Laparoscopic preperitoneal ventral hernia repair with prolene mesh with fixation through transabdominal prolene stitches

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Objective
To evaluate the efficacy and safety of our technique in laparoscopic repair of ventral hernias.
Summary background data
Laparoscopic ventral hernia repair (LVHR) was first reported in 1993. The successful application of laparoscopic techniques for the repair of ventral hernias has been well accepted. The recurrence rate after standard repair of ventral hernias may be as high as 10%, and the wide surgical dissection required often results in wound complications. Use of a laparoscopic approach may decrease rates of complications and recurrence after ventral hernia repair.
Patients and methods
Data on all patients who underwent LVHR performed using our procedure between February 2013 and February 2015 were collected retrospectively.
Results
LVHR was completed in 27 of the 30 patients (nine men and 21 women) in whom it was attempted. The patients' mean BMI was 36.5; the mean defect size was 3.2 cm. Mesh averaging 6.3 cm was used in all cases. Mean operating time was 105 min, and hospital stay averaged 1.9 days. Our complication rates were 16.6%. The most common complications were ileus (6.6%) and prolonged seroma (6.6%). During a mean follow-up time of 12 months, the hernia recurrence rate was 3.3%. Overall, 10% of patients had pain for 1 month. Recurrence was associated with vigorous exercise within the first 3 months postoperatively.
Conclusion
In this series, the preperitoneal laparoscopic technique for ventral hernia repair had a low rate of conversion to open surgery, a short hospital stay, a moderate complication rate, and a low risk of recurrence avoiding the potential complications related to intraabdominal mesh position.

Keywords:
laparoscopic ventral hernia, prolene mesh, transabdominal stitches

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Introduction

Laparoscopic ventral hernia repair (LVHR) was first reported in 1993. The successful application of laparoscopic techniques for the repair of ventral hernias has been well accepted [1,2]. In fact, many authors have suggested LVHR with mesh as the new procedure of choice for the treatment of abdominal wall fascial defects [3,4]. Fascial defects involving the umbilicus are common. Typically, these defects are small, symptomatic, and mandate repair once detected [5,6]. They are easily repaired using an open technique and usually require only local anesthetic with light intravenous sedation [7,8]. For typical defects (2 cm), a primary repair is often performed with the use of mesh reserved for either large or recurrent hernias [9]. Problems with conventional ventral hernia repair include a relatively high rate of recurrence (>10% in some series) [9,10] and a potentially increased risk of infection relative to other skin incisions, particularly with the use of mesh, owing to the location in and around the umbilical crease. Several small series and case reports have demonstrated the feasibility of LVHR as a potential means of avoiding these problems [11,12].

Patients and methods

A 24-month retrospective hernia study was started in February 2013 and continues up until February 2015 at the General Surgery Unit at Ain Shams University Hospital or Ain Shams specialized hospital. The study was approved by the ethical and scientific committee of the General Surgery Department, Ain-Shams University will be added in pat and methods. It was initially started and primarily performed for internal observance with follow-up evaluation; a case series of 30 patients having laparoscopic repair of ventral wall

abdominal hernia was performed. For the evaluation, a minimum of a 1-year follow-up had to be passed.

Patients presenting at the General Surgery Unit at Ain Shams University Hospital who were 18 years of age or older, with a diagnosis of ventral wall hernia, were eligible for random assignment to laparoscopic preperitoneal ventral hernia repair with prolene mesh with fixation through transabdominal prolene stitches. Patients gave written informed consent before inclusion into the study. In general, four exclusion criteria for the participation were defined: (a) infants or children with anatomic limitation for laparoscopic approach, (b) elderly patients with comorbidity where it was preferable to perform surgery with intravenous sedation and local anesthesia, (c) patients who had extensive abdominal surgery in the past which would have made the laparoscopic dissection difficult or even impossible, and (d) patients' choice for a no laparoscopic operative approach. There were no exclusion criteria for the evaluation, and all files and patient medical histories were complete for evaluation. Data collection included postoperative pain, use of pain medication, return to work, potential complications, and recurrence rate. All patients were asked before surgery to rate their pain or discomfort on a visual analog scale from 0 (=none) to 10 (=worst) pain preoperatively, and again for 7 days after surgery, and at 1 month and at 1 year postoperatively. The number of days until return to work was recorded. An evaluation for potential complications and recurrence was performed during follow-up as well.

Surgical technique

The laparoscopic repair technique consisted of trocar placement followed by CO_2 peritoneal insufflation to obtain pneumoperitoneum. The initial entry site was usually just inferior to the tip of the 11th rib using Veress needle followed by the placement of two to three additional working trocars. The contents of the hernia sac were then reduced back into the peritoneal cavity and the fascial edges delineated (Fig. 1).

