Laparoscopic cholecystectomy accompanied by simultaneous umbilical hernia repair: A retrospective study

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ABSTRACT

Background: Umbilical defects may cause technical problems for general surgeons in patients during laparoscopic cholecystectomy (LC) operations and may increase the incidence of incisional hernia. **Aim:** The objectives of this study were to determine the optimal repair method for umbilical hernias that already exist or are encountered incidentally and to present data regarding potential problems that may occur during LC. **Settings and Design:** Medical records of patients who had received simultaneous umbilical hernia repair (UHR) with LC were investigated retrospectively. **Materials and Methods:** Cholelithiasis was accompanied by umbilical hernia in 64 (8.6%) out of 745 patients who underwent LC and UHR simultaneously in our hospital between 2000 and 2004. **Statistical Analysis Used:** The Mann-Whitney U, Chi-square, One-Way Anova, Kaplan-Meier survival analysis, the log-rank test and t test were used for statistical analyses. **Results:** LC was followed by UHR using primary suture (Group 1), Mayo repair (Group 2) and flat mesh-based repair (Group 3) in 32 (50%), 18 (28.1%) and 14 (21.9%) patients, respectively. Mean body mass indexes (BMI) of patients were 26.6 kg/m^2, 29.2 kg/m^2 and 39.9 kg/m^2 in Groups 1, 2 and 3, respectively. Recurrence rates were 9.4%, 5.6% and none (0%) in Groups 1, 2 and 3, respectively. Recurrence was observed in three (7.0%) out of 43(67.2%) patients with BMI$\geq$30 kg/m^2 while umbilical hernia recurred in one (4.8%) out of 21 (32.8%) patients with BMI$<$30 kg/m^2. Overall morbidity and mortality rates were 14.1% and 0%, respectively. **Conclusions:** The outcomes of the UHR with mesh after laparoscopic surgeries appear to be better for either obese or non-obese patients than primary suture techniques in recurrence rates.

KEY WORDS: Hernia repair, laparoscopic cholecystectomy, umbilical hernia

Laparoscopic cholecystectomy (LC) 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 LC advantageous.[1,2]

Umbilical hernias comprise 6% of all abdominal hernias in adults.[3] Several surgical methods have been used in the treatment of umbilical hernias. However, there is no consensus yet on the best method for umbilical hernia repair (UHR).[4-6]

Simultaneous occurrence of umbilical hernia and cholelithiasis may cause technical problems in CO_2 insufflations and trocar insertion during LC. Satisfactory data are not yet seen in literature regarding which type of repair method should be selected for treatment of umbilical hernias.[7] The aims of this study were to determine the ideal repair method to accompany LC for known or incidentally encountered umbilical hernias and to present data regarding potential problems with LC.

Materials and Methods

In this study, medical records of patients who had received simultaneous umbilical hernia repair with LC were investigated retrospectively. LC was performed in 745 patients in our hospital between January 2000 and January 2004, 78 (10.5%) out of whom received simultaneous UHR with LC. Patients with strangulated umbilical hernia (n=1), recurrent umbilical hernia (n=2), omphalitis or periumbilical fistula (n=2) were excluded from the study. Moreover, patients receiving hernia repair with dual mesh (n=1), those ranked with American Society of Anesthesiology (ASA) risk score IV (n=3) or with accompanying diseases such as chronic pulmonary disease, cardiac disease, ascites, chronic renal failure, diabetes (n=4) and those who received LC conversion to open surgery (n=1) were also excluded. Sixty-four (8.6%) patients who satisfied inclusion criteria were analyzed. Umbilical hernias in 56 (87.5%) patients were diagnosed by clinical examination in the preoperative period. Ultrasonography was performed in all patients with umbilical defect detected during physical exam or in those with possible hernia in order to characterize defect size and content of umbilical hernia. The sizes of umbilical hernias, which were incidentally detected during various surgical operations were obtained from surgery reports. In eight (12.5%) patients, umbilical hernias were detected incidentally by routine digital examination of the umbilical port during LC. Patients were

assigned to three groups: LC+ primary repair (Group 1, n=32, 50%), LC+ Mayo repair (Group 2, n=18, 28.1%) and LC+ flat mesh hernioplasty (Group 3, n=14, 21.9%). All patients received elective operations under general anesthesia. The choice of the operative technique depended on the individual surgeon's preference.

