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MANAGEMENT OF RECURRENT CALCULAR GALL BLADDER AFTER CHOLECYSTECTOMY, A SURGICAL DILEMMA

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Abstract

Background: *Gallstones with symptoms are often treated with a cholecystectomy. Postcholecystectomy syndrome is defined by the continued presence of symptoms after surgery. Subtotal cholecystectomy, residual cystic duct stump stone, hourglass gall bladder, and double gall bladder are some of the biliary causes of postcholecystectomy syndrome. These causes are uncommon, but they necessitate identification and provocation therapy. Such patients could be managed laparoscopically; however, this requires laparoscopic surgical teams with the necessary skills.****Materials and Methods:****This study is a retrospective analysis of patients who were admitted to the Surgery Department of TBRI Hospital and other private hospitals that required laparoscopic surgery for residual gallbladder, cystic duct stump stone, hourglass gall bladder, and double gall bladder.****Results****:****Between 2021 and 2023, 22 patients were hospitalized with residual gallbladder, cystic duct stump stones, hourglass gall bladders, and double gall bladders that required surgery. All patients underwent a complete cholecystectomy. Symptomatology was dominated by recurrent biliary colic (100%), while fever occurred in 9 (40%) patients. The period between the primary surgery and the surgery to complete the resection varied between 2-22 years. Duodenal injury was encountered in only one case (7.14%), and one patient had a CBD injury after ERCP and was managed laparoscopically. The average number of days of hospitalization was three. No patient showed any symptoms at the 6-month postoperative follow-up.****Conclusions:** *The causes of postcholecystectomy syndrome include residual gallbladder/cystic duct stump stones, hourglass gallbladders, and double gallbladders. Patients with symptoms who need surgery are challenging to*

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manage. Although laparoscopic surgery is favored, it demands a skilled surgeon who is competent in laparoscopic procedures.

Keywords:*Cystic Duct Stump Stone, Endoscopic Retrograde Cholangiopancreatography, Gall Stone, and Postocolecystectomy Syndrome.*

INTRODUCTION

In the adult population, the prevalence of gallstones has been estimated to be between 11 and 36%, with 50% of cases being symptomatic (1). Laparoscopic cholecystectomy (LC) is the "gold standard" treatment for symptomatic gallstones (2). Cholecystectomy is a common procedure carried out all over the world to treat gallstone disease. However, a partial or subtotal cholecystectomy is performed to reduce the risk of bile duct damage in specific circumstances, such as incorrect identification of the calot's area, low cystic duct insertion, dense adhesions, severe inflammation, and an inexperienced surgeon performing the treatment (3–4). The portion of the gallbladder that is still present in these cases is known as the residual gallbladder, which may continue to contain calculi or inflammation or develop later and cause symptoms that need to be treated [5]. Stump cholecystitis has been documented to occur in as many as 5% [6] of individuals after an emergency cholecystectomy, but it is uncommon after an elective procedure. It usually affects middle-aged women, who are frequently fairly certain that their symptoms are akin to those that led to their initial cholecystectomy [7]. The term post-cholecystectomy syndrome" (PCS) is used to describe the persistent previous symptoms that occur in 10–40% of cholecystectomy patients. Common biliary causes include the presence of a residual gallbladder or cystic duct stump, common bile duct stones, sphincter of Oddi dyskinesia, hourglass gall bladders, and the extremely rare double gall bladder. Common nonbiliary reasons include esophageal reflux disease, gastric ulcers, liver disease, or pancreatic illness (8). The diagnosis of residual gallbladder or cystic duct stump calculi is made on the basis of clinical suspicion in patients who have persistent symptoms after cholecystectomy and is then confirmed by radiological tests such as ultrasonography (USG), magnetic resonance cholangiopancreatography (MRCP), endoscopic retrograde cholangiopancreatography (ERCP), and endoscopic ultrasound (EUS) in some patients (9). Once the diagnosis is established, the only option for therapy is to have the gallbladder remnant removed during a subsequent cholecystectomy (10). By increasing laparoscopic experience among surgeons, laparoscopic completion cholecystectomy has produced positive results (11).

