Cohort Study

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Open versus laparoscopic completion cholecystectomy in patients with previous open partial cholecystectomy: a retrospective comparative study

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Background: Some patients report recurrence or persistence of their manifestations after cholecystectomy, and retained gallstones may be a relevant etiology for their complaint. Completion cholecystectomy is advised for these cases to alleviate their manifestations. No previous studies have compared the outcomes of open versus laparoscopic outcomes in these patients, especially in patients who had initial open partial procedures. That is why we performed this study to report the perioperative outcomes of the two approaches in such patients.

Methodology: This is a retrospective analysis of 80 patients who had a completion cholecystectomy in the authors' center (40 open and 40 laparoscopic cases) after initial open partial cholecystectomy.

Results: The duration elapsed since the primary procedure had an average of 18 months in the open group and 21 months in the laparoscopic group. Abdominal pain and dyspepsia were the most common presentations. Some patients had stump cholecystitis or jaundice. The intraoperative assessment revealed either the residual gallbladder or a long cystic duct stump. Laparoscopy yielded shorter operative time, earlier oral intake, and shorter hospitalization periods compared to the open approach ($P < 0.05$). The latter was associated with a 20% wound infection rate that was never encountered after laparoscopy ($P = 0.003$).

Conclusion: Previous open partial cholecystectomy does not hinder subsequent laparoscopic completion cholecystectomy. Additionally, laparoscopy is associated with better perioperative outcomes than the open approach.

Keywords: completion cholecystectomy, laparoscopy, laparotomy, retained gallstones

Introduction

Cholelithiasis, or gallbladder stones, is a common surgical disorder that is present in 8–9% of women and 5–6% of men[1]. Cholecystectomy is the best option for patients reporting symptoms related to cholelithiasis[2], and that procedure is commonly performed in Egypt for such cases[3]. That procedure could be performed via the laparoscopic or open approaches, with significant advantages for the former, including less postoperative pain, faster recovery, and improved patient satisfaction[4,5].

HIGHLIGHTS

- In some governmental health care systems, right subcostal cholecystectomy is the available procedure for cholecystectomy.
- Partial cholecystectomy are common problem for patients and surgeon.
- Residual gallbladder presented by symptomatic calcular cholecystitis.
- The lack of presence of experts in laparoscopic surgery makes the scenario difficult.
- We try to answer the question: does a patient with previous open cholecystectomy contraindicated to do revision laparoscopic cholecystectomy for residual part or not?
- We must try laparoscopic first for residual gallbladder cholecystectomy.

Resolution of cholelithiasis-associated symptoms is reported in up to 92% of patients following cholecystectomy[6]. Yet, some patients may report similar manifestations as the preoperative period, which is known as "post-cholecystectomy syndrome[7,8]. Multiple causes have been described to explain the etiology of that syndrome[6]. However, the most important one is the presence of gallbladder remnants that may harbor or develop stones, resulting in the persistence or recurrence of preoperative symptoms[9,10].

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Sponsorships or competing interests that may be relevant to content are disclosed at the end of this article.

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Residual gallbladder has been detected in 2.5% of cases after cholecystectomy[10]. That occurs secondary to incomplete surgical excision of the gallbladder (subtotal or incomplete cholecystectomy)[11]. Surgeons may prefer to perform that procedure to avoid major biliary injury in patients with acute cholecystitis, frozen Calot, or unclear biliary anatomy[12–14].

Symptomatic patients with residual or retained gallstones should undergo a completion cholecystectomy procedure to alleviate their manifestations[15]. Multiple studies confirmed the alleviation of patient symptoms after such procedures with a safe perioperative profile[9,10,16]. Nonetheless, none of them have compared the outcomes of open versus laparoscopic outcomes in these patients.

That motivated us to conduct the current study, which compared the perioperative outcomes of open versus laparoscopic completion cholecystectomy in patients with retained stones, who were primarily managed by open partial cholecystectomy.

Protocol

A copy of the protocol is available for review by the Editor-in-Chief of this journal on request.

Patients and methods

This retrospective research was conducted at "Al-Azhar University General Surgery Department," and it was designed for adult patients presented with symptomatic retained gallstones following previous open partial or incomplete cholecystectomy, who were managed by either open or laparoscopic completion cholecystectomy in our department during the interval between January 2014 and December 2023. The data of these patients were collected from our medical archive. Patients who had retained stones after previous laparoscopic procedures were excluded. The work has been reported in line with the STROCSS criteria[17].

