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SURGICAL ENDOSCOPY
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Laparoscopic cholecystectomy and common bile duct exploration are safe for older patients

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Abstract
Background: Laparoscopic common bile duct (CBD) exploration is a well-established treatment option in dedicated centers. However, few data are available on the results in elderly patients.
Methods: The outcome after laparoscopic CBD exploration in elderly patients (age ≥70 years) was compared with that in a concurrent control group of younger patients (age < 70 years).
Results: There were 77 elderly patients in group A and 207 younger patients in group B. American Society of Anesthesiology (ASA) III and IV patients and prior abdominal operations were more frequent in group A ($p < 0.001$). Two patients from each group underwent conversion to open surgery. There was no significant difference frequency of use between the transcystic and choledochotomy approaches, although the latter tended to be more frequent in the group A because of larger stones (group A, 53.4%; group B, 37.6%). Minor and major morbidity (group A, 12%; group B, 13.6%), rate of recurrent stones (group A, 1.3%; group B, 1.9%), and mortality (group A, 1.3%; group B, 0%) were not significantly different between the two groups. The single death in group A involved a patient with acute toxic cholangitis who underwent emergency surgery after multiple failed attempts at endoscopic retrograde cholangiopancreatography/endoscopic sphincterotomy performed elsewhere. No CBD stenosis was observed at follow-up assessment.
Conclusions: Elective laparoscopic CBD exploration is safe and effective. It may become the standard of care in both elderly and younger patients.

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Key words: Laparoscopic cholecystectomy — Choledocholithiasis — Common bile duct exploration — Single-stage laparoscopic management — Elderly

Common bile duct (CBD) stones occur more frequently with advanced age [1, 21]. Operative morbidity and mortality after open cholecystectomy and CBD exploration are related to preexisting cardiovascular disease rather than advanced age alone, and myocardial infarction is most commonly the leading cause of death [13]. Operative mortality after biliary tract surgery in the elderly, however, is associated with emergency rather than elective operations [20, 21].

The introduction of endoscopic retrograde cholangiopancreatography (ERCP) with endoscopic stone extraction aimed to reduce mortality in elderly patients by relieving acute suppurative cholangitis, possibly avoiding surgery altogether by leaving the gallbladder in situ. With the diffusion of endoscopic techniques, the double-stage approach, in which preoperative endoscopic retrograde cholangiopancreatography (ERCP) endoscopic sphincterotomy (ES) was followed by open cholecystectomy, became the standard treatment instead of open surgery alone, even in non-high-risk patients. After the introduction of laparoscopic cholecystectomy, the incidence of endoscopic techniques for the diagnosis and treatment of CBD stones before surgery suddenly and unjustifiably increased [3]. Laparoscopic exploration of the CBD, introduced initially to deal with unsuspected ductal stones discovered incidentally during routine intraoperative cholangiography, has proved to be safe and effective [5].

In the era of laparoscopic cholecystectomy, few studies have reported the results of this procedure in the elderly [4, 15], and no study has specifically addressed single-stage laparoscopic management of gallstones and CBD stones in patients of advanced age. The current

prospective study aimed to evaluate the results of single-stage laparoscopic cholecystectomy and CBD exploration in a series of unselected patients older than 70 years, and to compare them with the results in a control group of younger patients treated with the same type of approach by the same surgical team during the same period.

Materials and methods

We followed treatment algorithm published previously [6, 7]. All the patients admitted to our surgical unit with symptomatic gallstones were included into this prospective study and managed according to this algorithm. No patient selection based on age, American Society of Anesthesiology (ASA) physical status classification, body mass index, or patient history of previous abdominal operations, acute cholangitis, or pancreatitis was applied by our surgical team. Beyond the contraindications for creation of pneumoperitoneum, there were no other absolute contraindications for laparoscopic cholecystectomy and CBD exploration. According to our protocol, preoperative diagnostic ERCP was indicated only to rule out bile duct or papillary cancer in patients with slow onset jaundice in the absence of biliary colics. In more recent years cholangiomagnetic resonance imaging has been incorporated into the algorithm instead of ERCP. Acute cholecystitis within 72 hours from its onset is not a contraindication. Any severe coagulation disorder is corrected preoperatively.

