Assessment of Technical Feasibility of Umbilical Hernia Repair During Laparoscopic Cholecystectomy

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ABSTRACT

Background : A minimally invasive approach to umbilical hernia defects repair simultaneous with cholecystectomy offers an attractive alternative to traditional open surgery; however, concerns regarding feasibility, safety, cost effectiveness, and outcomes must be considered.

Aim of work : Evaluating the technical feasibility of combined umbilical defects repair with laparoscopic cholecystectomy by different techniques depending on the size of the defect.

Patients and Methods : Laparoscopic cholecystectomy accompanied with umbilical hernia repair was attempted in 50 patients classified into two groups : Laparoscopic cholecystectomy with anatomical closure using endoclose in patients with defect size < 3 cm (Group 1), or with onlay mesh hernioplasty in patients with defect size ≥ 3cm (Group 2).

Results : The operation time, length of hospital stay and the time needed to return to work were more prolonged in the 2nd group. The defect size and the air leak during insufflation affected significantly the operation time and length of hospital stay. Post operative pain and complications were more in the 2nd group. Obesity (BMI>30) and co-morbidities are important factors for development of complications.

Conclusion : The operating time, postoperative pain, length of hospital stay, wound infection and the time needed for return to work are less in patients underwent primary anatomical repair of umbilical hernia using endoclose device than patients underwent flat onlay mesh hernioplasty after laparoscopic

cholecystectomy, however, this was accompanied by a higher rate of recurrence.

KEYWORDS

Hernia repair, laparoscopic cholecystectomy, umbilical hernia, endoclose, onlay mesh hernioplasty

INTRODUCTION

Umbilical hernia frequently accompanies cholelithiasis especially in female patients. [1] It comprises 6% of all abdominal hernias in adults and when combined with gall bladder disease, it has an incidence of 4.7-18%. [2,3]

Umbilical defect may cause technical problems for general surgeons during laparoscopic cholecystectomy operations. As most cholecystectomies are completed laparoscopically, in those cases, some surgeons prefer inserting the first trocar via umbilical ring with open technique or through supra/infra umbilical region then repairing the hernia. [3]

Although such techniques as primary sutures, Mayo repair, mesh hernioplasty, Prolene hernia system with laparoscopic cholecystectomy can be used, satisfactory data are not yet seen in literature regarding which type of repair method should be selected for treatment of umbilical hernias. [3,4]

AIM OF WORK : Evaluating the technical feasibility of umbilical defects repair during laparoscopic cholecystectomy by different techniques depending on the size of the defect.

PATIENTS AND METHODS :

Laparoscopic cholecystectomy with simultaneous umbilical hernia repair was performed in 50 patients who were admitted at the Department of General Surgery in Kasr El-Ainy, Cairo University Hospital and the Department of General Surgery in El Monira General Hospital between Jan. 2011 to Dec. 2013. Patients with umbilical hernia were diagnosed by clinical examination. Ultrasonography was performed in all patients with umbilical defect detected during physical examination or in those with possible hernia in order to

characterize defect size and contents of umbilical hernia and to assess the gall bladder disease.

- **Inclusion criteria:**

Any age, any sex of patients with non-complicated chronic calcular cholecystitis associated with non-complicated umbilical hernia.

- **Exclusion criteria:**

1. Patients with associated medical comorbidities such as chronic pulmonary disease, cardiac disease, ascites, chronic renal failure.
2. Patients with complicated umbilical hernia.
3. Patients with umbilical pathologies like omphalitis, sinus or fistula.
4. Complicated cholecystitis.

The data were collected prospectively and a detailed tabulation was developed to record information on preoperative factors including age, gender, body mass index (BMI), previous abdominal surgery and associated medical risk factors (i.e., diabetes mellitus, hypertension, cardiovascular disease, etc.).

- **Preoperative preperation :**

All patients had routine pre operative laboratory investigations including complete blood count, liver and kidney function, fasting blood sugar. Abdominal sonography was done for assessment of gallbladder and any other intra abdominal pathology. All patients received antibiotic prophylaxis with 3rd generation cephalosporine intravenously at time of induction of anesthesia.

