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Original Article

Laparoscopic Versus Open Abdominal Repair of Incisional Hernia

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ABSTRACT

Background: Incisional hernia is a common health problem and its method of repair [open or laparoscopic] is still under debate.

Aim of the work: To evaluate the technique and results of the laparoscopic and the open abdominal incisional hernia repair.

Patients and methods: This is a retrospective study conducted on 40 patients with abdominal incisional hernia, admitted to general surgery department of Al-Azhar University Hospital [Damietta]. All records were reviewed for patient demographics, preoperative evaluation, operative and postoperative data. The complications were reviewed and compared between groups. These complications included ileus, cellulitis, flap necrosis, infection, hematoma, seroma, cyst, recurrence and other injuries.

Results: The open group had a shorter operative time than the laparoscopic group [85.3 ± 13.21 vs 110.0 ± 10.04 minutes, respectively]. However, time to oral intake [hours] and the duration of hospital stay [days] were significantly shorter in the laparoscopic when compared to the open group [9.20 ± 1.2 , 1.92 ± 0.69 vs 20.0 ± 2.4 and 2.70 ± 0.68 respectively]. Postoperative complications showed no significant difference between groups.

Conclusion: The laparoscopic repair of incisional hernia is a safe and effective alternative to the open repair with a shorter hospital stay, early oral feeding and a lower rate of complications.

Keywords: Hernia; Incisional; Recurrence risk; Open repair; Laparoscopic repair

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* Main subject and any subcategories have been classified according to the research topic.

INTRODUCTION

A hernia is defined as a protrusion of an organ or its fascia through the wall of the cavity that normally contains this organ or its fascia. These contents are parts of the intestine or abdominal fatty tissues which enclosed in the peritoneal sac. The term hernia can be used for bulges in other areas. However, it is most often used to describe abdominal-wall hernias [1].

The main hernia types are femoral, inguinal, umbilical, diaphragmatic and incisional. Hernias are usually associated with a non-troublesome symptom, but some abdominal manifestations may be representing a serious problem. The diagnosis of hernia is usually straight forward, by feeling and seeing the hernial bulge. The development of hernia is proportionately correlated with patient age and there was a male-sex predominance [2].

An incisional hernia occurs after abdominal surgery as the intestines push through the incisional scar or surrounding weakened tissues [3].

Incisional hernias are due to a weakness of the surgical wounds, produced by a hematoma, seroma, or infection; all of which lead to reduced wound healing [4].

Incisional hernia is a common long-term complication after abdominal surgeries, with an incidence of 3%-20% [5].

Untreated incisional hernia increased in size by time and lead to difficult repair. Incisional hernia is usually associated with abdominal pain, restriction of daily activities and unattractive appearance. The complications of incisional hernia are uncommon, but could be very serious or life-threatening. Intestinal obstruction or strangulation and entero-cutaneous fistulae can occur. The skin ulceration and spontaneous rupture can threaten the patient's life [6].

Surgical management for incisional hernia markedly improves the patients' quality of life. The available data regarding the complication rates of open versus laparoscopic repair are highly heterogeneous [7].

Another option is Trusses, corsets, or binders that held hernias in place by pressure on the skin of the abdominal wall. These approaches are temporary and can lead to skin damage and infection due to friction. They are usually used in older patients with very large hernial defect and there is an increased complications risk [8].

The repair of incisional hernia aimed to re-build the myofascial layer integrity and provide durable cutaneous coverage and the recurrence risk [9].

During the past five decades, the surgery for incisional hernia repair was advanced from direct suturing to the use of synthetic mesh to obtain a tension-free repair. Finally, the tension-free ideas have been applied in laparoscopic repair [10].

The laparoscopic approach takes advantage of the wide exposure and accessibility for prosthetic mesh placement and avoiding the large incision, extensive subcutaneous dissection and tissue flaps, and the need for drains, and consequently leading to lowering the rate of wound complications [11]. In addition, the surgery through smaller key holes is associated with less pain and speed recovery. Laparoscopic repair had been proven to be the safest approach for incisional hernia [12].

In the current [our] institution, there is a growing attitude to adopt laparoscopy for most surgical interventions. However, many still advocate open surgery with minimal incisions. Incisional hernia repair is a topic for debate in our institution and many others. Thus, we intended to check the outcome of laparoscopy and open repair of incisional hernia.

AIM OF WORK

The purpose of this study is to evaluate the technique and results of the laparoscopic and open abdominal incisional hernia repair.

PATIENTS AND METHODS

This is a retrospective study conducted on 40 patients with abdominal incisional hernia, admitted to general surgery department of Al-Azhar University Hospital [Damietta] between October 2018 and June 2019.

