

# Indications and Outcomes of Concomitant Cholecystectomies and Sphincterotomies: Observational, Descriptive and Analytical Case Series Involving 144 Patients

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## ABSTRACT

**Introduction:** Advances in interventional endoscopy and laparoscopic surgery have significantly changed the treatment of gallbladder lithiasis associated with common bile duct stones, allowing them to be treated in a single anaesthetic procedure by laparoscopic cholecystectomy and endoscopic sphincterotomy. The aim of this study was to clarify the performance of this technique and its indications and, secondarily, to study the risk factors for complications and failure of this procedure, based on the experience of the Department of Visceral Surgery and Gastroenterology.

**Patients and Method:** This is an observational, retrospective, descriptive and analytical study. Data were collected from the medical records of 161 patients with common bile duct stones concomitant with gallbladder stones treated at the Cheikh Zaid International University Hospital in Rabat between 2016 and 2022. A follow-up survey was conducted by telephone in 2023 to assess the satisfaction and medium- and long-term outcomes of all patients. A total of 144 patients who had undergone cholecystectomy and endoscopic sphincterotomy in a single anaesthetic procedure were included in the study. This single-stage procedure was evaluated by looking at clinical, biological, radiological, peri- and post-operative data, the cost of the hospital stay, and data from the telephone survey. Risk factors for complications and failure of this procedure were also investigated using univariate and multivariate statistical analysis.

**Results:** In this study, females accounted for 54.2% of the sample, with a male/female sex ratio of 0.85. The mean age was  $59.2 \pm 18.7$  years, with extremes of 16 and 98 years. The predominant age group was between 60 and 80 years, accounting for 39.6%. In terms of surgical data, the most common technical difficulty during cholecystectomy was pediculitis in 33.3% of cases, and choledochal stone formation during sphincterotomy in 32% of cases. Total cholecystectomy was performed in 95.8% of cases. The single-stage anaesthetic procedure had a high success rate of 95%. It involved a hospital and post-operative stay of 1 to 2 days, morbidity and mortality rates of 7.6% and 0% respectively, and hospital costs of 27,606 Moroccan dirhams. The risk factors for complications and failure of this procedure were the presence of a thin VBP, which was associated with 23.5% complications and 11.8% failure ( $p=0.065$ ), or a diverticular papilla, which was associated with 33.3% failure.

**Conclusion:** The combined approach of laparoscopic cholecystectomy and endoscopic sphincterotomy under a single anaesthetic is safe and 95% effective. It reduces morbidity and mortality, length of hospital stay, number of general anaesthetics and hospital costs, with a view to early rehabilitation and healthcare savings. It is still important to identify the predictive factors for surgical difficulties in order to better select and advise patients who are eligible for this technique.

## Keywords

Common bile duct stones, Gallstones, Laparoscopic cholecystectomy, Endoscopic sphincterotomy, Case series, Cheikh Zaid Hospital, Rabat.

## Introduction

Gallstone disease is one of the most common digestive disorders. The incidence of gallstones varies from 5% to 15% in adults [1] and the probability of having common bile duct stones in patients who are candidates for cholecystectomy is around 10% to 18% [2]. Treatment requires cholecystectomy, if not already performed, and treatment of common bile duct stones, the approach to which is still a matter of debate. Before the era of interventional endoscopy, this treatment was known as "all surgical". Treatment of common bile duct stones could be performed concurrently with open or laparoscopic cholecystectomy [3].

Since the advent of endoscopic sphincterotomy, it has been standard practice to perform this procedure for residual stones and in cases where surgery is difficult. In complicated cases, drainage of the bile ducts was performed first, followed by definitive treatment, which was either "entirely surgical" or endoscopic and then surgical, in sequence [4]. The advent of laparoscopic cholecystectomy in the late 1980s gradually changed the protocol for common bile duct stones associated with gallbladder lithiasis. Typically, endoscopic biliary sphincterotomy is performed first, followed by laparoscopic cholecystectomy 2 to 4 weeks later [5]. The risk of two hospitalisations, two anaesthetics, and a 10% chance of recurrent biliary disease over time [5], in addition to the cost of these two hospitalisations, led to the consideration of a single-stage procedure: laparoscopic cholecystectomy followed by sphincterotomy under the same anaesthetic [6].

The aim of this study is to evaluate the performance of this single-stage treatment and to identify the risk factors for complications and failure.

This case series has been reported in accordance with the preferred reporting guidelines for surgical case series: PROCESS guidelines 2025 [7].

