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Original article

Comparative study between fascial defects closure and non-closure in laparoscopic incisional and ventral hernia repair

Ayman Mahmoud Elwan, Mohammed Eid.

General Surgery Department, Damietta Faculty of Medicine, Al-Azhar University, Egypt.

Corresponding author

Ayman Mhamoud Elwan

General Surgery Department,

Damietta Faculty of Medicine,

Al-Azhar University, Egypt

ORCID: 0000-0001-7718-0976

Email: dr_aymanelwan@yahoo.com

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Background: Incisional hernias are common after abdominal surgery. Laparoscopic repair has advantages over open repair. Traditionally, laparoscopic ventral repair of hernia has been done as a bridged repair to accomplish circumferential overlap of the fascial defect. More recently, there has been a growing trend to do primary fascial closure to reapproximate the fascia before mesh insertion.

Aim of the work: to present our experience with laparoscopic ventral and incisional repair of hernia to determine outcomes and different results of fascial defects closure and non-closure.

Methods: From January 2016 to April 2018, 68 patients suffering from ventral and incisional hernias were treated in New Damietta University Hospital. Laparoscopic repair was decided for all patients.

Results: Operative time for group A ranged from 50-120 minutes (average 96.8 min), 30-90 minutes (average 66 min) for group B. Chronic post-operative pain reported in 12.9% in group A and 6.6% in group B. 16.1% from group A had seroma lasting 4 weeks, while it was reported in 36.7% from group B, which remain for 6 weeks. There were 7 patients from group A complaint of post-operative respiratory embarrassment which resolved conservatively except for one patient, who necessitated ICU admission for two days. No one from group B complaint of post-operative respiratory complications.

Conclusions: Although there were no major statistical differences between fascial closure and non-closure groups, the seroma and recurrence were less in fascial closure group.

Keywords: Ventral hernia; incisional hernia; laparoscopy; ventral hernia repair (LVHR); fascial closure.

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Introduction

Adult ventral hernias are acquired defects through the fascia may develop due to increased intra-abdominal pressure and strain on the abdominal wall. The bulge of peritoneum, pre-peritoneal fat, omentum, and visceral organs through an umbilical or ventral hernia can lead to signs and symptoms ranging from discomfort to incarceration and strangulation. These hernias, once symptomatic, need operative intervention. In general population, adult umbilical hernias and ventral hernias are reported in 2–5%^[1].

Incisional hernia is usually developed as a result of healing failure or late diastasis of the fascial planes. The incidence increased up to 30% in cases of surgical wound infection. Incisional hernia must be considered a disease and can affect multi-organs since, in relation to the site and the size of the defect, can interfere with the dynamic respiratory, vascular or other viscera^[2].

Incisional hernias are common after abdominal surgery. Laparoscopic repair is advantageous than open repair including lower rates of wound infection, shorter hospital admission and less pain^[3]. The treatment of ventral hernias, either primary or secondary, representing a challenge for surgeons. Incisional hernia reported in 11–20 % of cases after major abdominal surgery^[4]. The laparoscopic intervention for ventral hernias is quickly growing with patient and surgeon interest in less morbid hernioplasty and the application of minimally invasive surgery. The procedure is based on the open, preperitoneal sublay restoration described by Rives and Stoppa^[5,6].

Incisional hernia repair has developed from suturing to prosthetic repair. The recurrence rate of suture repair and mesh repair for Incisional hernia repair were reported to be 46–63% and 23–32 %, respectively^[7]. Since laparoscopic repair firstly introduced by LeBlanc in 1993, laparoscopic ventral hernia repair has gained approval not only in the United States, but also overall the world^[8].

Despite the widespread acceptance of minimally invasive techniques to ventral hernia repair, controversy continues regarding the ideal operative intervention. Traditionally, LVHR has been developed as a bridged repair, where a portion of mesh is positioned intraperitoneally in an underlay site to accomplish circumferential overlap of the fascial defect^[9]. More recently, however, there has been a tendency to perform primary fascial closure to reapproximate the fascia before mesh situation. While some surgeons encourage for a theoretical advantage of performing primary fascial closure before mesh placement, others have proposed that primary fascial closure is unnecessary^[10].

Advocates of primary fascial closure claim that closure may improve function of the abdominal wall, reduce recurrence by achieving a larger extent of fascial overlap with the mesh, and decrease seroma formation by decreasing the effective dead space between the mesh and overlying tissue^[11]. Many case series and some comparative trials have been reported. However, there is a lack of high-quality, cohort studies to propose a true benefit of one maneuver over the other^[12].

The purpose of our study was to present our experience with laparoscopic ventral and incisional hernia repair to determine outcomes and different results of fascial defects closure and non-closure.