The surgical technique, also described in detail previously [6, 7] will be outlined only briefly. With the patient under general anesthesia, the surgeon stands on the patient's left side. After pneumoperitoneum is established, the first 10-mm trocar is positioned periumbilically to accomodate the 45° telescope with a 3CCD camera. Under direct vision with the table tilted in an anti-Trendelemburg position and to the left (i.e. right side up), three more trocars are positioned. One 10-mm trocar is placed in the epigastrium two fingerbreaths left of the midline, one 5-mm trocar in the right hypochondrium perpendicular to the cystic duct–CBD junction, and another 5-mm trocar in the right flank region for grasping and raising the gallbladder fundus.

After the cystic duct and artery are isolated, they are closed with titanium clips and a small cystic duct opening is created with scissors. The cystic duct is cannulated with a 4-Fr ureteric drainage catheter (AC5304; Porges S.A., Le Plessis Robinson Cedex, France) and held in place with a cholangiography fixation clamp (28378CH: Karl Storz GmbH, Tuttlingen, Germany) to obtain an intraoperative cholangiogram (IOC). The technique of routine dynamic IOC during laparoscopic cholecystectomy has been reported previously [11]. When CBD stones are identified on IOC, CBD exploration by a transcystic or choledochotomy approach is conducted.

The diagnosis of CBD stones encompasses a wide range of different situations, from one or a few small stones in an otherwise normal CBD to long-standing, large, piled-up stones in a widely dilated bile duct. Therefore, the choice of approach is made according to the number, size, and location of the ductal stones; the presence of bile duct dilation; and the anatomy of the cystic duct–CBD junction. A limited number (<5) of small stones (<0.8 cm) located in a nondilated CBD indicates a transcystic approach. If the cystic duct is too narrow, it can be dilated gently with a balloon dilator catheter (14720; W. Cook Europe APS, Bjaeverskov, Denmark) to accomodate a 7.5-Fr choledochoscope (Laparo–Choledocho–Fiberscope, 11292AD; Karl Storz GmbH).

After the CBD is entered with the choledochoscope, the ductal stones are identified and removed with a 3-Fr flat wire basket introduced through the working channel of the choledocoscope. If a stone is impacted at the level of the papilla, intracorporeal electrohydraulic lithotripsy (Circon Acmi, Stamford, CT, USA) is used under direct vision to break it. Sometimes lithotripsy generates several stone fragments, and their removal may be facilitated by gently dilating the papilla with a balloon dilator catheter (14720; W. Cook Europe APS). The fragments then are irrigated into the duodenum by injecting sterile saline into the CBD through a transcystic duct catheter.

After ductal clearance is documented by completion intraoperative cholangiography, transcystic duct soft rubber drainage (Silcolatex T-tube, 178700; Willy Rusch AG, Kernen, Germany) may be positioned to prevent postoperative cholangitis. This condition may develop after any instrumental maneuver on the papilla such as transpapillary passage of the Dormia basket or lithotripsy of impacted stones, which may be followed by postoperative edema of the papilla. The biliary drainage is secured in place with a 4/0 monofilament absorbable transfixing suture on a straight needle (PDS II, Z620; Johnson & Johnson International, c/o European Logistics Centre, B-1130, Brussels, Belgium) according to a personal technique [7, 8]. If the papilla has not been disturbed during the exploration maneuvers, no biliary drainage is initiated.

