not typically done[18].

CONCLUSION AND RECOMMENDATIONS

Ghost ileostomy may lessen the number of needless stomas and their effects, but it doesn’t lessen the incidence of anastomotic dehiscence.

It was shown to be an economical, simple, and safe procedure. The proper application of this procedure necessitates exact timing: exteriorisation of the ileal loop as soon as feasible if leakage happened, and early identification of leakage by routine use of drains, postoperative labs, or imaging.

With no discernible distinction in postoperative morbidity or mortality, ghost ileostomy is a suitable alternative to conventional loop ileostomy for individuals having elective low anterior resection.

There are certain restrictions on the current investigation. The statistical analysis was constrained by the small sample size, which also decreased the results' generalisability.

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