

# One-step versus two-step procedure for management procedures for management of concurrent gallbladder and common bile duct stones. Outcomes and cost analysis



Ann Ital Chir, 2021 92, 3: 260-267

pii: S0003469X21035338

Online ahead of print 2021 - Feb. 23

free reading: [www.annitalchir.com](http://www.annitalchir.com)

Alessandra Di Lascia, Nicola Tartaglia, Giovanna Pavone, Mario Pacilli, Antonio Ambrosi  
*con la collaborazione di:* Rosario Vincenzo Buccino, Fabio Petruzzelli, Maria Rosaria Menga,  
Alberto Fersini, Francesca Maddalena

Department of Medical and Surgical Sciences, University of Foggia, Foggia, Italy

## One-step versus two-step procedure for management procedures for management of concurrent gallbladder and common bile duct stones. Outcomes and cost analysis

**BACKGROUND:** The management of cholelithiasis and choledocholithiasis combined is controversial. The more frequent approach is a two-stage procedure, with endoscopic sphincterotomy and stone removal from the bile duct followed by laparoscopic cholecystectomy.

This study aims to demonstrate how, on the basis of the personal experience, the Rendez-vous technique, that combines the two techniques in a single-stage operation is better than the sequential treatment.

**METHODS:** Between June 2017 to December 2019, 40 consecutive patients with cholelithiasis and choledocholithiasis combined were enrolled for the study: 20 were treated with the sequential treatment and 20 with the Rendez-vous method. The preoperative diagnostic work-up was similar in the two groups. The endpoints of the study included incidence of endoscopic and surgical complications, rate of hospitalization and cost analysis.

**RESULTS:** The study showed no difference in demographic parameters between the two groups, but the success rate of clearance of CBD was significantly smaller for sequential arm, with the need of additional procedures. We found a statistical reduction of postoperative acute pancreatitis, hospital stay and charges in Rendez-vous group, at the expense of a prolonged total operating time.

**CONCLUSIONS:** The data of the study confirm the superiority of the Rendez-vous technique because it resolves cholelithiasis associated with choledocholithiasis in a single surgical act, with greater acceptance of the patient who avoids a second invasive surgical act, and with a reduction in complications; moreover, it requires shorter hospitalization, resulting in reduced costs. We propose this option in the management of cases where preoperative ERCP-ES has failed.

**KEY WORDS:** Common bile duct stones, Cholecysto-choledocholithiasis, Endoscopic retrograde cholangiopancreatography, Endoscopic sphincterotomy, Laparoscopic cholecystectomy, Laparo-endoscopic Rendez-vous

### Introduction

About 5%-25% of the adult population have gallstones that can lead eventually to serious complications such as cholecystitis and pancreatitis. In fact, some cases (2%-

4%) become symptomatic each year. More than 1 in 10 patients (10%-18%) have concomitant common bile duct (CBD) stones <sup>1</sup>.

Laparoscopic cholecystectomy (LC) is today the gold standard treatment in the management of cholelithiasis <sup>1,2</sup>. However, there is no consensus on the optimal method of management of concomitant gallstones and common bile duct stones.

Before the advent of laparoscopy, the standard treatment of the cholecysto-choledocholithiasis was open cholecystectomy and intraoperative cholangiography followed by open common bile duct clearance. With the increasing

Pervenuto in Redazione Novembre 2020. Accettato per la pubblicazione Gennaio 2021

Correspondence to: Nicola Tartaglia: Department of Medical and Surgical Sciences, University of Foggia, Via Luigi Pinto 1, 71122 Foggia, Italy (e-mail: [nicola.tartaglia@unifg.it](mailto:nicola.tartaglia@unifg.it))

use of laparoscopy, the surgical management has changed and the advent of endoscopic techniques has created a dilemma in the management of choledocholithiasis, in fact the treatment of cholecysto-choledocholithiasis has suffered important changes over the last 25 years<sup>3</sup>.

The options for the treatment include open or laparoscopic cholecystectomy (LC) with intraoperative CBD exploration and endoscopic sphincterotomy (ES) performed before, during or after surgery.

In addition, new imaging techniques such as magnetic resonance cholangiopancreatography (MRCP) and endoscopic ultrasound (EUS) offer the opportunity to accurately visualize the biliary system without instrumentation of the ducts.

For a long time, the approach combining ERCP with ES before cholecystectomy, has been considered to be the treatment of choice<sup>4</sup>. Endoscopic retrograde cholangiopancreatography (ERCP) still remains the gold standard method of treatment for choledocholithiasis. However, ERCP may present some disadvantages and complications, one of which is a failure to cannulate the ampulla of Vater<sup>5</sup>. Moreover, post-ERCP pancreatitis could result from inadvertent pancreatic cannulation and contrast injection and remains a risk of interval migration of additional gallbladder stones before cholecystectomy<sup>6,7</sup>. More recently the alternative technique of combined LC with intraoperative ERCP and ES is emerging in an attempt to manage cholecysto-choledocholithiasis in a single-step procedure.