Aim of work:

This study was conducted to assess patients who had undergone cholecystectomy but still had gall bladder or cystic duct stump stones. It is difficult to identify and treat the biliary causes of post-cholecystectomy syndrome. Patients who experience symptoms following cholecystectomy need surgery. We will discuss our experience laparoscopically treating gallbladder and cystic duct stump stones following cholecystectomy.

MATERIALS AND METHODS

The present study involved a retrospective analysis of 22 patients who underwent completion cholecystectomy at the Theodor Bilharz Research Institute, Egypt, and other private hospitals between 2021 and 2023. Two groups of patients were included: the first group A, which includes 14 patients, underwent laparoscopic surgery using indocyanine green (ICG) or intraoperative cholangiogram (IOC), while the second group B, which includes 8 patients, underwent laparoscopic conversion to open cholecystectomy using intraoperative cholangiogram (IOC).

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The inclusion criteria include patients presenting with previous cholecystectomy (open or laparoscopic) in our hospital or other centres with residual GB stones or cystic duct stump stones with or without common bile duct stones. Patients unfit for surgery or who refused surgery were excluded. Patient data were recorded in a prospectively maintained database for all patients undergoing cholecystectomy in our hospital.

Patient data were recorded in a prospectively maintained database for all patients undergoing cholecystectomy in our centre since 2000.

Ethical approval:

The study's protocol was approved by the TBRI institutional review board under Federal Wide Assurance (FWA 00010609), and the work was carried out in accordance with the World Medical Association's Code of Ethics for Human Experiments (Declaration of Helsinki) and its later amendments (GCP guidelines) or comparable ethical standards.

Examination and diagnosis

After taking a thorough medical history, routine blood tests, including liver function tests, a physical examination, and an evaluation of the surgical scar from the prior procedure were performed. Magnetic resonance cholangiopancreatography (MRCP) and ultrasound were used to identify the remaining gallbladder or cystic duct stump stones (Fig. 1). When a patient had a history of jaundice, abnormal liver function tests, or a dilated common bile duct on ultrasound, an ERCP may have been performed. Prior to surgery, patients received information about the procedures and signed consent forms.

Operation protocol:

All patients received a preventative antibiotic before surgery. The conventional ports for a laparoscopic cholecystectomy were then introduced under vision after pneumoperitoneum had been produced using the open-technique procedure. The gall bladder fossa was exposed after adhesiolysis (Fig. 2) using a harmonic scalpel or ligaSure. The cystic duct stump or remnant of the gall bladder was located and meticulously dissected (Fig. 3). Calot’s triangle was dissected cautiously to avoid iatrogenic injury to CBD or the right duct. In all cases, intraoperative cholangiogram (IOC) or ICG were performed to define the anatomy, find any remaining stones, and find common bile duct stones after identifying and gently pressing the cystic ducts at their junction with CBD to milk them. The cystic duct and artery were then clipped and divided (Fig. 4). Dissection of the remnant gall bladder from the liver bed by a harmonic scalpel or ligaSure. An abdominal drain in the Morrison pouch was placed.

If CBD stone was present or identified, we did choledochoyomy, then extraction of stone using choledocoscope and dormiabasket with insertion of Ttube and abdominal drain in the Morrison pouch.

Postoperative Discharge and Follow-up:

Routine postoperative care was followed by an institution of a soft diet soon after the return of bowel activity. The patients were discharged after drain removal either on postoperative day 2 or when the drainage was less than 30 ml for 24 h and non-bilious. Follow-up was done for six months for all cases.

All the data regarding clinical presentation, diagnostic modalities, intraoperative findings such as degree of adhesion, conversion rate, intraoperative visceral injury bleeding, total operative time, blood transfusion, postoperative complications such as biliary leakage, pulmonary complications,

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postoperative pathology, and re-exploration and follow-up after laparoscopic completion cholecystectomy were noted and analysed.

