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ARAŞTIRMA / RESEARCH

Differences between groups with and without morbidity in cholecystectomy

Kolesistektomide morbiditesi olan ve olmayan gruplar arasındaki farklar

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Abstract

Purpose: The aim of this study was to determine the differences between the patients with postoperative complications and the patients without postoperative complications in cholecystectomy cases and to identify parameters that should be considered regarding complications.

Materials and Methods: Patients who underwent cholecystectomy between January 2019 and July 2020 at Igdir State Hospital, Igdir, Turkey were identified retrospectively. The patients' general characteristics were retrieved from their medical records. Patients who developed complications in the 30 days after surgery were considered the morbidity-positive group, and the patients without complications were considered the morbidity-negative group. The differences between the two groups were evaluated.

Results: The study included 108 patients. The patients' mean age was 46.44 years (range: 18–83), and 85 (78.7%) were women. Male gender, age over 40 years, preoperative fever with the presence of haemangioma on ultrasonography (USG) and cystic canal closure using silk were associated with increased morbidity. Interestingly, umbilical hernia repair in the same surgery was associated with reduced morbidity.

Conclusion: This study found that male gender, older age, and preoperative fever were associated with increased morbidity in cholecystectomy patients. Presence of preoperative haemangioma is a new parameter associated with increased morbidity. In addition, we recommend using silk sutures when closing the cystic duct during cholecystectomy and repairing the umbilical hernia, if present.

Keywords:. Advanced age, cholecystectomy, fever, haemangioma, morbidity.

Öz

Amaç: Bu çalışmada Kolesistektomi olgularında postoperatif komplikasyon gelişen hastalar ile postoperatif komplikasyon gelişmeyen hastalar arasındaki farkları belirlemek ve komplikasyonlar açısından dikkat edilmesi gereken parametreleri tanımlanması amaçlanmıştır.

Gereç ve Yöntem: Ocak 2019-Temmuz 2020 tarihleri arasında Iğdır Devlet Hastanesi'nde kolesistektomi yapılan hastalar retrospektif olarak belirlendi. Hastaların genel özellikleri tıbbi kayıtlarından alındı. Ameliyat sonrası 30 gün içinde komplikasyon gelişen hastalar morbidite pozitif grup, komplikasyon gelişmeyen hastalar morbidite negatif grup olarak kabul edildi. İki grup arasındaki farklar değerlendirildi.

Bulgular: Çalışmaya 108 hasta dahil edildi. Hastaların yaş ortalaması 46.44 (dağılım: 18-83) ve 85'i (%78.7) kadındı. Erkek cinsiyet, 40 yaş üstü, ameliyat öncesi ateş ile ultrasonografide (USG) hemanjiyom varlığı ve ipek ile kistik kanal kapatma artan morbidite ile ilişkiliydi. İlginç bir şekilde, aynı ameliyatta göbek fıtığı onarımı azalmış morbidite ile ilişkilendirildi.

Sonuç: Bu çalışma kolesistektomi hastalarında erkek cinsiyet, ileri yaş ve ameliyat öncesi ateş artmış morbidite ile ilişkili olduğunu bulmuştur. Preoperatif hemanjiyom varlığı artmış morbidite ile ilişkili yeni bir parametredir. Ayrıca kolesistektomi sırasında sistik kanal kapatılırken ipek sütür kullanılmamasını ve varsa göbek fıtığı tamir edilmesini öneriyoruz.

Anahtar kelimeler: İleri yaş, kolesistektomi, ateş, hemanjiom, morbidite.

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INTRODUCTION

Cholecystectomy is the surgical removal of the gallbladder. The most common indication for cholecystectomy is cholelithiasis, which is the presence of gallstones. Cholelithiasis mainly occurs as an asymptomatic disease and is discovered incidentally during imaging conducted to diagnose other abdominal diseases. Although gallstones are mostly asymptomatic, each year, about 20% of patients who have asymptomatic gallstones become symptomatic[1-3]. Gallstones can cause complications, such as cholecystitis, cholangitis, choledocholithiasis and gallstone pancreatitis, depending on the level of stone obstruction in the biliary tree[4]. In rare cases, due to biliary-enteric fistulas, ileus can be seen in patients[5].