The combined laparoendoscopic treatment was first described by Deslandres et al<sup>8</sup> in 1993. However, the method didn't encounter wide interest immediately. After the years, many authors used this approach in their practice. In 2009, La Greca et al<sup>9</sup> published the first review of original papers and case reports including a total number of some 800 patients, describing the results and comparing the LERV treatment with the other two main available treatment options. The overall effectiveness of the LERV technique was 92.3%. From then on, the advantages of the LERV approach were outlined by several authors.

The aim of this study is to compare one-step and two-step procedures for management of concurrent gallbladder and common bile duct (CBD) stones to evaluate outcomes and cost analysis.

## Patients and Methods

A retrospective study was conducted in our Institution from June 2017 to December 2019 and it enrolled forty consecutive patients who had received either the one-step or two-step procedural pathway for cholecysto-choledocholithiasis.

They were separated in two groups of 20 each. In group A patients were treated with two stage management, first by preoperative endoscopic retrograde cholangiopancre-

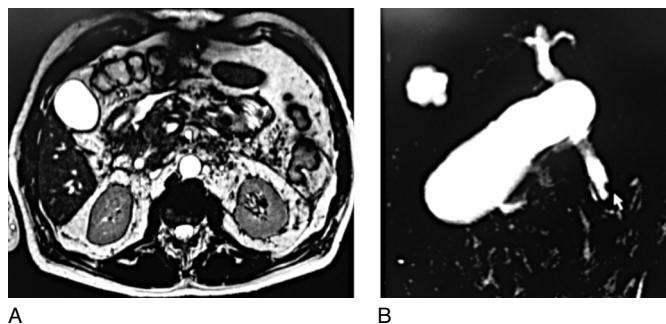


Fig. 1: A) Magnetic resonance cholangiopancreatography (MRCP) of a patient of group. B) evidence the common bile duct stone (Department of General Surgery, Ospedali Riuniti, Foggia).

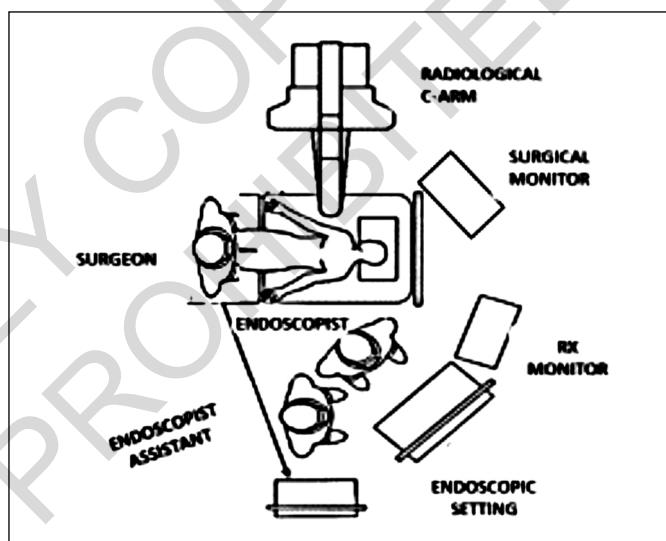


Fig. 2: Set-up of operating room for a Rendez-vous technique (Department of General Surgery, Ospedali Riuniti, Foggia).

atography (ERCP) and sphincterotomy (ES) and second by LC. In group B patients were treated with one stage management of by Laparoendoscopic Rendez-vous technique (LERV technique).

All patients with symptomatic cholelithiasis (or acute cholecystitis) and suspected CBD stones admitted to our Institution were underwent firstly biochemical and abdominal ultrasound exams, that are used routinely to confirm the diagnosis.

Liver function tests (LFT) can be used to predict CBD stones. Elevated serum bilirubin and alkaline phosphatase typically reflect biliary obstruction but these are neither highly sensitive nor specific for CBD stones. Excepting obvious jaundice, a raised GGT level has been suggested to be the most sensitive and specific indicator of CBD stones. A value of greater than 90 U/L has been proposed to indicate a high risk of choledocholithiasis<sup>10</sup>.

The transabdominal ultrasound examination (US) is the most commonly used diagnostic radiologic exam. It has the advantages of being widely available, non-invasive,

TABLE I - Patients' demographic and pathological data.