Statistical analysis

A retrospective study, observer-blinded, single-centre clinical trial comparing conventional tail(s) = two; effect size d = 0.21; a err prob = 0.03; power (1-β err prob) = 0.45, Output: Non-centrality parameter a = 3.6228442; critical t = 1.9714347; sample size group 1 =14, sample size group 2 = 8, total sample size =22.

A statistical study of our results was conducted via the 26th version of the statistical package for social science (SPSS) (IBM Corp., Chicago, IL, USA) and Excel (Microsoft Office 2010).

Quantitative variables were presented as mean ± SEM, and comparisons between means of different groups were studied using the Mann-Whitney test (U-test). The categorical data were described as frequency and percentage (n, %) and analysed with the chi-square test (χ^2). In all tests, a *p*-value of <0.05 was considered statistically significant.

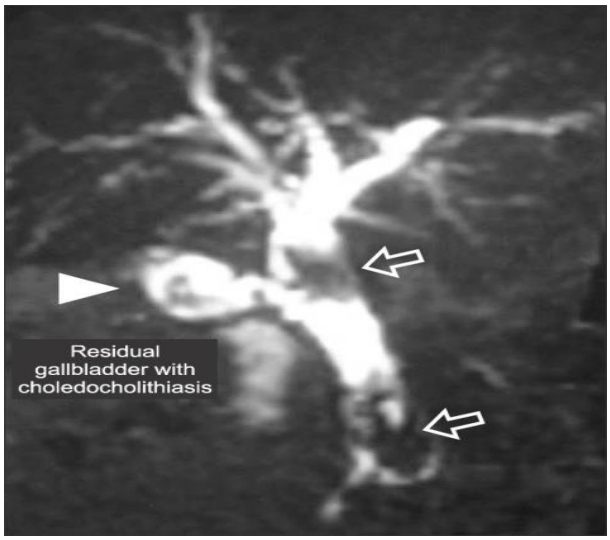