Although the transcystic approach is considered less invasive because it does not disrupt the integrity of the CBD wall, and therefore preferable, it is not always feasible. Sometimes narrow Heister valves that resist balloon dilation prevent entrance of the choledochoscope inside the CBD. In other cases multiple, large, piled-up stones are present in the CBD or the common hepatic duct. In these cases, the CBD usually is dilated, and direct CBD exploration can be safely performed through a short choledochotomy that we prefer to do transversely [9, 10]. After the CBD is opened with straight microscissors (Endopath DMS 15; Ethicon Endo-Surgery Cincinnati, OH, USA), direct exploration of the CBD and common hepatic duct is performed easily as described earlier for transcystic duct exploration. In this case, larger baskets (W. Cook Europe APS: 14720, 7 Fr and 14740, 4.5 Fr) also can be used under choledochoscopic vision coaxially with the endoscopic instrument.

In our experience with both the open and laparoscopic approaches, we have found that the use of T-tube biliary drainage after direct exploration prevents postoperative cholangitis and makes the procedure safer [9]. Again, the type of biliary drainage used is a soft rubber T-tube (Silcolatex T-tube, 178700; Willy Rusch AG). After the transverse branches of the T-tube are positioned inside the choledochotomy, this is closed with one continuous suture on one side of the T-tube, according to a previously published original technique [9]. Completion cholangiography through the biliary drainage confirms the absence of bile leakage and complete ductal clearance.

All patients with biliary drainage in place (transcystic duct or T-tube) are dismissed with their biliary drainage closed and under a medication. The biliary drainage is removed 4 to 5 weeks after the operation, with a prior direct cholangiography. If residual stones are demonstrated on biliary drainage cholangiography, percutaneous CBD exploration under fluoroscopic control with a 7.5-Fr choledochoscope through the biliary drainage sinus tract is performed. This procedure is carried out with light sedation and local anesthesia in the interventional radiology suite. Lithotripsy under choledochoscopic control and flushing of stone fragments with sterile saline allow complete clearance of the CBD, thereby avoiding ERCP/ES. If the percutaneous approach fails, or if a biliary drainage is not present, ERCP/ES is performed. For difficult residual ductal stones that cannot be managed percutaneously or by ERCP/ES, extracorporeal shockwave lithotripsy may be helpful to avoid a second surgical operation [12].

After discharge, all patients are followed up with yearly clinical visits, laboratory examinations and ultrasound.

The statistical methods used to compare the results between the two groups were the chi-square test for categorical variables, the Student's *t*-test for independent samples, and the Wilcoxon–Mann–Whitney test for quantitative variables. A significance level of 0.05 was assigned.

Results

The patient cohort considered for this study included all the patients who underwent surgery from January 1991 to January 2000. This choice was made to allow a minimum follow-up period of at least 15 months for each patient, and to enable evaluation of the occurrence of medium-term complications, namely recurrent ductal stones and stenosis. During this period, 284 patients (175 females, and 109 males) with a mean age of 57.6 years (range, 12–94 years) underwent single-stage laparoscopic management of gallstones and CBD stones at

Table 1. Demographic data for 284 patients

	Group A (>70 years)	Group B (<70 years)
Patients per group	77	207
Females	40	135
Males	37	72
Mean age (years)	76.1	43.4
Age range (years)	70–94	12–69

Table 2. History of patients before or at admission

	Group A *n* (%)	Group B *n* (%)	*p*
Biliary colic	68 (88.3)	198 (95.6)	0.75 ns
Acute cholangitis[a]	2 (2.6)	3 (1.5)	0.893 ns
Dyspepsia	54 (70.2)	101 (48.8)	0.114 ns
Jaundice	25 (32.5)	64 (30.9)	0.965 ns
Fever	12 (15.6)	8 (23.2)	0.327 ns
Pancreatitis	15 (19.5)	78 (37.7)	0.046 s
Cholecystitis[a]	1 (1.3)	2 (1)	0.681 ns

[a] Emergency procedure
ns, no significant difference; s, significant difference

Table 3. Incidence of elevated liver function tests (LFTs) and ultrasound findings

