Post-right hemicolectomy ileostomy and mucous fistula through single skin opening: comparative study with ileostomy and mucous fistula through two skin openings

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Background
Right Hemicolectomy (RHC) is a common procedure for various right-sided colon pathologies; cancer colon or terminal ileum, perforated appendix with unhealthy cecal base, traumatic injuries and other less commonly indications. Ileo-colic anastomosis is the preferred next step following resection of the diseased segment, however, in certain situations, ileostomy (IL) and mucus fistula (MF) may be done due to excessive soiling or post-leakage of ileo-colic an astomosis or due to bad general condition of patient at this situation. Analternative approach can be done in such cases, which is the construction of aside-to side ileo-colic anastomosis which is then brought out in the right abdominal wall anastoma, so that reconstruction can be done with out midline laparotomy. Here, in our study we did a short term comparison between two groups of patients underwent ileosto my with mucousfistula.The first under went posterior wall anastomosis and the second without.

Aim of Study
Compare between Two groups of patients post RHC; one underwent IL&MF through single skin opening with posterior wall anastomosis and the other one did IL&MF through separate skin openings, regarding postoperative and restoration of continuity outcomes.

Patients and Methods
This is a retrospective cohort study. Data retrieved from the medical records of Ain Shams University Surgery Hospital medical records. Patients were divided into 2 groups according to the type of ileostomy and mucus fistula; Group A: underwent ileostomy and mucusfistula with posterior wall anastomosis. Group B: operated up on by ileostomy and mucus fistula without posterior wall anastomosis.

Results
Twenty-three patients underwent ileostomy and mucus fistula through single skin opening with posterior wall anastomosis, while 25 patients were through 2 skin openings without posterior wall anastomosis. No statistically significant difference between both groups regarding postoperative stoma-related complications. Restoration of continuity showed significantly more rate of wound infection in-case of ileostomy and mucus fistula through separate skin openings that's attributed to midline laparotomy.

Conclusion
Ileostomy and mucus fistula through single skin opening with posterior wall anastomosis, is associated with similar complications rate to separate skin openings ileostomy and mucus fistula, however, its less risk of wound related SSI along with its ramifications as wound dehiscence and incisional hernia, due to avoidance of midline laparotomy when restoring bowel continuity is a worthy advantage.

Keywords:
ileostomy, mucus fistula, right hemic, stoma

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Introduction

There are three main types of stoma: colostomy, ileostomy, and urostomy; a stoma may be temporary or permanent [1].

In severely ill patients, the aim is only to deviate the fecal stream followed by delayed resection and anastomosis [2]. An alternative in such a complex situation might be a split stoma with excision of the

disease followed by an anastomosis at some point in the future [3].

Split stomas are created when both ends of the bowel are brought to the skin surface, but at different incision sites. It could be following a subtotal colectomy or right hemicolectomy, in which the ileum is formed into an ileostomy and the rectum or the colon into a mucous fistula, and it is usually temporary in nature [1].

Anastomotic leakage following right colectomy for malignancy is a rare complication associated with high mortality and morbidity [4].

The therapeutic dilemma is between the construction of an ileostomy and mucous fistula and the construction of a new ileocolic anastomosis, which have significant disadvantages, that is, the need for a new laparotomy for restoration of continuity, quality-of-life issues, and the danger of a new leakage arising from the latter [5].

An alternative approach can be done in such cases, which is the construction of a side-to-side ileocolic anastomosis which is then brought out in the right abdominal wall as a stoma, so that reconstruction can be done without midline laparotomy [5].

Here, in our study, we did a short-term comparison between two groups of patients who underwent ileostomy with mucous fistula. The first underwent posterior wall anastomosis and the second without.

The purpose of the study is to do a comparative study of short-term outcomes of ileostomy and mucous fistula with and without posterior wall anastomosis for patients after right hemicolectomy done at Ain Shams University Hospitals in the period between January 2016 and July 2018 (two and a half years).

