Laparoscopic completion cholecystectomy for patients with residual gallstone disease: a single-center experience

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Background
The incidence of residual gallbladder after cholecystectomy procedures may reach 2.5%. That remnant part of the gallbladder may harbor or develop stones, leading to recurrent symptoms. Surgical excision is recommended in such patients. Herein, we describe our experience regarding laparoscopic management of patients with residual gallbladder or cystic duct stump stones.

Patients and methods
We retrospectively reviewed the data of 24 patients with previous diagnosis, who were managed by laparoscopy in our tertiary-care setting. Relevant preoperative, intraoperative, and postoperative data were collected.

Results
The time interval since the previous cholecystectomy ranged between 3 and 120 months. Most patients had previously undergone an open cholecystectomy (75%), while the remaining cases were performed through laparoscopy. The laparoscopic assessment revealed residual gallbladder and cystic duct stump stones in 87.5% and 12.5% of cases, respectively. Conversion to the open approach was needed only in two cases (8.3%). Operative time ranged between 60 and 130 min (mean = 108.83), while intraoperative blood loss had a mean value of 111.88 mL (range, 50–150). The duration of hospitalization ranged between 1 and 4 days (median = 1). Postoperative morbidity occurred in eight patients (33.33%). Wound infection, gallbladder bed collection, and pulmonary embolism occurred in 16.7, 16.7, and 4.2% of patients, respectively. No specific risk factors for postoperative morbidity were identified.

Conclusion
Laparoscopic completion cholecystectomy is considered a safe and effective procedure in experienced hands for managing patients with symptomatic gallbladder residuals .

Keywords:
cystic duct stump, laparoscopy, residual gallbladder

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Introduction

Cholecystectomy is the main management option for patients with symptomatic cholelithiasis [1]. It is commonly performed through the laparoscopic approach because of its advantages over the open one [2,3]. Cholecystectomy is associated with significant relief of preoperative complaints in about 80% of patients [4]. However, the procedure has its complications, like bile duct injury, which is the most dreadful complication after cholecystectomy [5,6].

In some situations, some surgeons prefer to perform a subtotal or partial cholecystectomy to decrease the risk of bile duct injury [7]. These situations include dense adhesions, a frozen Calot's triangle, liver cirrhosis, Mirizzi syndrome, and severe gallbladder inflammation. In addition, little surgical experience may also play a role [8,9]. Gallbladder remnants may contain residual stones or develop new stones, leading to symptom recurrence [10]. The incidence of that complication may occur in 2.5% of patients following cholecystectomy [11,12].

That gallbladder remnant with its stones could elicit severe symptoms for the patients, ranging from simple abdominal colic to calcular obstructive jaundice [13]. Hence, its surgical excision is recommended [14]. Multiple reports have been published describing the efficacy of laparoscopy in the management of residual gallbladder [11,14,15]. Nonetheless, little has been published from the Egyptian setting. In this study, we present our experience regarding laparoscopic

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management of patients with residual gallbladder or cystic duct stump stones in our Egyptian tertiary-care setting.

Patients and methods

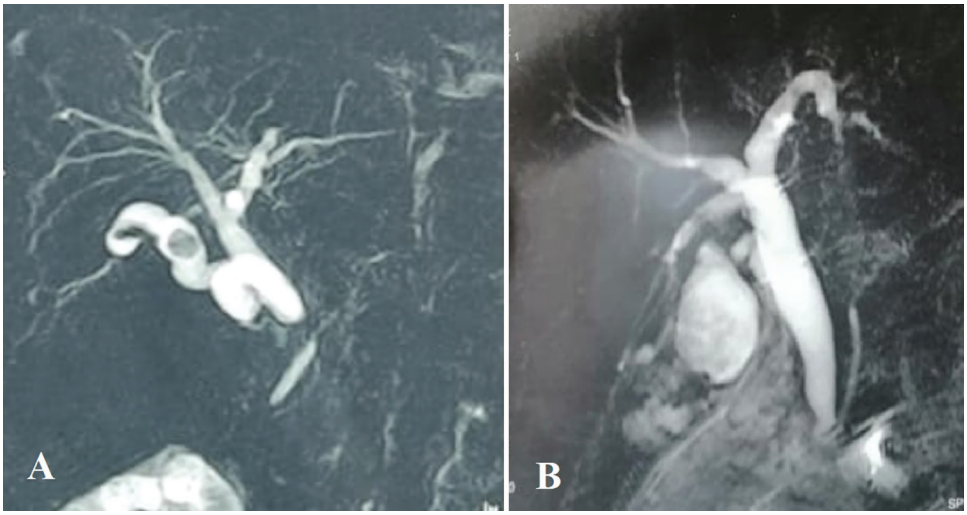
This is a retrospective analysis of 24 consecutive patients diagnosed with residual gallstone disease, following previous cholecystectomy, and managed by laparoscopic completion cholecystectomy in our tertiary hepatobiliary surgical center, Al-Rajhy University Hospital, Assiut, Egypt. These patients had the completion procedure during the period between January 2016 and December 2020. Before data collection, our study gained ethical approval from our scientific and ethics committee. Patients presenting with obstructive jaundice, manifestations of liver cirrhosis, or managed through the open approach were excluded from data collection.

