Outcomes of laparoscopic cholecystectomy in elderly patients

Ahmed M. Ghanem, Ahmed A. Bakr, Ahmed H. Hussein

Department of Surgery, Faculty of Medicine, Suez Canal University, Ismailia, Egypt

Correspondence to Ahmed M. Ghanem, MD, Department of Surgery, +2 kilo 4.5 round street Ismailia faculty of medicine Suez canal university, Ismailia, Egypt.
Tel: +201141299729;
e-mail: ahmedghanem215@gmail.com

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Background
Laparoscopic cholecystectomy (LC) is the conventional therapy for both symptomatic gallbladder stones and acute cholecystitis; nevertheless, these outcomes are representative of the overall population. Our study's objective was to evaluate the efficacy of LC in individuals aged 60 and older.
Methods
This prospective research was performed on 200 elderly cases aged 60 or older who underwent LC. Cases were classified into two groups regarding the age, group (A): Cases aged greater than or equal to 70 years and group (B) Cases aged 60 –less than or equal to 69 years. Group (A) were subdivided into three groups: age from 70 to 72 years (group A1), age from 73 to 76 (group A2), and age from 77 to 80 (group A3) were the additional age categories created from the original group of patients.
Results
American Society of Anaesthesiologists (ASA) score increased with age in both groups. In group B, 15.5% had ASA scores greater than or equal to 3, and increased to 37.5% in group A1, 68.8% in group A2 and 80.0% in group A3. ASA classification was significantly different between both groups ($P<0.001$). Acute cholecystitis was found in 8 (17.8%) patients in group A and 24 (15.48%) patients in group B whereas chronic cholecystitis was found in 37 (82.2%) patients in group A and 131 (84.5%) patients in group B, with no significant difference between both groups ($P=0.890$). The majority of surgically treated patients in all research groups were diagnosed with chronic cholecystitis.
Conclusion
LC in elderly patients is applicable with low mortality and morbidity rates. Despite the common prevalence of concurrent disorders involving the lung, heart, and diabetes mellitus (DM) in geriatric patients treated with LC, these medical conditions contributed slightly to the morbidity findings.

Keywords:
cholelithiasis, elderly, laparoscopic cholecystectomy, octogenerians

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Introduction

There have been an increasing number of senior individuals who are undergoing surgery for symptomatic gallbladder stones as a result of longer life expectancies and an increase in the frequency of gallbladder stones with advancing age [1].

In Western nations, gallstone disease is one of the most prevalent indications for abdominal surgery. This disease's prevalence grows in all age groups and both sexes [2].

Laparoscopic cholecystectomy (LC) is the usual therapy for both symptomatic gallstones and acute cholecystitis; nevertheless, these outcomes are based on the general population [3].

The number of elderly people undergoing surgery today for symptomatic gallbladder stones has increased due to longer life expectancies, an increase in the frequency of gallbladder stones, and an increase in age. The mortality and morbidity of these patients undergoing the operation are increased by the existence of related chronic comorbidities, limited functional reserves, and these individuals. Even though LC has become the gold standard for treating gallstones, there are still questions regarding its safety for the older population [4].

Numerous research examines cholecystectomy in older patients. Patients above the age of 80 are more likely to have severe gallstone disease or acute cholecystitis, more prone to perioperative morbidity, acute and open surgeries, and a longer hospital stay following surgery [5]. Our study's objective was to evaluate the efficacy of LC in individuals aged 60 and older.

Patients and methods

This prospective cohort research was performed on 200 elderly cases aged greater than or equal to 60 who were subjected to LC at the Department of Surgery conducted at the Suez Canal University Hospital for 2 years from March 2021 to February 2023. Based on physical examination, general conditions, laboratory investigation, and radiographic results, gallstone disease was diagnosed. All cases provided a signed, informed consent form. The research was done after approval of the ethical committee (AP:)

All elderly that underwent an elective or emergency cholecystectomy aged greater than or equal to 60 years in our hospital between 2021 and 2023 were included.

Exclusion criteria were Patients with cardiac disease, with ASA grade IV, with carcinoma in gall bladder, bleeding disorders, chronic liver disease, fatty liver, infectious diseases of the liver, cirrhosis, and portal hypertension.

Cases were classified based on the age into two groups, group (A): cases aged greater than or equal to 70 years, and group (B): cases aged 69 years old or younger till 60 years. Group (A) were subdivided into three groups: age from 70 to 72 years (group A1), age from 73 to 76 (group A2), and age from 77 to 80 (group A3) were the additional age categories created from the original group of patients.

