

Rendezvous “Laparo-Endoscopic” Management of Cholecysto-Choledocholithiasis: A Comparison Between Two Techniques

Mohammed Khattab¹, Sami M. Said¹, Sobhy A. Kishita², Ayman Nafeh², Ahmed M. Abdelaziz Hassan², Mohamed A. Elrefaiy³, Rami Hassan Mohammed Hassan^{2*}, Hesham A. Elmeligy²

¹Department of General Surgery, Faculty of Medicine, Cairo University, Egypt

²Department of General Surgery, Theodor Bilharz Research Institute, Giza, Egypt

³Department of Hepatogastroenterology, Theodor Bilharz Research Institute, Giza, Egypt

***Corresponding author:**

Rami Hassan Mohammed Hassan

Mobile: +201063390040

E-mail: Ramyhassan060@gmail.com

ABSTRACT

Background: To maintain the less invasive approach to cholecysto-choledocholithiasis treatment, other alternatives have been suggested, including single-step and two-step procedures. Aims and objectives: To assess the safety, accuracy, and effectiveness of Rendezvous techniques as a single-step treatment for cholecysto-choledocholithiasis and compare two different techniques (Dormia basket and Guide wire) regarding operative timing, safety, feasibility, failure, and complications.

Material and Methods: This research was done on 40 cases (20 cases in group A “Dormia Basket” and 20 cases in group B “Guidewire”) at the Theodor Bilharz Research Institute (TBRI), General Surgery Department, during the period from November 2021 to October 2023.

Results: There was no statistically significant variance among both groups concerning the existence of common bile duct stones (CBDS) in scans “Ultrasound (US), Magnetic Resonance Cholangiopancreatography (MRCP),” CBD diameter, the rendezvous “Laparo-endoscopic” technique stage I, intraoperative and postoperative sequale, postoperative hospital stay, and follow-up till normalization of the liver functions or the presence of recurrent CBD stones by US, while there was statistically significant variance among both groups concerning the rendezvous “Laparo-endoscopic” technique stage II and stage III.

Conclusion: A one-stage laparo-endoscopic approach to cholecysto-choledocholithiasis is a safe and effective way to remove CBD stones with a small amount of time spent in the operating room, minimal risk of postoperative pancreatitis, and a quick recovery period. Our research indicates that the laparo-endoscopicrendezvous’ approach utilizing a Dormia basket catheter is superior to a flexible guidewire for duodenal papilla cannulation with a statistically significant difference in operating time.

Key words: cholecysto-choledocholithiasis, laparoscopic cholecystectomy, rendezvous technique.

Abbreviations:

CBDS: common bile duct stones;

US: Ultrasound;

MRCP: Magnetic Resonance

Cholangiopancreatography;

LC: laparoscopic cholecystectomy;

ERCP: endoscopic retrograde

cholangio-pancreatography;

LCBDE laparoscopic CBD exploration;

CD: cystic duct;

IOC: intraoperative cholangiogram;

ES: endoscopic sphincterotomy.

INTRODUCTION

Patients experiencing symptoms of cholelithiasis are typically treated with laparoscopic cholecystectomy (LC), a minimally invasive procedure. The introduction of LC has also altered therapeutic strategies for the management of

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choledocholithiasis. In order to maintain the minimally invasive approach to management, several alternatives have been suggested, such as two-step and single-step management (1).

Two-step preoperative endoscopic retrograde cholangio-pancreatography (ERCP), then LC while Single-step therapeutic approaches today vary depending on the experience of the surgeon and the availability of an ERCP or choledochoscope. The single step includes laparoscopic CBD exploration (LCBDE) when a choledochoscope is available, ERCP and LC in the same setting, and Rendezvous technique "laparo-endoscopic" combinations of LC and ERCP (2).

It has been observed that the probability of CBD cannulation failing during ERCP might range anywhere from 4 to 18 percent, depending on the architecture of the periampullary area and the level of experience of the endoscopist (3).

LCBDE, administered by choledochotomy or the transcystic pathway, is a process that demands clinical experience with a high level of technical complexity and advanced laparoscopic skills with direct removal of the stone or by choledochoscope, then primary closure of CBD or over the T-tube with the risk of postoperative bile leakage and a long hospital stay (4).

