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Fascial Defect Closure Versus Non-Closure in Laparoscopic Ventral and Incisional Hernia Repair

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ABSTRACT

Background: Incisional hernias are common after abdominal surgery. Laparoscopic repair has advantages over open repair. Traditionally, laparoscopic ventral hernia repair has been done as a bridging repair, with the fascial defect circumferentially overlapped. Primary fascial closure to reaproximate the fascia before mesh implantation has become more popular in recent years. **Aim of the work:** The goal of this study is to examine our experience of repairing ventral and incisional hernia by laparoscope in order to evaluate the outcomes and differences in fascial defect closure and non-closure in our ventral and incisional hernia repair experience. **Patients and methods:** 60 patients with ventral and incisional hernias were treated at Al-Azhar University Hospital in New Damietta from July 2018 to July 2020. Laparoscopic repair was decided for all patients. **Results:** The mean operative time by hours for group A (2.1±0.2) Vs group B (1.3±0.4) with highly significant deferent between 2 group $p < 0.001$. As regards the acute post-operative pain: (group B) showed less degree of pain post-operative complications: Post-operative seroma were reported in 5 cases (16.6%) of the group A and 11 cases (36.7%) of the group B recurrence, During the one-year follow-up period, 1 case in group A and 4 cases in group B experienced recurrent incisional hernia. In group A, we had one patient with a serosal intestine rip and two patients in group B. Conclusion: Although there were no significant statistical differences between the fascial closure and non-closure groups, the fascial closure group had reduced seroma and recurrence.

Keywords: Ventral hernia, incisional hernia, laparoscopy, fascial closure, fascial non closure.

1. Introduction

Adult ventral hernias are abnormalities in the fascia that can occur as a result of increased intra-abdominal pressure and abdominal wall stress. The hernia content as (Peritoneum, pre-peritoneal fat, omentum, and visceral organs) protruding through an umbilical or ventral hernia can cause everything from irritation to incarceration and strangling. Once these hernias become symptomatic, they must be treated surgically. Adult umbilical hernias and ventral hernias are estimated to affect 2–5% of the general population (Elwan and Eid, 2019).

Incisional hernia and primary ventral hernia are both prevalent and require surgical treatment. Incisional hernia complicates 3–20 percent of abdominal incisions, according to estimates (Itani *et al.,* 2010).

Failure to heal or late diastases of the fascial planes are the most common causes of incisional hernia. In the event of a surgical wound infection, the risk of incisional hernia increases by up to 30%. Incisional hernia is a disease that can impact multiple organs depending on the location and extent of the defect. It can also cause problems with the dynamic respiratory, circulatory, and other viscera systems (Roberto *et al.,* 2012).

Suture repair has given way to prosthetic repair in the incisional hernia. Suture repair and mesh

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repair for incisional hernia repair have been reported to have recurrence rates of 46–63% and 23–32%, respectively (Burger *et al.,* 2004) .

Laparoscopic ventral hernia repair has grown in popularity not only in the United States, but around the world, since its first introduction by LeBlanc in 1993 (LeBlanc and Booth, 1993).

Following abdominal surgery, incisional hernias are prevalent. Laparoscopic surgery has a number of advantages over open surgery, including a lower risk of infection, a shorter stay in the hospital, and less pain (Fink *et al.,* 2014). The approach of putting an intraperitoneal mesh, effectively bridging the hernia defect following reduction of the hernia contents but leaving the hernia sac in place, is used in the majority of laparoscopic incisional and ventral hernia repairs (Zhang *et al.,* 2014).

However, an unattractive swelling at the hernia site is prevalent. In the literature, bulging, pseudo-recurrence, and mesh eventration have all been used to describe swelling at the site of laparoscopic repair due to the sac remnant (Tse *et al.,* 2010).

These outcomes differ from genuine recurrence, which is defined as a disruption of the anterior abdominal wall fascia continuity at the hernia site on cross-sectional imaging such as CT. Despite several attempts to clarify this distinction, it makes little difference to a patient who is left with symptomatic swelling at the hernia site after laparoscopic incisional and ventral hernia repairs, especially if they require additional surgery (Tse *et al.,* 2010).

Closure of the fascial defect procedures attempt to restore the abdominal wall's integrity and thus function. Because the abdominal wall muscle layer is intact and the rectus muscles are restored to their midline position, the basic idea is that by sealing the surgical dead space, seroma production will be reduced, cosmoses will improve, and recurrence will be reduced (Chelala *et al.,* 2016).