Patients' demographic and pathological data	Group A (n = 20)	Group B (n = 20)	p
Male/Female	7/13	6/14	-
Age (years)			
Mean ± SD	62,52 ± 11,60	56,62 ± 11,4	
Median	64	58	0,12
Range	(45-85)	(30-80)	
Total bilirubin (normal value, 0.2-1.2 mg/dL)			
Mean ± SD	7,02 ± 3,44	8,1 ± 2,91	
Median	6,5	8	0,29
Range	(3-14)	(4-13)	
vGT (normal value, 10-55 U/L)			
Mean ± SD	300,19 ± 155,83	339,28 ± 124,13	
Median	275	325	0,38
Range	(100-600)	(200-550)	
Alkaline Phosphatase (normal value,30-120U/L)			
Mean ± SD	159,16 ± 21,75	172 ± 30,4	
Median	157,5	162,5	0,13
Range	(130-200)	(140-250)	
BMI			
Mean ± SD	23,8 ± 3,3	23,2 ± 1,8	
Median	23,5	23	0,51
Range	(19 - 28)	(21-26)	
ASA score			
I	4/20	4/20	
II	14/20	15/20	-
III	2/20	1/20	

vGT: Gamma glutamyl transpeptidase; BMI: Body Mass Index; ASA: American Society of Anesthesiologists

and inexpensive. For an ultrasound diagnosis of cholecystitis, it is necessary visualize gallbladder stones associated to a wall thickening, a pericholecystic fluid, and a Murphy's sign.

The ultrasound exam should routinely report indirect information suggestive of the presence or absence of CBD stones, specifically the CBD diameter or any signs of intrahepatic bile duct dilation. A CBD diameter of greater than 10 mm is associated with a higher prevalence of choledocholithiasis.

All patients in the study, because they had changes in biochemical tests or indirect signs of cholelithiasis on ultrasound, or both at the same time, were subjected to MRCP, the preoperative procedure of choice for the detection of CBD stones and for the study of biliary anatomy (Fig. 1).

In all our cases their preoperative MRCP examination showed evident stones in the CBD.

Concerning preoperative demographics parameters, the two groups were similar (Table I). The group A consisted of 13 female and 7 male patients with a median age of 64 years (range 45-85). The group B consisted of 14 female and 6 male patients with a median age of 58 years (range 30-80). In the two groups the mean value of liver enzymes was similar, such as BMI and ASA score.

All patients of group A underwent Two-step procedures that consisted of a preoperative ERCP + ES followed by laparoscopic cholecystectomy.

ERCP uses a flexible endoscope with lateral vision, that is introduced trans-orally until the second part of the duodenum with the goal of accessing the papilla of Vater. The endoscopist injects contrast dyes through the papilla into the ducts and takes X-rays to show lesions such as stones or strictures. Some of these can be treated right away with other instruments passed through the endoscope. Sphincterotomy consists in a small cut in the papilla of Vater with monopolar electrode to enlarge the opening of the bile duct in order to improve the drainage or to remove stones in ducts using a basket or balloon catheter.

Laparoscopic cholecystectomy is done according to the standard procedure <sup>11</sup>.

All patients of group B underwent single step procedure that consisted in Rendez-vous technique, a combined laparoscopic and endoscopic approach to common bile duct stones treatment (Fig. 2).

The denomination Rendez-vous was adopted in order to describe the technical phase in which the surgeon and the endoscopist met one other at the level of the duodenum.

TABLE II - Perioperative Outcomes.

	Group A Two-step patients n 20	Group B One-step patients n 20	P
Total operative time (min)			
Mean ± SD	80,85 ± 17,73	93,80 ± 16,34	0,02
Median	85	95	
Range	(50-105)	(65-120)	
Success Rate n. (%)	14/20 (70%)	19/20 (95%)	0,03
CBD Clearance Rate n. (%)	14/20 (70%)	20/20 (100%)	0,0079
Additional procedures n. (%)	6/20 (30%)	0/20	0,03
Additional ERCP	3 (50%)		
Rendez-vous	1 (16,6%)		
Choledochotomy, T-Tube Drainage	2 (33,4%)		
Complications n. (%)	7/20 (35%)	1/20 (5%)	0.0177
Bleeding n. (%)	2/20 (10%)	1/20 (5%)	0,54
Postoperative Pancreatitis n. (%)	5/20 (25%)	0/20	0,0168
Hospital Stay (days) [from the diagnosis of choledocholithiasis]			0,00001
Mean ± SD	16,71 ± 5,2	5,61 ± 1,35	
Median	16	5	
Range	(11-25)	(4-8)	
Hospital Charges (Euro)			
Mean ± SD	5226,2 ± 471,6	3821,46 ± 850,9	0,00001
Median	5150	3550	
Range	(4600-6000)	(2800-5300)	

The technique consists of an anterograde transcystic cannulation of the bile duct during laparoscopic cholecystectomy, with a guidewire that can be retrieved with a duodenoscope, thus facilitating retrograde bile duct cannulation.

In our study, indications for the rendezvous technique in patients with cholecysto-choledocholithiasis are:

- choledochal stones with a diameter not exceeding 10 mm;
- suspected choledochal stones in patient with uncertain diagnosis;
- high risk patients if subjected to sedation for ERCP;
- failure of a previous ERCP.

In addition to this, it's need to consider that female patients with young age and thin bile duct have a high risk of acute post-ERCP pancreatitis; these patients should be referred primarily to the Rendez-vous.