Patients with symptomatic residual gallbladder or cystic duct stump were included. The former was diagnosed by the presence of a wide free pouch attached to the cystic duct (remnant of the Hartmann pouch)[18], while the latter was diagnosed when there is a more than one cm cystic duct stump length[19,20]. The diagnosis of these cases was based on clinical and radiological findings.

Before data collection, we gained ethical approval from the university's ethical board. We found eighty patients meeting our enrollment criteria (40 had the open completion procedure, and 40 had the laparoscopic approach).

Prior to the procedure, all patients were clinically and biochemically assessed. Regarding the former, we focused on the patient's complaint, duration elapsed since the primary procedure, and medical comorbidity, while the latter focused on liver function tests and other preoperative routine laboratory workup. All patients were assessed by an experienced hepatobiliary sonographer, and their diagnosis was confirmed by "magnetic resonance cholangiopancreatography" (MRCP) (Fig. 1). Before patient admission, they signed a written consent document documenting their approval of the procedure and its possible complications (routinely in our department).

The choice of the open or laparoscopic approaches was dependent on the surgeon preference and expertise. The open group was explored using the same previous Kocher incision. A scarotomy was done, followed by careful dissection till reaching the abdominal cavity (Fig. 2). In the laparoscopic group, we used the same port design used for conventional laparoscopic cholecystectomy (one infraumbilical telescope port, two working ports at the right and left midclavicular lines 1–2 inches below the costal margin, and an assistant port in the right midaxillary line). The main working port was sometimes inserted in the midline according to the operator's preference (Fig. 3).

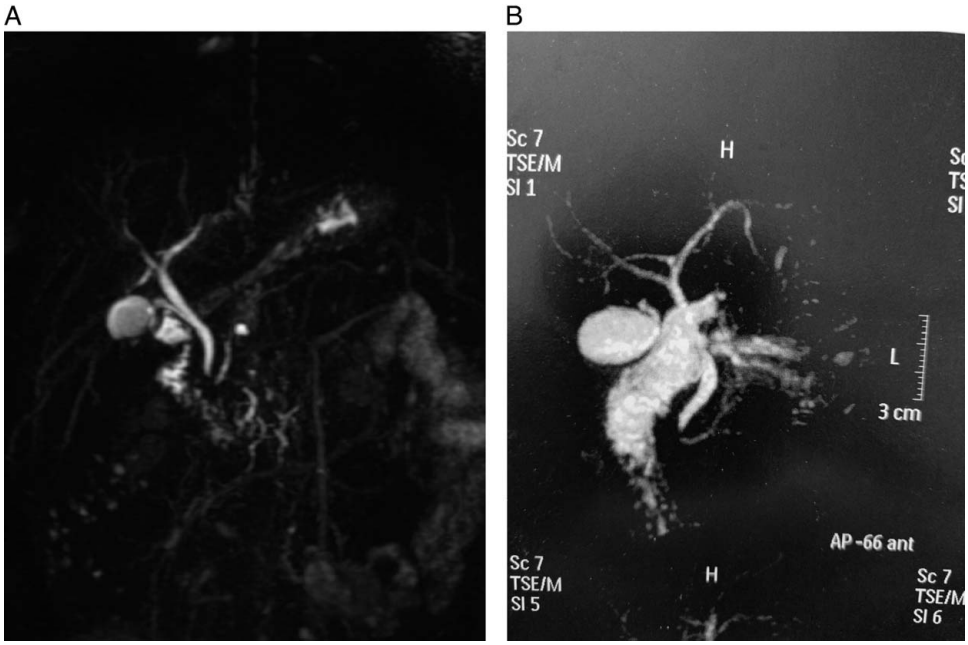

Figure 1. Preoperative magnetic resonance cholangiopancreatography images showing residual gallbladder (with filling defects representing stones in the left image). (A) Residual Gallbladder withe filling defect (stone). (B) Residual Gallbladder stump.