2. Patients and methods

2.1. Patient

- From July 2018 to July 2020, this research was carried out in the new Damietta university hospital.
- In this trial, sixty patients were randomly assigned to one of two groups: A or B.
- Group A (30 patients) had their ventral and incisional hernias repaired laparoscopically with fascial defect closure.
- Group B (30 patients) had their ventral and incisional hernias repaired laparoscopically without the fascial defect being closed.

2.2. Inclusion criteria

- The participants ranged in age from 20 to 60 years old.
- At least 6 months post last abdominal operation.
- Healthy patients without contraindication of general anesthesia.

2.3. Exclusion criteria

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

The study was carried out in accordance with the Ethical Committee's guidelines, and all patients gave their informed written consent prior to surgery. The dangers of converting to open repair were explicitly stated.

All patient will be submitted to:

- Full history taking.
- Full clinical examination.
- Laboratory investigation:

- CBC
- SGOT,SGPT
- S. bilirubin
- PT, INR
- S. creatinine
- fasting , pp blood glucose level

• ECG, Echocardiography if needed.
• Abdomino-pelvic U.S.
• Chest plain x ray.
• Cardiological consultation.
• Chest consultation.
• Uorological consultation.

2.4. Operative details

After full assessment of patients and exclusion of patients according to exclusion criteria, all patients were subjected to:

- Induction of anaesthesia with a prophylactic dosage of third-generation cephalosporin.
- Urinary catheterization to empty the urinary bladder.
- Nasogastric intubation.
- In a supine posture, the patient is tilted right or left, and Trendelnberg or anti-trendelnberg positions are used, depending on the necessity.
- Creation of pneurnoperitoneurn with:
- Open technique (Hasson).
- Using the visual port away from the lesion.
- A 30 degree telescope was placed distant from the defect's margin. Two more 5 mm ports were installed. During the operation, more extra ports might be placed if needed.
- Adhesiolysis was carried out quickly using a vessel sealing device. To establish the right size of a prosthetic mesh, the hernia defect was measured with a ruler or tape. Appropriately sized composite mesh was created to overlap the hernia's edges by at least 5 cm. At the corners of each side of the mesh, four size 0 absorbable sutures were put (Figure 1).

Fig. 1: Adhesolysis using vessel sealing device.

- The contents of the hernia sac were reduced, but the hernia sac was not eliminated.
- The flaw was discovered, and additional flaws were meticulously searched for.
- The defect size was measured by using appropriate tape from inside and multiple needles from outside after decreasing the intra-abdominal pressure (Figure 2).

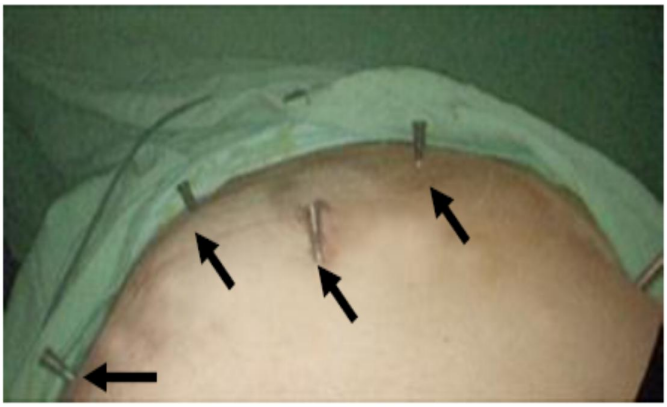

Fig. 2: Multiple needles are used to measure the defect from the outside.

• Interrupted transfascial non-absorbable sutures were used to seal the defect in group A.

Fig. 3: Transfascial closing of the defect.

- A composite mesh of appropriate size was rolled and introduced through the visual port to overlap 5cm around the defect (Figure 4).
- The pressure was reduced during mesh fixation.
- Transfascial, intracorporal sutures, and tacks were used to secure the mesh (Figure 5):
- Transfascial sutures along the mesh's edge, utilizing 4 to 6 transfascial sutures.
- A second inner layer of staples was inserted around the flaw and 5 mm absorbable tacks were placed all around the mesh at 1 cm intervals along the peripheral border (double crown method).
- Intracorporeal stitches can be added for reinforcement.

