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Prevention of a Parastomal Hernia with A Prosthetic Mesh in Patients Undergoing Permanent End-Colostomy

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ABSTRACT

Background: Parastomal hernia (PSH) is a frequent complication of end-colostomy following colonic cancer surgery. Putting a prosthetic mesh around the stomal opening is thought to decrease the incidence of parastomal hernia without an increase in the incidence of infection or other complications.

Objectives: Our objective was to evaluate the efficacy of putting prosthetic mesh during end-colostomy to prevent parastomal hernia.

Patients and Methods: One-hundred and four cases of colonic cancer at Menoufia University Hospital, Damanhour Oncology Center and Damanhour National Medical Institute were selected based on clinical diagnosis, ultrasonographic and laboratory findings for colonic cancer. They were divided into two groups: **Group A**; 52 patients of colonic cancer with end colostomy and **Group B**; 52 patients of colonic cancer with end colostomy and mesh enhancement. After positioning the stoma opening and its creation, we started to tailor the mesh and after tailoring; applied the mesh on the rectus sheath around the stomal end "subcutaneous, prerectus".

Results: There was no statistically significant difference between patients of both groups regarding age or gender, family history of colonic cancer, tumor size, investigations, presence of ascites, length of the specimen, tumor stage, hospital stay, ICU admission, complications, early follow-up. While there was significant reduction in PSH and prolapse in mesh group.

Conclusion: We can conclude that the use of mesh around the stoma opening can prevent complications especially prolapse and parastomal hernia.

Keywords: End-colostomy, Parastomal hernia, Prosthetic mesh.

INTRODUCTION

Ostomies are frequently created as diversionary treatments for gastrointestinal cancers. When the anorectum is excised due to malignancy (abdominoperineal resection), permanent ostomies are necessary [(1-3)].

Even while contemporary surgical treatments for colorectal malignancies more frequently emphasise restoring gastrointestinal integrity with or without proximal diversion, the creation of a permanent end colostomy is still required for specific disorders. All stomas are situated in the muscle of the rectus abdominis. The most prevalent adverse surgical outcome after the establishment of an end colostomy is a parastomal hernia. The fascial defect created when the ostomy was performed causes a ventral hernia known as a parastomal hernia. The likelihood of developing a parastomal hernia was significantly minimised by the use of preventive mesh. Other postoperative outcomes, including 30-day postoperative morbidity, 30-day postoperative mortality, colostomy necrosis, colostomy stenosis, and superficial skin infections (SSIs), were comparable between patients receiving prophylactic mesh and those who did not [(4)].

A parastomal hernia is one of the often-occurring adverse effects of a persistent stoma. With end colostomies having the highest occurrence (4–48%) and end ileostomies having the second-highest frequency (1.8–28.3%), the probability of developing a parastomal hernia varies based on the kind of stoma. Among the risk factors for patients include obesity, poor nutrition, steroid use, advanced age, and high intra-abdominal pressure. Bulging, pain, obstruction, confinement, and trouble attaching an appliance are all indications that a parastomal hernia has to be surgically corrected [(5,6)].

In addition to negatively affecting patients' quality of life (QoL), parastomal hernias are also associated with a number of potentially deadly adverse effects, including intestinal obstruction, confinement, and strangulation. In addition, recurrence rates for parastomal hernia repair generally range from 15 to 30% [(7)].

The majority of earlier randomised controlled studies revealed that using surgical mesh as a prophylactic intervention decreased the likelihood of parastomal hernia [(6,8)].

Given the fragile abdominal wall, the necessity to utilize meshes in a polluted environment, and occasionally the requirement to entirely re-site the stoma, surgical treatment of these hernias can be difficult. In certain instances, conservative therapy is even recommended above surgery for high-risk individuals with co-morbidities. The best ways to treat parastomal hernias (PSH), the best mesh to use, and the best fixation method are still up for debate, and methodological flaws plague the research that compares different approaches. Furthermore, there is no established symptom threshold for intervention. The emphasis has been on prevention, especially with the use of prophylactic mesh during index surgery [(9)].