The patient was placed in the supine position. A laparoscopic cholecystectomy was started with the ligation of the cystic artery, and then a small incision was made in the cystic duct.

All procedures included intraoperative cholangiography through a small incision of the cystic duct to check for CBD stones and to delineate bile duct anatomy.

The guidewire was introduced in the cystic duct from an ulterior trocar. It was then advanced through the ampulla of Vater from the CBD into the duodenum and an atraumatic laparoscopic bowel clamp is positioned

on the first jejunal loop to reduce bowel distension. Then, after the endoscope was inserted by the endoscopist from the mouth to the duodenum, the guidewire was identified and this can a facilitated intraoperative sphincterotomy, followed by CBD toilette, stone removal by a balloon.

At the end of the endoscopic biliary tract toilette, final cholangiography was performed and the endoscope was removed.

The procedure is then completed by cholecystectomy in one procedure; the cystic duct was clamped and cut, the gallbladder was removed, an abdominal tube was placed and the laparoscopic cholecystectomy procedure concluded.

The postoperative management was similar in the two groups, with the removal of the abdominal tube and a liquid diet in I postoperative day, and daily blood tests.

In order to compare one-step and two-step procedures for management of concurrent gallbladder and CBD stones, we decided the endpoints of our study:

- Incidence of endoscopic and surgical complications in two Groups.
- Rate of hospitalization. In the study the "Hospital stay" starts from the diagnosis of choledocholithiasis.
- Cost analysis. The costs must be evaluated by considering the total days of hospitalization, the cost of instrumental and blood tests, the cost of additional procedures such as ERCP and SE.

## STATISTICAL ANALYSIS

Continuous variables were analyzed using the Student-t-test. The results are reported as mean, median, standard deviation, and range. Categorical data were compared using the chi-squared test. Data are expressed as raw numbers (%) or median values (range). A p-value less than 0.05 was considered significant.

## Results

Table II summarize our findings regarding the perioperative outcomes (Table II).

The group A had a mean Total Operative Time of  $80,85 \pm 17,73$  min (Median 85, Range 50-105), and the group B had a mean Operative Time of  $93,80 \pm 16,34$  min (Median 95, Range 65-120; p-value <0,05).

In Group A, the mean time of the endoscopic procedure (ERCP, SE) was of 40 min (range, 30-60); while the mean operative time of VLC was of 45 min (range, 20-45).

The study reports a success rate of the procedures of 70% in Group A (two step), and of 95% in Group B (one step); this difference is statistically significant (p-value <0,05).

In Group A, in 6 patients (30%), there was a failure of complete duct clearance with preoperative ERCP and ES: because of inability to cannulate the papilla (in 1 patient for the presence of duodenal diverticula).

For these reasons, these 6 patients underwent additional procedures:

- in 3 patients (50%) a second ERCP was necessary to complete the clearance of CBD;
- in 1 case (16,6%) VLC and laparo-endoscopic rendezvous was preferred to reach the clearance of the CBD;
- in 2 cases (33,4%), the patients underwent laparotomic cholecystectomy with choledochotomy and toilette of the CBD with T-Tube drainage (because of previous abdominal surgery).

In 19 patients of group B (95%), it was possible to cannulate the cystic duct with the guidewire during LERV technique, while in 1 patient the cystic duct wasn't cannulated because of inflammation reaction and so an intraoperative ERCP was performed with sphincterotomy, without the guidewire. Successful duct clearance in group B was tested to 100%.

In our study, there were no deaths, no readmissions and nor long-term complications.

We reported 20% of total morbidity (8/40) of short-term complications: 7 cases in Group A (35%) and only 1 in Group B (5%) (p-value= 0,01). In Group A there were 2 bleedings and 5 postoperative acute pancreatitis, all treated medically. In Group B there was no intraoperative occurrences, nor postoperative pancreatitis.

Only one patient (5%) presented postoperative bleeding,

resolved with medical therapy. The difference of cases of postoperative acute pancreatitis between the two groups was statistically significant (p-value= 0,01)

In our study, all the patients that underwent LERV technique tolerated very well this procedure; in none case the conversion to open procedure was necessary; return of intestinal peristaltic activity was noted in all patients within 24 hours.

The mean hospital stay from the diagnosis of choledocholithiasis was 16 days (range, 11-25 days) in Group A and 5 days (range 4-8 days) in Group B (p-value <0,05).

This significant difference was due to the necessary to face the failure cases with additional procedures and to treat the postoperative complications.

This resulted in a significant reduction (p-value <0,05) in hospital charges in the two groups: the mean total hospital charge in the one-step group was 3550 Euro (range 2800-5300) and 5150 Euro (range 4600-6000) in the two-step group.

## Discussion

Cholecysto-choledocolithiasis involves the concomitant presence of stones in both the gallbladder and the common bile duct. The majority of people affected by gallbladder stones are unaware of their presence, and over a 10-year period of follow-up, only up to 25% of initially asymptomatic individuals will develop biliary colic.