Indications for surgery were symptomatic gallstones, acute cholecystitis, gallbladder polyposis cholangitis, or biliary pancreatitis. Typical 3 or 4-port procedure was used to accomplish a LC.

The following patient information was documented: sex, age, American Society of Anaesthesiologists (ASA) classification, comorbidities such as hypertension (HTN), diabetes mellitus (DM), and cardiopulmonary, surgical indication, preoperative endoscopic retrograde cholangiopancreatography (ERCP), conversion to open surgery. The rates and number of conversions to open surgery were documented, as postoperative complications.

All cases who were diagnosed with common bile duct stones underwent ERCP. After that, sequential cholecystectomy was performed [6]. LC was conducted by a team of surgeons utilizing the conventional American position with 3 or 4-port approach [7–9].

Statistical analysis

SPSS V25 was used for statistical analysis of the data (IBM Inc., ARMONK, NY, USA). Categorical data were presented as frequency and percentage and were statistically analyzed by χ^2 test and Fisher's exact test when appropriate. Parametric numerical data were presented as mean±standard deviation (SD) and analyzed using ANOVA test among the three groups. A two-tailed P value less than or equal to 0.05 was deemed statistically significant.

Results

Out of 200 cases included in the trial, 45 cases aged from 70 to 80 years old (group A), their mean age was 75.62±3.22 years old; 24 of them (12.0%) aged between 70 and 72 years old (group A1), 16 (8%) were between 73 and 76 years old (group A2), and 5)2.5%) were between 77 and 80 years old (group A3). The rest 155 (77.5%) cases (group B) aged from 60 to 69 years with a mean age of 64.82±3.01. Regarding sex, group A1 included 18 (75.0%) females and 6 (25.0%) males, group A2 included 9 (56.2%) females and 7 (43.8%) males, group A3 included 3 (60.0%) females and 2 (40.0%) males, and group B included 106 (68.38%) females and 49 (31.61%) males. Regarding the ASA classification, 152 (76.0%) cases were classified as either class I or II, and 48 (76.0%) cases were classified as class III. ASA score increased with age in both groups; in group B, 15.5% had ASA scores greater than or equal to 3, and increased to 37.5% in group A1, 68.8% in group A2 and 80.0% in group A3. The age was significantly higher in group A compared to group B (75.62±3.22 vs. 64.82±3.01, $P<0.001$). ASA classification was significantly different between both groups ($P<0.001$). There was no significant difference between the studied groups regarding sex (Table 1).

Regarding comorbidity, of the total population, 69 (34.5%) of patients had hypertension, 49 (24.5%) of patients had DM, 20 (10%) patients had cardiac disease, and 12 (6%) patients had peripheral vascular disease whereas 50 (25.0%) cases had no comorbidities. In group A, 11(24.4%) patients had hypertension, 11 (24.4%) patients had DM, and eight (17.8%) patients had cardiac disease, five (11.1%) patients had peripheral vascular disease and 10 (22.2%) patients had no comorbidities. In group B, 58 (37.4%) patients had hypertension, 38 (24.5%) patients had DM, 12 (7.7%) patients had cardiac disease, seven (4.5%) patients had peripheral vascular disease and 40 (25.8%) patients had no comorbidities. Comorbidities were insignificantly different between the studied groups (Table 2).

Table 1 Baseline characteristics of the studied patients

	Age (Years) No. (%)		Mean±SD	
Group A1 (70–72)	24 (12.0%)			
Group A2 (73–76)	16 (8.0%)		75.62±3.22	
Group A3 (77–80)	5 (2.5%)			
Group B (60-69)	155 (77.5%)		64.82±3.01	
Total	**200 (100.0%)**		***P* value <0.001***	
Sex	**Female**	**Male**	**Test value**	***P*-value**
	No. (%)	**No. (%)**		
Group A1 (*n*=24)	18 (75.0%)	6 (25.0%)		
Group A2 (*n*=16)	9 (56.2%)	7 (43.8%)	1.713	0.634
Group A3 (*n*=5)	3 (60.0%)	2 (40.0%)		
Group B (*n*=155)	106 (68.38%)	49 (31.61		
ASA	**ASA I or II**	**ASA III**	**Test value**	***P*-value**
	No. (%)	No. (%)		
Group A1 (*n*=24)	15 (62.5%)	9 (37.5%)	26.168	**<0.001***
Group A2 (*n*=16)	5 (31.2%)	11 (68.8%)		
Group A3 (*n*=5)	1 (4.2%)	4 (80.0%)		
Group B (*n*=155)	131 (84.5%)	24 (15.5%)		

ASA, American Society of Anesthesiology. *: significant as *P* value less than 0.05.