	Group A *n* (%)	Group B *n* (%)	*p*
Elevated LFTs			
Alkaline phosphatase	24 (31.1)	105 (50.7)	0.082 ns
Bilirubin (×3–4)	19 (24.7)	46 (22.2)	0.849 ns
Aspartate transferase	48 (62.3)	112 (54.1)	0.589 ns
Alanine transferase	52 (67.5)	118 (57)	0.684 ns
Ultrasound findings			
Dilated CBD (> 8 mm)	25 (32.5)	87 (42)	0.393 ns
CBD stones	12 (15.6)	53 (25.6)	0.199 ns

CBD, common bile duct; ns, no significant difference

Table 4. Preoerative risk factors

	Group A *n* (%)	Group B *n* (%)	*p*
Risk factors			
Respiratory insufficiency	53 (68.8)	82 (39.6)	0.016 s
Cardiovascular disease	48 (62.3)	23 (11.1)	<0.001 s
Liver disease	12 (15.6)	12 (5.8)	0.032 s
Pancreatic disease	13 (16.9)	8 (3.8)	0.002 s
Renal insufficiency	2 (2.6)	0	0.133 ns
Excessive weight	52 (67.5)	24 (11.6)	<0.001 s
Diabetes	24 (31.1)	0	<0.001 s
ASA physical status classification			
I	10 (13)	172 (83)	<0.001 s
II	21 (27.3)	35 (17)	0.611 ns
III	25 (32.4)	0	<0.001 s
IV	21 (27.3)	0	<0.001 s

ASA, American Society of Anesthesiology; s, significant difference; ns, no significant difference

Table 5. Scars from previous abdominal operations

	Group A *n* (%)	Group B *n* (%)	*p*
Upper abdomen			
Billroth II gastrectomy	12 (15.6)	6 (2.9)	0.001 s
Right hemicolectomy	6 (7.8)	0	0.001 s
Left hemicolectomy	3 (3.9)	0	0.031 s
Open cholecystectomy	5 (6.5)	0	0.001 s
Lower abdomen			
Appendectomy	18 (23.4)	45 (21.7)	0.937 ns
Cesarean section	7 (9.1)	15 (7.2)	0.819 ns
Hysterectomy	9 (11.7)	5 (2.4)	0.007 s
Ileal resection	1 (1.3)	0	0.611 ns
Inguinal hernia	16 (20.8)	4 (1.9)	0.001 s

s, significant difference; ns, no significant difference

our institution (Clinica di Patologia Chirurgica, Universitá di Ancona and I.N.I. Canistro, affiliated with the Università di Ancona, Italy for the teaching of laparoscopic surgery). For the comparative purpose of this study, patients were stratified in two groups according to age (Table 1). Group A included 77 patients 70 years of age or older (40 females and 37 males mean age 76.1 years; range, 70–94 years), whereas group B included 207 patients up to 69 years of age (135 females and 72 males; mean age 43.4 years; range; 12–69 years). In Group A, 26 patients were older than 80 years and 3 patients were older than 90 years.

In terms of the patients' history, there was no statistically significant difference between the two groups regarding the occurrence of biliary colics, dyspepsia, jaundice, or fever before admission (Table 2). A history of pancreatitis was significantly more frequent in younger than in older patients (37.7% vs 19.5%; $p = 0.046$). At admission, two patients in group A (2.6%) and three patients in group B (1.5%) had a diagnosis of acute cholangitis and underwent emergency surgery. Acute cholecystitis was present in one group A patient (1.3%) and two group B patients (1%).

The incidence of elevated liver function tests (alkaline phosphatase, bilirubin 3 to 4 times higher than normal values, transaminase), CBD dilation, or CBD stones seen on ultrasound were not significantly different between the two groups (Table 3). In terms of preoperative risk factors (Table 4), obesity, diabetes, cardiovascular and respiratory diseases and liver and renal disease were significantly more frequent in the older than in the younger group ($p \leq 0.001$), which accounted for a higher proportion of older patients classified as ASA physical status classification III (32.4% in group A vs 0% in group B; $p < 0.001$) and IV (27.3% in group A vs 0% in group B; $p < 0.001$). Conversely, a much higher proportion of younger patients was classified as ASA I (83% in group B vs 13% in group A; $p < 0.001$).

