Laparoscopic Versus Open Hernioplasty of Ventral and Incisional Hernias

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ABSTRACT

Although open repair, preferably with mesh has long been the standard approach for ventral and incisional hernias repair, laparoscopic repair is becoming increasingly popular among surgeons and patients following the development of minimally invasive techniques. Laparoscopic ventral hemia repair may be associated with fewer complications decreased length of hospital stay and lower recurrence rates. The aim of this comparative study is to evaluate the outcome and benefits of laparoscopic over conventional ventral and incision hernia repair. The study was conducted in Surgery Department Faculty of Medicine Fayoum university, on forty patients with incisional and primary ventral hernias with defect size more than 3cm, from September 2009 to December 2011. Patients were randomly selected and allocated into two groups using coin and flip method, Group A included twenty patients operated upon by laparoscopy and Group B included twenty patients who underwent open surgical repair. Both groups had nearly similar demographics and clinical data. The procedure was successfully completed in all patients of both groups, with no mortality or conversion to open procedure in group A The mean diameter of hernia defect was 5.6 cm in group A, compared to 6.1 cm in group B. Polypropylene mesh was used for all patients in group B and in group a different types of composite mesh was used. There was a significant decrease in the need for postoperative analgesia in group A compared to group B (P value <0.05). The study showed less complications and shorter hospital stay in group A, with no recurrence in both groups during a period of follow up for two years. ***Conclusion:*** *Laparoscopic ventral and incisional hernia repair is safe, effective and technically feasible approach with statistically significant reduction in postoperative morbidity earlier recovery and shorter hospital stay and with similar recurrence rate to the conventional open group.*

Key words: *Ventral, Incisional Hernia, Laparoscopic open tension free repair.*

INTRODUCTION

(VH) is a collective term used to describe hernias occurring as a result of weakness in the musculofascial layer of anterior abdominal wall and are one of the most common problems confronting general surgeons[(1)]. It represents 10% of hernias. Ventral hernias can develop as a result of prior surgery (inicisional) or spontaneously (umbilical, paraumbilial and epigastric)[(2)]. The incidence of ventral incisional hernia after laparotomy has been reported to be as high as 20 to 25%.[(3)]

Primary Suture repair of ventral hernias yield unsatisfactory results. The use of mesh in open ventral and incisional hernia repair had become the rule since the superiority of abdominal wall prosthetic reinforcement was demonstrated.[(4)]

Although the introduction of a prosthetic mesh to ensure abdominal wall strength without tension has decreased the recurrence rate, however open repair requires use of long incisions, significant soft tissue dissection as well as large subcutaneous flap creation and prolonged drainage, increasing complication rates and affecting recurrence rate[(3)].

Successful laparoscopic repair for ventral hernia was done by **LeBlanc** in 1993, and since then, many authors have published reports of Laparoscopic incisional and ventral hernia repair (LIVHR) as an accepted surgical technique. This procedure is fast emerging as an alternative to open technique[(2)].

While the advantages of laparoscopy over the open repair of ventral and incisional hernias are still unclear with a lot of debate, the risk of recurrence seems to be equivalent with rates of 9% or less for the most recent publications, when compared to large series of open repair with mesh.[(5)]

Although there is no general agreement on whether the laparoscopic treatment of ventral and incisional hernias should be used in very small or very large ventral hernias, or as a primary

method for repair, yet for more than a decade the laparoscopic approach for ventral hernia repair has demonstrated its feasibility and reliability to treat small and large abdominal wall defects with a low rate of conversion to open procedure[6].

Intraperitoneal mesh placement in contact with viscera has ben made possible and secure with the use of composite mesh, avoiding the risk of bowel fistula and with a reduction in adhesion formation.

Improvements in mesh fixation techniques could reduce the risk of postoperative pain and make the laparoscopic approach with intraperitoneal composite mesh placement feasible.[7]

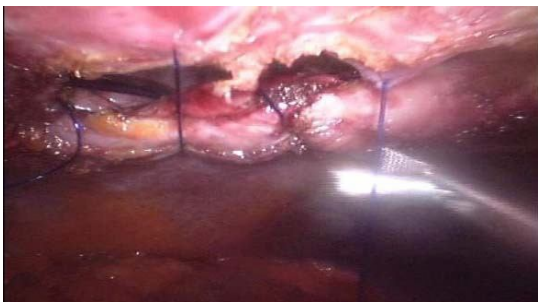
In this study a minimally invasive approach was applied to the repair of ventral and in cisional hernias with the expectation of earlier recovery, fewer postoperative complications and decreased recurrence rates. The aim of this study was to analyse and compare the outcomes after open and laparoscopic repair of ventral and incisional hernias and difference of postoperative complications, operative time, length of hospital stay and recurrence.