The rendezvous "laparo-endoscopic" technique is a lifesaver throughout endoscopic procedures. It involves inserting a Dormia basket or guidewire into the duodenum through the cystic duct (CD) and CBD. This allows for elective CBD cannulation, which is especially important in cases with anatomical variations or difficult papilla cannulation through ERCP. By doing so, the surgeon avoids accidentally cannulating the pancreatic duct. Then, instead of injecting the dye retrogradely as in ERCP - which can lead to post-ERCP pancreatitis and pancreatic damage - the surgeon injects the intraoperative cholangiogram (IOC) through the CD (5).

The aim of this research was to assess the safety, accuracy, and efficiency of Rendezvous techniques as a single-step treatment for cholecysto-choledocholithiasis and compare two different techniques (Dormia basket and Guide wire) regarding operative timing, safety, feasibility, failure, and complications.

MATERIAL AND METHODS

This research was done on 40 cases (20 cases in group A "Dormia Basket" and 20 cases in group B "Guidewire") at the TBRI, General Surgery Department, throughout the duration of November 2021 to October 2023.

Inclusion criteria

Cases with symptomatic gall bladder stones and confirmed concomitant CBD stone, calculi obstructive jaundice, presenting with biliary pain, ascending cholangitis, or acute biliary pancreatitis.

Exclusion criteria

People who are pregnant, a child, in prison, or have acute calculi cholecystitis that has been going on for more than 5 days, severe acute pancreatitis, ascending cholangitis with septic shock, CBD stones bigger than 1.5 cm in diameter and more than 3 stones in total, or who have had upper abdominal surgery before or have a reason not to have laparoscopic surgery are not eligible.

Ethical approval

The research procedure was authorized by the "Research Ethics Committee" of the TBRI and the School of Medicine at Cairo University, and each participant was asked to sign an informed consent document.

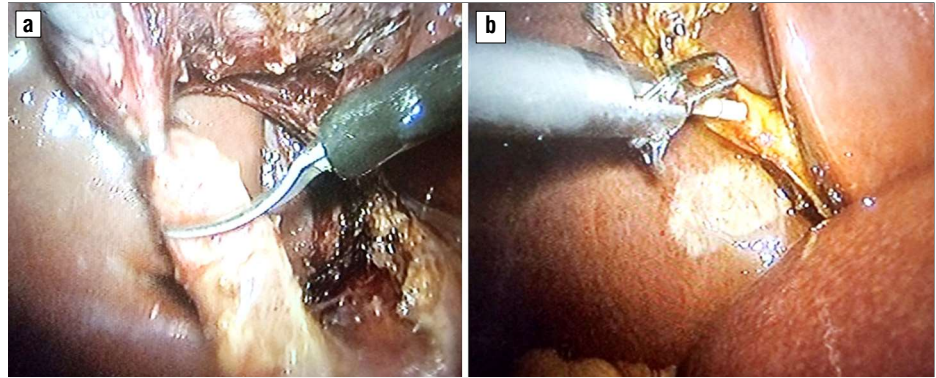
Method

The patient was placed in a somewhat anti-Trendelenburg and supine posture with their left leg tilted to the side using four port trocars in the American way. After the cystic artery was clipped, it was first dissected and split. A tiny incision was made in the CD distal to the clip, and the gallbladder was partly removed from the liver, leaving a rim of attachment at the fundus of the gall bladder and the CD intact. The CD was clipped as high as possible. To achieve an IOC, the CD was catheterized and diluted urographin was injected. Intraoperative ERCP and endoscopic sphincterotomy (ES) were carried out when the IOC showed or verified the presence of CBDS. On the left side of the patient's head, the ERCP apparatus was positioned (*fig. 1*).

