

*Research Article***Laparoscopic Versus Open Mesh Repair for Incisional Ventral Hernia****Mohamed Rabea, MD**

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Abstract

Objective: To evaluate and compare laparoscopic and open mesh repair of incisional ventral hernia. **Patients and Methods:** The study included 30 patients underwent laparoscopic mesh repair of ventral incisional hernia were evaluated and compared to another 30 patients underwent open technique. The follow-up ranged from 6 to 24 months. Primary end point was recurrence during follow-up period. Secondary end points were operative time, postoperative complications and length of hospital stay. **Results:** When compared to open technique, laparoscopic mesh repair results in lower hospital stay (4.6 ± 1.36 versus 7.2 ± 1.72 days; $p = 0.03$). The incidence of any postoperative complication per patient was 16.7% in laparoscopic group and 20% in open group, with statistically insignificant difference ($p > 0.05$). The rate of recurrence was 3.3% in laparoscopic group and 10% in open group, with statistically insignificant difference ($p > 0.05$). Recurrence of hernia was significantly correlated to COPD, previous open repair, seroma, wound infection, ileus and presence of postoperative complication after laparoscopic technique, in addition to BMI > 30 kg/m² and mesh/defect size in the open group and in all patients (regardless the technique). **Conclusion:** Laparoscopic mesh repair is safe and effective as open technique for management of incisional ventral hernia in terms of recurrence and postoperative complications, with additional advantage of reduced hospital stay.

Keywords: Incisional ventral hernia, laparoscopy, recurrence.**Introduction**

Ventral hernias are defects of the anterior abdominal wall. They can be congenital (umbilical and para-umbilical) or acquired (incisional)⁽¹⁾. Incisional ventral hernias are the most common post-operative complication after laparotomy. Despite advances in suture material and techniques of fascial closure, the incidence of incisional ventral hernias remains high between 10% and 20%⁽¹⁾.

Mesh repair is typically indicated to provide a tension-free repair and reduce the risk of recurrence, although mesh repairs are associated with an increased risk of infection⁽¹⁾. There are many different techniques currently in use for ventral and incisional hernia repair.

Laparoscopic techniques have become more common in recent years, although the evidence is sparse⁽²⁾. Laparoscopic repair has been

reported in some studies to be superior to open repair owing to fewer complications, less pain, and earlier return to work^(3,4). The lower complication rate with laparoscopy is a major contributing factor to a lower incidence of recurrence⁽¹⁾.

However, laparoscopic repair requires significant experience and expensive equipment and supplies⁽⁵⁾. The objective of this study was to examine and compare the safety and efficacy of laparoscopic versus open repair of incisional ventral hernias.

Patients and Methods

This prospective study was conducted to compare the results of laparoscopic and open mesh repair of incisional hernia at anterior abdominal wall for patients admitted to the Department of General Surgery at Al-Jafel International Hospital, from January 2007 to

January 2013. Thirty patients underwent laparoscopic mesh repair were evaluated and compared to another 30 patients underwent open technique. In laparoscopic group, we exclude patients with multiple scars on the abdominal wall, large defect where 5 to 6 cm meshes overlap is not possible intra-abdominally, patients with large amount of redundant skin and fat on the abdominal wall, patients with peritonitis, acute and subacute intestinal obstruction, severe cardiopulmonary disease and patients with portal hypertension.

Laparoscopic Technique:

Pneumoperitoneum was established with Veress needle in the subcostal position. The trocars were placed according to the hernia position. Three trocars (Two 6 mm trocars and a 10/12 mm trocar for the scope) were used. All abdominal wall adhesions were divided (Figure 1). The abdominal wall defect was identified and measured extra-abdominally. Expanded polytetrafluoroethylene (ePTFE, Gore-Tex®) mesh was used in all cases to overlap hernia margins by at least 5 cm. The mesh was fixed with a combination of sutures and tacks placed circumferentially at 1-cm intervals (Figure 2). The sutures were tied down, avoiding too tight knotting of the thread. No drains were used.

Open Technique:

After a dissection of the subcutaneous space, the sac of hernia was opened and resected. Implantation of the standard polypropylene mesh was done in sublay (retro-muscular) position. The mesh was then approximated to the fascia with large interrupted permanent polypropylene sutures. Because of the large dead space developed by the dissection of the skin and fat off the fascia, suction drain was placed.