In most cases, symptomatic cholelithiasis is treated with cholecystectomy, which can be performed either laparoscopically or using the open surgical technique[6]. With increases in surgeons' skills and advances in technology, laparoscopic cholecystectomy has become the gold standard for the treatment of symptomatic cholecystolithiasis.

As is well known, early diagnosis of acute cholecystitis enables prompt treatment and reduces both mortality and morbidity[7]. In contrast, delayed diagnosis can cause serious complications, including gangrene and perforation, which increase both mortality and morbidity. In one meta-analysis, the 30-day complication rate ranged from 4–31%, and the mortality rate from 0–5%[8]. Post-cholecystectomy complications decrease patients' quality of life and delay their return to normal life activities. Complications also increase the workload of the surgeon performing the operation.

The parameters known to increase morbidity include increased age, especially that over 40 years; male gender; the presence of acute cholecystitis before surgery; and emergency surgery. In this study, we evaluated the occurrence of these known factors and aimed to identify new factors that may affect morbidity after cholecystectomy.

MATERIALS AND METHODS

Patient selection

After the study was approved by the Non-invasive Clinical Research Ethics Committee of Erzurum Regional Education and Research Hospital, Erzurum, Turkey (Decision Number: 2021/04-73), the patients who had undergone cholecystectomy in the general surgery clinic of Igdir State Hospital, Turkey, between January 2019 and July 2020 were identified retrospectively. The study excluded patients in the paediatric age group (0–18 years) and those who were diagnosed and treated at external centres and then admitted to our centre. The patients' general characteristics were retrieved from the hospital's computer system and the archives of patients' medical records.

Procedure

The preoperative parameters evaluated included age, gender, symptoms and signs on admission, preoperative laboratory, and ultrasonography (USG) findings, the presence of acute cholecystitis and gallbladder stones on USG, size of the stones if present, additional liver pathology on USG and cholecystectomy urgency. Routine laboratory tests were evaluated, including hemogram, liver function tests, cholestasis enzymes and C-reactive protein (CRP). The gallbladder and the internal and external bile ducts were evaluated using hepatobiliary USG.

The perioperative factors evaluated included the type of surgery (laparoscopic, open or conversive), the materials used to close the ductus cysticus (metallic clips, Hem-o-Lok clips, or silk sutures) and the presence of an umbilical hernia repaired simultaneously.

The postoperative factors evaluated included length of hospital stay, pathological diagnoses of resected specimens, postoperative complications and mortality that occurred within 30 days postoperatively. Patients who developed complications in the 30 days after surgery were considered as the morbidity-positive group, and those without complications were considered as the morbidity-negative group. The differences between the two groups were compared.

Approach to cholecystolithiasis

After evaluations that included detailed physical examinations, laboratory tests and USGs, the surgery type was determined according to the results for each patient. Elective surgery was planned for patients with cholelithiasis, while emergency surgery was performed for those diagnosed with acute cholecystitis. All surgeries were performed by the same surgeons. In elective cases, laparoscopic surgery

was preferred as a first step. In patients who had gallbladder perforations and Mirizzi syndrome, open surgery was begun using a right subcostal incision. All cases that began with open surgery or that switched to open surgery were emergency cases. In patients who had acute cholecystitis that made it difficult to dissect the hepatocystic area using laparoscopic surgery, surgery was continued using a right subcostal incision (conversive surgery).

In the surgeries performed laparoscopically, metallic clips were used in cases in which the ductus cysticus was of normal thickness, and Hem-o-Lok clips were used in cases in which the ductus cysticus was enlarged. In open cholecystectomy, silk sutures are used routinely. Umbilical hernia repair was performed simultaneously in patients who were found to have an umbilical hernia during the insertion of the umbilical trocar. All the patients were followed up in the service postoperatively. Patients who developed complications during the follow-up were followed up until the complications were resolved. In addition, all patients were contacted routinely 15 days after hospital discharge. The reasons for re-admission to the hospital in the first 30 days due to postoperative complications were investigated. The patients who developed complications in the 30 days after surgery were evaluated as cases of morbidity.

Statistical analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences Version 22.0 (IBM SPSS Corp, Armonk, NY, USA). Quantitative variables were expressed as mean ± standard deviation (SD), median, and minimum-maximum. Qualitative variables were reported as numbers and percentages. The Shapiro-Wilk test was used to assess the normality distribution of the quantitative variables. Although the means and SDs were used for homogeneous distributions, median was used for heterogeneous distributions. The Fisher's Chi-square test was used to compare the qualitative variables. The Mann-Whitney U test was used for heterogeneous distributions, and the Student's t test was used for homogeneous distributions. $p<0.05$ was considered statistically significant.

