Comparative retrospective study between using mesh or not in iliostomy closure as a preventive method for incisional hernia

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Background and Aims: Stomal site incisional hernia is a complication following ileostomy closure, with rates about 40%. Because there were no previous studies undertaken to find a definite solution for it. Different preventive methods was studied to decrease the incidence of post-ileostomy closure incisional hernia. One of these methods was the usage of prophylactic mesh reinforcement mode of absorbable poliglecaprone monofilament fiber and non-absorbable polypropylene monofilament fiber) during ileostomy closure and study its role in prevention of stomal site incisional hernia without increasing the incidence of wound complications.

Aim of the work: Evaluating the importance of prophylactic mesh reinforcement during closure of ileostomy to prevent stomal site incisional hernia.

Methods: This was a retrospective study, included 40 Egyptian patients presenting for ileostomy closure. Half of them without mesh and the other half applied mesh at ileostomy site during closure. Patients of the two groups underwent ileostomy closure between February 2018 and March 2020 and then they had been assessed in the following two years for the occurrence of postoperative incisional hernias.

Results: Regarding the incidence of incisional hernia, 10 out of 40 patients (25%) in the current study developed incisional hernias. In group B (without mesh reinforcement) 8 patients (40.0%) developed incisional hernias, while in group A (with mesh reinforcement) 2 patients (10.0%) developed incisional hernias. Although there was trend for developing incisional hernia in patients without mesh reinforcement and the study shows significant result of incisional hernia reduction with mesh reinforcement during the first six months after closure (p=0.035), prophylactic mesh repair significantly reduce that incidence in the total follow-up period of the two years (p=0.028).

Conclusion: The study shows significant decrease of incisional hernia with mesh reinforcement during the first six months after closure. However, in the total follow-up period of the two years prophylactic mesh repair significantly reduce post-ileostomy closure incidence of incisional hernia, without significantly increasing the incidence of wound infection.

Keywords: Incisional hernia, Iliostomy closure, Mesh repair.

Introduction

Ileostomy refers to a stoma done by pulling the ileum onto the surface of the skin. Intestinal waste is collected in an external pouching system which is adhered to the skin.2

Ileostomy is used temporarily to protect a distal anastomosis such as in ileal pouch anal anastomosis or a low colorectal anastomosis. It is also used for fecal diversion from the distal anorectum as perianal Crohn's disease, anorectal cancer, diverticular disease, severe perineal trauma or sepsis, treatment of anastomotic and fecal incontinence.2

There is no significant difference in number of complications between early and late closure of temporary ileostomy, but there is significant difference in types of complications that occur where the early closure has more wound complications and not associated with increased morbidity and mortality while the late closure has significantly small bowel obstruction rates.3

The overall complication rate for ileostomy closure is ranging from 4.7% to 33.3%. And classified into early and late; early complications like wound infection, anastomatic leakage, bleeding, and death; late complications like incisional hernia, intestinal obstruction. There are other systemic complications that may occur as cardiorespiratory problems, pneumonia, deep vein thrombosis and urinary tract infection.4

Wound infection ranges from 1.7% to 18.3 for ileostomy closure and leads to wound dehiscence and incisional hernia.5

Incisional hernia is the most common late complication; with rates as high as 40 %. As the incidence of bowel cancer increases, more temporary ileostomies are needed and the complication is likely to increase.6

Preoperative and postoperative optimization limits the incidence of incisional hernias. The materials and technique used in abdominal wall closure are considered of the most important risk factors. That is why it is very important to optimize the surgical technique used in abdominal wall closure to prevent the patients from suffering from incisional hernias and the risks of their repair.7

The abdominal wall has moderate strength, three quarters of which resides in the aponeurosis and the rest in the muscles, peritoneum, and skin. Postoperative scar tissue is always weaker and reaches maximum strength about 80 days after the operation. However, if non-absorbable meshes are used, the process of integration is efficient by the tenth day, increasing until about day 35, when it becomes stable.8