PATIENTS & METHODS

This study was conducted in surgery Department Faculty of Medicine Fayoum University , on forty patients with incisional and primary ventral hernia with defect size more than 3 cm from September2009 to December2011,who underwent ventral hernia repair with mesh using open and laparoscopic technique..The forty patients were randomly selected and allocated into two groups using coin and flip method ,twenty patients each.**Group A** include twenty patients operated upon by laparoscope, and **Group B** include twenty patients who underwent open surgical repair for ventral and incisional hernias. Composite meshes were used in group A while polypropylene mesh was used for group B. All patients in both groups were subjected to full history taking (Personal and Medical),followed by physical examination that include clinical assessment of the hernia defect size. In addition, routine preoperative laboratory investigations (CBC - liver function tests – blood sugar – kidney function tests – ECG and chest x-ray and abdominal ultrasonography were done).

Patients with complicated or recurrent hernias, ASA score more than 2, BMI more than 40, and any contraindications for laparoscopic surgery were excluded from the study.Patients were fully informed about the risks and benefits of the procedure and the possibility of conversion to open surgery in laparoscopic group. Written consent was taken from every patient.Patients were hospitalized the day before surgery and kept fasting 8 hours before surgery and, on clear fluids 24hours before surgery.Charcoal tablets were given to reduce gut distension. Single intravenous dose of 3rd generation cephalosporin was given with induction of anesthesia for the purpose of surgical prophylaxis. All patients were subjected to general anesthesia with insertion of nasogastric tube and urinary catheter after intubation and both were removed at the end of the procedure. The surgical procedures were performed by the same surgical team

In group A; A verus needle was inserted below the left costal margin for induction of pneumoperitoneum, the first trocar was inserted using 10mm port, being placed away as far as possible from the defect.Oblique view scope (30°) is inserted to facilitate the insertion of the other two 5mm trocars. The abdominal wall defects were freed of peritoneal and visceral adhesions by means of electrosurgical dissection. Then the hernial content was reduced and the defect in the fascia was outlined. A minimum of 3 cm arround the border of the defect was cleared of adhesions. The hernia defect has been defined by pushing an intra- abdominal instrument against a palpating finger on the abdomen and working out the hernia or by placing needles through the abdominal wall and confirming the position of the hernial defect,the defect was narrowed or closed via polypropylene number1 intracorporial suturing **(Fig. 1)**.



Fig(1): closure of defect.

We attempted to narrow the defect in some patients and succeeded to close it in the majority of patients, as closure or at least narrowing of the defect decrease the incidence of seroma formation.A composite mesh was introduced through 10 mm port.The size of the mesh depends on the size of the defect,the mesh size should cover the defect with 3 to 5 cm overlapping the defect.We did fix the composite mesh via 5mm tuckers,one cm apart with double crowning technique.Identification of the defect and the four corners of the mesh was facilitated via needle inserted through the abdominal wall. **(Fig. 2)**

Fig. (2): Gore tex mesh fixed via tuckers with double crowning technique

No drains was used in laparoscpic group, closure of the fascial defect at the 10mm port site was done via vicryl 0.and skin incision via 4/0 vicryl subcuticular closure . Patients were given sips of water after passing flatus or feces or after hearing intestinal sounds.Postoperatively all patients received analgesics in the form of narcotics for 24 hours then non steroidal anti inflammatory injections and oral analgesics were given upon the patient request.

In group B: prefascial prosthetic implantation was the used technique. After identification and proper dissection of the hernial sac with adequate preparation of the fascial edge, the sac was opened and any adhesions were freed and contents were reduced completely. The hernia defect was closed by fascial plication with continuous polypropylene sutures (No. 1). In cases where the defect was too large, closure of the peritoneum was done first by continuous vicryl 2/0 stitches then plication of the fascial covering was done to narrow the defect as much as possible without tension. Onlay implantation of the prepared polypropylene mesh was done and fixed to the aponeurosis without tension with polypropylene (no. 1) sutures.Then suction drain was inserted under the raised subcutaneous flaps , then subcutaneous and skin closure were done.The postoperative pain was evaluated in the first 48 hours postoperative.The operative time, hospital stay, intraoperative and postoperative morbidities were recorded. Comparisons between the two groups were assessed with t-test and chi-square test. Results were expressed as mean values. Differences were considered significant when $P<0.05$.The discharge criteria are met once the patients were afebrile with audible bowel sounds and able to tolerate liquid diet and oral analgesia.