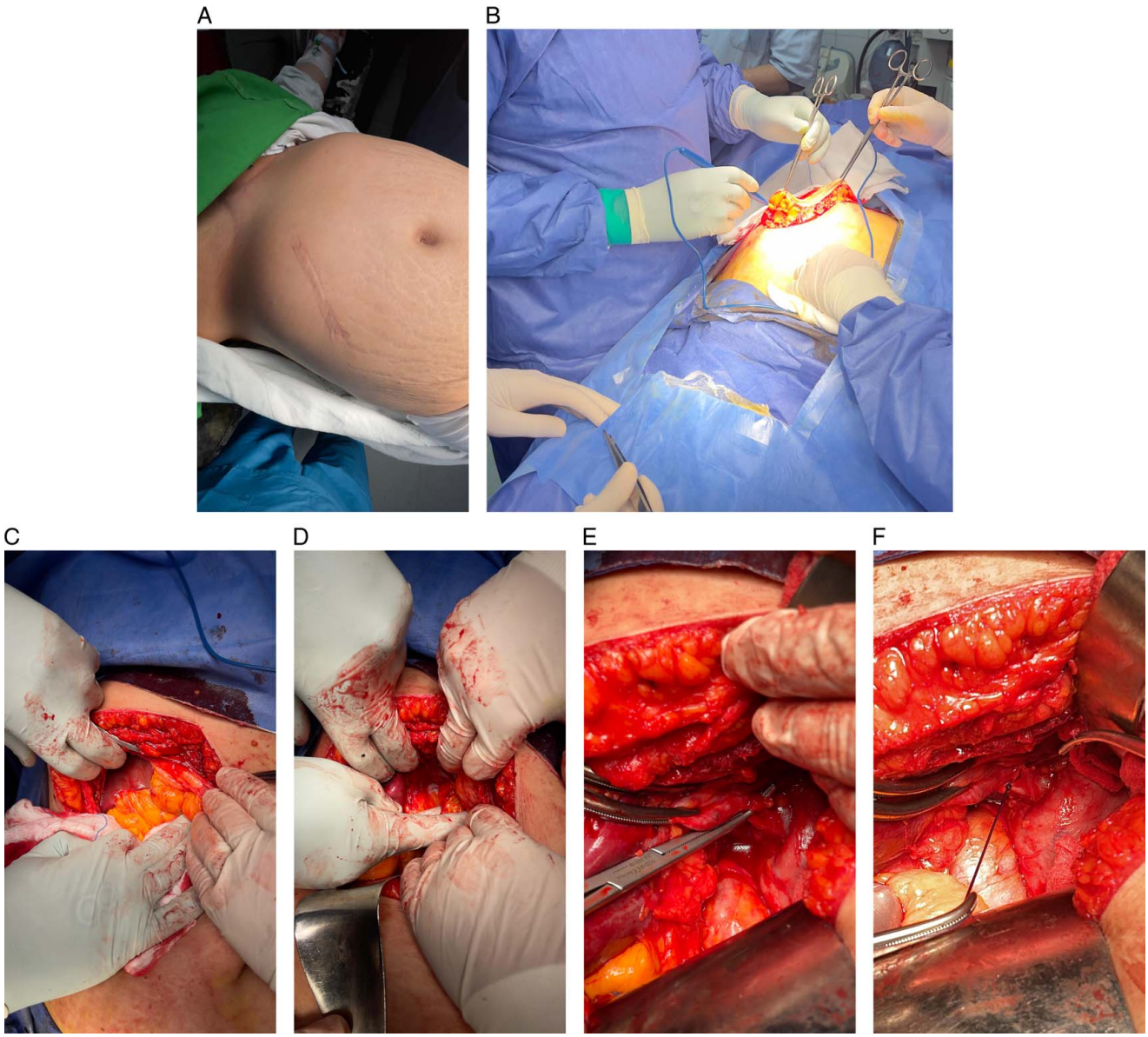

Figure 2. Steps of the open completion procedure. (A) Photo of the old scar of the initial partial cholecystectomy. (B) Scarotomy for the old scar. (C) Intraoperative adhesions. (D) Adhesiolysis. (E) Passing around the cystic duct. (F) Ligation of cystic duct and artery.