Scars from previous surgical operations involving the upper abdomen were significantly more frequent in group A than in group B (Table 5). Five patients in group A, as compared with none in group B, had undergone open cholecystectomy several years before admission to our unit. These patients were referred after failure of ERCP/ES, performed elsewhere, for the treatment of residual CBD stones.

On the basis of the IOC findings, ductal stones were preoperatively unsuspected in 42.8% of the patients in

Table 6. Results

	Group A	Group B	*p*
CND stones			
Unsuspected *n* (%)	33 (42.8)	94 (45.4)	0.096 ns
Suspected/proven *n* (%)	44 (57.1)	113 (54.6)	0.925 ns
Referrals after failed ES *n* (%)	18 (23.3)	24 (11.5)	0.056 ns
Laparoscopic CBD exploration			
Completed *n* (%)	75 (97.4)	205 (99)	0.919 ns
Operative time (min) *m* (range)	165 ± 72 (105–230)	148 ± 84 (60–240)	0.310 ns
TC and no biliary drainage *m* (range)	115 ± 33 (105–145)	110 ± 37 (60–130)	0.304 ns
TC and biliary drainage *m* (range)	144 ± 60 (115–210)	133 ± 71 (110–210)	0.233 ns
Choledochotomy + T-tube *m* (range)	174 ± 48 (125–230)	161 ± 61 (120–240)	0.097 ns
Conversions *n* (%)	2 (2.6)	2 (09)	0.322 ns

ES, endoscopic sphincterotomy; TC, transcystic exploration; ns, no significant difference

Table 7. Results of laparoscopic common bile duct (CBD) exploration

	Group A *n* (%)	Group B *n* (%)	*p*
TC	35 (46.6)	128 (62.4)	0.257
No biliary drainage	19 (54.2)	54 (42.2)	0.986 ns
Transcystic drainage	16 (45.8)	74 (47.8)	0.113 ns
Choledochotomy	40 (53.4)	77 (37.6)	0.173 ns
Biliary drainage	40 (100)	74 (96.1)	0.128 ns
No biliary drainage	0	3 (3.9)	0.698 ns

TC, transcystic CBD exploration; ns, no significant difference

Table 8. Results of common bile duct (CBD) exploration maneuvers

	Group A *n* (%)	Group B *n* (%)	*p*
Basket retrieval	75 (100)	205 (100)	0.988 ns
Choledochoscope	68 (90.6)	190 (92.7)	0.988 ns
Balloon retrieval	4 (5.3)	9 (4.4)	0.997 ns
Lithotripsy	7 (9.3)	9 (4.4)	0.235 ns
Papillary dilation	12 (16)	35 (17)	0.999 ns

ns, no significant difference

group A and 45.4% of the patients in group B (Table 6). In 57.1% of group A and 54.6% of group B, CBD stones were suspected or known preoperatively. Of these, 18 patients in group A (23.3%) and 24 in group B (11.5%) (nonsignificant difference) were referred for surgical treatment after one or more failed attempts at endoscopic sphincterotomy performed in other departments. The causes of ERCP/ES failure in elderly patients were more often the presence of large, piled-up ductal stones.

The operation was completed laparoscopically in 280 of 284 patients (Table 6), for an overall conversion rate of 1.4%. Two of the patients whose operation was converted to open surgery were in group A (2.6% conversion rate), and two were in group B (0.9% conversion rate). The difference was not statistically significant. The mean operative time was different according to the type of CBD exploration performed (transcystic approach with or without biliary drainage or choledochotomy with a T-tube), but the overall mean operative time was not significantly different between the two groups (Table 6).

A transcystic duct approach was found to be indicated in 35 group A patients and 128 group B patients (Table 7), whereas a relatively higher proportion of elderly than younger patients required a choledochotomy, but the difference was not statistically significant ($p = 0.173$). After transcystic duct CBD exploration, the number of patients requiring transcystic duct biliary drainage was not significantly different (Table 7). In contrasts, after choledochotomy, all the patients, except for three patients in the younger group, underwent placement of a T-tube, as described in the Methods section (Table 7).