All the patients were followed up weekly for one month after discharge from hospital, then monthly for six months for late complications, then after 9 and 12 months and lastly at the end of second postoperative year.

RESULTS

The study was conducted on fourty patients presented to General surgery department at Fayoum University between September 2009 to December 2011,with clinically diagnosed ventral and incisional hernias.The patients were eligible for double-blinded random assignment to open tension-free or laparoscopic tension-free hernioplasty.Patients were randomized by using the coin flip method into two groups.Group A include twenty patients (50%) underwent laparoscopic tension free repair and Group B include twenty patients (50%) who underwent the open tension free repair for ventral and incisional hernias.Theprocedure was successfully completed in all patients of both groups. No patients from group A required conversion to open procedure. No mortality.The two study groups had nearly similar demographics ,with amean age of40.2 in groupA ,and 45.1 in groupB and female to male ratio of almost 2:1 in both groups.

Table (1): Patients Demographic and clinical data

	Group A	*Group B*	*P. value*
No. of patients	20 patients (50%)	20 patients (50%)	NS*
Male : female	3 : 7	4 : 6	NS
Mean age(years)	40.2	45.1	Ns
BMI*	34	36	NS
History of previous operation	4 patients (20%)	8 patients (40%)	Less than 0.05

*NS : not statistically significant. *BMI : body mass index.

In group B 8 patients (40%) have incisional ventral hernia compared with 4 patients (20%) in group A " P. value is less than 0.05 ".

Table (2): Anatomical site of hernia and different types of incisional hernia

	Group A	*Group B*
Kocher incision	2 patients (10%)	2 patients (10%)
Midline laparotomy incision	-	4 patients (20%)
Pfannesteil incision	-	2 patients (10%)
McBuney incision	2 patients (10%)	-
Paraumbilical hernia	16 patients (80%)	12 patients (60%)

The duration of the hernia was as follow less than 6 months-1year andmore than 1 – year.represented 55%,30%,15% in groupA and 65%,25%,10% in group B respectively.The hernia contents were omentum in 12 patients (60%) and 14 patients (70%), and omentum with small bowel in 8 patients (40%) and 6 patients (30%) in group A and B respectively.

Table (3): Hernia defect , mesh size, and operative time

	Group A	*Group B*	*P. value*
Defect size (mean diameter in cm)	5.6 cm	6.1 cm	NS
Mesh size (mean in cm²)	170 cm²	212 cm²	Less than 0.05
Mean operative time	130 minutes	100 minutes	Less than 0.05

In group A the mean diameter of hernia defect was 5.6 cm compared to 6.1 cm in group B, with no statistical significance, and the mean mesh size was 170 cm² in group A and 212 cm² in group B, P. value less than 0.05.

While polypropylene mesh was used for all patients in group B; in group A proceed mesh was in 6 patients (30%), physiomesh was used in 6 patients (30%), and the extended polytetraflouroethylene mesh (Gore tex) was used in 8 patients (40%). The mean operative time in group A was relatively longer (130 minutes) than that of group B (100 minutes) with P. value less than 0.05. This may be due to extensive adhesolysis done in 8 patients (40%) in group A that accounts for the cases with longer operative time.

Table (4): Postoperative pain

	Group A	*Group B*	*P. value*
PO* narcotic need	4 patients (20%)	16	Less than 0.05
Pain at 6 hours PO			
mild	8 patients (40%)	4 patients (20%)	NS
moderate	8 patients (40%)	4 patients (20%)	NS
severe	4 patients (20%)	12 patients (60%)	Less than 0.05
Pain at 24 hours PO			
none	6 patients (30%)	-	less than 0.05
mild	10 patients (50%)	4 patients (20%)	less than 0.05
moderate	2 patients (10%)	4 patients (20%)	NS
severe	2 patients (10%)	12 patients (60%)	less than 0.05

* postoperative in group A, there was asignificant decrease in the need for narcotic therapy to control pain during early postoperative period compared to group B (20% of patients in group A versus 80% of patients in group B, with P. value less than 0.05). however on subjective assessment of postoperative pain in patients, in spite of parenteral narcotic therapy was more frequently needed in group B the patients still experienced more pain than those in group A (P. value less than 0.05).