Although there is no set protocol, mesh repair has been shown to have a lower recurrence rate than

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initial repair, and the mesh can be placed intraperitoneally, preperitoneally, or on the fascia onlay. The most often mentioned intraperitoneal mesh repairs are keyhole and modified Sugarbaker procedures. The hernia opening and raised intestine are both extensively covered by one mesh in the modified Sugarbaker procedure, which is a variant of the technique first described by Sugarbaker in 1980. The raised bowel is inserted through a central hole in the keyhole procedure, and the mesh is then fastened to the abdominal wall [(6)].

The purpose of this study was to assess patient outcomes with and without a prosthetic mesh in the prevention of parastomal hernia in patients having permanent end-colostomy.

PATIENTS AND METHODS

In this prospective randomized controlled cohort research, 104 colorectal cancer patients who underwent open surgery also chose to have a permanent end colostomy. Over the course of a year, surgeries were performed at Menoufia University Hospital, Damanhour Oncology Center, and Damanhour National Medical Institute.

All of the patients who underwent open colorectal surgery, including the construction of a permanent end colostomy (cancer colon, cancer rectum), patients aged 20 to 70, and patients with anorectal cancer were included in our study.

Patients with poorly managed diabetic mellitus, those with hypoproteinemia, those younger than 20 or older than 70, those with immunosuppressive status, and heavy smokers were all removed from the study groups.

The patients were split into two groups:

Group A included 52 colorectal cancer patients who underwent traditional stoma surgery without mesh, and **Group B** included 52 colorectal cancer patients who underwent "the intervention group" procedure, which involved creating an end-colostomy by inserting a subcutaneous light-weight monofilament polypropylene mesh.

All research participants underwent:

A. Clinical evaluation, which included thorough history taking and clinical examinations to confirm patients' pathologies.

B. Laboratory testing, including blood chemistry, coagulation profile, liver function tests, renal function tests, and total blood count: blood glucose level is included, alkaline phosphatase (AP), C-reactive protein (CRP), tumor markers "AFP, CEA, CA19.9".

C. Imaging studies: included; (1) abdominal U/S, (2) abdominal CT examination, and (3) Abdominal MRI to assess the cases and their extent.

D. Instrumental studies: Colonoscopy for diagnosis and tissue diagnosis "biopsy".

E. Operative assessment of the two groups included operative technique (**Figs. 1-3**), operative time, and bleeding.

After positioning the stoma opening and its creation, we started to tailor the mesh. In our cases we used the propylene mesh, and tailored it in the form of button-hole around the stomal end "permanent stoma".

After tailoring; we applied the mesh on the rectus sheath around the stomal end "subcutaneous, prerectus"; fixed it with a simple suture with 4-5 sutures between the intestinal wall and the inner end of the mesh.

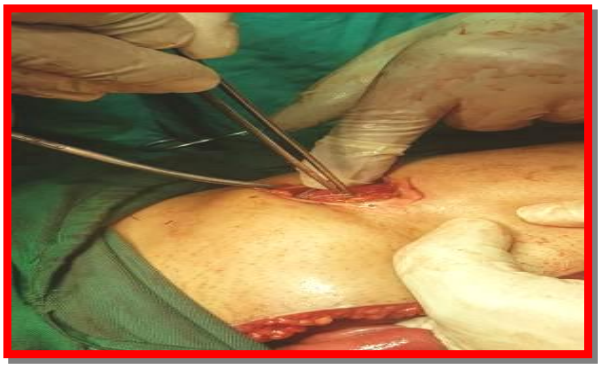

Fig. (1): Placing of the mesh during operation.

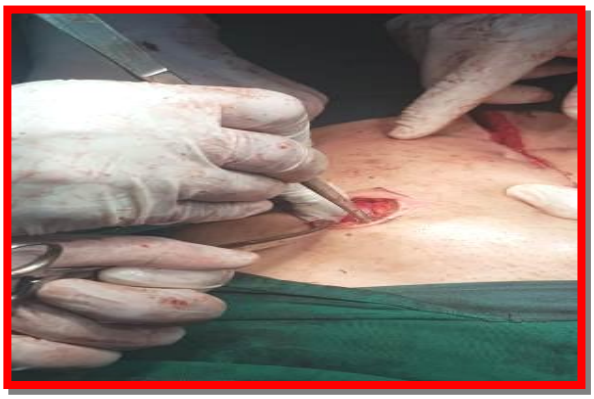

Fig. (2): Finally positioning of the mesh around the stoma.