Postoperative follow-up:

The follow-up ranged from 6 to 24 months. Primary end point was recurrence during follow-up period. Secondary end points were operative time, postoperative complications and length of hospital stay.

Statistical Analysis:

Data were analyzed using Statistical Package for the Social Science (SPSS), version 16 for windows. Differences between the laparoscopic and open repair groups were compared using Chi-square test or the Fisher exact test for qualitative variables and the unpaired t-test for continuous quantitative variables. Non-parametric Spearman's test was used to determine correlation of the outcome with different risk factors. The significance of statistical test was considered when P-value was ≤ 0.05 .

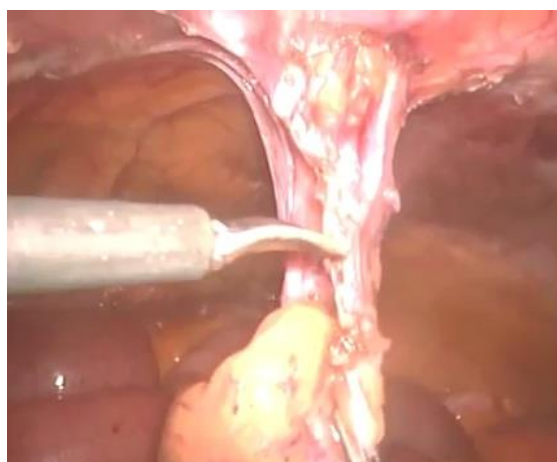


Figure 1: Laparoscopic dissection of the sac of incisional ventral hernia

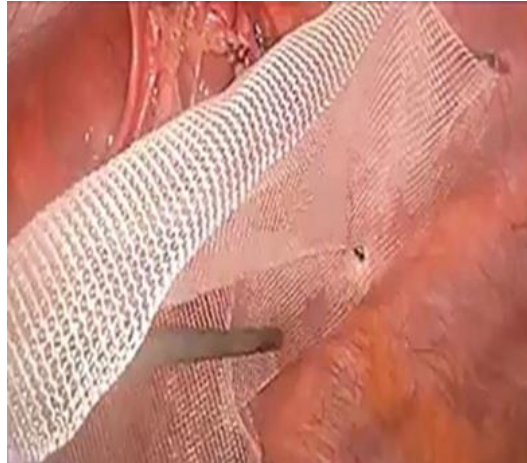


Figure 2: Fixation of mesh with tacks during laparoscopic repair of incisional hernia

Results

The preoperative characteristics of patients in both groups were nearly similar with statistically insignificant differences regarding age, gender, obesity (BMI more than 30 kg/m^2), history of diabetes mellitus, COPD previous open repair (Table 1).

Operative and postoperative outcome were comparable between both groups (Table 2). Patients with laparoscopic mesh repair showed insignificant difference to patients with open mesh repair regarding operative time (81.83 ± 30.73 versus 92 ± 47.36 min; $p > 0.05$), defect size (1.1 ± 0.4 versus 1.8 ± 0.8 cm; $p > 0.05$) mesh size (241 ± 120.14 versus 210 ± 112.11 cm²; $p > 0.05$) and mesh/defect size (2.67 ± 0.97 versus 2.80 ± 0.96 ; $p > 0.05$). Patients with laparoscopic mesh repair had lower hospital stay than patients with open mesh repair (4.16 ± 1.36 versus 7.20 ± 6.77 days; $p = 0.03$). There were no intra-operative complications in both groups and there was no mortality as a result of the procedure. The mean follow-up duration was 10.73 ± 0.94 months in laparoscopic group and 13.06 ± 4.78 months in open group, with statistically insignificant difference ($p > 0.05$). During the

hospital stay and follow-up period, the incidence of any postoperative complication per patient was 16.7% in laparoscopic group and 20% in open group, with statistically insignificant difference ($p > 0.05$). There were no patients with mesh infection in both groups. There was statistically insignificant difference between both groups in the incidence of each complication (seroma, wound infection, bleeding, ileus, intestinal obstruction). The rate of recurrence was 3.3% in laparoscopic group and 10% in open group, with statistically insignificant difference ($p > 0.05$).