Table (4): Postoperative complications and hospital stay

	Group A	*Group B*	*P. value*
Wound infection	-	4 patients (20%)	Less than 0.05
seroma	4 patients (20%)	6 patients (30%)	NS
Infected seroma	2 patients (10%)	-	NS
Skin necrosis	-	1 patients (5%)	NS
Prolonged ileus	-	2 patients (10%)	NS
Postoperative hospital stay (mean in days)	4 days	7 days	Less than 0.05

There were fewer complications in group A than group B which collectively didn't reach a statistical significance. While 6 patients (30%) in group B got wound infection which was treated by wound drainage antibiotics and repeated dressing, no similar complication was reported in group A (P. value less than 0.05). one patient (5%) in group B developed a skin necrosis at wound edge that required surgical debridement under local anaesthesia on the 7th. Postoperative day. Two patients (10%) of group B had a prolonged paralytic ileus (lasts more than 48 hours postoperatively) managed conservatively. In group B, 6 patients (30%) get seroma that required repeated (2 -4 times) aspiration, also in group A seroma developed in 6 patients (30%) in 4 (20%) of those it resolved spontaneously, however 2 patients (10%) had persistent infected seroma that required ultrasound guided percutaneous drainage and antibiotic therapy. No patients in either group had shown signs of infected mesh or required mesh removal. Group A had a significant shorter mean hospital stay than group B (P. value less than 0.05)

Table (5): Follow up time and recurrence rate

	Group A	*Group B*	*P. value*
Follow up period (mean in months)	20	22	NS
Lost patients	3	1	NS
Recurrence	-	-	NS

Patients in both groups were followed up by mean of visits or telephone call, 3 patients (15%) in group A were lost during follow up (2 patients after 6 months and one patient after 9 months), in group B only one patient (5%) was lost after 12 months of follow up. No recurrences reported in any patients of both groups during the whole period of follow up.

DISCUSSION

Pimary ventral and postoperative incisional hernias are one of the most common problems confronting general surgeons.The principle of laparoscopic ventral and incisional hernia is based on Rives-Stoppa repair which involve extensive tissue dissection in a myofascial plane for placement of mesh. Le Blanc first described laparoscopic repair of ventral hernias in 1993[8].Technical feasibility of the laparoscopic repair for abdominal wall defects has been demonstrated by various reports published since 1993.[8].

The laparoscopic technique carried a large number of theoretical advantages; lesser abdominal wall trauma, smaller fascial dissection, lesser wound and prosthetic contamination, fewer visceral injuries and no need for drainage. These advantages have been confirmed in numerous reports[9] as well as in our study. The laparoscopic approach facilitates the adhesiolysiswhich is the most challenging part of laparoscopic ventral hernia repair, with more comprehensive exploration of the abdominal cavity and less risk of iatrogenic injury of the intestinal loops that may be incarcerated or closely adherent to the scarring site. The CO2 itself help to separate the adhesions through creating a surgical emphysematous plane that can delineate adherent tissue and bowel borders for more safe sharp dissection.

In our study we didn't encounter any case of intraoperative bowel injury during adhesiolysis. Erosions and fistulization did not occur in any of the patients in the laparoscopic group. This is a major complication of intraperitoneal mesh placement for ventral hernia repair.The composite and Gore tex mesh were used in this study in an attempt to minimize the risk of erosion and fistulization. The composite mesh is characterized by two different surface, one that promotes fibrous ingrowth into the mesh and another that is relatively resistant to adhesion formation and placed adjacent to the abdominal viscera[10,11]. In this study,we found that Gore tex mesh is very thick, nontransparent, and difficult to be introduced into the peritoneal cavity, However both proceed and physiomesh are excellent composite mesh,they are thin, ,easy to be introduced into the peritoneal cavity, also Physiomesh is transparent, unrolls spontaneously in the peritoneal cavity,and has affinity to stick into the peritoneum, facilitating its fixation via tacks, It has absorbable marker which facilitates identification of mesh center. In all cases of laparoscopic group,we used non absorbable 5mm tacks that were applied to the mesh 1cm apart with double crowning technique.Several studies had shown that laparoscopic ventral and incisional hernia repair are associated with fewer complication rate ,decreased postoperative pain ,shorter hospital stay and lower recurrence rate.Our study showed that laparoscopic approach have a very low complication rate with no wound or mesh infection and less seroma formation Seroma formation was not a significant problem except in two patients (10%) where infected seroma was treated with antibiotics and ultrasound guided aspiration. In ventral incisional hernia, placing polypropylene mesh in a preperitoneal position via laparoscopic approach is virtually impossible.