- **Operative technique :**

Patients were assigned to two groups: laparoscopic cholecystectomy with endoclose repair of umbilical defects less than 3cm (Group 1, n= 27, 54%), and laparoscopic cholecystectomy with anatomical repair and onlay mesh hernioplasty for defects ≥ 3cm (Group 2, n=23, 46%).

Laparoscopic cholecystectomy was performed using the standard four ports method. Under general anesthesia, we performed an incision at the level of the hernia and we isolated the peritoneal sac. Through a direct cut down onto the

peritoneum we controlled the presence of adhesions and avoided any visceral injury.

The 1st laparoscopic port (umbilical port) was inserted by Hasson technique. A purse string suture was placed around the fascia and peritoneum in order to prevent excessive carbon dioxide (CO2) leak. Then the abdomen was insufflated to 15 mm Hg. After pneumoperitoneum was achieved, a 30-degree laparoscope was used.

After introduction of the other ports, laparoscopic cholecystectomy was performed and the gall bladder was taken out off through epigastric port. The patient was returned to a flat, supine position and umbilical hernia was repaired as follows.

The 1 st Group:

The camera was placed through the epigastric port and the fascial defect was closed primarily by interrupted polyglactin sutures (Vicryl 1) using endoclose needle.

Endoclose suture device is a device with a spring-loaded with a 1 polyglactin suture. It was introduced into the abdomen between the edge of the skin and the port about one cm from one side of the trocar and appears from the abdominal cavity (Fig.1). The suture was then released and dropped in the abdominal cavity, after which the device was removed (Fig.2).

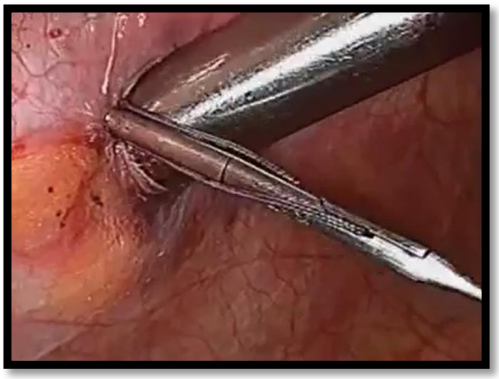

Fig.(1) : Insertion of endoclose needle

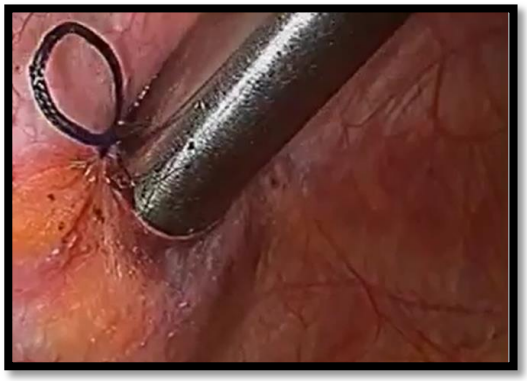

Fig.(2) : The suture is released and dropped in the abdominal cavity

The spring-loaded suture carrier was then passed through the fascia and peritoneum 180º degree from the original insertion site on the other side of the trocar between the skin incision and the port (Fig.3). With the assistance of a 5 mm grasping forceps through a lateral port, the suture was reloaded onto the opened notch in the endoclose needle (Fig.4).

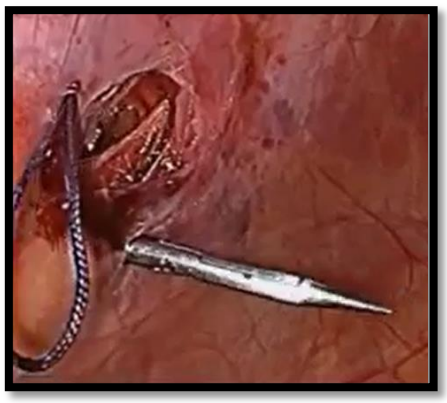

Fig.(3) : Reinsertion of the endoclose needle into the abdomen

Fig.(4) : Reloading the suture onto the needle

The device and suture were brought out of the abdomen, i.e., one strand of suture passes through the Scarpa's fascia about one cm on one side of the trocar, through the abdominal wall, and the abdominal cavity, pierces the peritoneum on the other side of the trocar, through the abdominal wall, and appears on the Scarpa's fascia about one cm from the other side. The sutures were tied to approximate the fascia and peritoneum. Then, umbilicus was fixed to the linea alba. (Fig.5)