Analyzing the correlation of the recurrence of hernia to different pre-, intra- and post-operative risk factors in all patients or in each group (Table 3) showed that recurrence after laparoscopic technique was significantly correlated to COPD, previous open repair, seroma, wound infection, ileus and presence of postoperative complication. Recurrence after open technique and in all patients (regardless the used technique) was significantly correlated to the same risk factors in laparoscopic group in addition to significant correlation to BMI $> 30 \text{ kg/m}^2$ and mesh/defect size.

Table (١): Preoperative characteristics

Variables	Open repair (n=٣٠)	Laparoscopic repair (n=٣٠)	P-value
Age (years)	٥٣.٧٣±١٣.٩٢	٤٨.٩٦±١٢.٧٣	٠.١٧
Male/Female	١٦/١٤	١٨/١٢	٠.٦٠
Obesity (BMI > ٣٠ kg/m ^٢)	١٢ (٤٠%)	١٤ (٤٦.٧%)	٠.٦٠
Diabetes mellitus	٧ (٢٣.٣%)	٩ (٣٠%)	٠.٥٥
COPD	٤ (١٣.٣%)	٣ (١٠%)	٠.٦٨
Previous open repair	٣ (١٠%)	٢ (٦.٧%)	٠.٦٤

BMI: Body mass index. COPD: Chronic obstructive disease.

Table (٢): Operative and postoperative outcome

Variables	Open repair (n=٣٠)	Laparoscopic repair (n=٣٠)	P-value
Operative time (min)	٩٢±٤٦.٣٦	٨١.٨٣±٣٠.٦٣	٠.٣٢
Defect size (cm)	٩±٣.٨	١٠±٤.١	٠.٣٣
Mesh size (cm ^٢)	٢١٠±١١٢.١١	٢٤١±١٢٥.١٤	٠.٣٠
Mesh/defect size	٢.٨٥±٠.٩٦	٢.٦٧±٠.٩٧	٠.٤٧
Hospital stay (days)	٧.٢٠±٦.٧٢	٤.٠٦±٤.٣٦	٠.٠٣*
Follow-up (months)	١٣.٥٦±٤.٧٨	١٥.٧٣±٥.٩٤	٠.١٢
Any complication °	٦ (٢٠%)	٥ (١٦.٧%)	٠.٧٣
Seroma	١ (٣.٣%)	٣ (١٠%)	٠.٣٠
Wound infection	٢ (٦.٧%)	١ (٣.٣%)	٠.٥٥
Postoperative bleeding	٠ (٠%)	١ (٣.٣%)	٠.٣١
Ileus	٣ (١٠%)	٢ (٦.٧%)	٠.٦٤
Intestinal obstruction	١ (٣.٣%)	١ (٣.٣%)	١
Recurrence	٣ (١٠%)	١ (٣.٣%)	٠.٣٠

* Significant difference. ° Some patients had more than one complication.

Table (٣): Correlation of the recurrence of hernia to different pre-, intra- and post-operative risk factors

Variables	All patients		Open repair		Laparoscopy	
	r-value	p-value	r-value	p-value	r-value	p-value
Age	٠.٢٣	٠.٠٦	٠.١٥	٠.٤٠	٠.٢٣	٠.٠٦
Female gender	٠.٠٩	٠.٤٥	٠.٠٨	٠.٦٤	٠.١٥	٠.٤٢
BMI > ٣٠ kg/m ^٢	٠.٣٠	٠.٠١*	٠.٤٠	٠.٠٢*	٠.١٩	٠.٢٩
Diabetes	٠.١٤	٠.٢٨	٠.٣٤	٠.٠٦	-٠.١٢	٠.٥٢
COPD	٠.٥٢	٠.٠٠١*	٠.٥٢	٠.٠٠٣*	٠.٥٥	٠.٠٠١*
Previous open repair	٠.٦٤	٠.٠٠١*	٠.٦٣	٠.٠٠١*	٠.٦٩	٠.٠٠١*
Mesh/Defect size	٠.٢٩	٠.٠٢*	٠.٣٨	٠.٠٣*	٠.٢٦	٠.١٦
Seroma	٠.٤٦	٠.٠٠١*	٠.٥٥	٠.٠٠١*	٠.٥٥	٠.٠٠١*
Wound infection	٠.٨٥	٠.٠٠١*	٠.٨٠	٠.٠٠١*	١	٠.٠٠١*
Ileus	٠.٦٤	٠.٠٠١*	٠.٦٣	٠.٠٠١*	٠.٦٩	٠.٠٠١*
Intestinal obstruction	-٠.٠٥	٠.٧٠	-٠.٠٦	٠.٧٤	-٠.٠٣	٠.٨٥
Complication	٠.٥٦	٠.٠٠١*	٠.٦٦	٠.٠٠١*	٠.٤١	٠.٠٢*