Figure 1

The circular incision and skin removal.

Patients and methods

This is a retrospective cohort study. Data of the patients were retrieved from Ain Shams University Surgery Hospital medical records. Approval of the Ain Shams University Surgical Institutional Ethical Committee was obtained and every patient was consented upon contributing in the study. The study population was all patients who underwent ileostomy and mucous fistula after right hemicolectomy for any pathology in the period between January 2016 and July

Figure 2

Exposure of the subcutaneous fat down to the anterior rectus sheath.

Figure 3

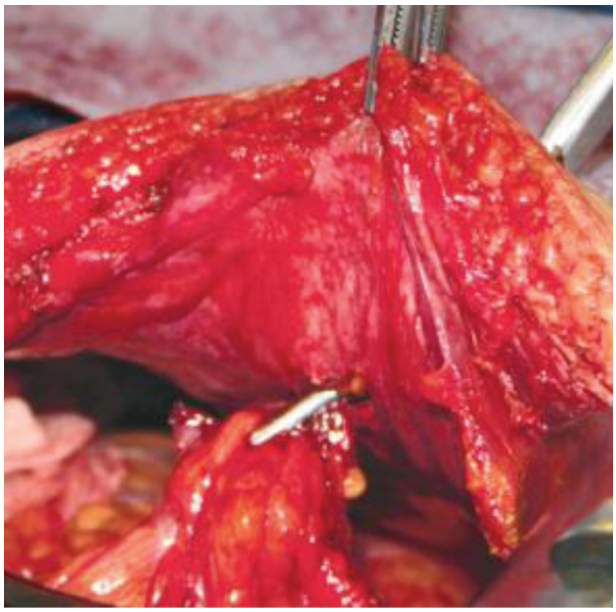
The opening in the abdominal allowing two average size fingers.

2018. All age groups and both sexes were included. We excluded patients who underwent right hemicolectomy for Crohn's disease as restoration of continuity has different leakage rate, which may affect our results. Moreover, patients with missed follow-up data or unclear information at medical records were also excluded.

The following data were collected from medical records for all patients: full clinical data, personal data, preoperative laboratory and radiological investigations, past medical and surgical history, operative findings, and postoperative data (start of stoma functioning, stoma complications, hospital stay, follow-up visits data, time to stoma closure, and the need for midline laparotomy for closure).

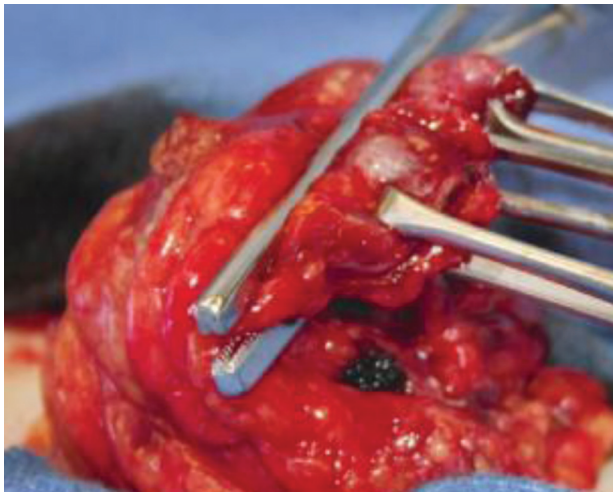
Patients were divided into two groups according to the type of ileostomy and mucous fistula: group A underwent ileostomy and mucous fistula with posterior wall anastomosis (both ends came out through a single stoma opening), and group B underwent ileostomy and mucous fistula without posterior wall anastomosis (both ends came out through two separate skin openings).