Intraoperative steps were similar in both groups. Careful adhesiolysis was initially performed till reaching the gallbladder bed. Then, dissection was continued till identification of the residual gallbladder or the long cystic stump. Either of them was cranially retracted, followed by meticulous dissection at the Calot triangle. After proper identification of the cystic duct and artery (confirmed by two senior surgeons), they were ligated (or clipped) and divided. After a good wash and hemostasis, the ports were closed in the laparoscopic group, and the abdominal wall was closed in layers in the open group. The duration of the procedure and intraoperative complications were recorded.

Postoperatively, close monitoring of the patients was done. Oral fluid intake was allowed if we detected good intestinal sounds. The patients were discharged if they tolerated oral intake, had a sound abdominal examination, were free from adverse events, and had their pain controlled with oral medications. The duration till the first oral intake, as well as the hospitalization period, were recorded. The patients were reviewed 2–3 weeks after their discharge for stitch removal. The incidence of early adverse events was noticed and recorded.

Data collection

The collected data included demographic parameters, presentation, duration elapsed since the primary procedure, relevant laboratory workup, MRCP findings, intraoperative findings, operative time, time to oral intake, hospitalization period, and postoperative complications.

Statistical analysis

We used the SPSS software to compare the open and laparoscopic groups. Either of the following three tests were applied: the χ^2 test