Fig. 3: Final result.

Follow-up of patients in short term for one month postoperatively included: (1) Days of the a first flatus, day for first liquid diet, length of hospital stay and complications **(Figs. 4, 5)**; (2) Intensive Care Unit admission (patient admitted to ICU postoperatively at any time during hospitalization); (3) Postoperative morbidities (events that require additional treatment within 30 days from surgery); **while patients of both**

groups followed for detection of parastomal hernia occurrence, at which time after surgery, its complications, how to deal with it.

Fig. (4): A case of end-colostomy with PSH.

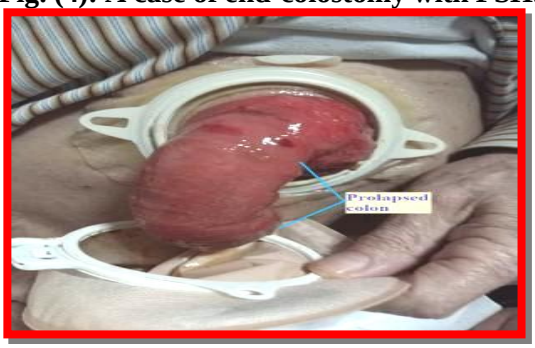

Fig. (5): A case of end-colostomy with prolapse through colostomy.

Ethical approval:

This experiment was ethically approved by the Faculty of Medicine, Menoufia University, and Damanhour National Medical Institute. All research participants and/or their family members received thorough information about the procedure and provided signed informed permission before the procedure. The study was conducted out in line with the Helsinki Declaration.

Statistical analysis

Version 20.0 of the IBM SPSS software suite was used to analyze the data. To represent qualitative data, frequencies and relative percentages were employed. To compare the differences between two or more sets of qualitative variables, the Chi square test (X^2) was utilised. Quantitative data were presented as mean±SD and range. A p value of less than 0.05 was regarded as significant.

RESULTS

No statistically significant differences between groups were found in age, sex, family history of colon cancer, tumor size, laboratory studies, and specimen length (Table 1).

Table (1): Demographic data of patients of both groups

Variable		Group (A) (n = 52)	Group (B) (n = 52)	P Value
Age (years):				
Min.-Max.		32-70	35-67	0.921
Mean±S.D.		53.20±11.1	51.80±10.7	
Sex:	Male (n/%)	32 (59.3%)	35 (67.3%)	0.581
	Female (n/%)	20 (40.7%)	17 (32.7%)	
Family history of colonic cancer				
Yes (n/%)		48 (92.3%)	50 (96.1%)	0.732
No (n/%)		4 (7.7%)	2 (3.9%)	
Tumor size				
Min.-Max (cm)		3.0-6.8	3.3-6.9	0.892
Mean±S.D.		4.79±1.192	4.87±1.339	
Investigations: Hb conc. (g/dL):	Mean± S.D	11.28±1.37	11.27±1.43	0.830
Platelet (mcL):	Mean± S.D	201.43±27.49	202.37±30.06	0.901
Serum Urea (mg/dL):	Mean± S.D	19.07±4.70	20.40±5.01	0.276
Creatinine (mg/dl):	Mean± S.D	0.86±0.15	0.79±0.16	0.071
AST (U/L):	Mean± S.D	36.83±8.03	33.07±8.13	0.097
ALT (U/L):	Mean± S.D	48.07±11.87	43.83±10.68	0.256
Serum Bilirubin (µmol/L):	Mean± S.D	0.76±0.18	0.80±0.19	0.722
Carcinoembryonic Antigen (CEA) (ug/L):	Mean± S.D	9.88±2.45	8.05±1.98	0.120
Ascites:	Yes (n/%)	47 (90.4%)	49 (94.2%)	0.658
	No (n/%)	5 (9.6%)	3 (5.8%)	
Specimen length (cm):				
	Min.-Max.	21.1-28.9	21.2-28.7	0.946
	Mean±S.D.	24.91±2.656	24.95±2.297	

*: Significant

There were no statistically significant differences between the two groups in tumor stage, the number of removed lymph nodes, hospital stays, and admission to the Intensive Care Unit. Admissions were made as a result of either severe septicemia. In terms of intraoperative blood loss, the first flatus day, and the first stool day, there were statistically significant variations in the groups' surgical outcomes. There were no statistically significant differences between the two research groups when it came to the occurrence of early complications. The study's participants were monitored for six months to look for signs of PSH. The rate of colostomy prolapse was statistically significantly lower in group B "mesh group" than in group A. Additionally, there was a statistically significant decrease in the rate of PSH in Group B "mesh group" compared to Group A (Table 2).