*significant correlation

Discussion

The surgical treatment of incisional hernia has changed rapidly during the last decade with the increasing use of mesh technique and the introduction of laparoscopy. The choice of the most suitable technique for management of patients with incisional hernia may be difficult because of the heterogeneity of those patients with patient-specific co-morbidity and innate differences such as the difference of collagen formation quality^(3,11). Incisional hernias are ventral hernias through an operation scar and are a serious complication of abdominal surgery. Incisional hernias occur in 11-23% of laparotomies⁽¹¹⁾. The repair can be done by either an open or a laparoscopic technique. The open technique can be performed through a suture repair, a components separation technique or a mesh repair. Laparoscopic correction is always performed with a mesh⁽¹¹⁾.

The main finding of the present study is that laparoscopic mesh repair of incisional ventral hernia has advantages over the open mesh repair in reduced hospital stay after surgery, however the fewer postoperative complications and the lower rate of hernia recurrence noticed with laparoscopic technique did not reach the statistical significance. Our primary endpoint was recurrence of hernia which occurred in 10% of open group and 3.3% of laparoscopic group, with insignificant difference, during follow-up period up to 5 years. These incidences agreed with incidences in literature reported in recent comparative studies estimated recurrence rate within 5 years of follow-up. This rate ranged from 0 to 8.2% after open repair and from 2 to 12.0% after laparoscopic repair^(4,12-15). In the study by Olmi et al.,⁽¹²⁾ recurrence rates were 0% for open group and 2% for laparoscopic group. Misra et al.,⁽¹³⁾ reported recurrence rate of 3% in the open group and 2% in laparoscopic group. Asencio et al.,⁽¹⁴⁾ reported recurrence rate of 4.9% in open group and 1.7% in laparoscopic group. Itani et al.,⁽⁴⁾ found recurrence rate of 8.2% in the open repair group and 12.0% in the laparoscopic group at 5 years of follow-up. Similar to our findings, none of those authors reported a significant difference in the recurrence rate between both groups.

In the present study, recurrence of hernia was significantly correlated to COPD, previous open repair, seroma, wound infection, ileus and presence of postoperative complication after laparoscopic technique, in addition to BMI > 30 kg/m² and mesh/defect size after open group and in all patients (regardless the technique). There is no consensus about the factors influencing the recurrence after mesh repair of incisional ventral hernia. Recurrences were attributed to various factors. Misra et al.,⁽¹³⁾ attributed recurrence to inadequate space for mesh fixation in a low-lying defect, whereas Olmi et al.,⁽¹²⁾ attributed recurrence to inadequate mesh overlap, and Itani et al.,⁽⁴⁾ attributed recurrence to postoperative surgical-site infection.

Cassar et al.,⁽¹¹⁾ reviewed 1098 laparoscopic and 298 open repairs and found higher recurrence rates for large hernias and patients with a wound infection. They also found that staples alone were inadequate for fixation of mesh and that the interval between two staples should be less than 1 cm. Bedi et al.,⁽¹⁶⁾ stated that recurrence decreases with the use of transfacial sutures and with experience. Other studies have noted that lateral defects⁽¹⁷⁾, larger defects⁽¹³⁾, BMI higher than 30 kg/m²⁽¹²⁾, and perioperative complications⁽¹¹⁾ are associated with significantly higher recurrence rates.