All patients were evaluated by the same surgical team, which included history taking (focusing on the complaint, duration since previous cholecystectomy, and type of intervention), clinical examination (focusing on complexion, surgical scars, and presence of hernias), and routine preoperative laboratory investigations (including liver function tests). All patients were radiologically assessed by pelviabdominal ultrasound for general assessment of the biliary tree and the entire abdominal cavity. In addition, a magnetic resonance cholangiopancreatography (MRCP) was ordered for all patients for objective delineation of the biliary tree, cystic duct stump, and/or gallbladder residual (Fig. 1).

All procedures were performed through laparoscopy using the classic port design for laparoscopic cholecystectomy (one periumbilical port for the camera, two working ports at the right and left midclavicular lines, two inches below the costal margin, and one assistant port at the right midaxillary line). Abdominal insufflation was done first, by a Veress needle, followed by the insertion of the camera port and the visual insertion of other ports. The design of the port location was modified when needed to avoid dense adhesions between the omentum and the anterior abdominal wall, allowing easy access to the operative bed.

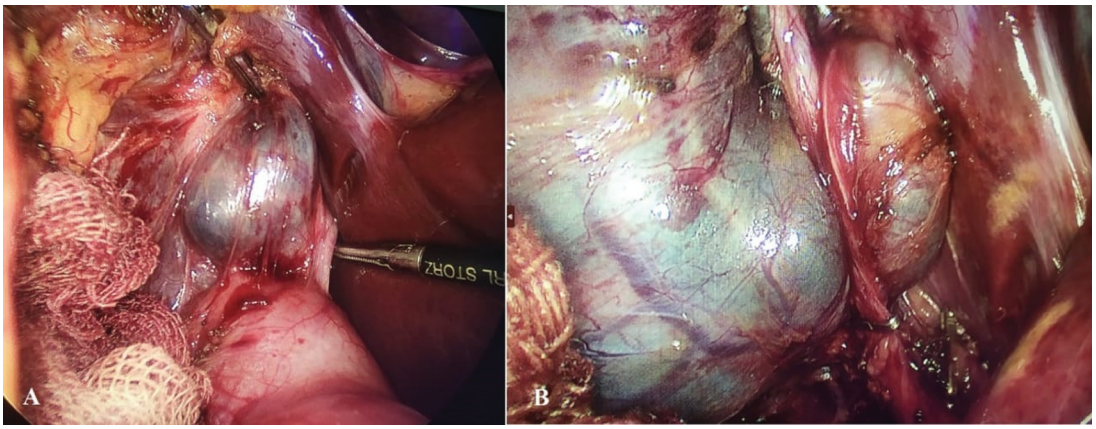
Careful adhesiolysis was done first till complete exposure of the gallbladder bed. Dissection was continued downward till the identification of the residual gallbladder or cystic duct stump. The Calot's triangle was identified and dissected till clear identification of the cystic duct and artery, which were clipped (Fig. 2). Care was taken not to leave a long cystic duct stump and not to retract the cystic duct laterally to avoid compromise of the main biliary tree by the applied clips. Proper wash and hemostasis were done, followed by removal of the gallbladder residual or the cystic duct stump. A surgical drain was inserted into the gallbladder bed, followed by desufflation of the abdominal cavity and closure of the ports. Operative time and intraoperative blood loss were recorded. In addition, the need for conversion to the open approach and the etiology of conversion were recorded. The criteria of conversion of the procedure from the laparoscopic to open approach were defined such as an unclear anatomy, prolonged operative time,

Figure 1



Preoperative MRCP images showing (a) long cystic duct stump containing stones and (b) residual gallbladder.