Fig.(5) : The device and suture are brought out of the abdomen

The 2nd Group:

After laparoscopic cholecystectomy was done, all ports were removed and onlay repair with polypropylene mesh (Prolene mesh) was performed where the sac is excised for anatomical repair. The anterior abdominal wall aponeurosis is closed by continuous prolene with a 2^{nd} layer of interrupted sutures. The mesh is stretched over the whole dissected abdominal aponeurosis till 10cm around the defect and is fixed to the anterior rectus sheath with polyprolene 3/0 suture. The umbilicus was sutured to the mesh over the fascia with a polypropylene suture and a subcutaneous suction drain was used routinely. The skin was closed with absorbable subcuticular vicryl sutures.

Postoperative pain was evaluated in the first 6 hours, 12 hours and 24houre after surgery by the Behavioural Pain Scale which is a measurement used to assess pain.

Postoperative pain analgesia was achieved by meperidine (50 mg) for moderate and severe pain or non-steroidal anti-inflammatory drugs (NSAIDs) for mild pain.

The administration of antibiotic (ceftriaxone 2 g/day divided q12hr) continued postoperatively, until the discharge of the patient from the hospital. Postoperative wound infection, recurrence, number and frequency of analgesic intake within postoperative first week, length of hospital stay and days needed to return to work were recorded. All patients were followed up regularly for 6 months on outpatient basis.

RESULTS :

Mean age of the studied patients who underwent laparoscopic cholecystectomy combined with umbilical hernia repair was 42.84 ± 9.72 years (ranged between 24-60 years). Females comprised 45 of cases (90%) and 5 cases were males (10%). The average size of hernia in all patients ranged from 0.7 to 4 cm with mean size 2.254± 1.03cm. The average patients' body mass

index (BMI) ranged from 22.8 to 41.3 kg/m2 with a mean value 29.94± 3.54 kg/m2.

Co-morbid factors were found in 13 patients. 4 cases (8.0%) were diabetics; 2 in the 1st group [7.4%] and 2 in the 2nd group [8.7%] and their blood glucose level was controlled preoperatively. 6 patients (12.0%) had history of hypertension; 3 in the 1st group (11.1%) and 3 in the 2nd group (13.0%) which was controlled, while three patients (6.0%) were hypertensive and diabetic; 1 in the 1st group (3.7%) and 2 in the 2nd group (8.7%).

Mean operative time was 58.68±13.75 minute (49.22 ± 11.22 minute in the 1st group and 69.78 ± 5.76 minute in the 2nd group) and ranged from 38 to 90 minute (38 to 90 minute in the 1st group, and 62 to 80 minute in the 2nd group). This difference between the two groups was statistically highly significant (P<0.001). It was affected significantly by the size of hernia defect as it was prolonged if defect ≥ 3cm (P<0.001).

Mean time of post-operative length of hospital stay was 2.36± 1.48 day (1.59 ± 1.34 day in the 1st group and 3.26 ± 1.1 day in the 2nd group) which ranged from 1 to 7 days (1 to 7 days in the 1st group, and 2 to 7 days in the 2nd group) . The difference between the two groups was statistically highly significant (P<0.001). This was significantly affected by the size of hernia defect as it was longer if ≥ 3cm (P<0.001) and by the presence of co-morbid factors (P=0.013).

Air leakage was observed in 10 patients (1in the 1st group and 9 in the 2nd group) however a purse string suture was placed around the fascia for all patients to prevent excessive the leak. Air leakage significantly affected both the operating time and the length of hospital stay which were prolonged (*P* =0.001).

It was noted that BMI of patients did not affect the operating time (*P* =0.412) or the length of hospital stay (p=0.208).

Mean time needed for return to work was 13.76 ± 6.89 day (9.74 ± 5.10 day in the 1st group and 18.48 ± 5.65 day in the 2nd group) which ranged from

7 to 25 days (1 to 7 day in the 1st group, and 10 to 30 days in the 2nd group). The difference between the two groups was statistically highly significant (P<0.001).