Group A: using a dormia basket catheter

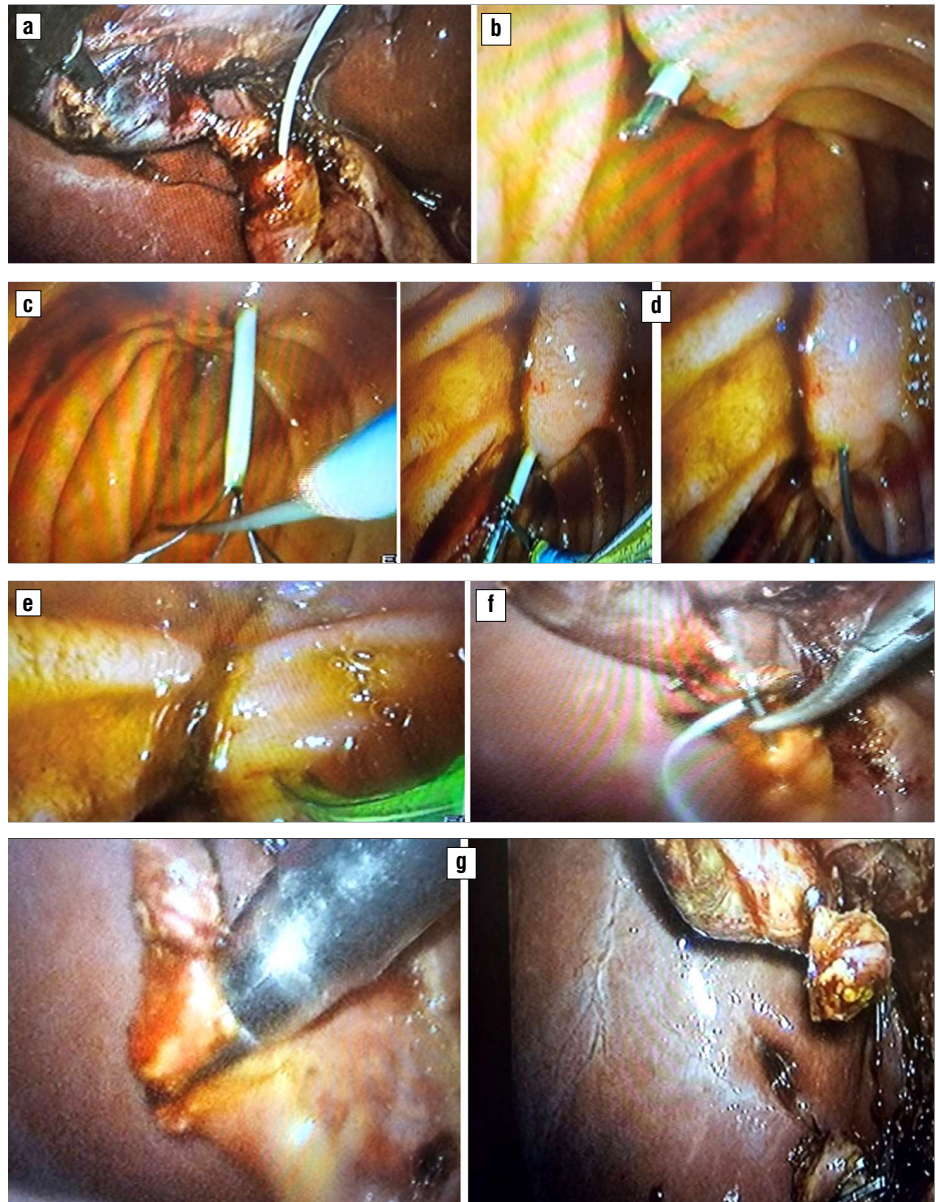
The Dormia basket catheter was inserted into the duodenum via the papilla after passing through the CD opening and into the CBD (*fig. 2*). While the endoscopist monitored the Dormia basket catheter's passage through the papilla, they continued to feed the endoscope to the duodenum in the same way as traditional ERCP. A sphincterotome with a guide wire

**Figure 1 - (a) Incision in cystic duct;
(b): Catheterization of CD for IOC**



attached to it was advanced under endoscopic supervision until its hydrophilic tip became lodged in the Dormia basket, which had been opened. In order to do

elective CBD cannulation, the endoscopist advances the sphincterotome over the guide wire during the laparoscopic procedure. The surgeon closes the basket to