On the contrary, little is known about the natural history of common bile duct stones, but it is estimated that about half of asymptomatic common bile duct stones, discovered accidentally at intraoperative cholangiography, will spontaneously pass the papilla of Vater within six weeks.

Nevertheless, because retained stones may lead to pain, partial or complete biliary obstruction, cholangitis, hepatic abscess, and pancreatitis, their removal is warranted. Before the advent of laparoscopy, open cholecystectomy and intraoperative cholangiography, followed by open common bile duct exploration, were the standard of care for common bile duct stones removal during cholecystectomy for cholelithiasis<sup>14</sup>.

With the increasing use of laparoscopy since the early 1990s, the surgical management acquired a variety of strategies<sup>15</sup>.

Laparoscopic cholecystectomy is today the gold standard treatment in the management of cholelithiasis and Endoscopic retrograde cholangiopancreatography (ERCP) still remains the treatment of choice for choledocholithiasis<sup>16</sup>.

To preserve the minimal invasive concept of management, a number of options have been proposed, including two and single step management. Thus, the therapeutic approaches today vary, depending on availability experience and expertise and include open or laparo-

scopic CBD exploration, various combinations of LC and ERCP and combined laparo-endoscopic procedures.

Nevertheless, there is no consensus on the optimal method of treatment of concomitant gallstones and common bile duct stones, which ideal management is still a matter of debate<sup>17</sup>.

The most used procedure is represented by preoperative ERCP and endoscopic sphincterotomy followed by cholecystectomy (sequential two-stage intervention)<sup>4-18</sup>.

In our study successful of preoperative ERCP can be possible in 70% of patients, but in the majority of patients, and in skilled hands, duct clearance can be achieved in over 90% of patients as showed from data of Literature<sup>19,20</sup>.

The following cholecystectomy is generally performed laparoscopically, if not contraindicated, as in our study. The optimal timing of surgery is controversial<sup>21</sup>.

In the case of incomplete clearing of the common bile duct, a common bile duct exploration may be performed during the same laparoscopic intervention.

The laparoscopic-endoscopic rendezvous technique was developed to facilitate bile duct cannulation during endoscopic sphincterotomy, and reduce the risk of failed endoscopic common bile duct clearance, and clinical post-operative pancreatitis due to inadvertent pancreatic duct cannulation.

Our study reports the feasibility of LERV, as well as several retrospective and prospective patient series<sup>22</sup> with a success rate of 95% in clearance of BCD and a low rate of morbidity of 5%.

The majority of endoscopists consider LERV technique easier to do than standard ERCP<sup>15</sup>.

In fact, performing LC and ERCP at the same time allows to optimize the therapeutic strategy, increasing comfort of the patients who undergo a single minimal-invasive operation under general anesthesia<sup>23-24</sup>, using the same fluoroscope as used for the laparoscopic cholecystectomy.

The presence of an experienced biliary endoscopist among our surgical staff facilitates the performance of Rendez-Vous in the present series, reducing organization problems and technical problems also related to the supine position. Moreover, our data demonstrates that LERV technique is superior to sequential ERCP and LC in the management of CCL in terms of occurrence of acute pancreatitis, length of hospital stay, and costs.

The major complication of ERCP is acute pancreatitis, this is due to the inadvertent cannulation of the pancreatic duct. During the LERV technique, the use guide-wire avoids the risk of cannulation of the pancreatic duct and reduces the rate of pancreatic complications.

The intraoperative ERCP of Rendez-vous allows the selective cannulation of the bile duct, preventing Wirsung opacification using contrast agent, damage and manipulation of the papilla and the use of risky techniques to access the papilla, such as precut sphincterotomies.

In our series we report no cases of postoperative acute pancreatitis in LERV Group with a significant difference with the two-step Group ( $p = 0,0168$ ).

LERV technique has been associated with shorter hospital stay, when compared with preoperative endoscopic sphincterotomy in several study of Literature<sup>25</sup>, as well in our study with the reduction of hospital stay from a median of 16 days of Group A to a median of 5 days in Group B ( $p$ -value  $<0,05$ ).

Moreover, our study suggests that laparoendoscopic rendezvous is preferable to sequential treatment also in terms of lower cost accrued not only by a shorter hospital stay, but by another economic advantage of a single step treatment that is the option to perform intraoperative cholangiography in patients with equivocal suspicion of CBD stones, potentially eliminating the need for additional procedures and limiting the rate of postoperative acute pancreatitis and their medical therapy.

From a health economics point of view, trials and meta-analyses demonstrated lower costs in the one stage technique than in the sequential method<sup>26</sup>.

In Belgium, a non-randomized trial reported that total hospital costs were significantly less after one-stage management (2636 vs. 4608 Euro in the two-stage arm)<sup>27</sup>, such as our statistically significant results (3550 vs. 5150 Euro in the sequential arm;  $p$ -value  $<0,05$ ).