## Patients and Method

This observational, retrospective, descriptive and analytical, single-centre study included all patients treated for common bile duct stones concomitant with gallbladder stones at the Cheikh Zaid University Hospital in Rabat from January 2016 to December 2022. Patients with gallbladder stones associated with a hydatid cyst of the liver, those whose pathological findings revealed a tumour aetiology, and those who had been treated in a manner not compliant with the department's protocol were excluded, as were all incomplete records. A total of 161 patients were included. Of these, 144 had undergone cholecystectomy and endoscopic sphincterotomy under the same anaesthesia. They were classified into subgroups, namely subgroup 1 (n=80) consisting of patients without technical difficulties and subgroup 2 (n=64) consisting of patients with surgical and/or endoscopic technical difficulties.

Surgical difficulties were related to the presence of severe cholecystitis with pediculitis or any other surgical difficulty specified by the surgeon. Endoscopic difficulties concerned the presence of choledochal stones, a narrow bile duct, a stone lodged in the lower bile duct or the presence of a diverticular papilla. Sociodemographic data (gender and age), clinical data (ASA score, personal history of comorbidities, clinical signs, clinical picture on admission); paraclinical data (biological data including liver function tests and cholestasis tests; radiological data including ultrasound, abdominal CT scan, MR cholangiopancreatography and endoscopic ultrasound) were analysed. Intraoperative data during cholecystectomy, cholangiography and sphincterotomy were also evaluated, as well as the overall and post-operative length of stay, post-operative progress and follow-up (complications, stay in intensive care, rehospitalisation and procedure failure).

The pathological results, hospital costs and satisfaction rates for the procedure were then evaluated. A telephone survey was also conducted in the first quarter of 2023 using a questionnaire designed to evaluate the medium- and long-term follow-up of all patients. Data were entered into a Microsoft Excel spreadsheet and analysed using JAMOVI software. The statistical analyses focused on descriptive statistics and contingency tables using various statistical tests. Qualitative variables were expressed as numbers and percentages. Quantitative variables with a symmetrical distribution were expressed as means and standard deviations. Quantitative variables with an asymmetrical distribution were expressed as medians and quartiles. The comparison of a qualitative variable between two independent samples was performed using the chi-square test. The association between two independent samples was studied using Student's t-test for variables with a symmetrical distribution and the Mann-Whitney test for variables with an asymmetrical distribution.

## Results

### Descriptive study of results

Analysis of demographic data showed that 54.2% of patients were female % of patients, with a male-to-female ratio of 0.85. The average age was  $59.2 \pm 18.7$  years, with extremes of 16 and 98 years. The predominant age group was between 60 and 80 years, representing 39.6%.

With regard to the surgical data relating to cholecystectomy, the criteria used were difficulty technique and distribution of the sample according to the type of Cholecystectomy is shown in Figures 1 and 2, respectively. The majority of patients (95.80%) underwent total cholecystectomy.

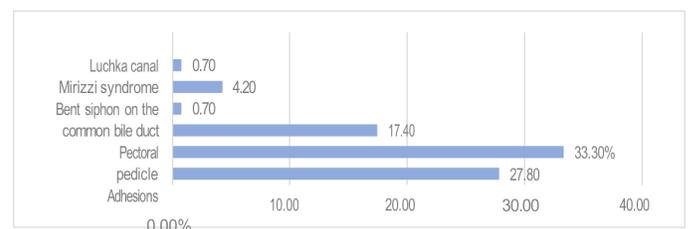
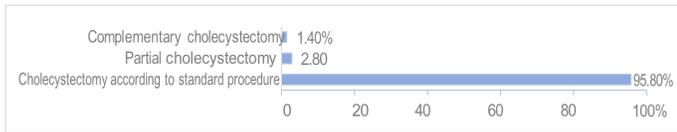
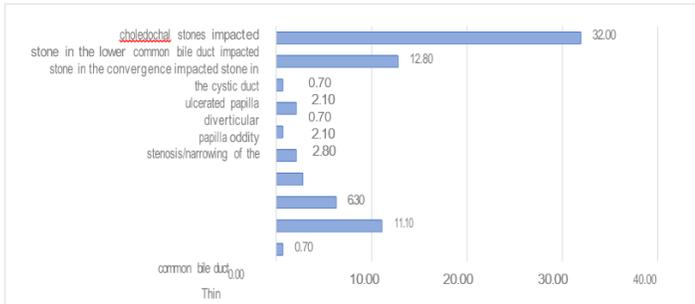


Figure 1: Distribution of patients according to surgical difficulty.