LC was performed using the standard four-port method in 681 out of 745 patients in whom pneumoperitoneum was achieved by Verres technique using carbon dioxide (CO_2). Sixty-four patients with cholelithiasis and umbilical hernia received LC and hernia repair simultaneously in the same surgery session. Under general anesthesia, we performed an incision at the level of the hernia and we isolated the peritoneal sack. Through a direct cutdown onto the peritoneum we controlled the presence of adherence and prevented a visceral injury and, as in an open laparoscopy, we inserted laparoscopic port (Hasson technique).[8] A purse string suture is placed around the fascia and peritoneum in order to prevent excessive CO_2 leak. Following LC, gall bladder was taken out off epigastric port in endobag without the fascia being enlarged in all patients. Drains were placed selectively in difficult cases where there was a risk of postoperative bleeding.

For Mayo repair, the fascial defect was extended laterally on both sides until a double breasting of the two fascial flaps was achieved. The upper fascia is imbricated over the lower fascia with a row of interrupted 0 sutures (Prolene 0; Ethicon). These begin and end high on the vest, while the trousers are secured in a horizontal manner at the belt line. When these sutures are secured, the free superior edge (vest) overhangs the inferior fascia (trousers) and a second layer of interrupted 0 sutures (Prolene 0; Ethicon) is used to secure the free edge. For suture herniorrhaphy, the fascial defect was closed primarily by interrupted polypropylene sutures (Prolene 0; Ethicon). Onlay repair with polypropylene mesh (Prolene mesh; Ethicon), requires that the peritoneal defect be closed using 3/0 polyglactin suture (Vicryl; Ethicon). Following invagination of the sac an onlay polypropylene mesh was inserted. The mesh edges were turned over for at least 1 cm. Then the edges were fixed with four corner sutures using polypropylene 0 sutures (Prolene 0; Ethicon) to ensure proper stretching of the mesh. This was followed by placement of three evenly spaced longitudinal rows of continuous sutures fixing the mesh to the anterior abdominal wall from the edge of the defect to the edge of the mesh using polypropylene 2/0 sutures (Prolene 2/0; Ethicon). The upper and lower edges of the mesh were then fixed by a continuous row of polypropylene 2/0. Finally, the umbilicus was sutured to the mesh or the fascia with an absorbable material.

A subcutaneous suction drain was used routinely except when the residual subcutaneous cavity was small. In total, all patients in the mesh group, five (7.8%) in Group 1 and six (9.4%) in Group 2 had drainage. All drains were taken out 24h after the surgery. All patients received low-dose low molecular weight heparin subcutaneously.[9] The administration of heparin continued postoperatively, until the discharge of the patient from the hospital. All patients received antibiotic prophylaxis with sefazoline sodium 1 g intravenously during induction of anesthesia.

Postoperative analgesia was achieved by oral acetaminophen (500 mg, four times a day) or oral codeine/acetaminophen (30-60 mg, four times a day) combination. Level of pain was evaluated by visual analogue scale (VAS) scoring system on postoperative first, second and seventh days.[10] Patients were also requested to describe their pain by marking its location on a vertical chart, on which 0mm represented no pain and 100 mm most severe pain.

Operative time, postoperative complications, number of analgesic intake within postoperative first week and length of hospital stay were recorded. The patients were followed up postoperatively for the first week, then one month later and finally every six months.

Statistical differences between groups were determined by the Mann-Whitney U, Chi-square and One-Way Anova tests where appropriate. Recurrence rates were analyzed by Kaplan-Meier survival analysis and the log-rank test.[11] Means were compared using an unpaired *t* test. A *P* value less than 0.05 was considered significant. Statistical analyses were performed using Statistical Package for Social Sciences for Windows version 11.5 software (SPSS Inc, Chicago, IL, USA).