Patients and Methods

From January 2016 to April 2018, 68 patients suffering from ventral and incisional hernias were treated in New Damietta University Hospital. Laparoscopic repair was decided for all patients.

Inclusion criteria:

- Age ranged from 20 to 50 years old.
- At least 6 months post last abdominal operation.
- Healthy patients with good general condition.

Exclusion criteria:

- Children.
- Patients with strangulated hernia.
- Patients cannot tolerate general anesthesia.
- Presence of ascites.
- Patients with densely scarred abdomen.
- Extremely large hernia.

The study was conducted according to the Ethical Committee, and informed written consent was obtained from all patients before surgery. The risk of conversion to open repair was clearly explained.

Seven (10.3%) patients needed conversion to open intervention and were excluded from the rest of data analysis. All conversions occurred with early cases in the study, we referred this due to severe adhesions. The remaining 61 patients were randomly divided into two groups; (A) including 31 patients underwent laparoscopic ventral or incisional hernia repair with closure of fascial defect, (B) including 30 patients underwent laparoscopic ventral or incisional hernia repair without closure of fascial defect.

After general anesthesia was induced, the patient was positioned supine with the arms adducted and “tucked” at the sides. Insertion of Foley's catheter, the stomach was decompressed with Ryle tube. Prophylactic antibiotic was injected with induction of anesthesia. Open Hasson technique was employed to enter the peritoneal cavity according to hernia site. Then insertion of 10 mm visual port, following establishment of pneumoperitoneum using a pressure of 14 mmHg, a 10 mm–30° endoscope was introduced, and the abdomen was inspected, tilting of the patient to right, left, up or down according to needs, to create a clear field and good visualization of the defect (Figures 1, 3, 6).

Another two 5 mm assisting ports were inserted under vision. Often, a fourth 5-mm port was placed contralaterally to facilitate intra-abdominal mesh manipulation and fixation.

After entrance to the abdominal cavity, adhesiolysis performed sharply with electrocautery or vessel sealing devices. Reduction of the hernia contents was performed using blunt graspers and sharp dissection and facilitated with manual compression from outside the abdomen. The hernia sac was left in situ. The hernia defect measured with ruler or tape to determine an appropriate size of a prosthetic mesh. The borders of the abdominal wall defect were delineated with external needles, using a combination of laparoscopic vision and external palpation. Appropriate size composite mesh was fashioned to overlap margins of the hernia by at least 5 cm. The mesh was rolled up and pushed or pulled into the abdomen through a 10-mm port site, appropriate orientation of the mesh during insertion and unfolding of the mesh was undertaken.

For group (A), primary fascial closure technique; an extracorporeal suturing, with non-absorbable sutures were used. Through small abdominal incisions, a suture passer was used to close the defect with simple interrupted sutures (Figure 2). Most defects were 4 to 8 cm wide. Two or three hitch sutures were taken in the base of the defect.

Two graspers were used to unfold the mesh, after orientation of the mesh intracorporeally, the sutures which fixed to the mesh corners were pulled through the abdominal wall with a suture passer. Once sufficient overlap confirmed, sutures were tied with knots buried in subcutaneous tissue. The borders of the mesh were stapled to the parietal peritoneum and fascia with 5-mm spiral tacks at approximately 2 cm intervals (Figure 4). Placing the tacks facilitated by the external manual compression of the tacker's tip.

Additional full-thickness stitches were applied circumferentially every 4 to 7 cm by using the suture passer, to ensure that the mesh will not be displaced over time. The knots were tied in the subcutaneous tissue and skin released to avoid dimpling (Figure 5). For group (B), the same steps were taken without fascial closure.

Statistical analysis was conducted using PC with the Statistical Package for the Social Science (SPSS) version 16.0 for Windows (SPSS Inc, Chicago, IL, USA). Categorical variables were presented as frequency and percent, while numerical variables demonstrated as arithmetic mean and standard deviation. Comparison between groups was done by Chi square or student (t) test for qualitative and quantitative data respectively. P value < 0.05 was significant.

Results

Sixty-one patients underwent laparoscopic ventral or incisional hernia repair from January 2016 to April 2018 at New Damietta University Hospital. There were 49 male (80.3%) and 12 females (19.7%). The average age was 44.13 years (32–56 years).

Follow up period ranged from 3 months to 27 months (average 16.2 months).

Twenty-two patients (36.1%) had primary defect (9 epigastric and 13 paraumbilical). Thirty-nine patients (63.9%) had incisional hernia (11 post-nephrolithotomy, 8 post open appendectomy, 7 post open cholecystectomy, 13 post-midlines exploratory incision). The width of defects ranged from 2 cm to 8 cm (average 4.7 ± 1.1 cm). there was no significant difference between groups A and B.