Table (2): Operative data of patients of both groups

Variable	Group (A) (n = 52)	Group (B) (n = 52)	P Value
Stage (n/%):			
Stage I	11 (21.2%)	14 (26.9%)	
Stage II	21 (40.4%)	22 (42.3%))	0.932
Stage III	20 (38.4%)	16 (30.8%)	
No. of L. Ns retrieved:			
Min.-Max.	9-28	7-25	0.514
Mean±S.D.	18.40±5.341	16.83±4.684	
Operative Time:			
Min.-Max.	130-255	140-260	0.495
Mean± S.D	194.83±31.91	189.00±33.85	
Time of resection only:			
Min.-Max.	65-90	74-103	0.314
Mean±S.D	72±22.5	81±21.7	
Intraoperative blood loss:			
Min.-Max.	54-148	80-175	**0.003***
Mean± S.D	108.43±24.35	128.73±25.58	
Days of the first flatus:			
Min.-Max.	1-4	2-5	**<0.001***
Mean± S.D	2.63±1.13	3.80±0.89	
Days for first stool:			
Min.-Max.	2-6	2-7	**0.036***
Mean± S.D	3.70±1.09	4.43±1.31	
Length of hospital stay:			
Min.-Max.	2-11	4-11	0.089
Mean±S.D.	6.43±2.144	7.33±1.845	
I.C.U admission (n/%):			
No (n/%)	46 (88.5%)	44 (84.6%)	0.552
Yes (n/%)	6 (11.5%)	8 (15.4%)	
Early complications:			
No	44 (84.5%)	46 (88.5%)	
Yes	8 (15.4%)	6 (11.5%)	
Wound infection	4 (4.4%)	4 (7.7%)	0.898
Intestinal obstruction	0 (0.0%)	1 (1.9%)	
Seroma of the wound	2 (3.85%)	1 (1.9%)	
Chest infection	1 (1.9%)	0 (0.0%)	
Urinary tract infection	1 (1.9%)	0 (0.0%)	
Delayed complications:			
Prolapse (n/%)	4 (7.7%)	1 (1.9%)	**0.021***
PSH (n/%)	2 (3.85%)	1 (1.9%)	**0.032***

*: Significant

DISCUSSION

11–69% of all colostomies experience one of the many problems associated with colostomies. Early consequences include stomal ischemia and necrosis, retraction, parastomal infection, skin difficulties, and issues related to improper stoma siting and occur in 22–68% of individuals. Up to 58% of individuals may experience late problems, which frequently include parastomal herniation, prolapse, stenosis, and skin issues [6,10].

Parastomal hernia, a frequent post-colostomy complication [11], occurs when the abdominal viscera protrudes via a hole in the abdominal wall close to the stoma. After repair, it has a significant recurrence incidence (15.7%) and is challenging to treat. PSH of the sigmoid colon through the abdominal wall and perineum is common after radical resection of rectal cancer. The prevalence of PSH is increasing as a result of the increased patient survival after this procedure; in severe cases, incarceration or intestinal obstruction may be deadly [12]. After low anterior rectal resections (LAR) with loop ileostomy (LI), the prevalence of permanent stomas (PS) may be more than 30%; in older patients, it may even be 50% [13,14].

In instances with a permanent colostomy, our study sought to assess the effectiveness of placing a mesh across the stomal aperture to prevent problems like prolapse and/or parastomal hernia.

A total of 104 patients had an open operation for the elective construction of a permanent end colostomy in this prospective randomized controlled cohort trial. Two groups of patients were randomly assigned. 52 colorectal cancer patients in Group A had standard stoma surgery without mesh. Group B: Fifty-two patients with colorectal cancer who were part of "the intervention group", in which an end colostomy was made and a lightweight monofilament polypropylene mesh was inserted under the skin of the prerectal muscle.