Lithotripsy was used more frequently in the elderly patients (Table 8) because these patients more often had larger or impacted stones, but the difference was not statistically significant. Papillary dilation with a balloon catheter to facilitate the washout of stone fragments also was evenly distributed between the two groups (Table 8).

No significant difference was observed in the occurrence of minor complications between the two groups

Table 9. Major complications

	Group A *n* (%)	Group B *n* (%)	*p*
Biloma	2 (2.6)	5 (2.4)	0.744 ns
Port infection	0	4 (1.9)	0.525 ns
Hyperamylasemia	2 (2.6)	9 (4.4)	0.775 ns
Umbilical hematoma	0	1 (0.5)	0.598 ns
Total	4 (5.3)	18 (8.8)	0.527 ns

ns, no significant difference

Table 10. Major complications and mortality

	Group A *n* (%)	Group B *n* (%)	*p*
Major complications			
Bile leakage	2 (2.6)	3 (1.5)	0.880 ns
Clip displacement	2	2	
TC drainage displacement	0	1	
Hemoperitoneum	2 (2.6)	4 (1.9)	0.915 ns
Lysis of adhesions	0	1	
Cystic artery bleeding	2	1	
Trocar site bleeding	0	2	
Acute pancreatitis	0	1 (0.5)	0.598 ns
Sub hepatic abscess	1 (1.3)	1 (0.5)	0.950 ns
Jejunal perforation	0	1 (0.5)	0.598 ns
Total	5 (6.6)	10 (4.8)	0.797 ns
Mortality	1 (1.3)	0	0.650 ns

TC, transcystic biliary drainage; ns, no significant difference

Table 11. Incidence of retained common bile duct (CBD) stones

	Group A	Group B	*p*
Retained CBD stone	7 (9.3)	8 (3.9)	0.168 ns
Intraoperative diagnosis	2	2	
Postoperative diagnosis (predismissal cholangiography)	5	6	
Treatment			
Percutaneous (fluoro/endo)	5	3	
Spontaneous passage	0	1	
ERCP/ES (failed percutaneous treatment)	2	4	

ERCP/ES, endoscopic sphincterotomy; ns, no significant difference

Table 12. Incidence of recurrent common bile duct (CBD) stones

	Group A	Group B	*p*
Recurrent CBD stones *n* (%)	1 (1.3)	4 (1.9)	0.865 ns
Biliary colic (months)[a]	1 (4)	3 (1,8,18)	
Increased AF (months)	0	1 (27)	
Treatment			
Spontaneous passage	0	1	
ERCP/ES	1	2	
Hepatico-jejunostomy	0	1	

AF, alkaline phosphatase; ERCP/ES, endoscopic sphincterotomy; ns, no significant difference

[a] Months after T-tube removal

(Table 9). A biloma was observed by ultrasound in 2.6% of the patients in group A and 2.4% of the patients in group B. Hyperamylasemia after instrumental papillary dilation occurred in 2.6% group A patients and in 4.4% group B patients (difference not significant). Also the incidence of major complications was not significantly different between the two groups (Table 10). Bile leakage from cystic duct clips displacement or transcystic duct biliary drainage dislodgement occurred in 2.6% of the group A patients and 1.5% of the group B patients. Hemoperitoneum from cystic artery or trocar site bleeding was observed in 2.6% of the group A patients and 1.9% of the group B patients (difference not significant). Acute pancreatitis (in 1 patient) and jejunal perforation (in 1 patient who underwent lysis of dense adhesions from previous gastric surgery) occurred, respectively, in two group B patients (0.5%). A subhepatic abscess, drained under ultrasound control, was observed in one patient from each group. The overall incidence of major complications was 6.6% in group A and 4.8% in group B (difference not significant). Mortality from cardiogenic shock (Table 10) occurred on postoperative day 3 after successful laparoscopic treatment of one ASA IV patient in group A (1.3%). This patient had undergone three failed attempts at endoscopic sphincterotomy for acute cholangitis in another hospital before referral, and eventually was referred for emergency surgical treatment. No mortality was observed in group B. The difference, however, was not statistically significant.