Figure 4



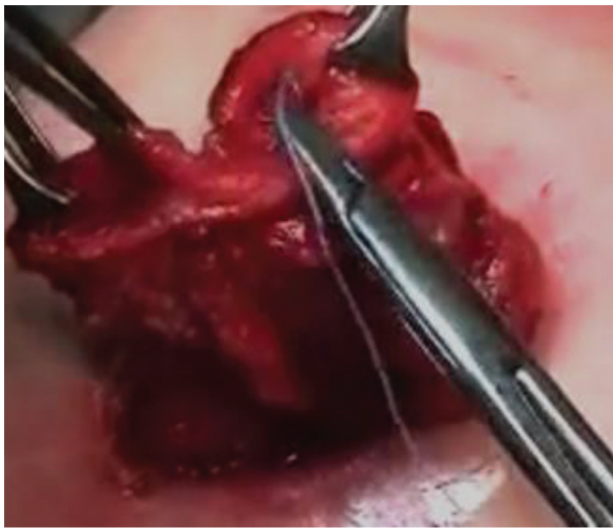
Delivering through the aperture.

Figure 5



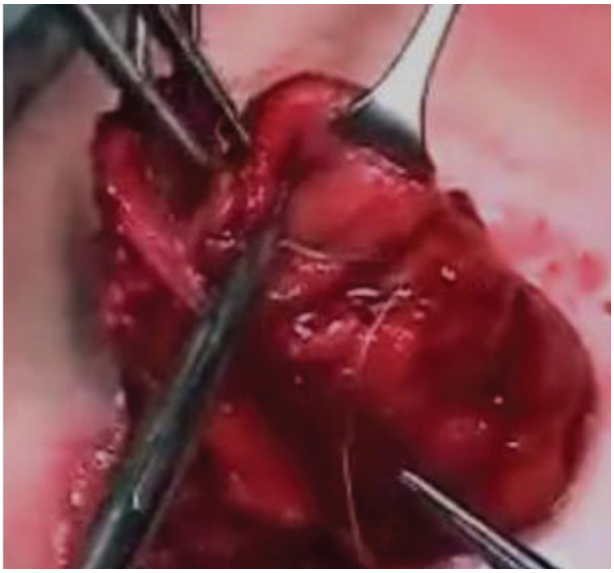
Both loops were outside the stoma opening.

Figure 6



Posterior wall anastomosis.

Figure 7

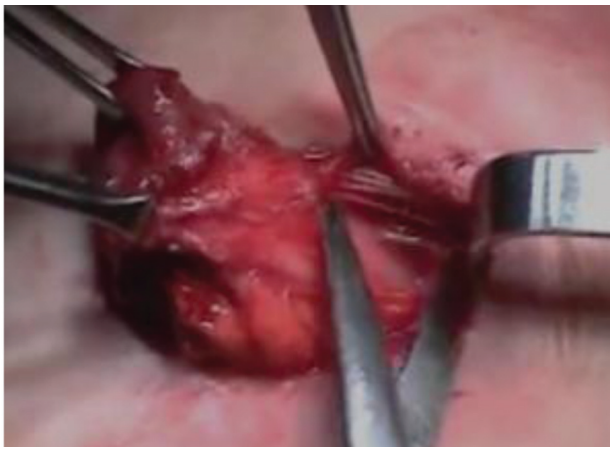


Posterior wall anastomosis.

Figure 8

The free edges of both bowel apertures fixed to skin with ileum directed down.

Figure 9



Division of subcutaneous adhesions.

Figure 10

After completion of anastomosis.

Figure 11

Gentle introduction of the anastomotic loop into the abdominal cavity.

Surgical techniques

Stoma construction

Ileostomy and (MF) mucus fistula through a single skin opening (with posterior wall anastomosis).

After adequate mobilization of the ileum and the colon, a circular incision, about 2 cm in diameter, was made at the designated site for stoma. The skin was removed, and the subcutaneous fat was preserved and divided with diathermy in a vertical direction (Figs 1 and 2).

The vertical incision was continued through the subcutaneous fat down to the anterior rectus sheath.

A cruciate incision was made in the anterior rectus sheath. Once the posterior rectus sheath was identified, a longitudinal incision was made through this layer and the peritoneum.