The inclusion criteria were patients with abdominal incisional hernia, age 18 - 50 years, both males and females and fit for surgery. The exclusion criteria were unfit for anesthesia or operation, pregnancy, recurrent or complicated incisional hernia. We inspected data of 40 patients, 20 in group 1 [open repair] and 20 in group 2 [laparoscopic repair]. For all patients, data for medical history, examination [general and local] and laboratory investigations were collected. Lab data included complete blood picture, fasting and postprandial blood glucose, coagulation profile, liver and kidney function tests. In addition, results of imaging studies were checked and documented. Imaging studies included ultrasonographic and computed tomography examination for the abdomen and pelvis, chest X-ray, and echocardiography.

Ethical considerations:

The study protocol was approved by the local institutional [ethical and research] board of Damietta Faculty of Medicine. In addition, an administration consent was obtained for data collection and handling of patient records, with the assurance of concealment of patient identity.

The operative details:

Each patient received a prophylactic dose of a third-generation cephalosporin with induction of anesthesia. A urinary catheter had been introduced to empty the bladder, and a nasogastric tube was introduced. In an open repair group, the patient was put in the supine position. The old scar was excised and deepened around the margins of the hernia until identification of healthy aponeurosis. Subcutaneous flaps were raised with clearance of aponeurosis for 5 cm around the defect [Figure 1]. The hernial sac was identified and its contents were reduced. The defect then was closed by non-absorbable 0 sutures. Polypropylene mesh was used as onlay and fixed by polypropylene 2-0 sutures over a distance of 5 cm around the defect [Figure 2]. The skin closed over a suction drain.

In the laparoscopic repair group, patients were operated in the supine position then modified by right or left tilt & Trendelenburg or anti-Trendelenburg positions, according to the need. The

pneumoperitoneum had been created by the open technique [Hasson] or by the use of the visual port away from the lesion. The 30-degree telescope was introduced away from the margin of the defect. Then, two additional 5 mm ports were placed. More additional ports can be added according to the need during the procedure. Omental and bowel adhesions were dissected using vessel-sealing device [Figure 3].

The hernial sac and its contents had been reduced, and a careful check for additional defects was carried out. The defect size was measured by using appropriate tape from inside and multiple needles from outside after decreasing the intra-abdominal pressure [Figure 4].

The defect was closed in most cases using transfascial non-absorbable suture [Figure 5]. A composite mesh of appropriate size was rolled and introduced through the visual port to overlap 5 cm around the defect. The pressure was reduced during mesh fixation. Mesh fixation was done with sutures and tacks [Figure 6]

[Transfascial sutures using 4 to 6 transfascial sutures at the edge of the mesh; 5 mm absorbable tacks were placed all around the mesh at 1 cm distance along the peripheral margin and a second inner row of staples around the defect; Intracorporeal stitches can be added for reinforcement]. At the end of the procedure, intraperitoneal drain inserted and pneumo-peritoneum was decompressed and port sites were closed [Figure 7]. A ball of gauze was placed over the region of hernia and pressure dressing applied. Foley's catheter and nasogastric tube were removed at the end of the procedure.



Figure [1]: Skin flaps and the defect are clearly seen in the midline incisional hernia.



Figure [2]: Polypropylene mesh was applied onlay position.



Figure [3]: Adhesiolysis using vessel-sealing device.

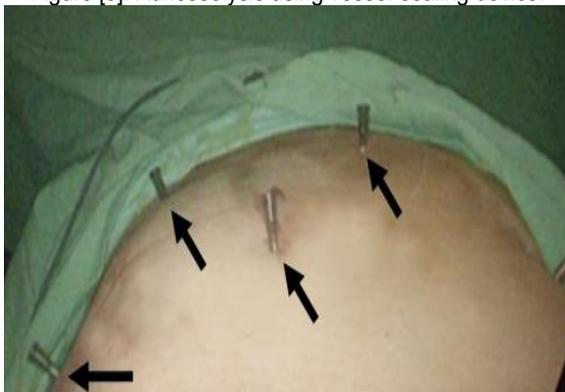


Figure [4]: Measurement of the defect from the outside using multiple needles.



Figure [5]: Transfascial closing of the defect.



Figure [6]: Mesh fixed with sutures and tacks.



Figure [7]: Postoperative abdominal appearance with a demonstration of port sites and previous scar.

The postoperative care for both groups:

Semi-setting position for all patients. Pain assessed by numeric rating scale [NRS] [13] and relieved by analgesia. Early mobilization of patients after recovery from general anesthesia. Oral fluid and diet were usually started with audible intestinal sounds. Complications during the postoperative period were looked for. These complications included ileus, cellulitis, flap necrosis, infection, hematoma, seroma, cyst, recurrence and other injuries. All patients were instructed to avoid lifting heavy objects or strenuous activities. After discharge from the hospital, all patients were arranged for follow-up at one week, one, three, six and 12 months thereafter.