RESULTS

The study included 108 patients. Their mean age was 46.44 years (range: 18–83), and 85 (78.7%) were women. The age of 69 (63.9%) patients was 40 years or older. Male gender ($p = 0.015$), advanced age ($p = 0.05$), and age > 40 years ($p = 0.02$) were associated with increased morbidity.

On hospital admission, 37 (34.2%) patients had no complaints of abdominal pain, while right upper-quadrant or epigastric pain was recorded in 71 (65.7%) patients. In addition, 18 (16.7%) patients had vomiting or nausea. A positive Murphy's sign was recorded in 49 (45.3%) patients, fever in 20 (18.5%) and jaundice in 2 (1.85%). Among the preoperative symptoms and findings, only fever was associated with higher morbidity ($p = 0.003$). Table 1 shows the preoperative signs, symptoms, and USG findings.

Leukocytosis (>10 x $10^3/mm^3$) was recorded in 41 (38%) patients and CRP levels > 5 mg/L in 22 (20.4%) patients. However, no differences in haematological or biochemical parameters were found between the two groups. In addition, leukocytosis and higher CRP levels did not increase the results regarding morbidity, which were $p = 0.607$ and $p = 0.365$, respectively.

USG identified acute cholecystitis in 30 (27.8%) patients and gallstones in 104 (96.3%). USG also identified many micro-calculi (< 10 mm in diameter) in 54 (50%) patients, macro-calculi (≥ 10 mm in diameter) in 50 (46.3%) patients and no calculus in 4 patients. The patients without calculus were operated on for the following diagnoses: polyps larger than 10 mm in length in 2 patients, adenomyomatosis in 1 patient, and acalculous cholecystitis in 1 patient. Neither the size of the stone nor the presence of acute cholecystitis on USG affected morbidity.

Preoperative USG identified 18 patients as having additional liver diseases: hepatosteatosis in 10 patients, hepatosteatosis with hepatomegaly in 3, haemangiomas in 4, and cyst in 1. The presence of haemangioma was the only one of these liver diseases to be associated with increased morbidity ($p = 0.023$). Table 2 groups the patients' preoperative parameters according to morbidity.

After preoperative evaluation, 49 (45.3%) patients required emergency surgery. The most common surgery used was laparoscopy, which was used in 93 (86.1%) patients. Open surgery was performed in 8 (7.4%) patients and conversion surgery in 7 (6.5%) due to the difficulty of the dissection. The ductus cysticus stump was closed using metallic clips in 68 (63%) patients, Hem-o-Lok clips in 26 (24%) and silk sutures in 14 (13%). The method used directly

affected the rate of morbidity (p = 0.048), which was higher (42.9%) among those in whom silk sutures were used. The morbidity rates in the groups in which Hem-o-Lok clips and metallic clips were used were 11.5% and 17.6%, respectively (p > 0.05). In contrast, while umbilical hernia repair conducted in the same surgery (p = 0.039) was associated with a reduction in morbidity (p = 0.039), there was no relationship with the type of surgery used. Table 3 groups the patients' operative and postoperative parameters according to morbidity.

Table 1. The preoperative signs, symptoms, and USG findings of the patients.

Symptoms	**n (%)**
Right upper quadrant or epigastric pain	71 (65.7%)
No abdominal pain	37 (34.2%)
Vomiting or nausea	18 (16.7%)
Signs	
Murphy's sign positivity	49 (45.3%)
Right upper quadrant or epigastric tenderness	22 (20.4%)
Fever (>37.5oC)	20 (20.3%)
Jaundice	2 (1.8%)
Ultrasound Findings	
Cholecystolithiasis	56 (51.85%)
Acute cholecystitis	25 (23.1%)
Hydropic gallbladder with cholecystolithiasis	19 (17.6%)
Perforated gallbladder with cholecystolithiasis	2 (1.8%)
Polyp (bigger than 10 mm in diameter)	2 (1.8%)
Acute cholecystitis with adenomyomatosis	1 (0.9%)
Adenomyomatosis	1 (0.9%)
Acalculous cholecystitis	1 (0.9%)
Chronic cholecystitis	1 (0.9%)

Table 2. The patients' preoperative parameters according to morbidity.