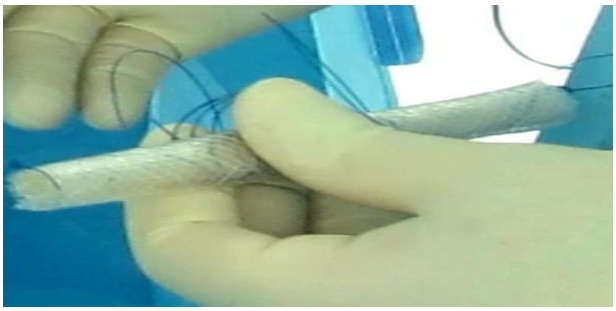

Fig. 4: Rolling the mesh with fixation sutures attached.

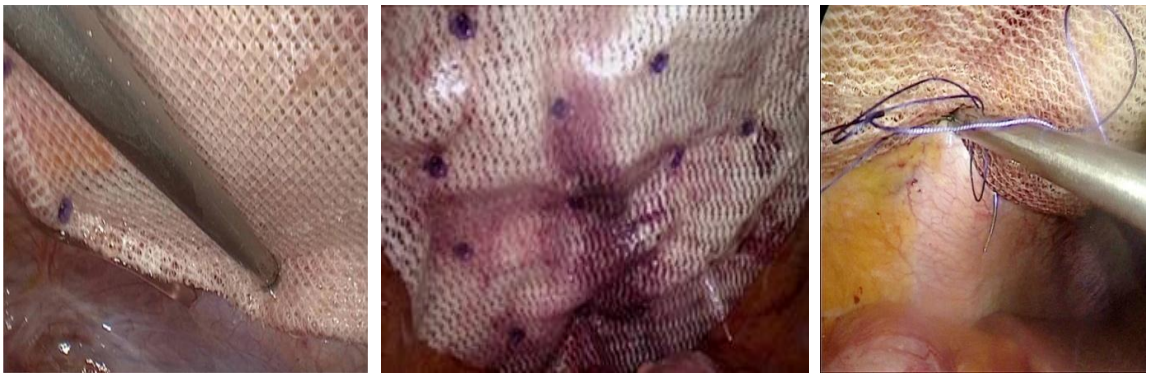

Fig. 5: Mesh fixed with sutures and tacks.

At the end of procedure intraperitoneal drain inserted and pneumoperitonium was decompressed and port sites were closed (Figure 6).

Fig. 6: Post-operative abdominal appearance with demonstration of port sites and previous scar.

The hernia was covered with a ball of gauze and a pressure dressing was applied.
At the conclusion of the procedure, Foley's catheter and Nasogastric tube were withdrawn.

2.5. Postoperative care for both groups.

- Semi setting position for all patients.
- For postoperative pain relief analgesia can be used, NRS (numeric rating scale) where means no pain and 10 means maximum imaginable pain (Breivik *et al.,* 2008).
- Early mobilization of patients after recovery from the general anesthesia.
- Oral fluid and diet were usually started with audible intestinal sounds.
- ICU was available if respiratory impairment occurred.
- Complications during the postoperative period were looked for:
- Ileus which was detected by clinical examination based on food intolerance after start of oral feeding, electrolyte disturbance, abdominal plain X-ray.
- A hematoma was defined as a buildup of blood in the operating field, requiring surgical intervention (puncture or drainage), in case of failure of conservative treatment.
- The term "seroma" refers to a collection of fluid in the surgical field.
- A cyst may arise because the hernia sac was not removed during laparoscopic surgery. Within a few months, nearly all cysts dissolve.
- Recurrence was diagnosed by clinical and radiological examinations.
- Other injuries: bowel and vascular injuries.
- For three months, the patients were told not to carry heavy things or engage in rigorous activities.

- Patients were scheduled for follow-up at one week, one month, three months, six months, and one year after discharge from the hospital.

2.7. Data analysis

The statistical analysis of the patient's data was done using SPSS Software (version 20). Descriptive data were expressed as means with standard deviation or medians with ranges, depending on the data distribution. Frequency distributions were used to describe categorical variables. Independent sample t-test was used to detect differences in the means by continuous variables and Chi-square test was used in cases with low expected frequencies.

P value <0.05 are considered significant.

3. Results

Fulfilling our inclusion and exclusion criteria, 60 patients underwent laparoscopic ventral hernioplasty at the Al Azhar university hospital: group (A): had 30 patients with a laparoscopic fascial defect closure while group (B) had 30 patients without a defect closure.