Table 2 Comorbidities of the studied patients

	Group A (*n*=45)			Group B (*n*=155)		
	Group A1 (*n*=24) No. (%)	Group A2 (*n*=16) No. %)	Group A3 (*n*=5) No. (%)	No. (%)	Test value	*P*-value
No	7 (15.6%)	3 (6.7%)	0 (0.0%)	40 (25.8%)		
Hypertension	7 (15.6%)	2 (4.4%)	2 (4.4%)	58 (37.4%)		
Diabetes mellitus	5 (11.1%)	5 (11.1%)	1 (2.2%)	38 (24.5%)	7.922	0.094
Cardiac disease	3 (6.7%)	4 (8.9%)	1 (2.2%)	12 (7.7%)		
Peripheral vascular disease	2 (4.4%)	2 (4.4%)	1 (2.2%)	7 (4.5%)		

Regarding the symptoms and clinical presentation, patients exhibited a variety of the usual gallbladder disease symptoms, including epigastric pain, fatty food intolerance, nausea and vomiting, Murphy's sign, biliary colic, right upper quadrant pain radiating to the back, dyspepsia, fever, bloating, and belching. Symptoms and clinical presentation were insignificantly different between the studied groups. Five patients with common bile duct stones who needed sphincterotomy and stone extraction underwent preoperative ERCP: 4 (8.9%) cases in group A and 1 (0.6%) case in group B). ERCP was significantly different between both groups (*P*=0.010). Table 3

Regarding surgical indications, 130 (65%) cases had biliary colic, 45 (22.5%) cases had acute cholecystitis, and 25 (12.5%) cases had biliary cholecystitis. Operative time in elderly patient ranged from 40 min to 2 h with a mean value of (118.51±9.90).

Acute cholecystitis was found in eight (17.8%) patients in group A and 24 (15.48%) patients in group B whereas chronic cholecystitis was found in 37 (82.2%) patients in group A and 131 (84.5%) patients in group B, with no significant difference between both groups (*P*=0.890). In group A, three (12.5%) patients had acute cholecystitis and 21 (87.5%) patients had chronic cholecystitis in group A1, three (18.75%) patients had acute cholecystitis and 13 (81.25%) patients had chronic cholecystitis in group A2 and two (40%) patients had acute cholecystitis and three (60%) patients had chronic cholecystitis in group A3, with no significant difference among the studied groups (*P*=0.340). Most surgically treated cases in all research groups were diagnosed with chronic cholecystitis (Table 4).

Blood gas samples were drawn from the arteries of the cases whose procedures lasted more than one hour, corresponding to 17 cases in groups A1, A2, A3 (cases ≥ 70 years) and 102 cases in group B (cases ≤69years). The Mean $PaCO_2$ was found to be 33.87 ±6.32 mmHg in the group A1, 38.65±5.21 mmHg in the group A2 and 37.98±9.68 mm Hg in the group A3. The pH values in groups A1, A2, and A3 had a mean of 7.42±0.06, 7.40±0.07, and 7.45±0.08, respectively.

Table 3 Symptoms and clinical presentation and preoperative endoscopic retrograde cholangiopancreatography of the studied patients

	Group A (*n*=45)			Group B (*n*=155)		
	Group A1 (*n*=24) No. (%)	Group A2 (*n*=16) No. (%)	Group A3 (*n*=5) No. (%)	No. (%)	Test value	*P*-value
Symptoms and clinical presentation						
Epigastric pain	23 (51.1%)	16 (100.0%)	5 (100.0%)	135 (87.1%)		
Fatty food intolerance	17 (37.8%)	12 (75.0%)	4 (80.0%)	124 (80.0%)		
Nausea and vomiting	11 (24.4%)	7 (43.8%)	3 (60.0%)	110 (71.0%)		
Murphy's sign	7 (15.6%)	3 (18.8%)	1 (20.0%)	20 (12.9%)		
Biliary colic	15 (33.3%)	14 (87.5%)	4 (80.0%)	115 (74.2%)	12.130	0.145
Right upper quadrant pain radiating to the back	13 (28.9%)	8 (50.0%)	2 (40.0%)	127 (81.9%)		
Dyspepsia	14 (31.1%)	5 (31.3%)	3 (60.0%)	90 (58.1%)		
Bloating	7 (15.6%)	3 (18.8%)	4 (80.0%)	76 (49.0%)		
Belching	5 (11.1%)	2 (4.4%)	3 (60.0%)	45 (29.0%)		
Preoperative ERCP						
Yes	1 (4.2%)	1 (6.3%)	2 (40.0%)	1 (0.6%)	–	**0.010**
No	23 (95.8%)	15 (93.8%)	3 (60.0%)	154 (99.4%)		