Parameters	**Morbidity positive group (n=21)**	**Morbidity negative group (n=87)**	**p value**
Age (mean, year)	52.62	44.94	0.05*
Age (n, %)			0.020**
<40 years	3 (7.7%)	36 (92.3%)	
≥40 years	18 (26.1%)	51 (73.9%)	
Gender (n, %)			0.015**
Male	9 (39.1%)	14 (60.9%)	
Female	12 (14.1%)	73 (85.9%)	
Symptoms and signs			
Right upper quadrant pain or epigastric pain			0.102**
Yes	17 (23.9%)	54 (76.1%)	
No	4 (10.8%)	33 (89.2%)	
Vomiting and nausea			0.749**
Yes	4 (22.2%)	14 (77.8%)	
No	17 (18.9%)	73 (81.1%)	
Murphy's sign			0.227**
Yes	12 (24.5%)	37 (75.5%)	
No	9 (15.3%)	50 (84.7%)	
Fever			0.003**
Yes	9 (45%)	11 (55%)	
No	12 (13.6%)	76 (86.4%)	
Jaundice			>0.999**
Yes	0 (0%)	2 (100%)	
No	21 (19.8%)	85 (80.2%)	

Laboratory (mean)			
Wbc ($10^3/mm^3$)	10.7	9.5	0.727*
Hb (g/dL)	13.9	13.6	0.533***
Plt ($10^3/mm^3$)	242.52	236.28	0.687*
CRP (mg/L)	9.2	3.7	0.736*
ALT (U/L)	24.7	38.1	0.249*
AST (U/L)	20.8	30.7	0.164*
Amylase (U/L)	66.9	63.3	0.665*
GGT (U/L)	48.2	62.8	0.849*
ALP (U/L)	81	87.8	0.988*
TB (mg/dL)	0.8	0.7	0.197*
DB (mg/dL)	0.33	0.30	0.550*
Leukocytosis			0.607**
Yes	9 (22%)	32 (78%)	
No	12 (17.9%)	55 (82.1%)	
Higher CRP level			0.365**
Yes	6 (27.3%)	16 (72.7%)	
No	15 (17.4%)	71 (82.6%)	
Evaluation with USG			
Presence of stone			0.068****
Micro (<10 mm)	14 (25.9%)	40 (74.1%)	
Macro (≥10 mm)	7 (14%)	43 (86%)	
No stone	0 (0%)	4 (100%)	
Preoperative diagnosis of acute cholecystitis			0.240**
Yes	8 (26.7%)	22 (73.3%)	
No	13 (16.7%)	65 (83.3%)	
Additional liver pathology			
HS			0.683**
Yes	1 (10%)	9 (90%)	
No	20 (20.4%)	78 (79.6%)	
HS with HM			>0.999**
Yes	0 (0%)	3 (100%)	
No	21 (20%)	84 (80%)	
Cyst			0.194**
Yes	1 (100%)	0 (0%)	
No	20 (18.7%)	87 (81.3%)	
Hemangioma			0.023*
Yes	3 (75%)	1 (25%)	
No	18 (17.3%)	86 (82.7%)	
Surgical emergency (n, %)			0.227**
Elective	9 (15.3%)	50 (84.7%)	
Urgent	12 (24.5%)	37 (75.5%)	

WBC: White Blood Cell, Hb: Hemoglobin, CRP: C-Reactive Protein, ALT: Alanine Aminotransferase, AST: Aspartate Aminotransferase, GGT: Gamma Glutamyl Transferase, ALP: Alkaline Phosphatase, TB: Total bilirubin, DB: Direct bilirubin, USG: Ultrasonography, HS: Hepatosteatosis, HM: Hepatomegaly.

* Mann-Whitney U Test, ** Chi Square Test, *** Student's T Test, ****Likelihood Ratio Test.

The study's overall morbidity rate was 19.4% (n = 21), and there were no mortalities. The most common complication (10.2%) was surgical site infection (n = 11). Table 4 lists the postoperative complications and their treatments.

The mean length of hospital stay was 3.78 days (range: 1–13 days). The mean hospital stays in the morbidity-positive and morbidity-negative groups were 4.3 days and 3.6 days, respectively (p = 0.309).