All the endpoints of our study are confirmed by the data, with a reduction of morbidity, hospital stay and hospital charges in the group of Rendez-vous procedure. Despite its advantages, several limitations need to be mentioned. People with a history of total or partial gastric resection are unlikely to be suitable for either a LERV procedure or for standard ERCP<sup>28</sup>. Other limitations are giant impacted stones, Mirizzi syndrome and preampullary diverticula<sup>29-30</sup>. In fact, only selected patients can be enrolled to Rendez-Vous on the basis of the criteria set out above. The procedure requires a specialized ERCP team, and in our study it takes about 40 minutes longer than laparoscopic cholecystectomy to perform, in comparison with the 60 minutes reported by Saccomani et al.<sup>16, 31</sup>.

Laparoendoscopic rendezvous is an attractive alternative for the treatment of patients with cholecysto-choledocholithiasis. The current evidence in favor of the LERV is promising and demonstrates the main advantages in regard to shorter hospital stay and selective cannulation of the CBD. The concept of the RV technique contributes in avoiding the main mechanisms of iatrogenic pancreatic damage, leading in lower incidence of post-ERCP pancreatitis. LERV requires basic laparoscopic equipment and skills; The only additional laparoscopic skill is the ability to perform an intraoperative cholangiogram, however, at an extra cost of increased operating time<sup>32</sup>. Despite the general improvement of skills in the last years, LERV is still considered as the least invasive approach for the treatment of cholecysto-choledocholithiasis<sup>33</sup>. However, the availability of the LERV nowadays is limited in most hospital centers, where the choice of the best approach for the treatment of patients with CBD stones is based on the institutional availability and expertise of their surgical and endoscopy teams. It seems that the lack of cooperation between the

two teams, still does not facilitate the diffusion of the LERV procedure.

So, general organization, technical problems and the availability of a skilled endoscopist and the specific material in the same operating theater of the LC have discouraged the diffusion of this combined approach.

Nevertheless, we conclude that the LERV procedure is a safe and effective treatment option for the management of concomitant cholecystocholedocholithiasis, because of associated with significantly lower postoperative complications, shorter hospital stay, and lower medical costs.

## Conclusions

The result of the present study suggest that LERV could be a safe and effective alternative strategy for patients with cholecysto-choledocholithiasis. In fact, it is associated with a higher success rate, a shorter hospital stay, and less cost compared with sequential therapy, ERCP + ES and LC.

One of the advantages of the LERV technique is the elective CBD cannulation and contrast injection through the CBD, that reduces the possibility of post procedural pancreatitis.

To all these factors our study adds another important reason to support the use of a LERV technique of cholecystis-choledocholithiasis, that is our use in all cases where preoperative ERCP-ES has failed.

These results promote the use of the laparoscopic rendezvous technique, that improves clinical and economical outcomes and reduces patient discomfort.

## Acknowledgments

Buccino Rosario Vincenzo, Petruzzelli Fabio, Menga Maria Rosaria, Alberto Fersini, Francesca Maddalena. They played an important role in surgical procedures.

## Riassunto

Diversi studi hanno dimostrato la superiorità della tecnica LERV rispetto alla strategia sequenziale nel management della calcolosi colecisto-coledocica in termini di riduzione delle complicanze postoperatorie, della degenza ospedaliera e dei costi complessivi.

Tali risultati sono talmente promettenti che ci hanno spinto ad adottare la medesima tecnica nel nostro Istituto. Con uno studio retrospettivo abbiamo arruolato, tra Giugno 2017 e Dicembre 2019, 40 pazienti consecutivi affetti da calcolosi colecisto-coledocica; 20 del Gruppo A sono stati trattati con la strategia sequenziale, ERCP e SE seguite da colecistectomia laparoscopica, 20 del gruppo B sono stati trattati con la strategia One-Step, il Rendez-Vous Laparoendoscopico, con il quale in

un solo atto chirurgico viene bonificata endoscopicamente la via biliare principale ed eseguito l'intervento di colecistectomia laparoscopica. I risultati così ottenuti hanno dimostrato tutti gli endpoints prefissati. Si è ottenuta una netta riduzione delle pancreatiti postoperatorie nel gruppo LERV, come dimostrazione del suo massimo vantaggio, ovvero un'annullazione selettiva della via biliare principale, lasciando integro ed illeso il Wirsung.

Ciò associato alla possibilità di unire le due procedure in un unico solo atto chirurgico ha ridotto in maniera significativa la degenza ospedaliera, con conseguente riduzione anche dei costi.

Rispetto alla classica tecnica sequenziale, quella LERV si avvale di un tasso di successo molto più alto nella clearance della via biliare, eliminando anche l'utilizzo di procedure aggiuntive che andrebbero a gravare sulla degenza complessiva e sui costi.

Chiaramente il Rendez-vous ha delle chiare indicazioni, e va suggerito solo in pazienti selezionati; laddove sussistano i requisiti essenziali quali un endoscopista esperto e la possibilità logistica ed organizzativa di poter organizzare entrambe le procedure nella stessa sala operatoria.