The median (25th–75th percentile) length of hospital stay was 4 days (range, 4–7 days) for the patients in group A and 4 days (range, 4–7 days) for the patients in group B. The difference was statistically significant ($p = 0.002$).

After discharge, single retained CBD stones were observed in seven group A patients and eight group B patients (Table 11). Retained stones were cleared percutaneously under fluoroscopic–coledochoscopic control through the biliary drainage sinus tract in five group A patients and three group B patients. In one young patient with transcystic drainage, in situ spontaneous passage of a retained stone occurred while she was waiting for removal of the stone percutaneously. In two elderly and four younger patients, ERCP/ES was required when percutaneous treatment failed (Table 11).

No significant difference was observed in the incidence of recurrent ductal stones, which occurred in 1.3% of group A patients and in 1.9% of group B patients (Table 12). All five patients had undergone laparoscopic choledochotomy with a T-tube, which had been removed after a negative T-tube cholangiogram. In the single group A patient and in three of four group B patients, the diagnosis was made after recurrent biliary colics, which occurred 4 and 1, 8, and 18 months, respectively, after T-tube removal. In one additional group B patient, the diagnosis of recurrent CBD stones was suspected after an increase in the alkaline phosphatase levels was detected at a follow-up assessment 27 months after T-tube removal, in the absence of biliary colics. Spontaneous passage through the papilla was inferred after a negative ERCP in one group A patient. Three patients (1 from group A and 2 from group B) were treated with ERCP/ES (Table 12). One of the two patients from group B with recurrent CBD stones who underwent ERCP/ES had markedly dilated extrahepatic bile ducts, and re-recurrent ductal stones were demonstrated at Cholangio-MRI 22 months after ERCP/ES. This patient eventually underwent an uneventful open hepaticojejunostomy, which definitively cured his biliary stone disease. No CBD stenosis was observed at follow-up evaluation in the entire series.

Discussion

Physicians often are reluctant to refer elderly patients with symptomatic gallstones for elective biliary tract surgery [21]. This reluctance is not evidence based. According to reported data, age alone is not a contraindication to surgical treatment for biliary tract surgery [21]. One study reported a 7.7% mortality rate after open cholecystectomy and CBD exploration in elderly patients. In this population, cardiovascular complications (most commonly myocardial infarction) from preexisting cardiovascular disease, followed by cirrhosis, were the leading causes of death [13]. In another study, mortality occurred in 12.5% of elderly patients after emergency biliary tract surgery, whereas it was uncommon after elective operations [21]. The recommendation from these studies is that patients with symptomatic biliary tract disease, particularly the elderly, should be managed aggressively with early elective surgery to avoid the risks associated with emergency procedures that always are potentially fatal in these patients [21].

The introduction of ERCP with endoscopic stone extraction in the 1970s was aimed at reducing mortality

in patients with prohibitive surgical risk by relieving acute suppurative cholangitis, and if the gallbladder was left in situ, by avoiding surgery altogether. With the diffusion of endoscopic techniques, the double-stage approach became more popular than open surgery alone for most patients, even young, low-risk patients. Several randomized trials, however, after comparing the two approaches, demonstrated similar success rates between them [14, 16, 19, 20]. Albeit, a higher incidence of complications in the double-stage arm was related directly to the endoscopic procedure [19].

With the introduction of laparoscopic cholecystectomy in the late 1980s, the incidence of endoscopic techniques for the diagnosis and treatment of CBD stones before surgery suddenly increased [3], an increase that was largely unjustified. In fact, for patients undergoing laparoscopic cholecystectomy, ERCP with endoscopic sphincterotomy is a separate procedure with its own risks, and the combination of two different procedures in the same patient potentially increases overall morbidity and cost.