ERCP, endoscopic retrograde cholangiopancreatography.

Table 4 Comparison between studied groups regarding acute and chronic cholecystitis

	Acute cholecystitis No. (%)	Chronic cholecystitis No. (%)
Group A1(*n*=24)	3 (12.5%)	21 (87.5
Group A2 (*n*=16)	3 (18.75%)	13 (81.25%)
Group A3 (*n*=5)	2 (40%)	3 (60%)
Group B (*n*=155)	24 (15.48%)	131 (84.5%)

Mean $PaCO_2$ in group B was 38.32±9.32 mmHg and mean pH was 7.37±0.09. The variations with respect to mean $PaCO_2$ and pH measurements between the groups were insignificant ($P>0.05$).

Regarding Conversion to open cholecystectomy, 12.90% of the cases in group B, 16.6% of the cases in group A1, 18.75% of the cases in group A2 were subjected to conversion to open cholecystectomy and no cases in group A3 were subjected to conversion to open cholecystectomy. The differences between the Conversion and NonConversion to open cholecystectomy was insignificant (P=0.716) (Table 5).

Regarding conversion to open cholecystectomy, 7 of the 45 (15.6%) cases in group A required conversion, and 20 of the 155 (12.09%) cases in group B. Even though the older age group had higher conversion rate, the variation was not significant (P=0.163), In all age groups, inability to display anatomy safely was the most common reason for conversion, followed by intra operative bleeding, adhesions after previous laparotomy, bile duct injury and finally suspicion of cancer. (Table 6).

The rates of postoperative complication were 17.7%in group A and 19.53%in group B; however, this variation was insignificant (P=0.812). Mortality did not occur in both groups. (Table 7).

Table 8 shows that there was a significant relation between the incidence of comorbidities and ASA and comorbidities ($P<0.001$, 0.002, respectively), high ASA classification and presence of associated comorbidities are significantly associated with the incidence of postoperative complications.

Table 5 Comparison regarding Conversion to open cholecystectomy between studied groups

	Conversion to open cholecystectomy No. (%)	NonConversion to open cholecystectomy No. (%)	Test value	*P* value
Group A1(*n*=24)	4 (16.6%)	20 (83.4%)		
Group A2(*n*=16)	3 (18.75%)	13 (81.25%)	1.355	0.716
Group A3(*n*=5)	0	5 (100%)		
Group B(*n*=155)	20 (12.90%)	135 (87.09%)		

Chi-square test.

Table 6 Comparison regarding conversion to open cholecystectomy between studied groups

	Conversion to open cholecystectomy No. (%)
Group A(*n*=45)	**7 (15.6%)**
Inability to display anatomy safely	3 (42.85%)
Intra operative bleeding	2 (28.57%)
Adhesions after previous laparotomy	1 (14.3%)
Bile duct injury	0 (0.0%)
Suspicion of cancer	1 (14.3%)
Group B(n=155)	**20 (12.90%)**
Inability to display anatomy safely	11 (55%)
Intra operative bleeding	4 (20%)
Adhesions after previous laparotomy	3 (15%)
Bile duct injury	1 (5%)
Suspicion of cancer	1 (5%)

Discussion

There have been an increasing numbers of senior individuals that are undergoing surgery for symptomatic gallbladder stones as a result of longer life expectancies and an increase in the frequency of gallbladder stones with advancing age [10].

Recent national multicenter research revealed that 96% of cholecystectomies are performed laparoscopically, establishing LC as the standard treatment for benign gallbladder disorders. Acute cholecystitis or biliary colic account for more than 70% of cholecystectomy reasons [11].

The presence of chronic co-morbidities and inadequate functional reserves exacerbate the morbidity and mortality associated with surgery in these individuals [12].