Table 1 shows the comparison between the two studied groups regarding operation time, length of hospital stay and time needed for returning to work.

Table 1 : Comparison between mean values of different parameters in the two studied groups.

	1st group (n=27)	**2nd group (n=23)**	**P-value**
Operation time (min.)	49.22 ± 11.24	69.78 ± 5.76	0.001**
Hospital stay (days)	1.59 ± 1.34	3.26 ± 1.10	0.001**
Return To work (days)	9.74 ± 5.10	18.48 ± 5.65	0.001**

Data are expressed as mean ± SD. ***p< 0.001= highly significant*

Table 2 shows the different parameters affecting the operation time and length of hospital stay.

Table 2: The effect of BMI, Size of hernia, Comorbidity & Air Leakage on Operating time& Length of hospital stay

		N (%)	***Operating time (min)***	***P-value***	***Length of hospital stay (days)***	***P-value***
BMI	**≤ 30 kg/m2**	24(48%)	57.0 ± 13.27	0.412 (NS)	2.08 ± 1.18	0.208 (NS)
	> 30 kg/m2	26(52%)	60.23 ± 14.26		2.62 ± 1.70	
Size of defect	**< 3cm**	27(54%)	49.22 ± 11.24	0.001**	1.59 ± 1.34	0.001**
	≥ 3cm	23(46%)	69.78 ± 5.76		3.26 ± 1.1	
Co-morbid factors	**No**	37(74%)	56.73 ± 11.87	0.170 (NS)	1.95 ± 1.03	0.013 **
	Yes	13(26%)	64.23 ± 17.44		3.54 ± 1.94	
Air leak	**No**	40(80%)	54.28 ± 11.28	0.001**	1.98 ± 1.14	0.001**
	Yes	10(20%)	76.30 ± 6.82		3.90 ± 1.73	

Data are expressed as mean ± SD. *NS= p> 0.05= not significant.* ***p< 0.05= significant*

Median Behavioural pain scale measured in the first 6 hours, 12 hours and 24 houre after surgery. Pain was significantly higher in 2nd group than the

1st group (P= 0.004). Pain was slightly, but not significantly, higher in the first 12 hours and 24 hours after surgery in 2nd group than the 1st group.

Table 3 shows the comparison between both groups regarding post operative pain.

Table 3 : Comparison of post operative pain between the two groups

Behavioural pain scale	1st group	2nd group	P-value
After 6 hours	6.56 ± 1.05	7.43 ± 0.99	0.004**
After 12 hours	1.78 ± 0.85	2.13 ± 1.25	0.244(NS)
After 24 hours	0.15 ± 0.46	0.52 ± 0.85	0.067(NS)

*Data are expressed as mean ± SD NS= p> 0.05= not significant **p< 0.05= significant.*

Post operative complications were observed more in the 2nd group than in the 1st group. 7 cases (30.4%) of the 2nd group developed complications in form of seroma in 3 cases (13%), wound infection in 3 cases (13%) and DVT in 1 case (4.3%) while 5 cases (18.5%) of the 1st group developed complications in form of recurrence in 2 cases (7.4%), hematoma in 1 case (3.7%), wound infection in 1 case (3.7%) and chest infection in 1 case (3.7%)

Post operative complications were significantly higher in patients with BMI >30 (P=0.027). Also, the presence of co-morbid factors signifacantly increased the rate of development of complications (P<0.001)

Table 4 and 5 show the relation between the BMI of the patients and the presence of co-morbid factors with the development of complications, respectively.

Table 4 : The relation between BMI and complications

BMI	Complications		Total	P-value
	No	Yes		
≤30	23(50%)	1(46.15%)	24(48%)	*0.027
>30	20(50%)	6(53.85%)	26(52%)	
Total	43(100%)	7(100%)	50(100%)	

**p< 0.05= significant*

Table 5 : The relation between comorbidities and complications

		Complications		Total	P-value
		No	Yes		
Comorbidities	**No**	36	1	37	**0.001
	Yes	7	6	13	
Total		43	7	50	

DISCUSSION :