Holzmanand Eubanks[12], commented on the use of polypropylene mesh and stated that a peritoneal approach to incisional hernias is virtually prohibitive. Attempts to separate the peritoneum of the hernia sac are met with serious obstacles, results in large peritoneal defect and leaves exposed mesh. Any attempt to dissect out the sac will lead to more bleeding, with the potential of creating a communication between the frequently thinned out overlying skin and mesh. In our study no attempt was made to excise the hernia sac. Due to the extreme adhesions between polypropylene mesh and intraabdominal contents that others experienced in laparoscopic ventral hernia repair, considering the placement of mesh in a preperitoneal position in these cases is not possible.Polypropylene mesh is not an acceptable material for laparoscopic ventral hernia repair,

given the advantages of composite mesh as regards to adhesion formation. The substantial fixation of the composite mesh with permanent transabdominal wall sutures is important to the success of the laparoscopic ventral hernia repair. However fixation of the mesh using tacks,via a standard double crown technique is enough to secure the mesh, save time,and avoid the occurrence of chronic pain when the sutured are used to fix the mesh. We had At least between 3 – 5 cm overlap of the mesh over the defect based on Stoppatension free repair.

Compared to the laparoscopic group, the open group had overall more wound related complications where wound infection occurred in 4 patients (20%), seroma in 6 patients (30%) and skin sloughing in one patient (5%). In laparoscopic group the earliest postoperative complication was seroma formation that found in 6 patients (30%), in other studies the incidence of this complication ranged from 0-36%[3,12]. Laparoscopic ventral hernia repair involves no long incision, no wide fascial dissection or flap creation, no opening of the sac and no drains and this contribute to the lower risk of wound complication and seroma formation . We reported a significant decrease in the need for parenteral narcotics therapy in the laparoscopic group patients postoperatively, in addition subjective analysis of pain suggested that patients in the open group ,in spite of narcotic therapy, still experience more pain than in the laparoscopic group.The same findings were reported in a study by ***Zanghi et al.***[13] suggesting that postoperative pain contributed to the longer hospital stay in the open repair group.

In our study The mean operative time in group A (150 minutes) was significantly longer than in group B (120 minutes) which is comparable to that reported by ***Park and Holzman***[14,15] and ***Zanghi et al.***[13] Who reported also a similar difference with mean operative time of 140 minutes and 120 minutes in the laparoscopic group and the open group respectively. We believe that the time for laparoscopic repair decreases with the progress in the learning curve, but as in open repair this remains linked to the complexity of the defect and the entity of adhesion. Postoperative hospital stay in our study had been significantly shorter in the laparoscopic group with a mean stay of 4 days versus 7 days in the open group. The majority of studies had documented a decrease in overall hospital stay in laparoscopic group that can be attributed to decreased postoperative pain, absence of surgical drains, a more rapid return of oral intake, less wound complications and earlyreturn to ambulatory activity[16,17].

In our study, patients of the laparoscopic group and open group were followed up for a mean time period of 20 and 22 months respectivelys,with no recurrence found in any patient of both groups. However isolated studies had argued that the recurrence rate with laparoscopic repair may not be that low over a long-term follow up and is almost the same as with open repairs.The recurrence rates reported for open mesh repair was (0-10%) and Laparoscopic mesh repair produces similarly low recurrence rate (0-9%)[18]. The lower recurrence rates in laparoscopic repair of ventral hernia can be attributed to placing the prosthesis under the fascial margins and, intrabdominal pressures are essentially buttressing the repair attachments if it is placed anteriorly. The other is that it can clearly and definitively identify the defect margin, so that the extent of the defect can be accurately delineated laparoscopically. We can clearly establish the amount of overlap required, in practice it is to overlap 3-5 cm all margins.

Conclusion: The laparoscopic ventral and incisional hernia repair is safe, effective and technically feasible approach with a significant reduction in postoperative morbidity, earlier recovery and shorter hospital stay than the conventional open group. The recurrence rate in the laparoscopic group is similar or lower than the open mesh group. When properly performed, the laparoscopic approach does not and should not compromise the principles for successful mesh repair of ventral and incisional hernias.The outcome and cost benefits of LRVH over conventional open repair need further evaluation in countries of third world where resources are deficient.

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