Figure 2



Operative photos showing (a) residual gallbladder with dissection at the Calot triangle and (b) after correct clipping of cystic duct and artery.

uncontrolled bleeding, bile duct injury, and some anesthetic complications like bradycardia.

After transfer to the internal surgical ward, most patients were allowed to start oral fluids within 6 hours after surgery, and most patients were discharged on the first postoperative day unless complications occurred. The duration of hospitalization and incidence of complications were recorded. Patients were followed up after 2 weeks for the removal of stitches, and they were asked to come back if any complications occurred.

The previous data were collected from our medical archive. Preoperative data included patient demographic characteristics, medical comorbidities, complaints, interval from previous cholecystectomy, approach of previous cholecystectomy, preoperative laboratory parameters, common bile duct diameter, operative time, intraoperative blood loss, conversion to the open approach, duration of hospitalization, and incidence of complications.

Our data were tabulated and analyzed using the SPSS software program for MacOS. We expressed categorical data in numbers and percentages, while the numerical ones were expressed as means and medians (with standard deviation and range, respectively). Regression analysis was done to estimate the risk factors for postoperative morbidity after such procedures. The p value was considered significant if it was less than 0.05.

Results

Beginning with general patient demographics, the age of the included patients ranged between 32 and 60 years (mean = 46.92). Most participants were women (70.8%), while the remaining ratio was occupied by men. Their BMI ranged between 28.7 and 40 kg/m2. Regarding preexisting medical comorbidities, eight patients had hypertension (33.3%), while six patients had diabetes mellitus (25%).

Most patients reported colicky pain in the right upper abdominal quadrant (75%), while dull abdominal pain was reported by four patients (16.7%). Only two patients reported epigastric discomfort (8.3%). Most participants had a previous open cholecystectomy (75%), whereas the remaining patients were performed through laparoscopy. The time interval between the previous cholecystectomy and presentation ranged between 3 and 120 months (mean = 12.38). Previous endoscopic bile duct clearance was reported in one patient for calcular obstructive jaundice (4.2%). Table 1 summarizes the previous data.

The relevant preoperative laboratory and radiological data are shown in Table 2. One should notice that all participants had normal preoperative serum bilirubin. The diameter of the common bile duct ranged between 0.2 and 0.9 cm (mean=0.49).

All completion procedures were performed through laparoscopy. Conversion was needed only in two patients (8.3%); one patient had unclear anatomy, while the other had laparoscopy-induced anesthetic complications (bradycardia) that necessitated conversion to the open approach based on the anesthesiologist's request. On laparoscopic assessment, most patients had residual gallbladder (87.5%), while the remaining four patients had cystic duct stump stones (12.5%).

Table 1 Preoperative patient characteristics and details of previous cholecystectomy

All patients (*n*=24)	Mean & SD	Median	Range	IQR
Age (years)	46.92±6.65	47	32–60	45–50
BMI (Kg/m2)	33.49±3.69	33.45	28.7–40	29.63–36.18
Interval (months)	12.38±24.14	5.5	3–120	3–8.75
	Frequency		**Percentage**	
Sex				
Male	7		29.2%	
Female	17		70.8%	
Presentation				
Colic	18		75%	
Pain	4		16.7%	
Epigastric comfort	2		8.3%	
Previous procedures				
Open cholecystectomy	18		75%	
Laparoscopic cholecystectomy	6		25%	
Associated diseases				
Diabetes	6		25%	
Hypertension	8		33.3%	
Previous endoscopic stone extraction	1		4.2%	

Table 2 Relevant preoperative laboratory and radiological data.

All patients (*n*=24)	Mean & SD	Median	Range	IQR
Albumin (gm/dl)	3.73±0.32	3.75	3.20–4.30	3.50–4
Total bilirubin (mg/dl)	0.70±0.19	0.70	0.3–1.10	0.53–0.88
Direct bilirubin (mg/dl)	0.23±0.17	0.20	0.10–0.90	0.10–0.28
SGPT (Iu/L)	30.33±6.30	30	20–40	25.50–35
SGOT (Iu/L)	32.79±10.72	30	20–59	25–39.25
Bile duct diameter by MRCP (cm)	0.49±0.20	0.45	0.20–0.90	0.33–0.58

The duration of the procedure ranged between 60 and 130 min (mean = 108.83), while intraoperative blood loss had a mean value of 111.88 mL (range, 50–150) (Table 3).