The opening in the abdominal wall should allow two average size fingers to pass easily. The aperture was then inspected from both the internal and external surfaces for bleeding, especially from the rectus muscle (Fig. 3).

The ileum and colon, mucous fistula, were then delivered through the aperture, avoiding tension, kinking, or torsion of the bowel.

The epiploica were carefully excised with electrocautery, and the mesenteric fat was thinned out to facilitate passage of the bowel through the abdominal wall, avoiding compromising the mesenteric blood supply.

After irrigation of the abdominal cavity and insertion of nelaton drain, the abdomen is closed. The colostomy now could be matured. Both edges of bowels were

Figure 12

Closure of rectus sheath.

Figure 13

Skin closure by mattress sutures.

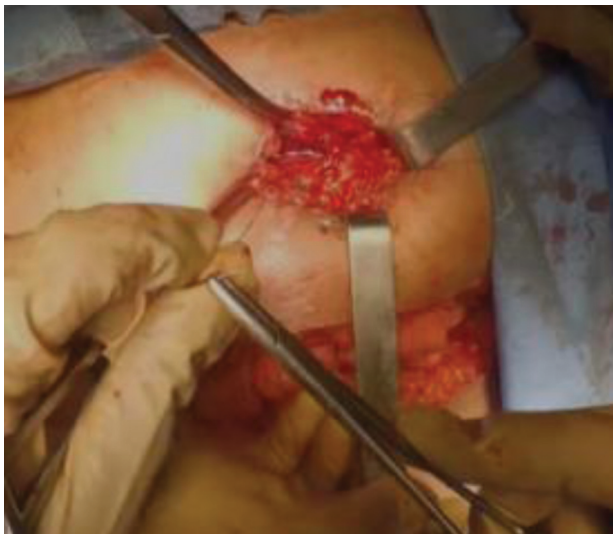
refreshed, and bleeding from the cut edges of the bowel was cauterized (Figs 4 and 5).

Posterior wall of ileum and colon were approximated and anastomosed by 4-0 vicryl suture, full-thickness, simple interrupted stitches. At the end of anastomosis, we get one side of the two bowel connected while the remaining circumference free (Figs 6 and 7).

After that, the free edges of the two bowel apertures were fixed to the skin with their edges everted outside and the proximal end, the ileum, directed downward.

Both edges were then everted using 3.0 vicryl sutures. Four-quadrant sutures were placed – typically beginning at the 2:00, 4:00, 8:00, and 10:00 o'clock positions. The sutures were placed full thickness through the bowel wall and then through the dermal layer of the skin. The sutures were not passed through the serosal layer of the bowel at

Figure 14



Closure of stoma after closure of midline incision.

skin level. Sutures were then tied, and additional sutures were placed circumferentially as needed (Figs 8 and 9).

Ileostomy and mucous fistula through two skin openings (without posterior wall anastomosis).

The same steps were performed as previous, but we created two openings, one for the ileum and the other for the mucous fistula, or in some cases from the same opening with skin bridge in between.

Restoration of continuity

The interval of stoma closure was widely variable, from 3 weeks to 3 months according to the pathology of colonic lesion and the general condition of the patient.

Positioning

The patient was placed in supine position on the operating room table.

Anesthesia

General anesthesia technique was used in all cases.

Ileostomy and mucous fistula through a single skin opening (with posterior wall anastomosis).

A circumferential incision was made on the skin 2–3 mm around the mucocutaneous junction.