Results

Mean age of 64 qualifying patients who underwent LC+UHR was 53.7 ± 14.9 years (range 23-81 years, 95%CI: 50.9-58.3). Women and men comprised 42 (65.6%) and 22 (34.4%) of these 64 patients, respectively. Mean hernia diameter in all patients was 1.8 ± 0.8 cm (range 1-3.8 cm, 95%CI: 1.6-2.0).

All patients who underwent LC had gallstones, but we did not detect acute cholecystitis and/or malignancy during histopathologic exam of the cholecystectomy specimens.

Data regarding characteristics of patients in the three groups are presented in Table 1.

Mean operative time was 59.3 ± 10.3 min (range 40-85 min, 95% CI: 57.1-62.6); it was slightly, but not significantly, shorter (P= 0.410) in Group 2 compared with that in Groups 1 and 3.

Median VAS pain scores measured on the first, second and seventh days were higher in Group 3 compared with those of the other two groups. There were statistically significant differences between different days in Groups 1, 2 and 3 (P=0.000, 95% CI: 28.6-34.1; P=0.001, 95% CI: 17.3-22.5 and P=0.000, 95% CI: 6.8-11.1 respectively). Analgesic intake was slightly, but not significantly (P=0.068, 95% CI: 7.0-8.4) higher in Group 2 than that in Groups 1 and 3.

It has been determined in our study that the surgery method does not affect surgical outcomes in patients with BMI <30 or BMI >30 (P= 0.122). Statistically significant differences were obtained in terms of BMI's of patients between Group 1 and Group 2 and Group 1 and Group 3 (P=0.000 and P=0.000, respectively), but not between Group 2 and Group 3 (P=0.309).

Table 1: Demographics and characteristics of patients in various treatment groups

	Group 1 (n= 32)	Group 2 (n= 18)	Group 3 (n= 14)	*P*
Age (year)+	56.5±14.4 (23-77)	55.5±18.1 (23-81)	54.6±11.6 (36-74)	0.532
Male: female	21:11	13:5	8:6	0.672
Body mass index (kg/m²)+	26.6±2.7 (23- 32)	29.2±2.0 (26- 32)	39.9±1.8 (27- 33)	0.000/0.309*
Hernia diameter (cm)+	1.0±0.2 (1-2.1)	2.0±0.4 (1-3.1)	3.0±0.6 (2-3.8)	0.000
Operative time (min)+	60±10.9 (40-85)	55±9.7 (45-78)	56±9.3 (48-75)	0.410
Visual analogue scale, 1st day+	22.5±9.2 (11-42)	33.0±9.8 (20-56)	36.5±9.4 (28-60)	0.000
Visual analogue scale, 2nd day+	12.0±7.4 (6-30)	18.0±11.7 (2-40)	28.0±8.6 (14-42)	0.001
Visual analogue scale, 7th day+	3.0±2.6 (1-12)	6.0±4.3 (2-15)	16.5±8.9 (6-32)	0.000
Analgesic intake (tablet)+	7.0±3.0 (2-12)	9.5±2.8 (4-12)	6.0±2.2 (3-10)	0.068
Mean follow-up period (months)+	22±8.7 (9-45)	26±9.5 (9-42)	26±9.5 (10-42)	

+Data given as mean (range), Group 1: LC+ Primary suture, Group 2: LC+ Mayo repair, Group 3: LC+ Mesh hernioplasty, *When Group 2 was compared with Group 3

Table 2: Postoperative complications

	Group 1 (n= 32)	Group 2 (n= 18)	Group 3 (n= 14)	*P*
Wound infection	1 (3.1)	1 (5.6)	1 (7.1)	0.821
Seroma	0 (0)	0 (0)	1 (7.1)	0.162
Recurrence	3 (9.4)	1 (5.6)	0 (0)	0.004
Atelectasis	0 (0)	0 (0)	1 (7.1)	0.162
Overall morbidity rate (%)	12.5	11.1	21.4	

Group 1: LC+ Primary suture, Group 2: LC+ Mayo repair, Group 3: LC+ Mesh hernioplasty, Figures in parentheses are in percentage

Table 2 shows rates of post-operative complications in the three groups.