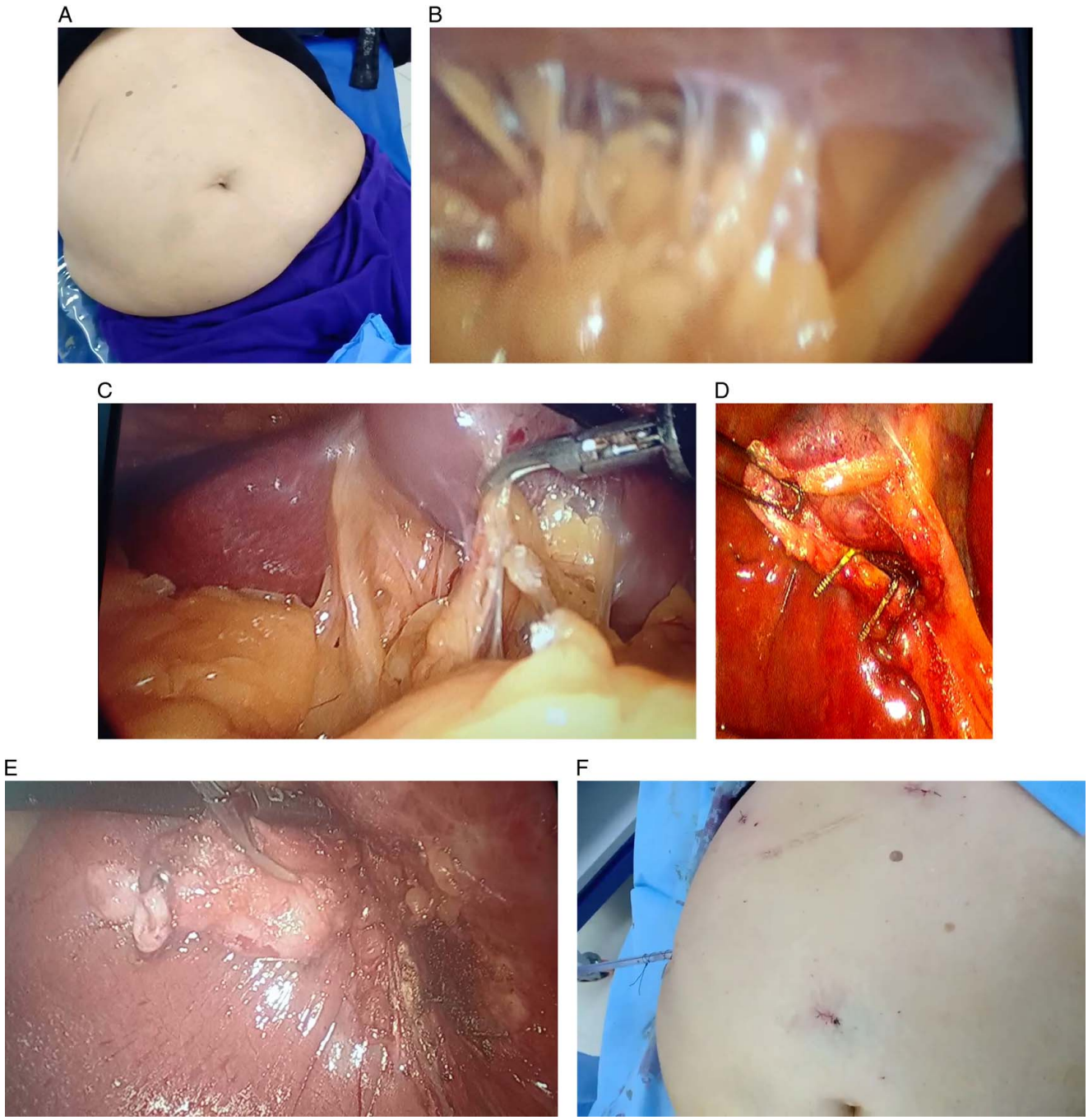

Figure 3. Steps of the laparoscopic completion procedure. (A) Preoperative photo showing the scar of the primary open procedure. (B) Laparoscopic view showing intraoperative adhesions. (C) Adhesiolysis. (D) Clipping of cystic duct and artery. (E) Dissection of the residual gallbladder from the liver. (F) Postoperative photo after the closure of the laparoscopic ports.

(for frequencies), the Mann–Whitney test (for medians), and the student *t*-test (for means). We considered any *P* value less than 0.05 as a significant one (marked with* in the following tables).

Results

Basic demographic parameters are shown in Table 1. Together with systemic comorbidities, they did not express the notable statistical differences between the study groups.

The most common presentations in both study groups were abdominal pain and dyspepsia. Additionally, stump cholecystitis was present in 5% of open-group cases and 7.5% of laparoscopic cases. Jaundice was present in 7.5% and 5% of cases in the same groups, respectively, for whom endoscopic bile duct clearance was performed prior to the completion procedure. The duration elapsed since the primary procedure had a median value of 18 months in the open group and 21 months in the other group. Table 2 summarizes the previous data, which were comparable between the two groups.

Table 1

Basic demographic data.

	Open group ($n=40$)	Laparoscopic group ($n=40$)	*P*
Age (years)	46.23 ± 6.51	47.93 ± 7.89	0.294
Sex, *n* (%)			0.491
Male	14 (35)	17 (42.5)	
Female	26 (65)	23 (57.5)	
BMI (kg/m^2)	32.72 ± 3.96	33.06 ± 3.63	0.694
Comorbidities, *n* (%)			
Diabetes	4 (10)	5 (12.5)	0.723
Hypertension	4 (10)	7 (17.5)	0.330

Table 3 summarizes relevant preoperative laboratory workup. MRCP revealed an average bile duct diameter of 6.55 ml in the open group and 6.45 ml in the laparoscopic group. Other MRCP parameters are shown in the same table.

Intraoperative findings included residual gallbladder and cystic duct stump stone. The former was present in most cases in both groups. Laparoscopy yielded shorter operative time compared to the open approach (90 vs. 110 min, respectively—$P = 0.012$). No patients required blood transfusion, and no iatrogenic bile duct injury occurred in the cases included (Table 4).

Laparoscopy was superior to the open approach regarding oral fluid intake and hospitalization period ($P < 0.001$). The open approach was associated with a 20% incidence of wound infection, which did not occur after laparoscopy ($P = 0.003$). No patients developed bile leakage after the operation (Table 5). All patients reported significant improvement or even resolution of their manifestations after the completion procedure (not shown in the tables).

Discussion

Based on our intensive search in the literature, this is the first study comparing open and laparoscopic completion cholecystectomy in patients with residual gallstones. That adds some novelty to our research. Although our study was retrospective in nature, we did notice notable statistical differences between the groups regarding preoperative data. That should decrease the bias risk and strengthen the integrity of our results.

Although the laparoscopic approach is the modality of choice for cholecystectomy[21], the open approach is still preferred in certain situations. These include intra-abdominal adhesions secondary to previous upper abdominal procedures, gallbladder inflammation, or in conjunction with other procedures necessitating laparotomy[22,23]. Surgical expertise in the laparoscopic approach, patient preferences, financial perspectives, and surgical theater ergonomics also play a pivotal role[24].