Advantages of Mesh-reinforced ileostomy closure represents a simple and strategy to reduce the incidence of incisional
hernia with rates as high as 40% representing the most common late complication in ileostomy closure. Although not all patients with an incisional hernia require intervention, yet, medical co-morbidities and intra-abdominal adhesions render hernia repair, when needed. Therefore, it is important for hernia prevention strategies like having a prophylactic mesh application in ileostomy closure.9

Disadvantages of Mesh usage in ileostomy closure lie in that the closure site is associated with bacterial contamination because the intestine is open and there is a higher risk of wound infection, especially the onlay mesh applied above the anterior rectus sheath which might lead to seroma formation and wound infection that’s why a suction drain in that area should be placed, but the intra or preperitoneal mesh insertion has low incidence of wound complications but it involves intestinal complications as intestinal adherence and consequent fistulization which is considered a very dangerous complication.10

Therefore, there is an important need to study and compare between the benefits and risks of having a prophylactic mesh insertion during ileostomy closure.

**Aim of the work**

The aim of the study was to compare between the usage of mesh or not in prevention of stomal site incisional hernia.

**Patients and Methods**

**Type of study: Retrospective randomized study**

**Study setting:** This study was conducted on patients presenting for ileostomy closure in Ain Shams University Hospital (ASUH) and Benha University Hospital.

**Study Sample:** This study was conducted on 40 patients presenting for ileostomy closure. Half of them don’t apply and the other half applied mesh at ileostomy site during closure. The group of patients who have undergone the mesh reinforcement was named Group A and the group of control patients was named Group B.

**Study duration:** Patients of the two groups underwent ileostomy closure between February 2018 and March 2020 and then they had been followed-up for two years for the assessment of postoperative incisional hernias.

**Study populations:** Patients attending at Ain Shams University Hospital (ASUH) with the following criteria:

**Inclusion criteria:** Patients who have undergone abdominal surgeries who are having temporary ileostomies of any type and will need surgery for ileostomy closure.

**Exclusion criteria**

1. Patients with temporary colostomy of any type.
2. Patients for whom laparotomy was required for closure of their ileostomies.
3. Patients with comorbidities like diabetes Mellitus (DM), chronic liver and chronic kidney disease.
4. Immunocompromised patients.
5. Pediatric age group.

**Type of Patients**

This was a retrospective randomized study that included 40 patients of ileostomy closure procedure of age ranging 28 to 62 years old and from both sexes attending to the hospital. The patients were randomly selected into two groups each included 20 patients, first group underwent ileostomy closure with mesh reinforcement, the second group underwent ileostomy closure without mesh reinforcement.

**All the patients in the present study were subjected to the following:**

**Preoperative data**

**Data collection from the patients including**

1. Age.
2. Previous surgery undergone and when it was done and the indication for performing an ileostomy in it.
3. Time between the ileostomy formation and closure to be within 4-8 weeks.
4. Presence of any comorbidities which like diabetes nullities, obesity, hypertension, chronic renal disease and malignant patient receiving chemotherapy or radiotherapy might be risk factors raising the incidence of stoma site closure herniation.
5. History of any other previous operations.
7. Laboratory investigations including CBC, serum albumin level and coagulation profile.
8. Radiological investigations: Distal loopogram with gastrograffin enema, pelviabdominal CT with contrast.

**Operative technique**

1. All patients received prophylactic intravenous antibiotics (Maxipime 1 gm and flagyl 500 mg).
2. Upon general or spinal anaesthetic induction.
3. Sterilization was done.
4. Circumferential skin incision was done surrounding the ileostomy site and dissection was done from all abdominal wall layers till separation of the loops from edge of peritoneum and the ileostomy defect in the intestinal wall was sutured.
5. Following re-establishment of intestinal continuity and return of bowel back into the intraperitoneal cavity
6. Closure of the rectus sheath with continuous 0 polypropylene sutures.
7. The tissue plane just superficial to the aponeurosis surrounding the fascial closure was dissected with monopolar diathermy to allow onlay placement of a polypropylene mesh size cover about 5cm all around the defect. (Ultrapro, Ethicon, Johnson & Johnson). The Ultrapro mesh is manufactured from equal parts of absorbable poligleaprone -25 monofilament fiber. The mesh is a macroporous partially absorbable mesh offers strength with reduced the foreign body mass formation and reduce the risk of complications as compared with microporous mesh.
8. Circumferential 2.0 polypropylene sutures were used to fix the mesh to the underlying fascia.
9. Suction drain was placed in the subcutaneous tissue.
10. The subcutaneous tissue and skin were closed with sutures.
In patients who did not undergo mesh reinforcement, the anterior rectus sheath was closed in a similar fashion using the same suture and the subcutaneous tissue and skin will be closed with sutures.