Age in our study's two groups did not differ, but it did fall within the worldwide range for colon cancer incidence. In their investigation, **De Robles and Young [11], Zeman *et al.* [14], Back *et al.* [15], Huang and his colleagues [16],** and **Jung and his colleagues [17],** discovered that there was no age difference between the groups, which is consistent with our findings. In their study, **Saied and colleagues [10]** discovered that the mean age of their patients was 55.88 years, which is consistent with our investigation.

Regarding sex distribution in our study, there was no gender difference between the groups. **De Robles and Young [11], Back *et al.* [15], Huang and his colleagues [16],** and **Jung and his colleagues [17]** found that there was no difference in the sex of the groups in their investigation concurred with our findings. In their investigation, **Saied and colleagues [10]** discovered that the men in the study group were more impacted, which was consistent with our results. **Zeman *et al.* [14]** discovered in their study that there was no difference in gender across the study groups, with a majority of men in each group, which is consistent with our findings.

Regarding the tumor stage's "percentage", there was no difference between the two groups in our study. In agreement with our findings, **Zeman *et al.* [14], Back *et al.* [15]** and **Jung and his colleagues [17]** discovered that there was no difference between the study's two groups in terms of the tumor category "tumor size and stage".

Regarding Laboratory Investigations, ascites, specimen lengths, tumor stage, and operation time, there was no statistically significant difference in our study. These give the study's comparison section more heft because the results are nearly identical in terms of technical feasibility.

Our research revealed that there was no change in the quantity and location of lymph nodes between the two study groups. **Back *et al.* [15]** reported that there was no difference between the cases of both groups in terms of the number and/or location of affected lymph nodes, which was consistent with our findings.

In our investigation, there was no statistically significant difference in the length of the specimen extracted between the two groups, which is consistent with the findings of **Jung and his colleagues [17]**.

Our research showed that group B operations took insignificantly longer time than group A, and that blood loss during surgery had no bearing on how long patients had to stay in the hospital after surgery. According to **Jung and his colleagues [17]** research, there was no statistically significant difference in the amount of operative time between the two groups, which was consistent with our findings.

In agreement with our study, **De Robles and Young [11]** reported that there was no difference in the length of postoperative hospitalisation between the group of patients with mesh repair and those without mesh.

With group B "Mesh group," late problems like prolapse or parastomal "PSH" significantly decreased in our research. In their study, **Styliński and his colleagues [18]** discovered that the use of prosthetic mesh, particularly when performed by skilled surgeons, reduces the likelihood of problems such as prolapse and/or PSH, which was consistent with our findings. Additionally, **Steinhagen and her colleagues [19]** research revealed that intestinal stomas were linked to an elevated risk of parastomal hernia, which was consistent with our findings.

Even in situations where the mesh wasn't employed, **Saied and colleagues [10]** discovered that the problems in their research were 16% for prolapse and 16% for PSH, which was inconsistent with our findings.

According to **Jung and his colleagues' [17]** investigation, there was a noticeably higher incidence of PSH in the colostomy group, which was consistent

with our findings. In agreement with our findings, **Ando and his coworkers** [6] determined in their investigation that using mesh during ostomy for cancer can lower the incidence of PSH. **Gillern and Bleier's** [20] study came to the same conclusion that adding mesh during colostomy surgery improves results and lowers the incidence of PSH, which was consistent with our findings. According to **Brandsma *et al.*** [21] study, surgical mesh repair for a parastomal hernia during surgery decreased PSH in the mesh group compared to the control group and did not increase infection rates, which is consistent with our findings.

In their meta-analysis, **Zhu *et al.*** [9] found that using preventive mesh at the time of primary colostomy construction is a potential strategy for preventing parastomal herniation. Although this method may not entirely avoid parastomal herniation, it may lower the occurrence of the condition over time without raising the risk of consequences. As a result, it can be the preferable choice for patients with permanent colostomies.

CONCLUSION

From our study we can conclude that the use of mesh during ostomies performance for colorectal cancer can prevent many of its complications especially prolapse and occurrence of parastomal hernia. So, we recommend its use during the performance of ostomies or cancer to prevent complications.

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