Mean length of hospital stay was 4.0 ± 3.9 days (range 2-18, 95% CI: 4.8-8.1), 5.5 ± 2.2 days (range 3-10, 95% CI: 4.6-7.1) days and 4.0 ± 3.0 days (range 2-14 days, 95% CI: 3.9-7.6) in Groups 1, 2 and 3, respectively. No significant difference was detected in terms of mean length of hospital stay between the groups (P= 0.84). No postoperative mortality was observed.

Overall follow-up was 25.0 ± 9.1 months (range 9-45 months, 95% CI: 23.1-27.8).

Umbilical hernia recurrence was observed in four out of 64 patients (6.3%) [Table 3] all of whom belonged to the suture-receiving groups (Group 1; n= 3, 9.4%, Group 2; n= 1, 5.6%). No recurrence was observed in patients who received mesh hernioplasty (Group 3; n= 0, 0%). Recurrence rate in patients of suture-receiving groups was statistically significant when compared with patients of mesh-receiving group (P= 0.004). Recurrence was observed in one (4.8%) out of 21 (32.8%) patients with BMI<30 kg/m² and three (7.0%) out of 43 (67.2%) patients with BMI≥30 kg/m². Recurrence rate in patients with BMI≥30 kg/m² was statistically significant (P= 0.009) when compared with patients having BMI<30 kg/m². On the other hand, no significant difference was observed between the significance level obtained after comparison among the three different treatment groups (i.e. primary suture, Mayo repair and mesh hernioplasty) and that obtained after comparison among the two different body weight groups (i.e. BMI≥ 30 kg/m² and BMI<30 kg/m²) (P= 0.435 and P= 0.509, respectively) [Table 4]. Mean recurrence interval was 21 months (range 9-45 months, 95%CI: 19.1-23.3).

Table 3: Characteristics of patients with recurrent umbilical hernia

Recurrence	n/total n
Recurrence in Group 1	3/ 32 (9.4%)
Recurrence in Group 2	1/18 (5.6%)
Recurrence in Group 3	0/14 (0%)
Male-female ratio	1/42: 3/22
Overall recurrence	
Patients with body mass index≥30 kg/m²	3/43 (7.0%)
Patients with body mass index<30 kg/m²	1/21 (4.8%)
Median time to hernia recurrence in months (range)	21 (9-45)

Group 1: LC+ Primary suture, Group 2: LC+ Mayo repair, Group 3: LC+ Mesh hernioplasty

Discussion

Many studies have investigated LC and its complications (incisional hernia from umbilical port) or UHR and its complications (recurrence rates).[3,7,12-15] However, only a limited number of studies have reported short- and long-term outcomes of UHR performed simultaneously with LC in the same session.[7,16] Prevalence of cholelithiasis accompanied by umbilical hernia varies between 4.7-18% (in our study, 10.5%).[12,17,18]

Fascia defects on the umbilicus increase postoperative port-site complications such as incisional hernia and intestinal obstruction as well as they cause a technical difficulty for LC.[7] Another potential hazard in such cases is the injury of organs and structures in the umbilical hernia sac during insertion of a trocar or a Verres needle. We performed LC using Hasson method followed by UHR.[8]

Incisional hernias after LC, the most common reason of which

Table 4: Distribution of body mass index and recurrence among treatment groups

	Group 1 (n=32)	Group 2 (n=18)	Group 3 (n=14)	*P*
Body mass index<30	7(21.9)	9(50)	5(35.7)	0.435
Recurrent	0(0)	1(11.1)	0(0)	
No recurrence	7(100)	8(88.9)	5(100)	
Body mass index≥30	25(78.1)	9(50)	9(64.3)	0.509
Recurrent	3(12)	0(0)	0(0)	
No recurrence	22(88)	9(100)	9(100)	