Kurmann et al.,⁽¹¹⁾ showed that width of the hernia ≥ 10 cm, surgical site infections and obesity (BMI ≥ 30 kg/m²) were significant risk factors for hernia recurrence. Marx et al.,⁽¹⁷⁾ reported that although the recurrence rate in obese patients ranged from 10-20%, their recent study confirmed the feasibility and safety of the laparoscopic approach for ventral hernias in morbidly obese patients (BMI ≥ 30 kg/m²), with lower recurrence rate (3.8%).

Mesh size is also associated with recurrence after repair of hernia. In the present study we found a significant correlation between mesh/defect size and recurrence. Wassenaar et al.,⁽¹⁷⁾ recommended that the mesh should cover not only the defect but also the entire incision to prevent recurrence. A larger mesh may protrude through the defect, causing recurrence. Chelala

et al.,⁽¹⁴⁾ reported that recurrence could be due to non closure of the defect with extrusion of mesh into the defect, especially when the mesh size is insufficient.

In my study, patients with laparoscopic mesh repair had lower hospital stay than patients with open mesh repair (8.6 ± 4.36 versus 12.2 ± 6.72 days; $p=0.03$). These findings agreed with studies in literature where laparoscopic incisional hernia repair is associated with a shorter hospital stay than open repair. Misra et al.,⁽¹⁵⁾ reported shorter mean of hospital stay in laparoscopic group of 1.87 versus 3.87 days in open group ($p = 0.007$). Olmi et al.,⁽¹⁷⁾ reported that mean hospitalization was 2.7 days for laparoscopic group patients and 9.9 days for open group patients ($p < 0.00$). Moreover, Asencio et al.,⁽¹⁶⁾ found that mean length of stay and time to oral intake were similar between groups.

The shorter hospital stay with laparoscopic technique constitutes an important economic benefit over open technique. Theoretical calculation by Olmi et al.,⁽¹⁷⁾ showed the cost of laparoscopic surgery to be higher than the cost of open repair but the overall cost to be less than that of the open technique, probably due to a shorter hospital stay.

In the present study, the overall rate of postoperative complications was 16.7% in laparoscopic group and 20% in open group, with statistically insignificant difference ($p > 0.05$). An early study by Olmi et al.,⁽¹⁷⁾ complications occurred in 16% of the laparoscopic and 20% of open group. Later on, Olmi et al.,⁽¹⁷⁾ reported complications in 16.8% of laparoscopic group and 29.8% of open group. Misra et al.,⁽¹⁵⁾ reported more wound-related infectious complications in the open group (33%) than in the laparoscopic group (7%) ($p = 0.03$).

In the study by Itani et al.,⁽⁴⁾ complications were less common in the laparoscopic group (23 patients [31.0%]) compared with the open repair group (30 patients [47.9%]; $P = 0.03$). Surgical site infection through 4 weeks was less common in the laparoscopic group (2.7% versus 23.3%). These findings highlights that wound-related

complications are the major disadvantage of conventional repair of incisional ventral hernia repair which compelling argument in favor of laparoscopic repair.

Seroma formation has been one of the most commonly reported postoperative complications after laparoscopic repair of incisional and ventral hernia. The incidence of seroma varies from 3 to 100% , with a peak presentation at 7 days postoperatively and almost complete resolution by 90 days after surgery^(18,19). In the present study, seroma developed in 10% of laparoscopic group patients. Seromas are known to develop after open repair as well, and its incidence is unaffected by the use of suction drainage⁽²⁰⁾. We agreed with other authors who reported that the placement of a compression dressing for 1 or 2 weeks reduced the occurrence of seroma^(18,20).

In conclusion, the safety and efficacy of laparoscopic mesh repair for management of incisional ventral hernia is proved in the present study, which appeared to be similar to open mesh repair, however laparoscopic technique is associated with reduced hospital stay and lower postoperative complications, which may overcome its higher cost than open repair and support its wide use. Recurrence within 5 years of follow-up is not different between both techniques and it is significantly correlated to history of COPD, previous open repair, seroma, wound infection, ileus, postoperative complication, BMI > 30 kg/m² and mesh/defect size. Further comparative mid-term and long-term studies are recommended to give more conclusive results in this concern.

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