An incision of the wall of the peritoneum was made starting at the level of the superior margin of the ventral wall defect then we dissected the sac from the subcutaneous space (Fig. 2). Now we started to dissect peritoneal flap about 4 cm all around the edge of the defect through the preperitoneal dissection.

The mesh was cut to a dimension of ~3 cm+the defect size, and four separate 2-0 prolene stitches with straight needle were used to transfix the abdominal wall from outside to inside and then dragged to the outside of the abdomen through a 10-mm trocar, then we tied the prolene stitches to the four angles of the mesh separately (Fig. 3), then we rolled the mesh, and then dragged it to the inside of the abdomen with the help of prolene stitch (Fig. 4) and Mesh was placed in the preperitoneal space (Fig. 5).

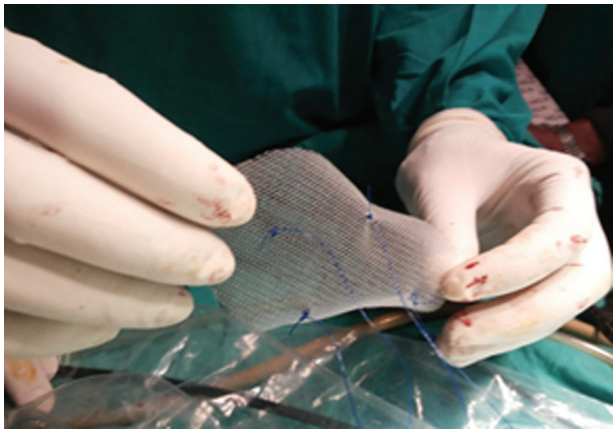
Figure 1

Hernia defect from inside.

Figure 2

An incision of the wall of the peritoneum at the level of±the superior margin.

Figure 3



Prolene stitches tied to the four angles of the mesh.

Figure 4

Rolled mesh ready to be entered the abdomen.

Figure 5

Mesh placed in the preperitoneal space.

Figure 6

Prolene stitch tied over the skin of abdomen region.

At the end, we tied the prolene stitch over the skin of abdomen region (Fig. 6). The peritoneal flaps were then closed using small, continuous, absorbable 2/0 sutures or by using surgical clips. At the end, we put a gauze between the skin and the prolene tie to avoid stitch mark. The prolene stitches were removed after 10 days postoperative during follow-up after natural mesh fixation started.

Table 1 Patient characteristics

Characteristic	Value
Male/female	9/21
Mean age (years)	33.7
Mean BMI (kg/m^2)	36.5
Mean defect size (cm)	3.2
Mean mesh size (cm)	6.3
Mean operating time (min)	105
Mean postoperative length of hospital stay (days)	1.9

Results

Patient characteristics

The demographic and perioperative data are shown in Table 1. Most patients were obese, and many had coexistent medical problems. In general, the hernia defects were an average size of 3.2 cm, and they were repaired with a large piece of mesh (equal to 3 cm plus defect size). Although the mean hospital stay was ~1.9 days, some patients were discharged the day of surgery.

Conversion to open surgery was necessary in three (10%) of the 30 patients owing to failure to make preperitoneal space and failure to make adequate peritoneal coverage.

Complications

Considering both wound and mesh infections, only one case had port site infection (1/30) with the overall infection rate was 3.3%. There were no infections in the converted cases. There was no intestinal injury. In two (6.6%) patients, a seromasover the mesh at the site of the retained hernia sac were developed, although many seromas were not noticedby the patient and most were resolved withoutintervention within 1 month.

Three (10%) of the 30 patients who underwent LVHR had pain for 1 month. In most patients, discomfort occurred only with movement. Patients with prolonged pain were treated with nonsteroidal anti-inflammatory agents. Prolonged ileus developed postoperatively in two (6.6%) patients, all of whom required hospitalization until oral intake could be tolerated, which mostly resolved within 2 days. There was no postoperative bleeding or hematoma.

Hernia recurrences

There is only one (3.3%) case of recurrence, as the patient did vigorous exercise within the first 3 months postoperatively against our recommendation.

Discussion

LVHR with our technique is a successful procedure that is very likely to become the standard of care in the future. Most repairs are performed with the use of preperitoneal prolene patch with transabdominal sutures fixation, and additional metal or absorbable fixation devices are not needed. These methods decrease the rate of recurrence and cost of the maneuver.

In our series (30 patients), LVHR using prosthetic mesh was associated with a low rate of conversion to open surgery in three (10%) patients. There were reported cases of conversion to a laparotomy mainly owing to severe adhesions with a range of 3–9.9% [13]. Here we have a short hospital stay (1.9 days), whereas in the literature, the duration of hospital stay range from less than 1 to 6.5, with a mean of 2.5 days [14].