The need for surgery, with an ageing population, is anticipated to increase over the next decade, along with a corresponding increase in frailty. Similarly, it is anticipated that a growing proportion of older individuals would come with gallstone disease [13].

As a result of the association between age and diminished functional reserve and the presence of various comorbidities, it is believed that operating on older cases may be linked with a higher risk of complications [14]. Despite this, individuals of advanced age may still be subjected to LC. Numerous research comparing the results of LC in senior vs younger patients have revealed that older age

Table 7 Comparison regarding postoperative complications between studied groups

	Group A No. (%)	Group B No. (%)	Test value	*P*-value
PostOperative Complications	8 (17.7%)	30 (19.53%)	0.05	0.812
Related to the Surgical Site	–	–		
– Bile duct injury	0	1 (3.33%)	–	–
– Bile leak	1 (12.5%)	3 (10%)	–	–
– Subhepatic collection	1 (12.5%)	5 (16.67%)	–	–
– Postoperative bleeding	0	1 (3.33%)	–	–
– Retained bile duct stone	1 (12.5%)	4 (13.33%)	–	–
– Wound infection	1 (16.7%)	3 (10%)	–	–
Mortality	0	0	–	–
Not Related to the Surgical Site	–	–		
– Myocardial ischemia	0	3 (10%)	–	–
– Arrythmia	1 (12.5%)	2 (6. 67%)	–	–
– Atelectasis/chest infection	2 (25%)	4 (13.33%)	–	–
– Urinary tract infection	1 (0.0%)	4 (13.33%)	–	–

Table 8 Relation between incidence of complication and American Society of Anesthesiology score and comorbidities of the studied patients

	Incidence of complications (*n*=38) *N* (%)	*P* value
ASA		
I or II	10 (26.3%)	<**0.001***
III	28 (73.7%)	
Comorbidities		
No	0	
Hypertension	18 (47.4%)	**0.002***
Diabetes mellitus	12 (31.6%)	
Cardiac disease	4 (10.5%)	
Peripheral vascular disease	4 (10.5%)	

ASA, American Society of Anesthesiology. *: significant as *P* value less than 0.05.

is related to more complications, greater conversion rates, and longer hospital stays [15].

Our study's objective was to evaluate the efficacy of LC in individuals aged 60 and older.

Out of 200 cases included in the trial, 45 cases aged from 70 to 80 years old (group A), their mean age was 75.62±3.22 years old; 24 of them (12.0%) aged between 70 and 72 years old (group A1), 16 (8%) were between 73 and 76 years old (group A2), and 5)2.5%) were between 77 and 80 years old (group A3). The rest 155 (77.5%) cases (group B) aged from 60 to 69 years with a mean age of 64.82±3.01. Regarding age, a significant variation between groups was reported. Most research utilize 65 or 70 years of age as the cutoff for elderly patients [16,17].

There is evidence that 16% of men and 50% of women in their 70 s have gallbladder illness [18].

It is believed that individuals aged 80–89 make up 42% of female cases and 28% of male cases [19].

In 30 years, the share of the population over 65 is anticipated to increase from 18% now to 25%. Gallstone disease is more prevalent among the elderly, and the complications of gallstone disease, such as cholecystitis, biliary colic, and pancreatitis, account for a significant proportion of acute surgical admissions [5].

ASA score increased with age in both groups. In group B, 15.8% had ASA scores greater than or equal to 3, and increased to 37.5% in group A1, 68.8% in group A2 and 80.0% in group A3. The variation was highly significant between the ASA scores ($P<0.001$).

Carbon dioxide pneumoperitoneum has severe intraoperative ventilatory and circulatory consequences during LC due to raised intraabdominal pressure and absorbed carbon dioxide. Even though these effects are not clinically significant for healthy individuals, they are believed to be harmful for those at high risk for anesthesia (ASA 3 and 4) [20,21].

Yetkin *et al.* [14] reported that, all cases having a surgical duration longer than one hour (26 cases in groups A1, A2, and A3 and 152 cases in group B) had an evaluation of $PaCO_2$ and pH values in blood samples collected at the conclusion of the first hour of surgery. The variation was insignificantly different between the groups ($P>0.05$).

Similarly, Koivusolo *et al.* [22] reported that the pneumoperitoneum induced with 10 mmHg to 12 mm Hg pressure during LC in cases with ASA scores 3 or 4 did not induce extra hazard in older population.