Fig 1: residual gall bladder with stones inside

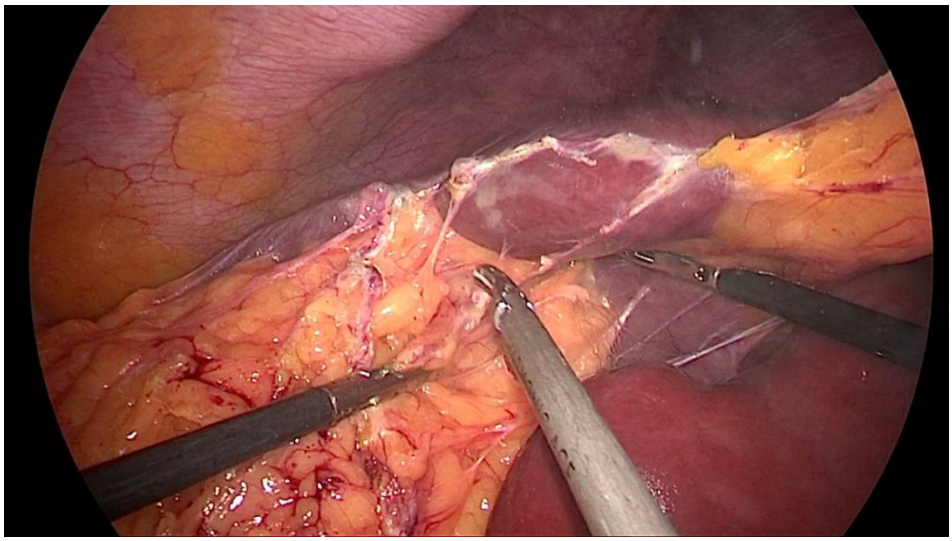

Fig 2: Right hypochondrium adhesion syndrome after cholecystectomy

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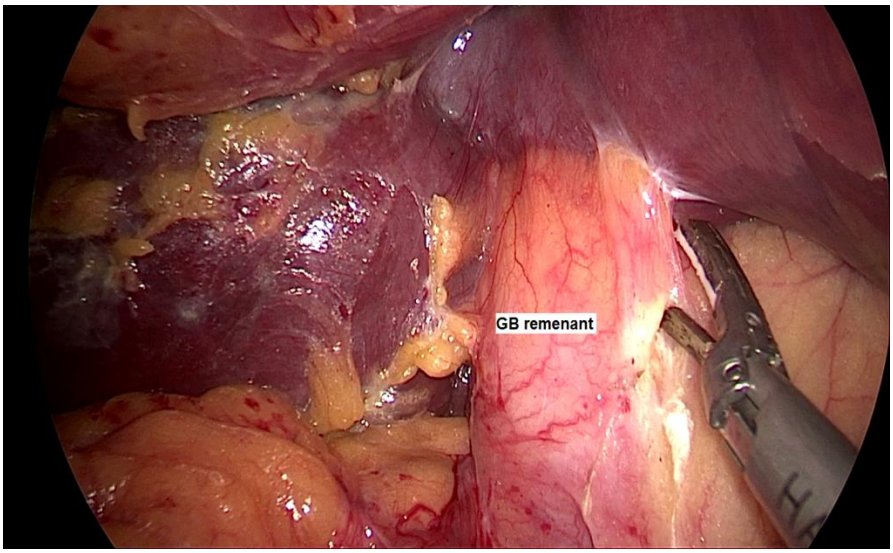

Fig 3: Cystic duct stump separated from liver, operative finding

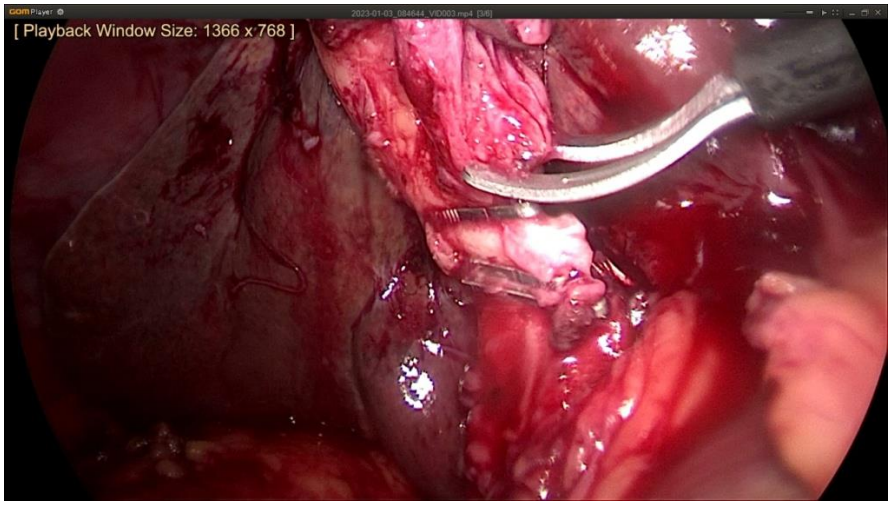

Fig 4: Calculus exposed after opening the cystic duct remnant

RESULTS

The clinical presentation is summarised in Table 1. The time interval between initial cholecystectomy and diagnosis of retained residual GB stone or cystic duct stone ranged from 2 to 22 years (the mean was 66.5 months). In our study, all patients presented with recurrent attacks of biliary colic, while 9 patients presented with fever, 6 patients had jaundice, only 3 patients had pancreatitis, and 4 patients were diagnosed with cholangitis. Preoperative ERCP was done in 10 cases (table 1).