Data analysis:

SPSS Software [version 20] was used to perform statistical analysis of patient's data. According to the data distribution, descriptive data were expressed as either means with standard deviation or median with ranges. 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 is considered significant.

RESULTS

Our study included 40 patients with abdominal incisional hernia; they were divided into two groups [20 patients each, the open and the laparoscopic groups respectively]. Both groups were comparable regarding patient age and gender [Table 1].

Both open and laparoscopic groups were comparable as regard to location of the hernia and

post-operative pain. However, the open group had a significantly shorter operative time than the laparoscopic group [85.3±13.21 vs 110.0±10.04 minutes respectively]. But, time to oral intake [hours] and the duration of hospital stay [days] were significantly shorter among the laparoscopic when compared to the open group [9.20±1.2, 1.92±0.69 vs 20.0±2.4 and 2.70±0.68 respectively] [Table 2].

Post-operative complications are presented in detail in table [3] and there was no significant difference between the open and the laparoscopic groups.

Table [1]: Patient demographics among studied groups

Variable		Group I [open]	Group II [lap]	Test	p
Age		19.10±10.89; 29-45	19.84±8.71; 33-49	0.37	0.7
Gender	Male	9[45.0%]	10[50.0%]	0.16	0.10
	Female	11[55.0%]	10[50.0%]		

Table [2]: Location of hernia and outcome among studied groups

Variable		Group I [open]	Group II [lap]	Test	p
Location	Upper midline or paramedline	7[35.0%]	8[40.0%]	0.15	0.98
	Lower midline or paramedline	6[30.0%]	5[25.0%]		
	The upper right quadrant	4[20.0%]	4[20.0%]		
	Lower right quadrant	3[15.0%]	3[15.0%]		
Operative time [min]		85.3±13.21; 60-115	110.0±10.04; 90-130	13.1	<0.001*
The mean time for oral intake [hours]		20.0±2.4; 12-36	9.20±1.2; 6-12	7.4	<0.001*
Hospital stay duration [days]		2.70±0.68; 2-5	1.92±0.69; 1-3	5.6	<0.001*
PO pain	None	0[0.0%]	3[15.0%]	5.38	0.15
	Mild	10[50.0%]	12[60.0%]		
	Moderate	6[30.0%]	4[20.0%]		
	Severe	4[20.0%]	1[5.0%]		

Table [3]: Post-operative complications

Variable	Group I [open]	Group II [lap]	Test	p
Seroma	2[10.0%]	4[20.0%]	0.78	0.33
Superficial wound infection	2[10.0%]	0[0.0%]	2.10	0.15
Flap necrosis	0[0.0%]	0[0.0%]	a	
Bowel injury	1[5.0%]	2[10.0%]	0.36	0.54
Ileus	2[10.0%]	1[5.0%]	0.36	0.54
Recurrence	2[10.0%]	1[5.0%]	0.36	0.54
Vascular injury	0[0.0%]	0[0.0%]	a	

a: No statistics can be computed as variables are constant

DISCUSSION

The widespread adoption of tension-free repair concept for incisional hernia with mesh, led to a reduction of the recurrence rate than the direct suturing technique. The next marked change was the introduction of the minimally invasive laparoscopic approaches [14].

The current study was designed to compare between the open and the laparoscopic repair of incisional hernia. Both groups were comparable regarding to sex distribution with a slight predominance of females in overall patients [52.5%], which is consistent with Misra *et al.* [15], Tsuruta *et al.* [16] and different than Wolter *et al.* [17].

The laparoscopic repair was significantly associated with longer operative time than the open repair [110.0±10.04 vs 85.3±13.21 minutes, respectively]. Comparable results were reported by Eker *et al.* [18] with a mean operative time of 100 minutes in the laparoscopic group and 76 minutes in the open group. On the other side, Asti *et al.* [14] reported a shorter operative time in the laparoscopic when compared to the open repair [90 vs 140 minutes, respectively]. However, Rogmark *et al.* [19] reported no significant difference between the open and the laparoscopic repairs regarding operative time. This variation in operative time may be related to the learning curve of operator especially in the laparoscopic group, where increased operator experience associated with a shorter operative time.

In the laparoscopic group, one patient [5.0%] converted to open repair due to extensive adhesions. Rogmark *et al.* [19] reported a conversion rate of 5%, while Barbaros *et al.* [20] report no case was converted from laparoscopic to the open repair.