Operative time for group A ranged from 50-120 minutes (average 96.8 ± 10.9 min), 30-90 minutes (average 66.03 ± 8.78 min) for group B, with significant increase of operative time in groups A when compared to group B. The average length of hospital stay was 2.5 ± 0.6 days (1 to 4 days) for group A, and 1.8 ± 0.55 day (1 to 3 days) for group B, with significant increase of operative time in groups A when compared to group B.

As regard chronic postoperative pain, there were 4 patients (12.9%) in group A and two patients (6.7%) in group B. Five patients (16.1%) from group A had seroma lasting 4 weeks; there was seroma for 11 patients (36.7%) from group B remain for 6 weeks. Seroma was resolved spontaneously for the two groups. As regard recurrence, there was one patient (3.2%) from group A and 4 patients (13.3%) from group B during the follow up period, with no significant difference between groups A and B.

There were 7 patients (22.6%) from group A complaint of post-operative respiratory embarrassment which resolved gradually with conservative measures except for one patient, who necessitated ICU admission for two days. No one from group B complaint of post-operative respiratory complications.



Figure (1): Post-nephrolithotomy incisional hernia

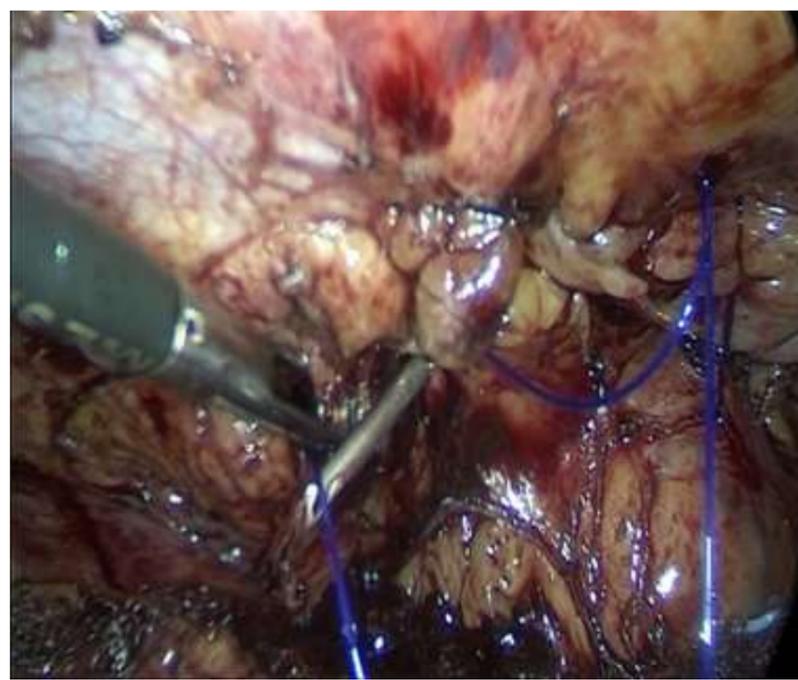


Figure (2): Fascial closure with trans-abdominal sutures.



Figure (3): Post-open appendectomy incisional hernia for 3rd time.



Figure (4): Fixation of composite mesh without fascial closure.



Figure (5): Post-operative abdominal appearance with demonstration of port sites and previous scar.



Figure (6): Para-umbilical hernia

Table (1): Results among studied populations

Variables		Group A	Group B	Total	Test	P value
Sex	Male	24(77.4%)	25(83.3%)	49(80.3%)	0.33	0.56
	Female	7(22.6%)	5(16.7%)	12(19.7%)		
Age (mean±SD) Range		43.23±7.01; 32-55	45.07±6.52; 33-56	44.13±6.78; 32-56	1.06	0.29
Defect width (mean±SD) Range		4.74±1.06; 2-7	4.67±1.15; 3-8	4.70±1.10; 2-8	0.26	0.79
Defect Type	Primary	10(32.3%)	12(40.0%)	22(36.1%)	0.39	0.52
	Incisional	21(67.7%)	18(60.0%)	39(63.9%)		
Operative time (mean±SD) Range		96.81±10.95; 50-120	66.03±8.78; 30-90	81.67±18.38; 30-120	12.07	<0.001*
Hospital stay (mean±SD) Range		2.52±0.63; 1-4	1.80±0.55; 1-3	2.16±0.69; 1-4	4.73	<0.001*
Outcome	Chronic PO pain	4(12.9%)	2(6.7%)	6(9.8%)	0.66	0.41
	Seroma	5(16.1%)	11(36.7%)	16(26.2%)	3.32	0.06
	Respiratory complication	7(22.6%)	0(0.0%)	7(11.5%)	7.65	0.006*
	Recurrence	1(3.2%)	4(13.3%)	5(8.2%)	2.07	0.15
Follow up period (mean±SD) Range		15.94±3.37; 3-21	16.50±2.81; 13-27	16.21±3.09; 3-27	0.70	0.48

Discussion

Laparoscopic repair of ventral hernia has been recognized as a safe and effective maneuver and gives many profits such as reduction of wound morbidity, shortening of hospital length of stay, and decreased postoperative pain compared to open repair^[13].