The diagnoses of all case with residual GB stones or cystic duct stump stones were carried out using abdominal US and MRCP. MRCP was accurate in detecting cystic duct stump stones in all cases, and US was accurate in 19 cases (71.4%). ERCP and papillotomy were carried out before completion of cholecystectomy in ten cases (45.5%), and CBD was cleared in all cases except one case that needed choledochoyomy and laparoscopic extraction by dormia basket.

Laparoscopic completion Cholecystectomy was completed successfully in 14 cases (63.64%), and conversion was needed in eight cases due to marked adhesion and distorted anatomy. There was

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marked adhesion in the majority of the cases between the colon, duodenum, abdominal wall, and liver. Blood loss was less than 500 ml, and none of the patients required a blood transfusion. The mean operative time was 108.00 ± 8.06 min (60–180 min). Lateral right hepatic duct biliary injury occurred in one case; it was about 3 mm in size and was managed intraoperative by primary closure by proline 5/0 without a T tube. Duodenal injury occurred in one case, about 4 mm in size, and was treated with Vicryl 3/0 (Table 2).The mean hospital stay was 3.2 days (1–9 days). Abdominal collection developed in two cases and was managed conservatively by antibiotics and follow-up US. All patients were asymptomatic at 6 months' follow-up.

Table 1: Demographic data

Variable	N =22	laparoscopic surgery using ICG or IOCn=14	laparoscopic converted to open cholecystectomy n=8	*p-value*
Age (mean±SE) (years)	50.50±2.34	52.0±3.35	48.70±3.31	>0.496
Sex [n (%)] Male Female	 7 (31.81%) 15(68.18%)	 4 (28.57%) 10 (71.43%)	 3 (37.50%) 5 (62.50%)	 >0.350
BMI	42.16±0.85	35.87±2.01	42.20±1.38*	<0.02
Clinical presentation **n%** Recurrent biliary colic Fever Jaundice Pancreatitis Cholangitis	 22 (100%) 9 (40.1%) 6 (27.3%) 3(13.63%) 4 (18.9%)	 14 (63.63) 6 (42.85%) 4 (28.57%) 2 (14.28%) 2 (14.28%)	 8 (36.36) 3 (37.50%) 2 (25.00%) 1 (12.50%) 2 (25.0%)	 >0.547
Time interval between primary and completion cholecystectomy (years)	2-22 7.95±1.12	2-22 6.14±1.35	3-11 7.87±0.89	>0.377
Preoperative ERCP [n (%)]	10 (45.46%)	8 (57.14%)	2 (25.00%)	

*p<0.05 significant increase

Table 2: Operative and post-operativedata

	Total N =22	Group A n=14	Group B n=8	*p-value*
Grade of adhesions 1 2 3 4	 1 (4.50%) 7 (31.82%) 4 (13.67%) 11 (50.0%)	 --- 5 (35.71%) 3 (21.43%) 7 (50.0%)	 1 (12.5%) 2 (25.0%) 1 (12.5%) 4 (50.0%)	 >0.23 7
Laparoscopic completion cholecystectomy Laparoscopic converted to Open cholecystectomy Conversion rate	14/22 (63.64%) 8/22 (36.36)	14/22 ----	---- 8/22	
Intraoperative cholangiogram	16 (72.7%)	12 (8.57%)	4 (50.0%)	
Residual gallbladder stone [n(%)] Single Multiple	 4 (18.18%) 18 (81.82%)	 1 (7.14%) 13 (92.85%)	 3 (37.50%) 5 (62.50%)	
CBD injury	1(4.6%)			
Duodenal injury	1 (4.6%)			
Blood loss (ml)	196.91±14.37	202.86±20.57	186.50±17.47	>0.55

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	(100–345)	(100-345)	(134-287)	1
Operative time (min)	108.00±8.06 (60–180)	101.29±10.6 (60-180)	119.88±11.83 (68-170)	>0.27 8
Bile leakage**post-operative**	0			
Drain removal	3.07±0.31 (1.16–6.90)	2.38±0.32 (1.16-3.50)	3.47±0.43* (1.60-6.90)	<0.05
Hospital stay (days)	3.78±0.37 (1–9)	3.93±0.53 (1-5)	3.51±0.42 (1-9)	>0.59 2