**Figure 2:** Distribution according to the type of cholecystectomy performed.



VBP Choledochoduodenal fistula

**Figure 3:** Distribution of patients according to the technical difficulty associated with sphincterotomy.

Table 1 summarises the results of the descriptive study

**Table 1:** Overall descriptive results of the study.

Variables studied	Group (N=144)
Age (median) in years	62 [45-74]
Sex ratio (M/F)	0.85 (66/78)
ASA (I/II/III/IV)	(50%/39%/9,00%/2,00%)
<b>Radiological data</b>	
Stone size (majority)	Microstones 53.30%
Number of stones (majority)	Multilithiasis 88.20%
<b>Intraoperative findings</b>	
<b>Surgical</b>	
Pediculitis	33.30%
Mirizzi type (1/2/3/4)	(1.4% / 0.7% / 1.4% / 0.7%)
Partial cholecystectomy / complementary	2.80% / 1.40%
<b>Endoscopic</b>	
Measurement of VBP: Median [Q1-Q3]	12.0 ±4.0mm
Fine BVP	12.50
Calculation embedded in the common bile duct	12.80
Diverticular papilla	2.10
<b>Distribution into difficulty subgroups (number of cases)</b>	
Group without difficulty	80
Group with technical difficulty	64
<b>Post-operative follow-up</b>	
Simple	132 (91.7%)
Complicated	12 (7.6%)
<b>Postoperative complications</b>	
Acute pancreatitis	4 (2.80%)
Angiocholitis	0
Bleeding from the papillae	2 (1.40%)
Sepsis	1 (0.70%)
Duodenal perforation	1 (0.70%)

<b>Postoperative course</b>	
Residual lithiasis	2 (1.40%)
2nd Sphincterotomy	3 (2.08%)
Chest pain	0
Death	0
<b>Pathological findings</b>	
Acute cholecystitis	31.30
Chronic cholecystitis	68.80
<b>Length of hospital stay</b>	4 [3-5] days
<b>Length of post-operative stay</b>	2 [1-2] days
<b>Admission to post-operative intensive care</b>	12 (8.33%)
<b>Rehospitalised patients</b>	6 (4.20%)
<b>Procedure success rate</b>	137 (95%)
<b>Procedure failure rate</b>	7 (4.90%)
<b>Procedure satisfaction rate</b>	95.2
<b>Cost of hospitalisation in MAD</b>	
Average ± standard deviation	30,015 ± 10,726
Median [Q1-Q3]	27,606 [23,070-33,677]
Min-max	13,150-70,628

The evaluation of the procedure following a telephone survey revealed a satisfaction rate of 95.2%.

Study of risk factors for failure and complications of the procedure Table 2 presents the risk factors for complications and failure during cholecystectomy and sphincterotomy performed during the same anaesthesia.

**Table 2:** Risk factors for complications and failure during single-stage treatment of gallbladder lithiasis associated with common bile duct lithiasis.

Risk factors for complications	P value	Risk factors for failure	P value
Male	0.762	Male	0.538
41-60 years	0.969	>80 years old	0.105
Cholecystitis + pancreatitis + cholangitis	0.863	Simple gallbladder	0.578
Micro-calculus	0.749	Calculi of varying sizes	0.432
multilithiasis	0.298	multilithiasis	0.390
Team with more expertise low	0.644	Team with weaker expertise	0.541
Pediculitis	0.824	Pediculitis	0.583
		Mirizzi syndrome	0.170
Plastron	0.943	Plastron	0.423
Partial cholecystectomy	0.436	Partial cholecystectomy	0.158
Fine VBP		Fine VBP	<b>0.065</b>
		Diverticular papilla	<b>0.055</b>
Bile duct stone	0.408	Bile duct stone	0.334
		Stone lodged in the lower bile duct	0.123

Analytical and comparative study between subgroup 1 (without difficulty) and subgroup 2 (with difficulty) of single-stage anaesthetic management

Table 3 summarises the results of the analytical and comparative

study of subgroups 1 and 2 of patients treated under a single anaesthetic

**Table 3:** Results of the analytical and comparative study of the two subgroups.

		Subgroup 1 (80 patients)	Subgroup 2 (64 patients)	P value
Length of stay	Overall	4 days	4 days	0.190
	Post-operative	2 days	2 days	0.301
Success rate		97.50	92.2	0.141
Post-operative complication rate		6.3	9.4	0.483
Postoperative pancreatitis		2.5	3.1	0.821
Rehospitalisation		3.8	4.7	0.780
Hospital cost		27,319 MAD	28,495 MAD	<b>0.050</b>

Patients with surgical and/or endoscopic technical difficulties had a complication rate of 9.4% compared to 6.3% in patients without technical difficulties.