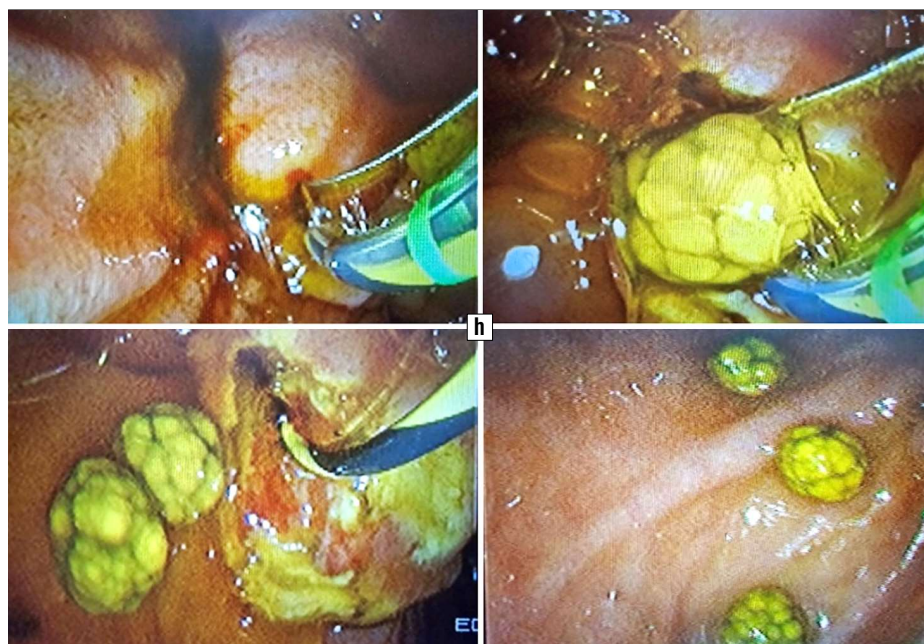


**Figure 2 - Using a dormia basket
catheter in group A**

(a): Dormia basket catheter passed into CBD through the opening in cystic duct; (b): The dormia basket passes through the papilla into the duodenum; (c): A sphincterotome loaded with guide wire introduced through endoscope to approach the opened Dormia basket; (d): Laparoscopic surgeon close the basket to grasp the guide wire into CBD; (e): Sphincterotome is then advanced over the guide wire by the endoscopist to achieve elective CBD cannulation; (f): surgeon open the basket and let the endoscopist retreating guide wire; (g): double clip the cyst duct distal to the opening to avoid bile leakage during completing the process;

Figure 2 - Using a dormia basket catheter in group A

(h): Sphincterotomy & balloon dilatation followed by CBD stone clearance



capture the guide wire and pulls back the basket catheter. Now that the endoscopist had the guide wire retracted through the opened basket, the surgeon extracted the catheter from the basket and double-clipped the cyst duct at the entrance to prevent bile leakage. As with standard ERCP, the procedure began with a sphincterotomy and balloon dilatation as directed. The next step was to remove the CBD stone using a basket or balloon catheter while under fluoroscopic monitoring. To make sure the CBD is out of the system, another cholangiography per ERCP was done. After aspirating the air and fluid from the duodenum and stomach, the endoscopist removes the duodenoscope. In order to finish the cholecystectomy, the surgeon utilized clips to separate the CD.

Group B: using a guide wire (Jag-wire)

With the use of fluoroscopy, a guide wire was threaded into the duodenum via the catheter (*fig. 3*). After the endoscopist located the wire and secured it in a polypectomy loop, the procedure was reversed: the wire was extracted through the mouth while the scope remained in place. Afterwards, a sphincterotome was advanced through the wire to perform elective CBD cannulation. Now that the sphincterotomy is still in the distal CBD, the wire was extracted through the mouth. The CD was cut, and the cholecystectomy was finished by dividing the duct among the clips.

Follow-up

All patients underwent postoperative follow-up for

liver functions (AST, ALT, total bilirubin, GGT, amylase, and lipase) until normalization and ultrasonography for the presence of recurrent CBD stones after one week, two weeks, and one month from the operation.