Group A = laparoscopic surgery using IOC or ICG

Group B = laparoscopic converted to open cholecystectomy

**P<0.05 significant increase*

DISCUSSION

The persistence of previous symptoms following cholecystectomy is known as post cholecystectomy syndrome. To relieve symptoms and prevent complications like recurrent obstructive jaundice, cholangitis, pancreatitis, mucocele, and carcinoma, patients with residual GB stones or cystic duct stump stones require completion cholecystectomy (12). Remaining gallstones or new stones could develop inside the remaining gall bladder after partial cholecystectomy over time (13). The cystic duct remnant may have residual or recurring calculus. Recurrent calculi are caused by biliary stasis, whereas retained calculi are left behind after surgery (14). The period of time following the first surgery when post-cholecystectomy syndrome can emerge has been documented to range from a few days to many years [15].

In a study of 516 patients, Bradshaw et al. found that acute cholecystitis, thick adhesions, and anatomical distortion all required a second cholecystectomy (16). In their study of 93 patients with residual gallbladder stones, Singh A. et al. (17) found that 29% of the operations were inadvertent subtotal cholecystectomies, and 71% of the patients had the remaining gall bladder left behind by the operating doctors. We found that in our study group, the reasons for partial or subtotal cholecystectomy during the initial procedure were largely the same as those indicated in other publications.

The residual cystic duct's length has been and continues to be a subject of discussion in the literature; lengths of less than 1 cm are permitted; however, in the era of laparoscopy, the dissections frequently take place close to the gallbladder rather than at the junction of the cystic duct and CBD (18).

In patients receiving laparoscopic cholecystectomy, the incidence of residual cystic duct calculi was observed to be 4.19%, as opposed to 0.02% in patients undergoing conventional open cholecystectomy (19), according to Palanivelu et al. Failure to recognise the gall bladder-cystic junction is a frequent cause of a long cystic duct remnant, and it occurs much more frequently in individuals with acute cholecystitis (20). This condition can be avoided by appropriately locating the junction of the cystic duct and the bile duct and by safely dividing the cystic duct while maintaining the cystic duct length under 1 cm. In our experience, most cases of post-cholecystectomy syndrome involve patients who underwent laparoscopic surgery many years earlier, when the laparoscopic technique was being developed in tertiary centres in the region. This may help to explain the lack of surgical experience and the fear of the inexperienced surgeon when doing difficult or acute cholecystitis that required a less aggressive and safer technique.

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We discovered right upper quadrant pain to be the most prevalent presenting symptom, followed by fever, jaundice, postprandial distension, and nausea, which were comparable to those of several earlier studies (Table 1).

Ultrasonography was used in our study as the initial imaging modality for suspected cases of recurrent gallbladder calculi. In 16 patients (72.7%), the presence of residual gallbladder or cystic duct calculi was recorded by ultrasonography, and in 6 cases (27.3%), it was confirmed by MRCP. ERCP was done in 10 cases in which CBD stones were suspected. A mandatory MRCP should be performed on every patient before surgery since it is extremely helpful in the diagnosis and serves as a guide during the surgery (Table 2). The same findings were reported in various other studies. Endoscopic ultrasound (EUS), which has a reported sensitivity of 96.2% and specificity of 88.9%, is recommended in cases where there is a high index of suspicion and equivocal abdominal ultrasonography (21-22).

In our study series, we successfully performed laparoscopic complete cholecystectomy on 14 (63.64%) patients. Eight patients (36.36%) had their surgery changed to an open operation due to dense adhesions in three cases, severe bleeding during dissection in one, Mirizzi's syndrome suspicion in two, duodenal fistula suspicion in one, and iatrogenic transverse colon injury during dissection in one. The benefits and success of laparoscopic complete cholecystectomy have been demonstrated in numerous studies (23–26).