All of the included patients in the current study had previous open partial cholecystectomy, and all of these cases were performed outside our center (in the private sector). There is a reasonable explanation for that finding. Laparoscopy has more financial costs compared to the open approach in the Egyptian private sector. It is possible that the patients chose the latter because of the financial problems of Egypt, where poverty is a challenging problem[25].

The association between the open approach and gallstone remnants should also be considered. These patients might have had acute cholecystitis on their primary presentation, which made the surgeons choose the open approach, which offers less visualization and magnification than laparoscopy[26,27]. Additionally, the presence of an acute inflammatory state might have induced unclear anatomy, which motivated the surgeons to perform an initial partial cholecystectomy to avoid dreadful biliary injury[28,29].

The reader might ask why we used the open approach in some of our patients despite its drawbacks compared to laparoscopy. In our center, some surgeons, especially old-aged ones, still believe that previous laparotomy is a contraindication for laparoscopy, especially if the laparotomy is in the same anato-

Table 2

Clinical presentation.

	Open group ($n=40$)	Laparoscopic group ($n=40$)	*P*
Manifestations, *n* (%)			
Pain			
Dyspepsia	40 (100)	40 (100)	—
Stump	19 (47.5)	16 (40)	0.499
cholecystitis	2 (5)	3 (7.5)	0.644
Jaundice	3 (7.5)	2 (5)	0.644
Endoscopic bile duct clearance, *n* (%)	3 (7.5)	2 (5)	0.644
Duration since the primary procedure (months)	18 (6–47)	21 (6–46)	0.675

Table 3

Relevant laboratory and radiological workup.

	Open group ($n=40$)	Laparoscopic group ($n=40$)	*P*
Laboratory findings			
Total leukocytic count ($\times 10^9$/l)	8.41 ± 2.03	8.36 ± 1.97	0.920
Albumin (gm/dl)	4.07 ± 0.23	4.19 ± 0.24	0.124
AST (U/l)	36.83 ± 7.62	38.93 ± 5.54	0.163
ALT (U/l)	38 ± 7.98	37.65 ± 8.04	0.846
Bilirubin (mg/dl)	0.88 ± 0.21	0.85 ± 0.20	0.517
MRCP findings			
MRCP diagnosis, *n* (%)			0.363
Residual gallbladder	32 (80)	35 (87.5)	
Cystic duct stump stone	8 (20)	5 (12.5)	
Bile duct diameter (ml)	6.55 (5–7.9)	6.45 (5–8)	0.843
Cystic duct stump length (ml)	2 (2–4)	2 (2–4)	0.990
No. stones	3 (2–4)	3 (2–4)	0.134
Size of largest stone (mm)	5 (3–8)	6 (3–8)	0.371
Abscess, *n* (%)	0	0	—
Pericholecystic fluid, *n* (%)	2 (5)	3 (7.5)	0.644

ALT, alanine aminotransferase; AST, aspartate aminotransferase; MRCP, magnetic resonance cholangiopancreatography.

Table 4

Intraoperative data.

Open group ($n=40$)	Laparoscopic group ($n=40$)	*P*	Open group ($n=40$)
Operative finding			0.363
Residual gallbladder, *n* (%)	32 (80)	35 (87.5)	
Cystic duct stump stone, *n* (%)	8 (20)	5 (12.5)	
Operative time (min)	110 (85–135)	90 (75–125)	0.012
Blood transfusion	0	0	—
Biliary injury	0	0	—

Table 5
Postoperative data.

	Open group ($n=40$)	Laparoscopic group ($n=40$)	*P*
Oral fluid intake (day)	1 (1–2)	0 (0–1)	< 0.001
Hospitalization period (day)	2 (2–4)	1 (1–2)	< 0.001
Bile leak, *n* (%)	0	0	—
Wound infection, *n* (%)	8 (20)	0	0.003

mical region of the re-operative procedure. Their opinion is based on older publications, which considered previous laparotomy as a relative contraindication for laparoscopy[30,31].

Abdominal pain, dyspepsia, and jaundice were the main presentations of our patients, and that agrees with previous studies that reported similar presentations for the same clinical entity[9,15,18,32,33]. Others reported the incidence of biliary pancreatitis secondary to these remnant stones[34–36].