We report a moderate complication rate, and only one case of port site infection (3.3%). One of the greatest benefits of LVHR is the reduction in wound and mesh infections. In a detailed analysis of wound complications from a pooled data of 45 published series involving 5340 patients, Piece *et al.* [15] reported wound infection rates of 4.6–8 times fold higher in open versus LVHR. Here two patients developed a seroma over the mesh at the site of the retained hernia sac. Seroma formation is one of the most commonly reported complications in LVHR though it is not unique to laparoscopy [14]. It occurs immediately after operation in virtually all patients. Most seromas develop above the mesh and within the retained hernia sac [16]. Carbanjo reported a higher incidence of seroma formation with expanded polytetrafluoroethylene than prolene-based meshes. The low incidence in the latter meshes has been attributed to the large pores of the prolene-based meshes that allow more efficient resorption of wound secretions into the abdominal cavity than expanded polytetrafluoroethylene meshes [17]. Three (10%) of the 30 patients developed pain at the site of surgery, which resolved in 1-month follow-up. After LVHR, ~5% of patients complained of persistent pain and point tenderness at the transabdominal suture site which usually resolves spontaneously within 6–8 weeks [17].

Whether LVHR is safer and more effective than open repair is not yet known. Several series of LVHRs have been reported by North American and European researchers (Table 2). The results show a marked consistency with respect to low perioperative morbidity and low rates of hernia recurrence during follow-up [1]. Other advantages of LVHR over open repair were cited but remain speculative. Nevertheless, these investigations have also consistently indicated that LVHR has advantages over the open procedure concerning perioperative complications, hospital stay, and hernia recurrences.

The specific LVHR technique used in our series is probably the laparoscopic approach to repair of ventral hernias reasonable operative time, although some surgeons have attempted to reduce operating time and possibly postoperative discomfort by discontinuing the use of transabdominal sutures entirely, or substantially reducing their numbers and relying primarily on a laparoscopic tacker. However, as most of the meshes used for LVHR are ~1-mm thick and the spiral tacks employed are 4-mm long and take up a 1-mm profile on the surface of the patch, a perfectly placed tack can be expected to penetrate only 2 mm beyond the mesh; thus, tacks will probably not provide the same holding strength provided by full-thickness abdominal wall sutures. In fact, Lyons *et al.* [23] demonstrated in a porcine model that the tensile strength of sutures in intraabdominal mesh is up to 2.5 times greater than that of tacks. In

Table 2 Studies comparing laparoscopic ventral hernia repair and open ventral hernia repair

Variables	Holzman *et al*. 1997 [18]	Park *et al*. 1998 [19]	Ramshaw *et al*. 1999 [20]	DeMaria *et al*. 2000 [21]	Carbajo *et al*. 1999 [22]	Our study
Number of patient						
LVHR	21	56	79	21	30	30
OVHR	16	49	174	18	30	
Mean LOS (days)						
LVHR	2	3	2	1	2	1.9
OVHR	5	7	3	4	9	
Complication rate (%)						
LVHR	23	18	19	19	7	16.6
OVHR	31	37	31	50	57	
Hernia recurrence rate (%)						
LVHR	10	11	3	5	0	3.3
OVHR	13	35	25	0	5	

LOS, length of stay; LVHR, laparoscopic ventral hernia repair; OVHR, open ventral hernia repair.

addition, higher hernia recurrence rates have been observed clinically in some cases in which only tacks were used, though not in others. So we believe that suture fixation of the mesh in LVHR is mandatory [24].

The extraperitoneal (preperitoneal) placement of the prostheses (as in our study) would in principle diminish the intraabdominal complications associated with formation of adhesions. It would also allow the safe use of the conventional meshes like prolene, which has high intrinsic tensile strength, has good memory, and is cheaper. In addition, the peritoneal coverage over the entire mesh provides additional security of fixation and a better mechanical advantage [25]. In this study, there is a low hernia recurrence rate of 3.3% during a mean follow-up time of 12 months. The recurrence rate in our series is low. Interestingly, but not surprisingly, we found that morbid obesity, large defect size, and postoperative vigorous exercise are associated with an increased risk of recurrences. Recurrence rates after LVHR range from 1.1 to 13%, whereas those after the open repairs ranged from 25 to 49% [26].

One of the original concerns of LVHR was the requirement that the mesh be placed intraabdominally, directly adjacent to the intestine. An ongoing debate continues to center on appropriate mesh choices. However, in our study, we used simple prolene mesh and placed it in preperitoneal pouch under cover of peritoneum.

Conclusion

Our experience with 30 LVHRs accumulated over 2 years. The use of a new technique has demonstrated it to be an effective and safe approach to the abdominal wall hernia. In this series, the preperitoneal laparoscopic technique for ventral hernia repair had a low rate of conversion to open surgery, a short hospital stay, a moderate complication rate, and a low risk of recurrence avoiding the potential complications related to intraabdominal mesh position.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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