Table 3. The patients' operative and postoperative parameters according to morbidity.

Parameters	Morbidity positive group (n=21)	Morbidity negative group (n=87)	p value
Type of surgery (n, %)			0.130*
Laparoscopic	15 (16.1%)	78 (83.9%)	
Open	3 (37.5%)	5 (62.5%)	
Conversion	3 (42.9%)	4 (57.1%)	
Ductus cysticus stump closure			0.048*
Metallic Clip	12 (17.6%)	56 (82.4%)	
Hem-o-Lok Clip	3 (11.5%)	23 (88.5%)	
Silk suture	6 (42.9%)	8 (57.1%)	
Umbilical hernia repair			0.039**
Yes	0 (0%)	15 (100%)	
No	21 (22.6)	72 (77.4)	
Pathology			0.606*
CC	18 (18.6%)	79 (81.4%)	
AC	3 (30%)	7 (70%)	
Dysplasia	0 (0%)	1 (100%)	
LOS (mean, days)	4.3	3.6	0.309***

AC: Acute Cholecystitis, CC: Chronic Cholecystitis, LOS: Length of Stay.
* Likelihood Ratio Test, ** Chi square Test, *** Mann-Whitney U test.

Table 4. Postoperative complications and their treatments.

Postoperative Complications (Within 30 days after surgery)	Treatment	n (%)
Surgical Site Infection	Drainage and daily cleaning	11 (52.2%)
Collection at operation area	Spontaneous regression	3 (14.2%)
	Interventional drainage (biloma)	1 (4.8%)
Suspected injury to the hepatic artery	Medical treatment (No injury was found on ultrasonography)	1 (4.8%)
Biliary Leak (low flow)	Medical	1 (4.8%)
Port side hernia	Surgical repair	1 (4.8%)
Hemorrhage from unknown origin	Surgical exploration (there was no focus on exploration)	1 (4.8%)
Pancreatitis	Medical follow-up	1 (4.8%)
Hemorrhage at port side	Controlled with suturing	1 (4.8%)
Total		21 (100%)

DISCUSSION

In the present study, we aimed to identify which factors could be protective against post-cholecystectomy morbidity. Morbidity is known to increase with increased age, especially that greater than 40 years, and the presence of preoperative fever, which is a sign of acute cholecystitis. In one meta-analysis, increased age was associated with increased rates of postoperative complications[9]. However, other studies found no correlation between older ages and morbidity[10-12]. The present study identified additional factors beyond those known to increase morbidity, including the presence of haemangioma

on preoperative USG and closure of the cystic canal using silk. Interestingly, morbidity was reduced by the repair of umbilical hernia during the same surgery.

Kanakala et al. found that male gender, emergency surgery, complex surgery and the presence of comorbidities were associated with the incidence of complications[13]. Although the incidence of gallstones is two to three times higher in women, morbidity is more common in men[14-17]. Some authors have attributed this excess morbidity to the later onset of symptomatic cholelithiasis in men[17,18]. Also, Lein noted that reasons for delayed presentation may include psychological and social factors and that a higher pain threshold in males may result in later presentation at more advanced stages of the disease than in females[17]. In contrast, Yol et al. observed that inflammatory processes and fibrosis were more severe in male patients who had acute cholecystitis[19]. It is known that the incidence of cholelithiasis increases over the age of 40 years[20]. A study involving 42,474 patients found that morbidity increased significantly in those older than age 65 (10.2% vs. 25.7%; $p < 0.001$)[21]. Many studies have found that being over age 65 increases morbidity significantly[13,18,22]. In a meta-analysis that included 14,645 patients, being over age 65 and male increased the rate of conversion from laparoscopic to open surgery[23]. In contrast, some studies have shown that greater age did not increase morbidity[10-12]. In the present study, older age, age greater than 40 years and male gender increased the likelihood of morbidity. We believe that this result can be attributed indirectly to comorbid diseases of advanced age, such as diabetes mellitus and chronic obstructive pulmonary disease, and their mediation of wound-related complications. However, one limitation of the present study is that it did not evaluate the status of comorbid diseases due to the insufficient reliability of its data.