Queste limitazioni non ne hanno favorito la diffusione nonostante i risultati incoraggianti prodotti da numerosi Trials e meta-analisi. Le prove attuali sull'uso di questa tecnica presentate in questo articolo sono promettenti e dimostrano i principali vantaggi della procedura rispetto alla classica strategia sequenziale.

## References

1. Dasari BV, Tan CJ, Gurusamy KS, Martin DJ, Kirk G, McKie L, Diamond T, Taylor MA: *Surgical versus endoscopic treatment of bile duct stones*. Cochrane Database Syst Rev, 2013; Sep 3; (9):CD003327, doi: 10.1002/14651858.CD003327.pub3.
2. Maple JT, Ikenberry SO, Anderson MA, Appalaneni V, Decker GA, Early D, Evans JA, Fanelli RD, Fisher D, Fisher L, Fukami N, Hwang JH, Jain R, Jue T, Khan K, Krinsky ML, Malpas P, Ben-Menachem T, Sharaf RN, Dominitz JA, ASGE Standards of Practice Committee: *The role of endoscopy in the management of choledocholithiasis*. Gastrointest Endosc, 2011; 74(4):731-44, doi: 10.1016/j.gie.2011.04.012.
3. Tartaglia N, Pacilli M, Di Lascia A, Pavone G, Cianci P, Vovola F, Fersini A, Ambrosi A: *Management of bile duct injuries after cholecystectomy: therapeutic approach and examination of possible sources of error. Report of 2 cases*. Surg Chron, 2020; 25(3):264-68.
4. Williams EJ, Green J, Beekingham I, Parks R, Martin D, Lombard M: *British society of gastroenterology guidelines on the management of common bile duct stones (CBDS)*. Gut, 2008; 57(7):1004-21, doi: 10.1136/gut.2007.121657.
5. Katanuma A, Maguchi H, Osanai M, Takahashi K: *Endoscopic treatment of difficult common bile duct stones*. Dig Endosc, 2010; 22 Suppl 1: S90-7, doi: 10.1111/j.1443-1661.2010.00979.x.
6. Parsi MA, Stevens T, Dumot JA, Zuccaro G: *Endoscopic therapy of recurrent acute pancreatitis*. Cleve Clin J Med, 2009; 76:225-33, doi: 10.3949/ccjm.76a.08017.