**Postoperative course and follow-up**

1. Patients were nil per os for 3 days postoperatively.
2. Received IV fluids, antibiotics (Maxipime 1 gm and flagyl 500 mg), analgesics and a pack of FFP twice per day.
3. Oral diet started on postoperative day 4.
4. Discharge of the patients was after normal vital signs without fever, normal passage of flatus and stool, normal feeding without vomiting, clean incision wound.
5. The suction drain wasn’t removed upon discharge of the patients.
6. Postoperative follow up were done once per week during postoperative month during which the drain is removed in the first or second visit.
7. The follow up visits become once per month to observe the occurrence of incisional hernia which was detected either if the patient was feverish and generally ill or by local inspection and palpation if the signs of inflammation and infection as erythema, hotness, tenderness and pus discharge were present or by laboratory investigations including high white blood cell count (more than 10,000 cells/mm3).
8. The occurrence of ileostomy closure site herniation was detected by clinical examination of the wound or radiologically through pelviabdominal ultrasound.
9. Postoperative follow up visits for a period of 24 months from the date of ileostomy closure.

**Statistical analysis**

Data were collected, revised, coded and entered to the statistical package for social science (SPSS) version 23. Quantitative data was represented as mean, standard deviation and ranges. Data were analyzed using independent t-test to compare means of two groups. Qualitative data were presented as number and percentage and compared using Chi square test. Graphs were produced by using Excel. P-value is considered significant if it is less than 0.05.

**Results**

During the follow-up period of 6 months, in group (A) no patients presented by a post-operative incisional hernia while in group (B) 4 patients presented by post-operative incisional hernia representing 20.0% of the total patients underwent closure without mesh reinforcement. That is shown in (Table 1).

Therefore, as regards post-operative incisional hernia, there is a significant difference between the two groups in the post-operative follow-up period of the first 6 months.

However, in the subsequent follow-up visits of the remaining 24 months, group (A) showed 2 cases of incisional hernia (one patient between 6-12 months and the other between 12-18 months). Also, group (B) showed an additional 1 case at the period between 6-12 months and another 2 cases in the period between 12 – 18 months and another 1 case in the period between 18-24 months which were all confirmed radiologically. In the total follow up period only two cases in group A (10.0%) versus 8 cases in group B (40.0%) with statistically significant difference between groups with p-value = 0.028. That is shown in (Table 2).

In group A, 6 patients had a post-operative wound infection representing 30.0% and 14 patients didn’t show infection representing 70.0%. That is shown in Table 3. Two cases of the 4 patient were treated surgically by mesh removal and that cases subjected later to post-operative incisional hernia; otherwise, the remaining 4 cases were treated by wound care and medical treatment. One case of them got a post-operative incisional hernia.

While in group B, only 4 patients had post-operative wound infection representing 20%, and 16 patients didn’t show infection representing 80%. That is shown in (Table 3).

All of that cases were treated by wound care and medical treatment. 2 cases of them got a post-operative incisional hernia.

Therefore, despite the wound infection being an important risk factor for occurrence of incisional hernia, no significant difference between mesh usages or not in increasing the incidence of wound infection.