Signs of complicated and perforated cases commonly include Murphy's sign and tenderness in the right upper quadrant of the abdomen, followed by fever, jaundice, systemic sepsis and organ failure[7]. In acute cholecystitis, the specificity and sensitivity of Murphy's sign are 35–98% and 63–96%, respectively[24]. In the present study, Murphy's sign was the most common symptom in 49 patients, and its presence was not associated with increased morbidity. In contrast, a prospective study found that fever and white blood cell counts higher than 15 x $10^3/mm^3$ were positively associated with postoperative complications[25]. In the present study, preoperative fever increased morbidity, while leukocytosis and high levels of CRP had no effect on morbidity. We believe this is due to the high rate of elective surgery cases.

Studies have found that the acute or chronicstatus of disease preoperatively and USG criteria, such as the presence of acute cholecystitis, play an important role in morbidity[13,20,21,26]. However, in the present study, neither the preoperative disease status nor the presence on USG of acute cholecystitis affected morbidity.

Also, in the present study, the preoperative presence of haemangioma increased morbidity regardless of the size of the haemangioma. No studies in the literature address the relationship between haemangioma and cholecystectomy morbidity. One new and interesting result of the present study is the development of morbidity in patients who have haemangiomas. To confirm that this correlation is not a statistical error, it is necessary to confirm it with those in other studies that involved larger numbers of patients.

Although laparoscopic cholecystectomy has become the standard treatment for symptomatic gallbladder diseases, conversion to open surgery is required in a substantial percentage of patients. Approximately 2% to 15% of patients require conversion to open surgery because of extensive fibrosis, anatomical anomalies, histories of previous upper-abdominal surgery and the lack of appropriate laparoscopy instruments[27,28]. The need for conversion may be occasioned if the cystic duct becomes foreshortened, the gallbladder densely adheres to the common bile duct or bleeding obstructs the view of the Calot's triangle[29]. In the present study, the conversion rate was 6.7%, consistent with the rates reported in the literature[30,31]. However, multiple studies have argued that laparoscopy is still a feasible and effective surgery in cholecystectomy[32,33]. Keus et al. included 38 trials in a study that associated laparoscopic surgery with lower morbidity[33]. However, another study of 2117 patients found that laparoscopic cholecystectomy in acute cases had higher rates of morbidity (11.9% vs. 6.1%)[13]. The present study found no differences in the morbidity rates among the surgical methods used.

The prevalence of cholelithiasis accompanied by umbilical hernia varies from 4.7–18%[34]. AlMarzooqi et al. found that morbidity was not increased by conducting abdominal-wall hernia surgery

concomitant with cholecystectomy[35]. In the present study, performing surgery for cholecystectomy simultaneously with that for umbilical hernia exerted an interesting protective effect against overall morbidity. Even though adding umbilical hernia surgery increases surgical stress, the addition of this surgery was associated with lower morbidity.

Studies found no difference among methods for closing the cystic duct and cystic arteria[36-38]. In the present study, neither open nor emergency surgeries increased morbidity, but the use of silk sutures to close the ductus cysticus increased morbidity. In elective surgeries, the use of Hem-o-Lok clips in cases that had enlarged ductus cysticus did not increase morbidity. Therefore, it can be concluded that the use of silk sutures directly increases morbidity regardless of the surgical method and the surgical urgency. This is the other new and interesting result of the present study.

The present study has some limitations, most notably the small number of patients included. New studies that include larger numbers of cases should be conducted. Also, the present study was a retrospective one, and a lack of information prevented it from evaluating the relationships among the American Society of Anaesthesiology (ASA) score, the presence of comorbidity and early outcomes. However, the preoperative anamnesis of all patients was investigated in detail and recorded in the hospital's electronic archives system.

The present study evaluated the factors for morbidity after cholecystectomy and found higher morbidity rates in patients who were older (especially 40 years and older) and male. However, some factors known to increase morbidity, including open surgery, acute cholecystitis and high infective parameters, did not increase morbidity in the present study. Preoperative fever in patients who had acute cholecystitis increased morbidity. New findings obtained by the present study include that morbidity is increased with the presence of liver haemangioma on USG and the use of silk sutures to close the cystic duct. Furthermore, simultaneous umbilical hernia surgery is a factor that protects against morbidity. Therefore, the authors recommend closing the cystic duct using non-silk suture materials and performing any needed umbilical hernia repair simultaneously with cholecystectomy.

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