Laparoscopic cholecystectomy is "gold standard" for the treatment of cholelithiasis. Short length of hospital stay, immediate regaining of physical activity, low rates of postoperative pain, morbidity and mortality and good cosmetic outcomes make laparoscopic cholecystectomy advantageous.[5]

With advancement in laparoscopic surgery, a number of surgical procedures can be performed combined with laparoscopic cholecystectomy in a single surgery.[6]

Umbilical hernia repair can be performed during laparoscopic cholecystectomy thus providing patients with all the benefits of minimally invasive surgery and also giving the benefit of single time anesthesia without increasing post operative & hospital stay period.[7]

This study involved 50 patients underwent two different techniques of umbilical hernia repair with laparoscopic cholecystectomy, simultaneously. The defect size was the main axis in this study which influenced the choice of the technique of hernia repair. 27 patients with simple interrupted closure of the fascia using the endoclose device for a defect size ≤3cm (1st group) and 23 patients with onlay mesh hernioplasty for defects more than 3cm (2nd group).

Some surgeons depended on the defect size in choosing the repair method as **Bozkırlı et al., (2012)**[8] while others made their choice depending on individual surgeon preference as and **Zoricic et al., (2013)**[9] But **Kamer et al., (2007)**[2] considered mesh repair is the gold standard.

The mean operation time was 58.68±13.75 minutes which was shorter in 1st group (49.22±11.24 min.) than in 2nd group (69.78±5.76 min.) and this may be related to many factors which are the wider fascia defects and the presence of air leak during insufflation of the abdomen. Also, it was not affected by the presence of co-morbid factors.

These results agree with **Bozkırlı et al., (2012)** [8] and **Zoricic et al.,(2013)**[9] while, the authors of **Kamer et al., (2007)** [2] have shown that mean operative time was 59.3 ± 10.3 min, it was slightly, but not significantly, shorter (P = 0.410) in group 2 (LC+ Mayo repair) compared with that in group 1 (LC+ primary repair) and group 3 (LC+ flat mesh hernioplasty).

The mean length of hospital stay was shorter in the 1st group (1.59 ± 1.34 day) than in the 2nd group (3.26 ± 1.10 day) and the patients were discharged earlier in the 1st group however patients of the 2nd group are not kept in the hospital until their drains are removed. The defect size, air leak and the presence of co-morbid factors affected significantly the length of hospital stay.

These results agree with **Bozkırlı et al., (2012).**[8] While, **Kamer et al., (2007)**[2] and **Zoricic et al.,(2013)**[9] mentioned that there is no significant difference in terms of mean length of hospital stay between the groups.

Postoperative pain was evaluated in the first 6 hours, 12 hours and 24 hours after surgery by the Behavioural pain scale. In the first 6 hours, it was significantly higher in the 2nd group than the 1st group (P= 0.004). After 12 hours and 24houre after surgery the pain in the 2nd group was slightly, but not significantly higher than the 1st group.

Kamer et al., (2007)[2] evaluated the postoperative pain by visual analogue scale (VAS) scoring system on postoperative first, second and seventh days. It was found that, pain scores measured on the first, second and seventh days were higher in Group 3(LC+ flat mesh hernioplasty) compared with those of the group1(LC+ primary repair) and group2(LC+ Mayo repair).

Post operative complications were observed more in the 2nd group, the most frequent complications were seroma and wound infection which may be related to the larger dead space and wider dissection needed for the mesh insertion. Recurrence was the most frequent complication found in the 1st group which may be an important factor influencing the choice of the proper repair method. Both obesity (BMI > 30) and the presence of co-morbid factors increased the incidence of development of post operative complications.

Wound infection was the highest rate among the other complications (4 patients) all of them were diabetics and with BMI ≥ 30 kg/m2.

CONCLUSION :

Umbilical hernia repair combined with laparoscopic cholecystectomy result in longer operating time, longer anaesthesia, and risk of increased blood loss. But it has the advantages of single hospital stay, single anaesthesia exposure, less post operative pain and morbidity, early return to work, better cosmesis and more convenient , efficacy and cost effective for the patient .However, the outcomes of the umbilical defect repair with mesh after laparoscopic surgeries appear to be better for either obese or non-obese patients than primary suture techniques in recurrence rates.

Finally, UHR combined with LC 'kills two pathologies with one scope'.

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