The skin edges are grasped and elevated, and the subcutaneous adhesions divided (Fig. 10). Near the fascial layer, one or two fingers were placed from the outside surface to guide entry into the

Figure 15

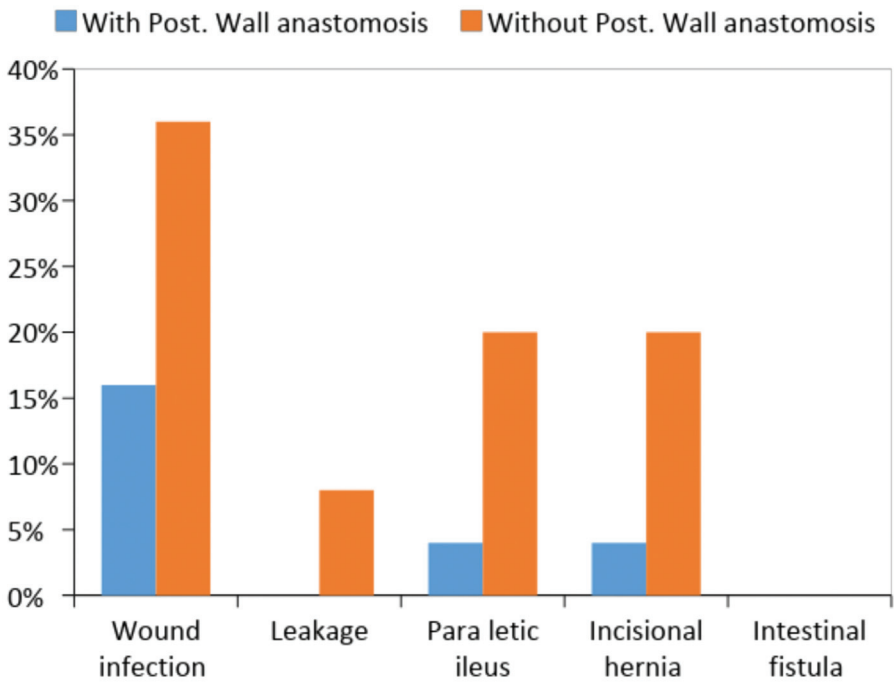


Chart showing the comparison between ileostomy and mucous fistula with and without posterior wall anastomosis according to complications (second operation after closure).

Table 1 Comparison between with and without posterior wall anastomosis according to comorbidities

Comorbidities	With posterior wall anastomosis (*N*=25) [*n* (%)]	Without posterior wall anastomosis (*N*=25) [*n* (%)]	χ^2	*P* value
HTN	5 (20)	3 (12)	0.149	0.699
DM	4 (16)	2 (8)	0.189	0.663
RF	2 (8)	4 (16)	0.189	0.663
LCF	4 (16)	3 (12)	0.010	0.920
Cardiac	0 (0)	1 (4)	0.014	0.905

DM, diabetes mellitus; HTN, hypertension; LCF, liver cell failure; RF, renal failure.

Table 2 Comparison between with and without posterior wall anastomosis according to pathology

Pathology	With posterior wall anastomosis (*N*=25) [*n* (%)]	Without posterior wall anastomosis (*N*=25) [*n* (%)]	χ^2	*P* value
Cancer colon	10 (40)	5 (20)	1.524	0.217
Perforated appendix	5 (20)	4 (16)	0.008	0.927
Intestinal tuberculosis	0 (0)	1 (4)	0.014	0.905
Gun shot	4 (16)	3 (12)	0.003	0.959
Perforating trauma	3 (12)	4 (16)	0.003	0.959
Colonic/ diverticular abscess	2 (8)	4 (16)	0.189	0.663
Typhlitis	0 (0)	1 (4)	0.014	0.905
Postanastomotic leakage	1 (4)	3 (12)	0.272	0.602

peritoneum. Care must be taken on the mesentery and blood supply. Once the mobilization was completed, both bowel lengths were checked to ensure that it was adequate for a tension-free anastomosis. Once there was redundancy, no further mobilization and the anastomosis was performed.

End-to-end anastomosis was done using continuous 4-0 vicryl sutures and then interrupted seromuscular sutures (Fig. 11).

After that, we introduce the anastomotic portion into abdominal cavity (Fig. 12). For the stoma aperture to be closed, the fascial layer needed to be mobilized from the subcutaneous fat before it was closed with interrupted vicryl sutures.