## Discussion

Advances in interventional endoscopy and laparoscopic surgery have significantly changed the treatment of gallbladder stones associated with common bile duct stones. Traditionally, endoscopic sphincterotomy is performed first, followed by laparoscopic cholecystectomy 2 to 4 weeks later [5]. The risk of two hospitalisations, two anaesthetics, and a 10% chance of recurrent biliary disease over time [5], in addition to the cost of these two hospitalisations, has led to consideration of a single-stage approach: laparoscopic cholecystectomy followed by sphincterotomy under the same anaesthetic [6]. The aim of this study was to clarify the performance of this technique and its indications and, secondarily, to study the risk factors for complications and failure of this procedure.

A total of 161 patients were treated, of whom 144 underwent cholecystectomy and endoscopic sphincterotomy under the same anaesthetic.

We identified more women than men, with a male/female sex ratio of 0.85. The predominance of women is noted in the majority of studies. Indeed, Lahkim et al., in a similar study on the combined treatment (sphincterotomy + laparoscopic cholecystectomy) of common bile duct lithiasis, conducted in 2020 at the Avicenne Military Hospital in Marrakesh, Morocco, reported a male/female sex ratio of 0.7 [8]. Similarly, studies by El Geidie [9] and Muhammedoğlu and Kale [10] also found more women, with M/F sex ratios of 0.41 and 0.65 respectively. Indeed, the usual epidemiological factors for gallstones show a prevalence of 15% in women and 7% in men [11], with women being more susceptible to developing gallstones because female sex hormones are involved in lithogenesis.

In our series, the age group most affected was between 60 and 80 years old, with a median age of 62 [45-74] years. These results are

similar to those found in the study by Muhammedoğlu and Kale [10], which had an average age of 62 years. The prevalence of GBC increases with age. It is 14% for those under 70 and 32% for those over 70 [11]. This recurrence of gallstones in older people can be explained by anatomical factors that develop with age, such as dilation of the bile duct to more than 13 mm, angulation of the CBD <145° and the presence of periampullary diverticulum [12].

Regarding the type of cholecystectomy, the vast majority (95.8%) underwent total cholecystectomy, while partial cholecystectomy was performed in four patients (2.8%). One patient (1.4%) underwent laparoscopic cholecystectomy on a gallbladder stump with residual stones. It should be noted that the feasibility and safety of laparoscopic gallbladder stump revision has been well established by other authors [13]. Our results differ from those of Vinish et al. [14], who performed partial cholecystectomy at a higher rate of 14% in a study of endoscopic extraction of gallbladder stones with laparoscopic cholecystectomy in tandem for gallbladder stones concomitant with gallstones.

The reasons for performing partial cholecystectomy in our series were:

- The presence of adhesions and a cystic duct buried in fibrosis,
- A bilio-biliary fistula with purulent contents,
- A very large gallbladder apron with possible pre-fistula (Mirizzi stage 3),
- A gallbladder plastron with a highly dilated cystic duct that was difficult to identify. The latter patient underwent further surgery to remove a stone lodged in the cystic duct, which was identified during opacification by the nasobiliary drain.

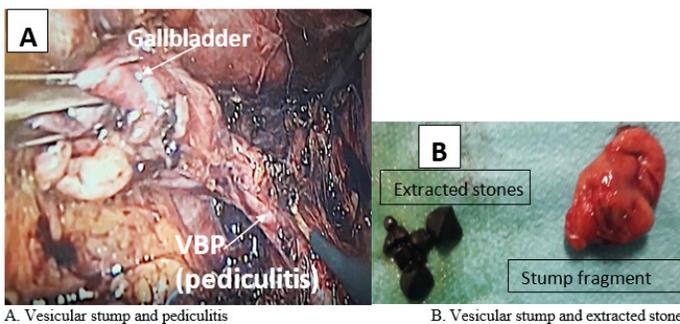
In these four patients, partial cholecystectomy was followed by sphincterotomy and placement of a nasobiliary drain.

During laparoscopic cholecystectomy, the main criterion for technical difficulty was pedicle inflammation in 33.30% of cases, followed by the presence of perivesicular adhesions in 27.80% of cases and plastron in 17.40% of cases. Other criteria such as Lushka's canal and a bent siphon on the VBP were the least frequent, with 0.70% of cases each. For Lahkim et al. [8], most lithiasic gallbladders were uncomplicated with a thin wall in 44% of cases, and perivesicular adhesions were observed in 32% of cases. Indeed, intraoperative difficulties may be related to inflammatory changes in acute cholecystitis, such as the presence of adhesions, vesicular distension, thickened walls, pediculitis, or related to the anatomy of the hepatic pedicle, such as abnormalities of the cystic duct, abnormalities of the main biliary convergence, or the presence of a biliodigestive fistula or Mirizzi syndrome [15].