As regards postoperative data, the duration of hospitalization ranged between 1 and 4 days (mean = 1.21). Wound infection occurred in four patients (16.67%), and they were managed by frequent dressings and topical antibiotics. Gallbladder bed fluid collection was encountered in four cases (16.67%); three of them were conservatively managed with antibiotics and anti-inflammatory drugs, while one patient required ultrasound-guided aspiration. In addition, pulmonary embolism occurred in only one patient (4.17%), who was managed with conservative anticoagulants with no need for invasive cardiopulmonary procedures. Postoperative morbidity occurred in eight patients, making our morbidity rate 33.3% (Table 4). All patients reported complete resolution of their preoperative symptoms at follow-up, with no further complications or biliary manifestations after stitch removal.

No significant risk factors for morbidity after the completion were specified in the current study (Table 5).

Discussion

Removal of the gallbladder during the cholecystectomy procedure could be intentionally or unintentionally incomplete Parmer and colleagues [14]. The surgeon could leave a residual intentionally when there is a risk of bile duct injury, like in patients with frozen Calot or severe adhesions, while lack of surgical experience is the main etiology for an unintentional residual. When detected, surgical excision of that remnant is highly recommended by most surgeons to avoid complications like Mirizzi syndrome, choledocholithiasis, cholangitis, and pancreatitis Enns and colleagues, Tantia and colleagues [16–18].

Our findings showed that colicky pain was present in most patients (75%), while dull pain and epigastric discomfort were reported by 16.7% and 8.3% of patients, respectively. Another study also reported

Table 3 Operative data

All patients (*n*=24)	Frequency		Percentage	
Procedure				
Laparoscopic cholecystectomy	22		91.7%	
Conversion to open	2		8.3%	
Findings				
Residual gallbladder	21		87.5%	
Cystic duct stump	3		12.5%	
	Mean & SD	**Median**	**Range**	**IQR**
Operative time (min)	108.83±21.03	115	60–130	92.50–123.75
Blood loss (ml)	111.88±32.13	115	50–150	92.50–140

Table 4 Postoperative data

All patients (*n*=24)	Mean and SD	Median	Range	IQR
Hospital stay (days)	**1.21±0.72**	**1**	**1–4**	**1–1**
	Frequency		**Percentage**	
Complications				
Wound infection	4		16.7%	
Gallbladder bed collection	4		16.7%	
Pulmonary embolism	1		4.2%	
Overall morbidity	8		33.3%	

Table 5 Predictors of postoperative morbidity after completion of cholecystectomy

Predictors	*P* value
Age	0.659
Female sex	0.528
BMI	0.350
Colic	0.616
Pain	0.527
Epigastric comfort	0.990
Time interval	0.971
Open cholecystectomy	0.334
Laparoscopic cholecystectomy	0.142
Diabetes	0.738
Hypertension	0.872
Albumin	0.516
Total bilirubin	0.405
Direct bilirubin	0.796
SGPT	0.211
SGOT	0.196
Bile duct diameter	0.941
Laparoscopic cholecystectomy	0.608
Conversion to open	0.692
Residual gallbladder	0.829
Cystic duct stump	0.540
Operative time	0.515
Blood loss	0.837
Hospital stay	0.839

that abdominal pain was the most common manifestation of residual gallbladder (90%). Other manifestations included dyspepsia (5%), while 5% of participants were asymptomatic [14]. El Nakeeb and associates reported that biliary colic was the most common manifestation (95.2%), followed by jaundice (42.9%), and fever (23.8%). Other manifestations included cholangitis (19%) and pancreatitis (4.8%) El Nakeeb and colleagues [4]. One could expect some differences between studies regarding the mode of presentation based on the included sample size.

In our study, the time interval between the previous cholecystectomy and the completion procedure ranged between 3 and 120 months. According to previous reports, that time interval could be short (few days) or long (several years up to 20) El Nakeeb and colleagues, Pernice and Andreoli, Palanivelu and colleagues [4,19–21].

Most of our patients had previous open cholecystectomy (75%) compared with laparoscopy (25%). We think that leaving a residual is more common with the open approach, as it lacks the wide field of view and magnification provided by laparoscopy. Also, all patients who had the open procedure in our study were explored through a minilaparotomy incision rather than the classic Kocher incision. Although minilaparotomy could yield better cosmetic results, it increases the risk of leaving a gallbladder residual.