The subcutaneous tissue was irrigated, and inverted 3.0 vicryl sutures were placed in the dermal layer. The skin was closed with proline mattress sutures or some times by a stapler (Figs 13 and 14).

Ileostomy and mucous fistula through two skin openings (without posterior wall anastomosis):

Almost all cases were done by mini-laparotomy, especially in two widely separate openings, or large oblique circumferential incision around stoma aperture.

Table 3 Comparison between with and without posterior wall anastomosis according to complications (first operation)

Complications (first operation)	With posterior wall anastomosis (*N*=25) [*n* (%)]	Without posterior wall anastomosis (*N*=25) [*n* (%)]	χ^2	*P* value
Peristomal irritation	10 (40)	10 (40)	0.000	1.000
Peristomal injection	12 (48)	10 (40)	0.081	0.776
Stomal retraction	1 (4)	3 (12)	0.272	0.602
Parastomal hernia	3 (12)	2 (8)	0.003	0.953
Intestinal fistula	1 (4)	2 (8)	0.005	0.942
Parastomal Leakage	2 (8)	1 (4)	0.005	0.942

Once the peritoneal cavity was opened, any adhesions were lysed. Both loops were identified from inside the abdominal cavity. Both edges were dissected from skin and subcutaneous tissue. Once the dissection and the mobilization were completed, we perform trimming of both edges, and the anastomosis was done either hand-sewn or stapled.

Then we closed the stoma aperture, as previously mentioned, and closed the abdominal wall after insertion of intra-abdominal drain (Fig. 15).

Results

A total of 57 patients underwent ileostomy and mucous fistula for various pathologies. They were recruited through the review of medical records of Ain Shams University Surgery Hospital in the period between January 2016 and July 2018. Nine patients were excluded (four missed follow-ups for stoma closure after primary procedure, three with unclear information about the primary procedure or the original pathology, and two diagnosed with Crohn's disease by specimen histopathology). The remaining patients (48) were sorted into two groups according to the type of stoma as follows: group A (23 patients with ileostomy and mucous fistula with posterior wall anastomosis through a single skin opening) and group B (25 patients with ileostomy and mucous fistula without posterior wall anastomosis through two skin openings).

Patients' demographics

There was no statistically significant difference between with and without posterior wall anastomosis regarding age (mean age, 39.6 and 38.3 for with and without posterior wall anastomosis, respectively, with *P*=0.77), sex (male represented 52 and 48% in with and without posterior wall anastomosis groups, respectively), or BMI (*P*=0.836).

Table 4 Comparison between ileostomy and mucous fistula with and without posterior wall anastomosis according to complications (second operation postclosure)

Complications (second operation posterior closure)	With posterior wall anastomosis (*N*=25) [*n* (%)]	Without posterior wall anastomosis (*N*=25) [*n* (%)]	χ^2	*P* value
Wound infection	4 (16)	9 (36)	4.663	0.047*
Leakage	0 (0)	2 (8)	0.521	0.471
Paralytic ileus	1 (4)	5 (20)	1.705	0.197
Incisional hernia	1 (4)	5 (20)	1.705	0.192
Intestinal fistula	0 (0)	0 (0)	0.000	1.000

Both groups showed no significant difference for the associated comorbidities as shown in Table 1, or for the original pathology that required resection, as shown in Table 2.

Stoma construction data

Twenty-three patients underwent ileostomy and mucous fistula through a single skin opening with posterior wall anastomosis, whereas 25 patients were through two skin openings without posterior wall anastomosis. Operative time was not statistically significant difference between both groups (*P*=0.768) with mean operative times in minutes of 146±3 and 162±4 for with and without posterior wall anastomosis, respectively. Stoma-related complications are shown in Table 3.