Statistical analysis

The data were entered into the computer, and the IBM SPSS software program version 20.0 was utilized to do the analysis. (Armonk, NY: IBM Corp.) In the description of qualitative data, both numbers and percentages were utilized. To determine whether or not the distribution was normal, the Shapiro-Wilk test was carried out. The range (minimum and maximum), mean, standard deviation, median, and interquartile range (IQR) were the statistical measures that were utilized to characterize the quantitative data. An evaluation of the significance of the data acquired was carried out at a level of 5%. The Chi-square test, Fisher's exact or Monte Carlo correction, the student t-test, and the Mann-Whitney test were the statistical operations that were carried out.

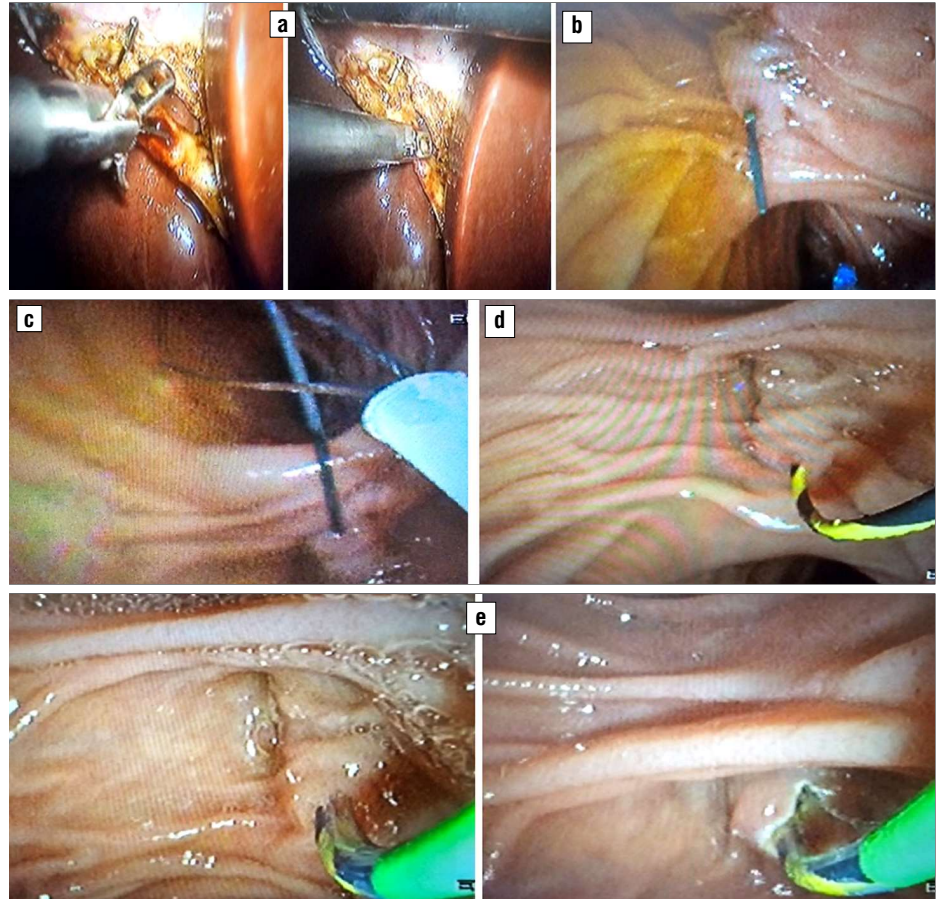
RESULTS

Table 1 showed that there was no statistical significance among both groups concerning the presence of CBD stones in Scans "US, MRCP" and CBD diameter.

Table 2 displayed that there was no statistically significant variance among two groups concerning the rendezvous "Laparo-endoscopic" technique stage I

Figure 3 - Using a guide wire (Jag-wire) in group B

(a): A Guide Wire is advanced through the catheter into the duodenum under fluoroscopic guidance; (b): Endoscopist inserts the endoscope in order to find the wire; (c): The wire trapped into a polypectomy loop; (d): The wire is pulled out through the mouth with the scope remaining in situ; (e): A sphincterotome is advanced through the wire for elective CBD cannulation, wire is removed through the mouth while the sphincterotome remains in the distal CBD.