Controversy continues regarding the best surgical technique for ventral hernia repair. Although laparoscopic hernia repair has produced lower rates of surgical-site infections and hospital stays, rates of wound complications and hernia recurrence have not improved^[14]. In addition, standard laparoscopic maneuver with bridging of the fascial defect is from time to time associated with bulging or clinical eventration. The role of primary fascial closure before mesh placement has been of interest as an extra step throughout laparoscopic ventral hernia repair^[15].

Christina *et al.*^[13] in their retrospective analysis of patients submitted to laparoscopic ventral hernia repair, have reported no significant variations in short-term complications of the wound after hernia repair using fascial closure compared to bridged repair alone. Specifically, fascial closure is associated risk of postoperative seroma, which reported in about 10–11% of patients regardless of operative maneuver.

Zeichen *et al.*^[16] compared closure and non-closure of fascial defect in laparoscopic ventral incisional hernia repair, and reported that, ages ranged from 26 - 91 years, and follow-up 1 - 108 months in the non-closure group (n = 255). On the other hand, ages ranged from 21 - 71 years, and follow-up 1 - 108 months in the closure group (n = 138). The recurrence rate reported in 4.8-16.7 % in the non-closure group and 0 - 5.7 % in the closure group. Seroma formation rate reported in 4.3 - 27.8% in the non-closure and in 5.6 - 11.4 % in the closure group.

Clapp *et al.*^[17] retrospectively investigated the outcomes of defect closure. The median follow-up duration was 24 months (7–34 months). In the non-closure group (n = 36), the recurrence rate reported in 16.7 %. However, the closure group (n = 36) had no recurrences. Bulging rate was

69.4 % in the non-closure and 8.3 % in the closure group. Surgical wound infection was reported in 13.9 % and 8.3% in the non-closure and closure groups respectively. Seroma formation rate was 27.8 % and 5.6 % in the non- and closure groups. Also, patient satisfaction and functional status rates were better in the closure than in the non-closure group: 8.8 ± 0.4 vs. 7.1 ± 0.5 and 79 ± 2 vs. 71 ± 2, respectively.

Banerjee *et al.*^[18] carried out retrospectively, a comparison between non-closure (n = 126) and closure (n = 67) of the defect. The mean follow-up duration was 10.5 months (1–36 months). The recurrence rate was 4.8 % and 3.0% in the non-closure and closure groups respectively.

True recurrence is associated with many factors such as surgical wound infection, previous repair of hernia, obesity and large size of the hernia defect^[19]. It is well-known that, meshes undergo contracture with time due to collagen tissue in-growth^[20] and so it is advisable to choose a too-small mesh, without adequate overlap in one or more directions, will lead to recurrence. The biomechanical characters of the mesh are also significant, as collagen deposition and fibrosis are closely linked to the porous nature of the mesh. Larger pores are thought to decrease fibrotic contracture and is associated with greater elasticity in the mesh, that is associated with greater compliance within the abdominal wall, and that for laparoscopic ventral hernia repair, a mesh that is flexible with good memory is required^[21].

Clapp *et al.*^[17] investigated the incidence of chronic pain with closure versus nonclosure and reported that the incidence was not statistically different between the two groups (9.4 and 18.2 %, respectively).

In our study we found that; operative time was longer for group A (96.8 min), also hospital stay for group A was (2.5 days) longer than group B (1.8 days). As regard respiratory embarrassment, it was stated for 7 patients from group A, which resolved gradually with conservative measures except for one patient who necessitated ICU admission for two days; we refer longer hospital stay for this group probably due to this reason.

Five patients from group A suffered from seroma, on contrary to 11 patients from group B. Seroma was the most

frequent minor complication that occurred, but it was lowered by local dressing compression. Chronic postoperative pain was occurred more for group A, may be due to tension and over fibrosis which coincided with defect closure.

We documented one recurrence for group A and 4 for group B. We can state that all the recurrences were correlated to obese patients with a deficient mesh overlapping the defect.

In conclusion, laparoscopic repair for ventral and incisional hernia is feasible and easy to learn, also it helps rapid recovery and early return to work.

Although there were no major statistical differences between fascial closure and non-closure groups, the seroma and recurrence were less in fascial closure group. More randomized controlled studies and large numbers of patients were required to give solid results and recommendations. Finally, we documented that the last chapter in hernia repair still not written until now.

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