### Table 1: Comparison between Group A and Group B regarding demographic data

<table>
<thead>
<tr>
<th></th>
<th>Group A (n = 20)</th>
<th>Group B (n = 20)</th>
<th>Test value</th>
<th>P-value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>16</td>
<td>13</td>
<td>1.129*</td>
<td>0.287</td>
<td>NS</td>
</tr>
<tr>
<td>Female</td>
<td>4</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Age (years)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>28.0 – 59.0</td>
<td>31.0 – 62.0</td>
<td>0.681*</td>
<td>0.500</td>
<td>NS</td>
</tr>
<tr>
<td>Mean ± SD.</td>
<td>49.22 ± 10.31</td>
<td>51.37 ± 9.65</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*: Chi square test; •: Student t-test.

P-value >0.05: Non significant (NS); P-value <0.05: Significant (S).
Table 2: Comparison between Group A and Group B regarding Ileostomy closure site incisional hernia in every 6 months during the 24 months follow-up period

<table>
<thead>
<tr>
<th>Ileostomy closure site incisional hernia</th>
<th>Group A (n = 20)</th>
<th>Group B (n = 20)</th>
<th>Test value</th>
<th>P-value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>0 - 6 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>20</td>
<td>100.0</td>
<td>16</td>
<td>80.0</td>
<td>4.444</td>
</tr>
<tr>
<td>Yes</td>
<td>0</td>
<td>0.0</td>
<td>4</td>
<td>20.0</td>
<td></td>
</tr>
<tr>
<td>6 – 12 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>19</td>
<td>95.0</td>
<td>15</td>
<td>75.0</td>
<td>3.137</td>
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<tr>
<td>Yes</td>
<td>1</td>
<td>5.0</td>
<td>5</td>
<td>25.0</td>
<td></td>
</tr>
<tr>
<td>12 – 18 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>18</td>
<td>90.0</td>
<td>13</td>
<td>65.0</td>
<td>3.584</td>
</tr>
<tr>
<td>Yes</td>
<td>2</td>
<td>10.0</td>
<td>7</td>
<td>35.0</td>
<td></td>
</tr>
<tr>
<td>18 – 24 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>18</td>
<td>90.0</td>
<td>12</td>
<td>60.0</td>
<td>4.800</td>
</tr>
<tr>
<td>Yes</td>
<td>2</td>
<td>10.0</td>
<td>8</td>
<td>40.0</td>
<td></td>
</tr>
</tbody>
</table>

*: Chi square test.

P-value >0.05: Non significant (NS); P-value <0.05: Significant (S).

Table 3: Comparison between Group A and Group B regarding wound infection at the closure site

<table>
<thead>
<tr>
<th>Infection at the closure site</th>
<th>Group A (n = 20)</th>
<th>Group B (n = 20)</th>
<th>Test value</th>
<th>P-value</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>14</td>
<td>70.0</td>
<td>16</td>
<td>80.0</td>
<td>0.533</td>
</tr>
<tr>
<td>Yes</td>
<td>6</td>
<td>30.0</td>
<td>4</td>
<td>20.0</td>
<td></td>
</tr>
</tbody>
</table>

*: Chi square test.

P-value >0.05: Non significant (NS); P-value <0.05: Significant (S).

Discussion

The present study was designed trying to find a solution for post ileostomy closure incisional hernia. Up till now there are no sufficient published studies about this issue. The main concern was postoperative wound infection.11

Regarding the incidence of incisional hernia, 10 out of 40 patients (25%) in the current study developed incisional hernias. In group B (Without mesh reinforcement) 8 patients (40%) developed incisional hernias (which was close to the mentioned rates of incisional hernias at ileostomy closure site),12 while in group A (With mesh reinforcement) 2 patients (10%) developed incisional hernias. Although there was trend for developing incisional hernia in patients without mesh reinforcement and the study shows significant result of incisional hernia reduction with mesh reinforcement during the first 6 months after closure, prophylactic mesh repair significantly reduce the incidence in the total follow-up period of the two years (p=0.028).

In the study done by Liu et al., 47 patients had onlay mesh reinforcement with the same type of mesh as in the current study and only 3 patients had incisional hernias (6.3% compared to 13.3% in our study). Contrary to our study, they have concluded that this technique has significantly reduced the incidence of incisional hernias at ileostomy closure site (p=0.001).13

This was despite the fact that both studies were similar regarding main indication of the ileostomy creative surgery and mean postoperative follow up time.