Laparoscopic exploration of the CBD, introduced to deal with unsuspected ductal stones discovered incidentally during routine intraoperative cholangiography, has proven to be safe and effective [5]. Since these initial experiences, several reports have been published on the results of single-stage laparoscopic treatment of gallstones and CBD stones, which now appears to be well-estabilished and highly successful treatment option in dedicated centers [6, 8]. A recently published randomized controlled trial [2] comparing laparoscopic single-stage and endolaparoscopic double-stage management of gallstones and CBD stones has reported equivalent success rates for the two options but a significantly shorter hospital stay for the single-stage approach. However, although a clear trend shows a move from large incisions towards minimal access procedures, laparoscopic CBD exploration still is not adopted by many surgeons, possibly because it is considered a demanding technique with a long learning curve. Because of unwarranted bias and misinformation, these fears frequently are called into question whenever an elderly patient presents with symptomatic biliary tract stone disease.

In this era of laparoscopic cholecystectomy, few data are available on the results of laparoscopic CBD exploration in elderly patients. The aim of this prospective study was to compare single-stage laparoscopic cholecystectomy and CBD exploration in a large series of unselected elderly versus younger patients who underwent surgery according to the same protocol.

The clinical scenario of extrahepatic biliary tract stone disease includes a wide variety of situations ranging from a few small stones in a normal CBD to large stones in a markedly dilated duct with fibrin debris deposited along the inside walls of the CBD. These different situations call for different approaches. If the transcystic approach seems to be more appealing because its postoperative course ideally is not different from that of laparoscopic cholecystectomy, as indeed observed in 26% of our whole series, it nevertheless cannot be applied to all patients. Elderly patients are particularly apt to present with long-standing biliary tract stone disease and dilated bile ducts, as confirmed by our relatively higher proportion of elderly than younger patients receiving a choledochotomy. Moreover, patients with larger CBD stones also are those in whom ERCP/ES most frequently fails, as observed in our experience, and those best served by a choledochotomy with a T-tube. Furthermore, patients with gallbladder left in situ after endoscopic sphincterotomy have an increased risk of recurrent biliary symptoms, which have been reported to occur in 25% of cases [17].

Previous reports have described and analyzed the surgical techniques of laparoscopic CBD explorations in detail [6–9, 10]. Choledochotomy appears to be a more demanding technique, but in fact, after an adequate learning curve, it is easier than the transcystic approach. As surgeons gain increasing experience with laparoscopic biliary surgery, and with even as the more difficult cases are subjected to single-stage laparoscopic treatment of gallstones and CBD stones, the percentage of choledochotomies probably is going to increase. However, we consider it mandatory to refrain from a liberal use of choledochotomy and to follow the transcystic approach whenever this is possible.

This patient series was an unselected one. That is, no patient selection based on age, physical status classification, body mass index, or the presence of scars from previous surgical operations was applied by our team. Of course, we cannot exclude some type of patient selection applied by the physicians (who are not surgeons) working in the emergency department of our hospital, which may explain the relatively low incidence of elderly patients with acute suppurative cholangitis that we observed during this 9-year period.

In conclusion, our experience favors the single-stage laparoscopic management of gallstones and CBD stones, not only in young patients but also in the elderly, although the length of stay tends to be slightly longer for the elderly than for the younger patients, possibly because there is a higher incidence of comorbidities among the elderly, which influence recovery time. This approach has proved to be safe and effective, as demonstrated in this study by low morbidity and mortality rates that are not significantly different between the elderly and between the younger patients. We believe that the described approach should be considered the treatment of choice for the management of gallstones and CBD stones in elective situations. In elderly patients classified as physical status ASA III and IV with acute toxic cholangitis, emergency ERCP/ES is justified. However, to avoid the risks associated with delayed treatment of this inevitably fatal condition, the surgeon should resort to prompt laparoscopic CBD exploration and decompression if the first endoscopic attempt fails.

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