Preoperatively, some of our patients had stump cholecystitis (5% and 7.5% in the open and laparoscopic groups, respectively). Other authors also reported the possibility of developing the entity (about 5% incidence rate) with retained stones, especially when the primary procedure was performed on an emergent basis (for acute cholecystitis)[16,32].

Our findings revealed a significant shortening in the operative time when laparoscopy was used. That reflects our experience in laparoscopy. Although one might think that the adhesiolysis process could be much faster in the open approach, it is important that gaining access to the abdominal cavity and closure of the wound in layers would prevail over the previous advantage, which makes laparoscopy a time-saving option for such cases.

In our study, the laparoscopic procedure had a median duration of 90 min. Ahmed and colleagues included 41 patients who had remnant gallstones after initial open cholecystectomy. The duration of the laparoscopic completion procedure ranged between 45 and 132 min (mean = 67)[10]. Other authors reported a higher mean operative time for the laparoscopic procedure, which was 102 min (range, 60–120)[32]. El Nakeeb *et al.*[37] reported a mean laparoscopic operative duration of 127 ± 31.3. Differences among studies are attributed to different surgical experiences and intraoperative complications.

All of our cases in the laparoscopic group were completed via laparoscopy, with no need for conversion to the open approach. Ahmed and his colleagues reported a 7.3% conversion rate in their laparoscopic completion cases. The causes of conversion included Mirizzi syndrome, transverse colon tear during dissection, and uncontrollable bleeding[10]. Additionally, Parmar *et al.*[32] reported a 9.5% conversion rate in similar cases. Differences among studies could be explained by different surgeon thresholds for conversion, intraoperative difficulties, intraoperative complications, and surgical place ergonomics.

No common bile duct injury was encountered in our study, and that is in accordance with previous reports, which stated a 0% incidence rate for the same complication[10].

Another advantage of laparoscopy in the current study is the faster onset of oral fluid intake. It was documented that the laparoscopic approach is associated with less tissue trauma, leading to less mast cell activation, less intestinal tissue inflammation, and subsequently faster return of bowel function[38,39], which was manifested as earlier return of bowel sounds in the current study.

Our findings revealed a shorter hospitalization period in the laparoscopic group. That could be explained by less postoperative pain intensity, faster bowel recovery, and less incidence of wound-related complications (like infections)[21,40,41].

We encountered more cases of wound infection in the open group. The creation of a large skin incision makes the surgical site more prone to contaminants, which increases the risk of infection. That risk is greatly reduced by the small ports used during laparoscopy[42–45]. Our incidence of wound infection is near the reported incidence of the same adverse event reported after open cholecystectomy (17.5%)[46].

In our study, the completion procedures via both approaches led to a significant resolution of the reported preoperative manifestations, and that coincides with El Nakeeb *et al.*[37], who reported similar outcomes.

Our study discussed a unique surgical perspective that was not discussed before. However, its retrospective nature is considered a limitation. Also, it was conducted in a single surgical center. These drawbacks should be covered in future studies.

Conclusion

We conclude that previous open partial cholecystectomy does not hinder subsequent laparoscopic completion cholecystectomy. Laparoscopy is more beneficial in such patients with remnant gallstones than the open approach, as the former yielded less operative time, earlier return of bowel function, shorter hospitalization period, and less incidence of perioperative morbidity.

Ethical approval

We have an ethical approval for the study from ethical committee of general surgery department—faculty of medicine—Al Azhar University Cairo.

Consent

Written informed consent was obtained from the patient for publication of this study. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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Author contribution

M.A.N. (co-author): data curation and collection, investigation, methodology, project administration, resources, supervision, writing original draft, writing review and editing. M.H.E.: data curation and collection, resources. A.H.: data curation and collection, resources. A.S.: data curation and collection, resources. W.R.: data curation and collection, resources. M.K.: data curation and collection. H.E.: data curation and collection, methodology. Y.M.M.: writing original draft, writing review and

editing. K.M.: data curation and collection, investigation. A.S.: conceptualization, data curation and collection, investigation.

Conflicts of interest disclosure

The authors have no conflict of interests.

Research registration unique identifying number (UIN)

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Guarantor

Adel Lasien, Ahmed Abdelaal Sultan.

Data availability statement

Datasets generated during and/or analyzed during the current study are publicly available.

Provenance and peer review

Not commissioned, externally peer-reviewed.

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