7. Tartaglia N, Di Lascia A, Cianci P, Vovola F, Pacilli M, Zita A, Fersini A, Ambrosi A: *Surgical management of non-parasitic hepatic cysts. A single center experience and a review of the literature.* Ann Ital Chir, 2019; 90:514-19, PMID:31566577.
8. Deslandres E, Gagner M, Pomp A, Rheault M, Leduc R, Clermont R, Gratton J, Bernard EJ: *Intraoperative endoscopic sphincterotomy for common bile duct stones during laparoscopic cholecystectomy.* Gastrointest Endosc, 1993; 39:54-58.
9. La Greca G, Barbagallo F, Sofia M, Latteri S, Russello D: *Simultaneous laparoendoscopic rendezvous for the treatment of cholecystocholedocholithiasis.* Surgical Endoscopy, 2009; 24(4):769-80.
10. Neri V, Ambrosi A, Fersini A, Tartaglia N, Cianci P, Lapolla F, Forlano I: *Laparoscopic cholecystectomy: evaluation of liver function tests.* Ann Ital Chir, 2014; 85:1-7. PMID: 25601366.
11. Tartaglia N, Cianci P, Di Lascia A, Fersini A, Ambrosi A, Neri V: *Laparoscopic antegrade cholecystectomy: A standard procedure?* Open Med (Wars), 2016; 11(1):429-432, doi: 10.1515/med-2016-0078. PMID: 28352832; PMCID: PMC5329865.
12. Borzellino G, Rodella L, Saladino E, Catalano F, Politi L, Minicozzi A, et al.: *Treatment for retrieved common.* 145(12):1145-149. [1538-3644].
13. Collins C, Maguire D, Ireland A, Fitzgerald E, O'Sullivan GC: *A prospective study of common bile duct calculi in patients undergoing laparoscopic cholecystectomy: Natural history of choledocholithiasis revisited.* Annals of Surgery 2004; 239(1):28-33. [0003-4932].
14. Neoptolemos JP, Shaw DE, Carr-Locke DL: *A multivariate analysis of preoperative risk factors in patients with common bile duct stones. Implications for treatment.* Annals of Surgery, 1989; 209(2):157-61. [0003-4932].
15. Saccomani G, Durante V, Magnolia MR, Ghezzi L, Lombezzi R, Esercizio L, et al.: *Combined endoscopic treatment for cholelithiasis associated with choledocholithiasis.* Surgical Endoscopy, 2005; 19(7):910-14.
16. Martin DJ, Vernon D, Toouli J: *Surgical versus endoscopic treatment of bile duct stones.* Cochrane Database of Systematic Reviews, 2006; 2. doi: 10.1002/ 14651858.CD003327.pub2.
17. Targarona EM, Bendahan GE: *Management of common bile duct stones: controversies and future perspectives.* HPB (Oxford), 2004; 6:140-43.
18. Scientific Committee of the European Association for Endoscopic Surgery (E.A.E.S.): *Diagnosis and treatment of common bile duct stones (CBDS). Results of a consensus development conference.* Surgical Endoscopy, 1998; 12(6):856-64.
19. Rhodes M, Sussman L, Cohen L, Lewis MP: *Randomised trial of laparoscopic exploration of common bile duct versus postoperative endoscopic retrograde cholangiography for common bile duct stones.* Lancet, 1998; 351(9097):159-61.
20. Di Lascia A, Tartaglia N, Fersini A, Petruzzelli F, Ambrosi A: *Endoscopy for treating minor post-cholecystectomy biliary fistula A review of the literature.* Ann Ital Chir, 2018; 89:270-77, PMID: 30588923.
21. Schiphorst AH, Besselink MG, Boerma D, Timmer R, Wiersema MJ, van Erpecum KJ, et al.: *Timing of cholecystectomy after endoscopic sphincterotomy for common bile duct stones.* Surgical Endoscopy, 2008; 22(9): 2046-50.
22. Cavina E, Franceschi M, Sidoti F, Goletti O, Buccianti P, Chiarugi M: *Laparo-endoscopic "rendezvous": A new technique in the choledocholithiasis treatment.* Hepatogastroenterology, 1998; 45(23): 1430-43.
23. Arenella A, Damiani M, Fulco R, Nipote B, Vitale A: *Endolaparoscopic treatment of cholecysto-choledochal lithiasis. Personal experience.* Ann Ital Chir, 2012; 83(5):395-97.
24. Sciumè C, Geraci G, Pisello F, Facella T, Li Volsi E, Modica G: *La tecnica del rendez-vous nel trattamento palliativo degli itteri neoplastici: nostra esperienza ["Rendez-vous" technique for palliation of neoplastic jaundice: personal experience].* Ann Ital Chir, 2004; 75(6):643-7, Italian, PMID: 5960358.
25. Rábago LR, Vicente C, Soler F, Delgado M, Moral I, Guerra I, et al.: *Two-stage treatment with preoperative endoscopic retrograde cholangiopancreatography (ERCP) compared with single-stage treatment with intraoperative ERCP for patients with symptomatic cholelithiasis with possible choledocholithiasis.* Endoscopy, 2006; 38(8):779-86. 0013-726X.
26. Alexakis N, Connor S: *Meta-analysis of one-vs-two-stage laparoscopic/endoscopic management of common bile duct stones.* HPB (Oxford), 2012; 14:254-59.
27. Topal B, Vromman K, Aerts R, Verslype C, Van Steenberghe W, Penninckx F: *Hospital cost categories of one-stage versus two-stage management of common bile duct stones.* Surgical Endoscopy, 2010; 24(2): 413-16.
28. Shimatani M, Takaoka M, Matsushita M, Okazaki K: *Endoscopic approaches for pancreatobiliary diseases in patients with altered gastrointestinal anatomy.* Digestive Endoscopy, 2014; 26( Suppl 1): 70-78.
29. Corallino D, Meoli F, Palmieri L, Puliani G, Isidori A, Paganini AM: *One-stage laparoscopic bilateral adrenalectomy, cholecystectomy and choledochotomy by a transperitoneal anterior approach. Case report of a combined management for a challenging condition.* Ann Ital Chir, 2020; 91:314-20, PMID: 32877382.
30. Morino M, Baracchi F, Miglietta C, Furlan N, Ragona R, Garbarini A: *Preoperative endoscopic sphincterotomy versus laparoendoscopic rendezvous in patients with gallbladder and bile duct stones.* Annals of Surgery, 2006; 244(6):889-93; discussion 893-96.
31. Tartaglia N, Petruzzelli F, Vovola F, Fersini A, Ambrosi A: *Antegrade cholecystectomy before ligating the elements. A technique that reduces complications.* Ann Ital Chir, 2019; 90:162-164, PMID: 31182702.
32. Tzovaras G, Baloyiannis I, Za hari E, Symeonidis D, Zacharoulis D, Kapsoritakis A, Paroutoglou G, Potamianos S: *Laparoendoscopic rendezvous versus preoperative ERCP and laparoscopic cholecystectomy for the management of cholecystocholedocholithiasis: Interim analysis of a controlled randomized trial.* Ann Surg, 2012; 255:435-39 [PMID: 22261836].
33. Gagner M: *Rendezvous technique versus endoscopic retrograde cholangiopancreatography to treat bile duct stones reduces endoscopic time and pancreatic damage.* J Laparoendosc Adv Surg Tech A, 2008; 18:113 [PMID: 18266587].