Ahmed and colleagues [11] reported that all their participants had a previous open cholecystectomy

(41/41) [11], which coincides with our results. However, El Nakeeb and colleagues reported an almost comparable prevalence of the open and laparoscopic approaches in their 21 cases. Previous open and laparoscopic cholecystectomies were performed in 52.4 and 47.6% of cases, respectively [4]. Shortage in laparoscopic experience could explain the rise of residual gallbladder in laparoscopic cases.

In our study, residual gallbladder stump was detected in 21 patients (87.5%), while cystic duct stump was present in the remaining four cases (12.5%). We intended to complete the dissection of the remnant gallbladder and cystic duct, leaving not more than 1 cm of cystic duct length, as recommended by Sitenko and colleagues [22].

Our findings showed that the operative time ranged between 60 and 130 min (mean = 108.83). Parmar and colleagues reported that their operative time ranged between 60 and 120 min (mean = 102.4) Parmar and Khandelwal [14]. Another study reported an operative time ranging between 60 and 180 min (mean = 127) El Nakeeb and colleagues [4]. Moreover, a similar study reported a mean operative time of 67 min (range, 45–132) Ahmed and colleagues [11]. Differences in operative time could be explained by different intraoperative adhesions, surgical expertise, surgical approach, and surgical setting ergonomics.

Our conversion rate was 8.33%, which is close to the findings reported by Ahmed and colleagues, who reported a 7.3% conversion rate (3/41). The causes of conversion included uncontrolled bleeding from the Calot triangle (one case), Mirizzi syndrome with difficult Calot (one case), and an iatrogenic transverse colon tear (one case) Ahmed and colleagues [11]. Besides, El Nakeeb and colleagues [4] reported conversion to the open approach in one patient (7.1%) due to complex adhesions and distorted anatomy. Singh and colleagues reported a higher conversion rate (20.4%) [15]. However, Chowbey and colleagues reported no need for conversion in their series [23]. Differences could be explained by heterogenicity in operative findings and surgical experience.

In our study, the duration of hospitalization ranged between 1 and 4 days. Ahmed and colleagues reported that the duration of hospital stay ranged between 2 and 9 days (mean = 2.8) [11]. Chowbey and associates reported that the same parameter ranged between 1.5 and 7 days (mean = 2.6) [23]. Differences between studies could differ based on the postoperative protocol and the incidence of postoperative complications.

Although we did not encounter any major complications in our study, one should mention that laparoscopic completion cholecystectomy has some risk for common bile duct injury due to adhesions and unclear anatomy, as reported in previous studies Parmar and Khandelwal, Palanivelu and colleagues, Concors and colleagues [14,17,24].

Our findings revealed a 16.7% wound infection rate, which is close to the findings of Singh and colleagues who reported an 11% wound infection rate [15]. Another study reported a lower rate (2.78%) Gania and colleagues [25].

Gallbladder bed collection was encountered in 16.7% of our patients, and one of them required aspiration while the other three were conservatively managed. Another study reported that three patients out of 21 (14.28%) developed postprocedural abdominal collection that was successfully managed by conservative therapy El Nakeeb and colleagues [4].

One patient developed pulmonary embolism after the operation (4.2%) despite using chemical and mechanical prophylactic measures against thromboembolism. That incidence lies within the reported range in the literature following abdominal surgery (0.33% – 6.6%) Temgoua and colleagues, Rasmussen and colleagues [26–28]. Our case had mild symptoms and was conservatively managed.

We did not detect any risk factor for post-completion morbidity in our study, and no previous studies have specified any significant predictors.

The efficacy of laparoscopic completion cholecystectomy was proven in our study as all patients reported no manifestations postsurgery. The resolution of biliary manifestations was also reported in the majority of patients in previous studies El Nakeeb and colleagues, Singh and colleagues, Chowbey and colleagues [4,15,23].

Our study has some limitations manifested in the small sample of patients collected from a single surgical institution. These cases should be reported, and an epidemiolocal study should be done to detect the risk factors for residual gallbladder after cholecystectomy to prevent the occurrence of that complication.

Conclusion

Laparoscopic completion cholecystectomy is considered a safe and effective approach in the management of patients with a history of previous cholecystectomy, even the open approach, who present with residual gallbladder or cystic duct stump stones. It is associated with a low incidence of postoperative complications and complete resolution of preoperative manifestations. However, the completion procedure should be performed by experienced hands or high-volume hepatobiliary surgeons to decrease the risk of major complications.

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Conflicts of interest

Nil.

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