Laparoscopic completion cholecystectomy is difficult and hazardous, but it is not impossible thanks to advancements in laparoscopic equipment and sealing devices. Laparoscopic completion cholecystectomy has now been proven to be safe and effective in removing any remaining gall bladder or cystic duct stump stones. The mean operative time for laparoscopic completion cholecystectomy in our study group was 67 min, ranging from 45 to 132 min, and was comparable with that in other studies (Table 2). We did not have any mortality in our series. 2 patients had postoperative bile leaks, which settled with conservative management since we had put in a tube drain in all the cases. A few cases of port site infection were noted, which responded to antibiotics and dressings. 8 cases started laparoscopically and need conversion to open procedures. The case of transverse colon injury, which was sutured after conversion to open surgery, had an uneventful postoperative recovery except for wound infection, which was managed with antibiotics and regular dressings. Merrizi case managed by T tube insertion and duodenal perforation managed by repair.

Iatrogenic bile injuries and postoperative bile collection have been described as complications during laparoscopic complete cholecystectomy [27, 28], which have been attributed to the challenging and deformed anatomy. In their study, Ganai et al. (29) discovered that intraoperative bleeding was the most frequent complication, followed by prolonged ileus and persistent serous drainage. According to El Nakeeb et al., three patients experienced intra-abdominal collection, which was treated conservatively with antibiotics (30). No case of carcinoma was reported on histological examination of a gallbladder remnant or cystic duct stump in our series.

In line with other study groups, our study group's average hospital stay was 3.78 0.37 days, ranging from 1 to 9 days (Table 2). The majority of patients (86.4%) experienced full symptom remission at the average follow-up of six months, while the remaining three patients (or 13.6%) continued to experience only minor symptoms. After a successful cholecystectomy, many other series (31) in the literature have also reported outstanding outcomes.

It is important to take every precaution to prevent residual gall bladder remnant or cystic duct stump stones by using proper traction, careful dissection of the cystic duct up to the CBD, defining the stone junction, trial genital milking of the cystic duct towards the GB before clipping, and

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performing an intraoperative cholangiogram or using indocyanine green, especially in patients with a history of calcular obstructive jaundice and pancreatitis. When a long, parallel low insertion was present, the cystic duct was explored, and stones were removed using stone forceps, a balloon, and a dormia basket until normal bile flow resumed. More than 5 mm should not be present in the cystic duct stump (32).

CONCLUSIONS

There should be a suspicion of gallbladder or cystic duct stump calculi if symptoms continue following cholecystectomy (post-cholecystectomy syndrome). Although MRCP is the study of choice for verifying the diagnosis, providing information about the accompanying diseases, and serving as a guide for effective surgery, ultrasonography is a useful initial imaging modality. Although technically challenging. Laparoscopic completion cholecystectomy is a safe alternative with good results and acceptable morbidity when performed by a skilled laparoscopic surgeon at a reputable laparoscopic centre. The threshold for conversion to open surgery should be considered, as it is necessary to prevent injury to the bile duct, the vascular system, or the gut.

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Conflicts of interest

Authors declared that they have no competing interests

Availability of the data and materials

All relevant data analyzed during this study are presented in tabular form in this published article. The original datasets used during the current study are available from the corresponding author on reasonable request

Informed consent statement was obtained from all the participants in the study.

Authors' contribution

Mohamed A. Elashry, Hesham A.Elmeligy, *Mahmoud Rady*, *Mohamed* Abbas sharing in design of the study. Mohamed Elashry, *Ahmed M.* Abdelaziz and Mohamed A. Abdelhady were involved data analysis, interpretation and manuscript writing and Mohamed A. Elashry collected the data from medical records. All authors shared in reviewing and approval of the final manuscripts.

Consent for publication

Not applicable

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