($p=0.879$), while there was statistically significant variance among both groups concerning stage II ($p<0.001$) and stage III ($p=0.028$).

Table 3 displayed that there was no statistical significance amongst both groups concerning intra-operative and postoperative segregation.

Table 4 displayed that there was no statistical significance amongst both groups concerning postoperative hospital stays.

Table 5 displayed that there was no statistical significance amongst both groups concerning follow-up till normalization of the liver functions or presence of recurrent CBD stones by US.

DISCUSSION

With advances in laparoscopy, endoscopy along with preoperative confirmation of CBD stone through

Table 1 - Comparison between the two studied groups according to the presence of CBD stone in scans "US, MRCP" and CBD diameter.

	Group A (n = 20)		Group B (n = 20)		Test of Sig.	P
	No.	%	No.	%		
US					$\chi^2=0.114$	0.736
Negative	7	35	6	30		
Positive	13	65	14	70		
MRCP					—	—
Negative	0	0	0	0		
Positive	20	100	20	100		
IOC					—	—
Negative	0	0	0	0		
Positive	20	100	20	100		
Diameter (mm)					t=0.764	0.45
Min. – Max.	9 – 15		9 – 15			
Mean ± SD.	11.25 ± 2		11.7 ± 1.72			
Median (IQR)	11 (9 – 13)		11.50 (11– 13)			

Table 2 - Comparison between the two studied groups according to operative time stages.

Operative time (minutes)	Group A (n = 20)	Group B (n = 20)	T	P
Stage I : Standard positioning, co2 insufflation, dissection of Calot's triangle and IOC				
Min. – Max.	15 – 28	15 – 29	0.167	0.869
Mean ± SD.	21.85 ± 3.75	22.05 ± 3.85		
Median (IQR)	22.5 (19 – 25)	22.5 (19 – 25)		
Stage II : Rendezvous “Laparo-endoscopic” technique				
Min. – Max.	14 – 29	19 – 42	61.5*	<0.001*
Mean ± SD.	21.6 ± 3.6	28.55 ± 5.89		
Median (IQR)	21 (19.5 –23.5)	27.5 (26 – 31.5)		
Stage III : Completion of laparoscopic cholecystectomy				
Min. – Max.	7 – 13	7 – 11	2.29*	0.028*
Mean ± SD.	10.28 ± 1.78	9.05 ± 1.47		
Median (IQR)	10.5 (9 – 12)	9 (8 – 10)		

Table 3 - Comparison between the two studied groups according to different parameters of intraoperative and post-operative segregation

	Group A (n = 20)		Group B (n = 20)		χ ²	P
	No.	%	No.	%		
CBD Clearance						
Negative	0		0	0	0	–
Positive	20		100	20	100	
Failure to remove stone	2	10	1	5	0.36	^{FE} p=1.0
Intraoperative visceral or vascular injury	0	0	0	0	–	–
Post-operative clinical pancreatitis	0	0	0	0	–	–
Bile leakage	1	5	0	0	1.026	^{FE} p=1.0

Table 4 - Comparison between the two studied groups according to hospital stay

	Group A (n = 20)	Group B (n = 20)	U	MCp
Hospital stay			181	0.62
Min. – Max.	1 – 14	1 – 3		
Mean ± SD.	2.1 ± 2.88	1.7 ± 0.8		
Median (IQR)	1 (1 – 2)	1.5 (1 – 2)		

Table 5 - Comparison between the two studied groups according to follow-up until normalization of liver functions and presence of recurrent CBD stones by US.

	Group A (n = 20)		Group B (n = 20)		MCp
	N.	%	N	%	
Follow up for normalization of liver function (back to normal levels)					0.92
• one week	16	80	17	85	
• two weeks	18	90	19	95	
• one month	20	100	20	100	
Follow up for recurrent CBDS					1.00
• one week	0	0	0	0	
• two weeks	0	0	0	0	
• one month	0	0	0	0	

MRCP, one-stage “Rendezvous” management of cholecysto-choledocholithiasis and co-ordination between laparoscopic surgeons and endoscopist has become more easier.