The age range in group (A) was 23-46 years with a mean S.D. of 33.607.679 years, while the age range in group (B) was 21-46 years with a mean S.D. of 35.607.908 years. Where P=0.488, there were no statistically significant differences between groups (Table 1).

Table 1: Comparison between two groups as regard to patient's age (years).

Age	Group (A) (n=30)	Group (B) (n=30)	P Value
Min.-Max.	23-46	21-46	0.488
Mean± S.D	33.60±7.679	35.60±7.908	

Gender in the group (A) shows that 14 (46.7%) were male and 16 (53.3%) In group (B), 12 (40 percent) were male and 18 (60 percent) were female, whereas in group (A), 12 (40 percent) were male and 18 (60 percent) were female. When P=1.000, there were no statistically significant differences between groups (Table 2).

Table 2: Comparison between two groups as regard to patient's gender.

Gender	Group (A) (n=30)		Group (B) (n=30)		P Value
	No.	%	No.	%	
Male	14	46.7	12	40	1.000
Female	16	53.3	18	60	
Total	30	100	30	100	

Hernia characteristics in the group (A) shows that 18 (60.0%) had incisional hernia, 12 (40%) had primary ventral hernia while in the group (B) 14 (46.7%) had Incisional hernia, A total of 16 people (53.3%) had a primary ventral hernia. Where P=0.199, there were no statistically significant differences between groups (Table 3).

Table 3: Comparison between two groups as regard to patient's hernia characteristics.

Hernia Characteristics	Group (A) (n=30)		Group (B)(n=30)		P Value
	No.	%	No.	%	
Incisional hernia	18	60.0	14	46.7	0.199
Primary ventral hernia	12	40.0	16	53.3	
Total	30	100	30	100	

The size of the defect in the group (A) ranged between 8-12 cm, with mean ± S.D. The mean S.D. for the group (B) was 10.471.506 cm, while the mean S.D. for the group (A) was 10.21.265 cm. Where P=0.604, there were no statistically significant differences between group (Table 4).

Table 4: Comparison between two groups as regard to patient's size of defect

Size of Defect	Group (A)(n=30)	Group (B) (n=30)	P Value
Min.-Max.	8-12	8-12	0.604
Mean± S.D	10.47±1.506	10.2±1.265	

The mean operative time for group A (2.1±0.2) Vs group B (1.3±0.4) with highly significant deferent between 2 group P < 0.001 (Table 5).

Table 5: Comparison between two groups as regard to patient's operation Time.

Operation Time(min.)	Group (A) (N=30)	Group (B) (N=30)	P Value
Operative time in hours (mean ±SD)	(2.1±0.2)	(1.3±0.4)	0.001

The hospitalization period in the group (A) ranged between 1-4 days with mean±S.D. 2.33±0.234 days while in the group (B) ranged between 1-3 days with mean±S.D. 1.8±0.082 days. Statistically significant differences between groups where found P<0.001 (Table 6).

Table 6: Comparison between two groups as regard to patient's hospitalization period.

Hospitalization Period	Group (A) (N=30)	Group (B)(N=30)	P Value
Min.-Max.	1-4	1-3	<0.001*
Mean± S.D	2.33±0.234	1.80±0.082	

As regards the acute post-operative pain: (group B) showed less degree of pain in comparison with the first group (Table 7 & 8).

Table 7: Showing acute post-operative pain on 1st post-operative day.

Post operative pain	Group (A) (N=30)	Group (B) (N=30)	P Value
Min.-Max.	3-6	2-5	0.000*
Mean± S.D	4.73±1.234	3.80±1.082	

Table 8: Post-operative pain scale.

Degree of pain	Group (A) (n=30)		Group (B) (n=30)		P Value
	No.	%	No.	%	
None	0	0	4	13.3	0.199
Mild	15	50.0	16	53.3	
Moderate	7	23.3	6	20	
Severe	8	26.6	4	13.3	
Total	30	100	30	100	

Regarding post-operative complications: Post-operative seroma were reported in 5 cases (16.6%) of the group A and 11 cases (36.7%) of the group B treated by repeated aspiration and external compression. In terms of recurrence, 1 patient in group A and 4 cases in group B developed recurrent incisional hernias throughout the one-year follow-up period. We had 1 serosal intestinal tear in the group A and 2 patients in group B.