Previous research has demonstrated that elderly have greater incidence of acute cholecystitis [18,23].

Yetkin *et al.* [14] reported that, even though cases aged greater than or equal to 70 years old were more likely to get acute cholescystitis than younger individuals, this variation was not significant. In contrast, subgroup analysis of individuals greater than70 found that the rate of acute cholecystitis in cases aged greater than or equal to 80 was 45.5%, which was significantly greater compared to the other age groups ($P=0.029$).

We believe this discovery explains the literature-reported greater prevalence of complications in people greater than 80 years old [24,25].

Regarding conversion to open cholecystectomy in our research, 7 of the 45 (15.6%) cases in group A required conversion, and 20 of the 155 (12.09%) cases in group B. Even though the older age group had higher conversion rate, the variation was not significant ($P=0.163$), In all age groups, inability to display anatomy safely was the most common reason for conversion, followed by intra operative bleeding, adhesions after previous laparotomy, bile duct injury and finally suspicion of cancer.

Literature identifies older age as a preoperative risk factor for conversion, possibly due to a greater number of cholecystitis episodes and a longer history of gallstones [26,27].

Yetkin *et al.* [14] reported that, 14.7% of the elderly group underwent conversion to open surgery. The younger age group had a conversion rate of 8%. Although patients greater than 70 had higher conversion rates, this was not significant. ($P=0.765$). Nevertheless, subgroup analysis of group A (≥ 70) found that cases greater than or equal to 80 years old had a significantly greater conversion rate compared to other subgroups ($P<0.01$).

Kamarajah *et al.* [5] found that, in the elderly group, conversion rates were up to three times greater. The risk of perioperative mortality and morbidity increases for patients whose minimum access surgery is switched to open surgery.

Frequently, advanced age is linked with low functional reserve and significant comorbidities, which might exacerbate the postoperative course.

The rates of postoperative complication were 17.7%in Group A and 19.53%in Group B; however, this variation was insignificant (P=0.812). Mortality did not occur in both groups.

Yetkin *et al.* [14] found that, Although the complication rates for cases aged greater than or equal to 70 years old were somewhat higher than those for younger patients (9.7% vs. 13.2%, P=0.359), these numbers are still lower than those reported for open cholecystectomy. Analysis of subgroups of elderly individuals revealed that the patients aged greater than or equal to 80 had a significant increase in the incidence of complications. The absence of pneumoperitoneum-dependent complications during the perioperative phase is another crucial aspect. Higher incidence of complications in people aged 80 appear to be the outcome of more difficult cholecystectomies (fibrotic gallbladder, acute cholecystitis, mirizzi syndrome, and others). So, we feel that cases aged greater than or equal to 80 should preferably be operated on by competent surgical personnel utilizing high-quality technological equipment, which will aid in reducing the incidence of complications.

The decrease in mortality and morbidity rates associated with LC in older people is considered one of its potential advantages. The reported morbidity and mortality incidence associated with open cholecystectomy in older patients when compared to LC is approximately 23% to 28% and 1.5% to 2%, respectively [28,29].

Charfare *et al.* [30] conducted preoperative ERCP, and 1.2% of patients had retained stones following surgery.

Kamarajah *et al.*, [5] reported non-significant variation in bile leak in age cut-offs of greater than or equal to 70 and greater than or equal to 80 years old, even though the risk of bile leak was greater in the overall cohort.

LC is linked with significantly lower rates of re-interventions and serious complications, according to a randomized controlled trial comparing percutaneous catheter drainage with LC in cases at high-risk with acute cholecystitis [31].

In Collins *et al.* [32] research conducted on 997 laparoscopic cholecyctectomy cases, 3, 4% of patients had clinically silent choledocholithiasis, of which one-third passed spontaneously after six weeks of surgery. We feel that selective biliary imaging, such as Magnetic resonance cholangiopancreatography (MRCP), decreases the need for intraoperative cholangiography operations and unnecessary ERCP, in addition, it is an effective and safe technique for preoperative diagnosis of bile stones, but also Preoperative evaluation of cardiovascular risk factors and proper patient monitoring are required for the diagnosis and management of potential adverse events [33].

Conclusion

LC in elderly patients is applicable with low mortality and morbidity rates. Despite the common prevalence of concurrent disorders involving the lung, heart, and DM in geriatric patients treated with LC, these medical conditions contributed slightly to the morbidity findings.

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Conflicts of interest

There are no conflicts of interest.

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