In our study, pre-operative US results revealed CBD stones in 65-75% of the studied cases, while intra-operative cholangiogram (IOC) and MRCP revealed CBD stones in all studied patients with a CBD diameter range

of 9–15 mm, and the range size of stones was 5–14 mm. According to a recent study by Mohseni et al. among UK surgeons, the majority preferred MRCP as the primary method for likely choledocholithiasis, while the remaining percentage chose intraoperative imaging (6).

In our research, the median operative duration was 54 minutes (range of 47.5–60.5 minutes) in group A and 59 minutes (range of 53–66.5 minutes) in group B, with statistically significant variance among both groups as regard the rendezvous "Laparo-endoscopic" technique stage II: "21 minutes (range of 19.5–23.5 minutes) for Dormia basket, 27.5 minutes (range of 26–31.5 minutes) for guide wire" (p -value < 0.001). While the flexible guidewire was easier for general doctors to use and could get clogged by CBD stones, the Dormia basket catheter was better at what it was supposed to do. In a study conducted by Sherif et al., who assessed the efficacy of one-stage laparo-endoscopic "rendezvous" treatment of cholecysto-choledocholithiasis, the median operative time was 65 minutes (range of 35–120 minutes), with a stage II range of 25–55 minutes (7).

In current retrospective research from Italy done by Lagouvardou et al., the median stage II time was 15 minutes (range of 12–22 minutes) (8).

Furthermore, research conducted by Tsiopoulos et al. discovered that the median stage II time was 32 minutes (range of 15–70 minutes). These results indicated that laparoscopic rendezvous could be a viable substitute for intraoperative ERCP and reduced the endoscopic duration (9).

In our study, conversion to LCBDE was performed in 2 cases in group A and 1 case in group B due to the inability to remove stones by ERCP, with no significant variance among both groups. Unfortunately, bile leakage was noticed in one patient on postoperative day one, but the patient was managed conservatively for 14 days without further intervention.

In a study conducted by Lin et al., the intraoperative rendezvous group had lower rates of postoperative pancreatitis, morbidity, and hospitalization, according to a current meta-analysis and systematic review involving 1061 cases (519 with two-stage preoperative ERCP and subsequent LC and 542 with intraoperative rendezvous). No distinctions were observed in stone clearance, bile leakage, or conversion rate (10).

Additionally, in research conducted by Sherif et al., conversion to CBD exploration following failure of rendezvous was performed in 2.5% of cases (7).

In our research, the mean duration of postoperative

hospitalization was 2.1 days (range of 1–14 days) in group A and 1.7 days (range of 1–3 days) in group B.

There was a significant improvement in success rate, reduction in hospitalization, postoperative acute pancreatitis, and financial expense when ERCP-ES was used intraoperatively rather than postoperatively, in accordance with recent comparative research by Tan et al. and Di Lascia et al. (11,12).

In addition, a study conducted by González et al., which contrasted three various methods for CBD stone management: LC + ERCP, ERCP followed by LC throughout the same hospital admission, and LC + LCBDE, found that there were no significant variances in success rates of ductal stone clearance; nevertheless, length of hospital stays and postoperative complications were better in the first group (13).

In our study, follow-up of liver functions (AST, ALT, total bilirubin, GGT, amylase, and lipase) returned to normal levels in 80–85% of patients in both groups within one week from the operation, and all patients returned to normal levels within a month. In addition, none of the patients developed recurrent CBD stones on follow-up US up to one month from the operation.

In a study conducted by Sherif et al., they were able to reevaluate every patient at one month and 86.5% at six months; every patient had no symptoms or signs of recurring CBD stones on radiologic or laboratory evaluation, and the median time for liver function to return to normal was 2 weeks (range: 1–3 weeks) (7).

CONCLUSION

A one-stage laparo-endoscopic approach to cholecysto-choledocholithiasis is safe and effective at removing CBD stones. It avoids postoperative pancreatitis and shortens the procedure and hospital stay. Our study recommends that the laparo-endoscopic 'rendezvous' technique using the Dormia basket catheter is better than flexible guidewire in duodenal papilla cannulation with a statistically significant variance in the operative time.

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