There was respiratory emprassment for 4 patients in group A, they managed with semi-sitting position, O_2 mask and no one need ICU admission. While there is no respiratory emprassment in goup B (Table 9).

Table 9: Post-operative complications.

Variable	Group (A) (n=30)		Group (B)(n=30)	
	No.	%	No.	%
Seroma	5	16.6	11	36.7
Recurrence	1	3.3	4	13.3
Bowel injury	1	3.3	2	6.7
Chest infection	4	13.3	0	0

4. Discussion

Primary fascial closure proponents believe that it can improve abdominal wall function, prevent recurrence by increasing fascial overlap with the mesh, and reduce seroma formation by reducing the effective dead space between the mesh and overlying tissue (Bittner *et al.,* 2014).

About age for both groups, group A was ranged between 23-46 years with mean±S.D. 33.60±7.679 years while in the group B ranged between 21-46 years with mean±S.D. 35.60±7.908 years. There was no significant statically difference between both groups which agree with Wolter, (2009).

Regarding gender distribution in our study, there were 14 males in group A and 12 males in group B representing 46.7% and 40 % of both groups respectively and 43.3% of the total study. While the female number was 34 cases representing 56.7% of the total count, 16 females in group A and 18 in group B. The increased female ratio agrees with Misra, (2006) and opposite to Wolter, (2009), where the male gender had more percentage.

In our study the size of the defect in the group A ranged between 8-12 cm with mean±S.D. 10.47±1.506 while in the group B ranged between 8-12 cm with mean±S.D. 10.2±1.265. There were no statistically significant differences between groups where in Nandeesh and Akash, (2020) the three of the defect was lower than 10 cm and majority was below 4 cm.

In our study the mean operative time for group B (85.3 minute) was shorter than group A (110 minute) and this agrees with the results of Elwan and Eid, (2019) with 96.8 minutes for closure of the defect and 66 minutes for nonclosure, our explanation is the need for extra time for transfascial closure of the defect.

We had two serosal intestinal tear in the group B representing 6.7%, treated with laparoscopic repair and no conversion was done. This agrees with Rogmark *et al.* (2013), where cases of serosal tear in laparoscopic group repaired without conversion.

In our study, group B stayed in the hospital for less time than group A, with an average of 1.8 days for group B and 2.3 days for group A. In groub A, Zeichen *et al.,* (2013) discovered. The average length of stay in the hospital after surgery was 1.23 days (range 1–3 days). Postoperative ileus was the most common cause for staying overnight. The average length of stay in the postoperative hospital for group B was 1.38 days (range 1–6 days).

In terms of acute postoperative discomfort, group B demonstrated less pain than group A. Clapp *et al.,* 2013 looked into the incidence of chronic pain with closure versus non-closure and found that there was no statistically significant difference between the two groups (9.4 and 18.2 percent, respectively).

Post-operative seroma were reported in two cases (10%) of group A and four cases (20%) of group B. This complies with study of Wennergren *et al.* (2016), with group A was (8.3%) and group B was (14.1%). While Zeichen *et al.* (2013) found a slightly higher incidence of seroma formation in the closure group, 11.4 % compared to 4.3 % in the non-closure group.

In our investigation, all cases of seroma were treated conservatively with repeated aspiration and compression.

In terms of recurrence, five instances experienced recurrent hernias over the follow-up period, which lasted anywhere from one month to 23 months on average. In group A, there is one and in group B, there are four. According to Zeichen *et al.* (2013), the non-closure group's recurrence rate was 4.8 to 16.7%, while the closure group's rate was 0 to 5.7 percent. The non-closure group's seroma formation rate was 4.3 to 27.8%, while the closure group's rate was 5.6 to 11.4 percent. According to Banerjee *et al.* (2012), the non-closure group had a recurrence rate of 4.8 percent, while the closure group had a recurrence rate of 3.0 percent.

4. Conclusion

Laparoscopic repair for ventral and incisional hernia is feasible and easy to learn, also it help rapid recovery and early return to work.

Although there were no significant statistical differences between the fascial closure and non-closure groups, the fascial closure group had fewer seroma and recurrence, implying that the fascial defect closure results are better due to the restoration of abdominal wall integrity.

Finally, we documented that the last chapter in hernia repair still not written until now, so we recommend more researches about this subject**.**

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