This difference is most probably explained by lower wound infection rate in their study (4.3% in the mesh reinforcement group and 2.8% in the control group), this might be due to non-complete skin closure compared to complete closure in our study.

While in the study of Bhanju et al. no cases developed incisional hernias at ileostomy closure site after biological mesh insertion intraperitoneally. This might be due to the usage of a different type of mesh inserted in a different anatomical site, the small number of patients in the study (Only 7 patients) and short follow up time of only 1 month.14

In another well-established study, Maggiori et al. studied the effect of using a retromuscular (Preperitoneal) bioprosthetic collagen porcine mesh at ileostomy closure site exclusively for rectal cancer patients who have undergone total mesorectal excision. They compared 30 patients mesh group with 64 patients with direct closure as a control group. Their technique significantly reduced the incisional hernia incidence as 3% in the mesh group developed incisional hernias compared to 24% in the control group (p=0.016).15

This might be due to performing the study on a larger sample of patients and usage of a bioprosthetic mesh with postoperative wound infection of only 5.3% instead of a synthetic one as in our study.

Van Barneveld et al. in their study used a different technique which was intraperitoneal mesh insertion during stoma creation surgery around the peritoneal defect of the stoma (A mesh consisted of a monofilament polyester structure.
with a one-sided layer of absorbable collagen for adhesion prevention) followed by reversal after a median time interval of 6 months through a technique similar to our study. They concluded that such a technique was safe (Regarding bowel contact complications) and effective in reducing the incidence of incisional hernias (Despite not performing any statistical analyses).

In their study no cases developed incisional hernias; this might be due to the fact that previously inserted mesh has been already incorporated within the abdominal wall giving it an extra strength. These results might also be due to that no cases in their study developed wound infection. But such study was performed on only 10 rectal cancer patients.

Birolini et al in their study have undergone only prosthetic mesh repair (Polypropylene mesh) in cases which developed incisional hernias after stoma closure procedures. Neither of the patients developed recurrence of incisional hernia. This might be explained by that such wounds have become less contaminated as hernias developed and were operated on years after the primary surgeries. This was confirmed by that only 1 of the 20 patients (5%) developed wound infection.

Morris-Stiff and Hughes in their study tried intraperitoneal usage of non-absorbable mesh (Polypropylene) in repair of parastomal hernias in 7 cases; 5 with terminal ileostomies and 2 with terminal colostomies. They reported failure of their technique as 2 cases (29%) developed recurrence of the hernias in addition to more serious complications as bowel perforation and obstruction. This failure was most probably due to the risk of inserting an intra-abdominal prosthetic material especially when related to colostomies rather than ileostomies.

Guzman and Valdivia studied the incidence of incisional hernia after stoma closure. They gave different results regarding the indication of stoma formation, where diversion for other pathological conditions (Mainly diverticulitis) was the main indication (79%) followed by malignancy (17%) and trauma (4%) (19).

These data were supposed to result in a lower incidence of incisional hernias (As malignancy compared to any other indication is itself a risk factor for herniation) but they resulted in a similar incidence (31.4%). This might be due to that this study was performed on both ileostomies and colostomies with majority of cases with colostomies (93%) and all incisional hernias occurred in cases with colostomies, as colostomies produce more well-formed stool with more incidence of wound infection and other complications after the surgery. All the surgeries in our study were performed by different level of surgeons with different level of experience (Senior Residents, Assistant Lecturer, Lecturer and Associated Professor). In other studies, the level of experience was not reported in some papers or consultant surgeons performed the closure surgeries. Different level of experience might lead to different results.

Conclusion

Prophylactic mesh reinforcement during ileostomy closure procedure significantly reduce the incidence of incisional hernia in the first post-operative six months. Although, it significantly decrease the incidence of incisional hernia in the total follow-up period of the post-operative 24 months.

Furthermore, prophylactic mesh insertion during ileostomy closure procedure not significantly increase the incidence of the closure site wound infection and dehiscence.

References