Bowel injury [serosal tear] was reported in two patients in the laparoscopic group [treated by laparoscopic repair at the same setting without conversion] and one patient in the open group [treated with repair].

Rogmark *et al.* [19] reported comparable results and serosal tear in the laparoscopic group repaired without conversion.

In the current study, no perforation of a hollow viscus was reported, and this agree with Misra *et al.* [15], but different than Eker *et al.* [18] who reported intestinal and urinary bladder perforation in the laparoscopic group. In addition, Itani *et al.* [21] reported bowel perforation in three patients [4.0%] of the laparoscopic group during dissection, which had been recognized intraoperatively, converted to open and repaired.

As regards to time to oral intake, the mean time for the open repair was 20.0±2.4 and 9.2±1.2 hours in the laparoscopic repair with a significant shortening in the laparoscopic group. These results are consistent with Itani *et al.* [22].

Hospital stay was significantly shorter after the laparoscopic than the open repair [0.92±0.69 vs 2.70±0.68 days respectively]. This lies in agreement with Tsuruta *et al.* [16] who reported a significantly shorter hospital for the laparoscopic than the open hernia repair [2.15 days for the laparoscopic and 5.28 days for the open repair]. On the other side, Rogmark *et al.* [19] didn't show any significant difference between the open and laparoscopic repair.

Regarding the acute post-operative pain, the laparoscopic repair was associated with lower pain than the open repair. However, the difference did not reach statistical significance. These results are supported by the study of Wolter *et al.* [17] who reported that, pain scales did not show any significant difference between both groups. However, Qadri *et al.* [23] reported a significant reduction of pain in the laparoscopic group.

In the current study, superficial wound infection was confined to open group [two patients], while none in the laparoscopic group had superficial wound infection. All treated in outpatient clinic with frequent dressing and antibiotics with a resolution of infection within days. The difference was statistically non-significant. Kautzanis *et al.* [24] reported comparable results, where no significant difference was found between the laparoscopic and open groups. However, Olmi *et al.* [25] reported a significant increase of wound infection in the open when compared to the laparoscopic group.

Post-operative seroma was reported in two patients [10%] of the open group and four patients [20%] of the laparoscopic group, with no significant difference. Itani *et al.* [21] reported less seroma in the laparoscopic group with a significant difference. The explanation for increased seroma in the current study may be due laparoscopic reduction without excision of hernial sac.

Regarding recurrence, three cases had recurrent incisional hernia during the follow-up period of one year; Two in the open and one in the laparoscopic group with no significant difference. Wolter *et al.* [17] reported a significant increase of recurrent hernia after open than the laparoscopic repair. Al Chalabi *et al.* [26] reported a non-significant difference as in the current study.

Post-operative ileus was reported in three patients, one in the laparoscopic and two in the open group. Asti *et al.* [14] reported prolonged ileus in 10 % of open and 4% of the laparoscopic groups, as in the current work. Lobato *et al.* [23] reported 1% of ileus in the laparoscopic group, who needed hospital readmission, and Misra *et al.* [15] did not report ileus in any patient.

In indirect evaluation of cost-effectiveness, the laparoscopic repair did not cost more than the open repair due to the shorter duration of hospital stay with less complications. Comparable conclusions were drawn by Earle *et al.* [27].

Overall, Olmi *et al.* [25] advocated laparoscopic incisional hernia repair, because of a shorter operative time [did not attained in the current study] and hospitalization, fewer complications, and faster return to work. Forbes *et al.* [28] also stated that, the laparoscopic repair of ventral and incisional hernia is at least as effective, if not superior to, the open approach in a number of outcomes. Misra *et al.* [15] added a better cosmetic appearance to the benefits of the laparoscopic repair of incisional hernia. Lavanchy *et al.* [29] conducted a unique study to compare between the laparoscopic and the open repair for incisional hernia. They follow-up their patients for up to 5 years and removed the bias of mesh position. They revealed the superiority of the laparoscopic repair in terms of a shorter operative time, the shorter

duration of hospital stay and reduced complications [specifically recurrence and wound infection].

Limits of the current study include the retrospective nature of the study with possible bias in the collected data and small number of included patients. However, to increase the power of the study we included all patients submitted to the laparoscopic repair and included equivalent number of patients treated by the open repair with matching for patient age and sex.

In conclusion, the laparoscopic incisional hernia repair seems to be a safe and effective alternative to open incisional hernia repair with a shorter hospital stay, early oral feeding and a lower rate of complications. We recommend increase application of the laparoscopic repair of incisional hernia and a larger multicenter randomized trial with longer follow-up to measure the long-term results.

Conflict of interest and financial disclosure

Authors declare that, there was no conflict of interest and they did not receive any financial support.

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