Group 1: LC+ Primary suture, Group 2: LC+ Mayo repair, Group 3: LC+ Mesh hernioplasty, Figures in parentheses are in percentage

is failure in closure of fascial defects, most commonly occur on the umbilicus (0.8-2.8%).[19,20] Besides, although enlarging of the umbilical port entrance seems like a practical and a reliable method, it is a predisposing factor for incisional hernia development.[21] Thus, we prefer enlargement of the epigastric port entrance for a convenient insertion of trocar in order to take out the gallbladder.

Although such techniques as primary suture, Mayo repair, mesh hernioplasty, LC and Prolen Hernia System can be used, there is no consensus on the best method for umbilical hernia repair.[5,6] Open repair of umbilical hernia is used as a standard procedure by most general surgeons. On the other hand, it has been reported that mesh hernioplasty dramatically decreases recurrence rates of umbilical hernias.[2,5,22] Laparoscopic repair of incisional hernia and ventral hernia appears to be safe, especially with the use of mesh and is proving to be effective as it decreases pain, complications, hospital stay and recurrences but its role in the repair of umbilical hernia remains controversial. In addition the technique of laparoscopic repair of umbilical hernias has not been standardized.[4,23,24] Although umbilical hernia repair using laparoscopic method has various advantages, we prefer open surgery with polypropylene mesh in umbilical hernia repair since dual mesh is very expensive in our country. On the contrary, Bowley and Kingsnorth reported that suture herniorrhaphy was highly effective but routine mesh use was a potential risk for prosthetic infections.[25] We believe that the minimal rate of wound or prosthetic mesh infection in our study is due mainly to the removal of cholecystectomy materials from the epigastric port side entrance in an endobag and to the fact that there were no patients with acute cholecystitis in the study group.

Recurrence rate is the most important factor in determining the optimal method for LC accompanied by simultaneous UHR. High recurrence rates have been reported after Mayo repair (varying between 10-30%) and suture repair (11%) in many studies.[3,26,27] Most surgeons currently prefer prosthetic mesh hernioplasty since they consider this technique gold standard for treatment of midline aponeurotic defects including umbilical hernia.[20,28,29] We found, in our study, recurrence rates of 9.4% and 5.6% in patients who received primary repair and Mayo repair, respectively. On the other hand, no recurrence was observed in patients who received tension-free herniorrhaphy with mesh.

Obesity is a significant risk factor for hernia recurrence.[14] Schumacher *et al*, reported increased rates of recurrence in patients with BMI>30 kg/m^2, while Halm *et al.* reported a recurrence rate of 5-18% in patients with BMI>25 kg/m^2.[30,31] Sauderland *et al*, reported a strong correlation between BMI and hernia recurrence, while no such correlation was found in a study by Halm *et al*.[14,31] Our main tendency with regard to the surgery method to use in umbilical hernia repair is to use tension-free mesh repair in cases with larger hernia defect diameters and to use primary repair in those with small defect diameters. In our study, regardless of BMI, we found higher recurrence rates in cases undergoing primary repair compared with those who received mesh repair. We found, in our study, recurrence rates of 7.0% and 4.8% in patients with BMI≥ 30 kg/m^2 and BMI< 30 kg/m^2, respectively. The BMI interaction with patients in various groups was as follows: recurrence rates in patients with BMI< 30 kg/m^2 in Groups 1, 2 and 3 were 0%, 11.2% and 0%; recurrence rates in those with BMI≥ 30 kg/m^2 in Groups 1, 2 and 3 were 12%, 0% and 0%, respectively.

Conclusion

Fascia defects on the umbilicus cause technical difficulties during LC. However, there is no consensus yet regarding umbilical defect repair after laparoscopic surgeries. Operative time, length of hospital stay, VAS score and analgesic intake depend on the level of difficulty of the LC. 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.

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