Restoration of continuity data

Closure of stoma was done at variable time intervals after stoma construction. The two groups showed statistically significant difference (*P*=0.037) in operative time in favor of the group with posterior wall anastomosis (88±4 min) over the group without posterior wall anastomosis (170±3 min). Despite the rate of postoperative (stoma closure) local complications being higher in the group of ileostomy and mucous fistula without posterior wall anastomosis, only wound infection was statistically significant (*P*=0.047), as shown in Table 4.

Discussion

There are many predisposing risk factors for the development of stoma-related complications based on three main categories: patient, operation, and disease-specific issues. Commonly reported patient-

specific parameters include age, gender, BMI, nutritional status and comorbidity. The stoma creations in emergency increase the complication rate and the type of stoma may also affect the result. Malignancy, obesity, and comorbid disease also increase the complication rate [6].

Our patients have most of these risk factors; some were elderly, some of them had malignancy, and the creation of the stoma in patients was performed in edematous, fragile bowel with short mesentery.

During pre-closure waiting period, an imaging test or endoscopic evaluation was performed to check the integrity of the distal bowel. We do not recommend any stoma reversal without checking distal bowel integrity, although some authors report that it is not strictly necessary in all cases [7].

Parastomal hernia is an incisional hernia that forms in relation to a stoma. They are uncommon in the early postoperative period ranging from 0–3% which goes with the results of our study. However, it's more common with longer follow-up periods ranging 14.1–40%. Recent studies showed that risk factors that help to develop parastomal hernia are similar to those for other abdominal wall hernias [8–10].

Incidence of stomal prolapse is variable in literature and differs according to the type of exteriorized bowel loop and its configuration. Ioop ileostomies have higher rates of prolapse where it its around 2% in loop ileostomies while its 16-19% in loop colostomies [11–13]. At our study, we exteriorized 2 bowel ends through a single opening with posterior wall anastomosis to act like loop stoma (proximal limb is ileal and distal limb is colon). We found 3 cases (12%) of stomal prolapse mainly of the distal limb of the stoma, this rate is less than the before mentioned rate of prolapse in loop colostomies and greater than that in loop ileostomies. However, it's still of non-significant difference when compared to end stomas performed at same study. We don't fix the the bowel wall or mesentery to the fascia, although it's suggested in some studies as a preventive measure [14], but remains controversial.

We had 1 case of stomal retraction (4%) when posterior wall anastomosis done. We attribute it to an affected vascularity to the ileal limb due to extensive inflammation that may had led to thrombosis at feeding vessels with subsequent shrinkage of mesenteric root and retraction. There was no significant difference when compared to ileostomy and mucous fistula through separate skin openings. Revising literature, The overall incidence of stomal retraction ranges from 1.4 to 9% [12,15,17–19] and may affect both ileostomies and colostomies [20,21]. Although most studies have identified retraction as a common early complication, it can also develop in the late postoperative period. Recent prospective studies show that retraction, in comparison to other complications, is one of the most commonly encountered (32.2–40.1%) [19,22].

Stoma closure is associated with various related complications. At our study, we had a statistically significant difference regarding wound infection rate in favor of our trialed technique of ileostomy and mucous fistula with posterior wall anastomosis (16% vs 36% for separate stomas). This goes with our hypothesis that long midline incision is susceptible to more wound related complications rather than stoma site wound. In literature, Surgical site infections are frequent complications following stoma reversal and are reported to occur in 2 to 41% of patients [9,23,24]. Wound infection after stoma closure can have significant ramifications such as wound dehiscence, incisional hernia, longer hospital stays, and increased hospital costs. A systematic review of 1,613 patients evaluating incisional hernia either at midline or at the stoma site following stoma reversal identified a median of 8.3% for stoma site incisional hernia and 44.1% for midline incisional hernia [25].

Conclusion

Ileostomy and mucous fistula through a single skin opening with posterior wall anastomosis is associated with similar complications rate to separate skin openings, ileostomy, and mucous fistula; however, its less risk of wound-related SSI along with its ramifications as wound dehiscence and incisional hernia, owing to avoidance of midline laparotomy when restoring bowel continuity is a worthy advantage.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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