During endoscopic biliary sphincterotomy, choledochal stones were the most frequently reported technical difficulty (32.00%). It should be noted that gallstones considered difficult are defined by their diameter greater than 1.5 cm, their multiplicity or choledochal calculi, their unusual shape (barrel-shaped) or their location (intrahepatic, in the cystic duct); but also due to the presence of difficult or altered biliary anatomy. This may involve narrowing

of the bile duct, a sigmoid-shaped CBD, a short distal CBD, acute angulation of the distal CBD  $< 135^\circ$ , or the presence of a diverticular papilla or a Billroth II gastrectomy [16,17]. In one of our patients, to overcome the difficulty of having an intradiverticular papilla, the decision was made to perform the rendezvous technique after cholecystectomy. This is a widely used approach as a single-session anaesthetic treatment. It begins with the insertion of a catheter through the cystic duct, which, under endoscopic guidance, passes the obstacle in the bile duct and exits through the papilla. At this point, the "rendezvous" with the endoscopist takes place, serving as a guide, simplifying biliary catheterisation and reducing the need for repeated cannulation of the Wirsung duct and thus the risk of post-operative pancreatitis. The usual protocol involves opacification followed by sphincterotomy in order to extract the stones using a Dormia device or balloon [2]. Ricci et al. [18] presented a systematic study comparing the available approaches for the treatment of gallbladder stones and common bile duct stones using a network meta-analysis, namely:

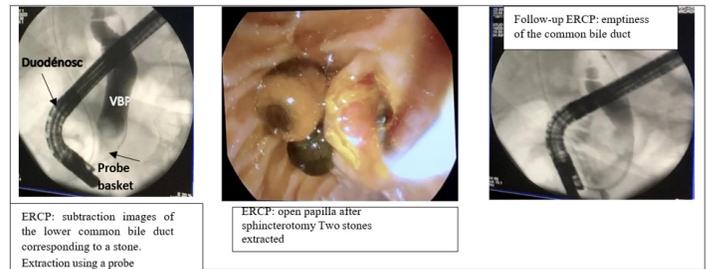
- Preoperative ERCP followed by cholecystectomy, followed by two-stage laparoscopic exploration of the bile duct,
- laparoscopic cholecystectomy plus intraoperative ERCP using the rendezvous technique
- cholecystectomy followed by post-operative ERCP.



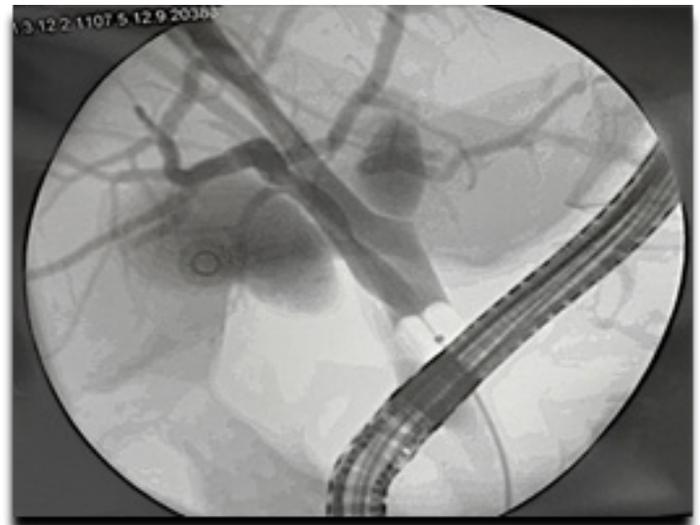
**Figure 4:** Series of a cholecystectomy supplement on a gallbladder stump:

The rendezvous approach (laparoscopic cholecystectomy plus intraoperative ERCP) was associated with the highest success rates and was the safest technique compared to the other approaches. However, this technique will only be used in the event of difficulties anticipated or encountered during endoscopic sphincterotomy. Its incidence in our study was less than 1%. In fact, we used it for one patient in whom the difficulty was related to the presence of an intradiverticular papilla. Theoretically, the rendezvous technique reduces the risk of post-ERCP pancreatitis due to a lower risk of oedema and cannulation of the pancreatic duct.

MAD 27,606. This hospitalisation period is shorter than that reported by Liu et al. [19], which was 7.5 days. The literature shows that treatment under a single anaesthetic reduces hospital costs, as reported by Rabago et al. [20] and Muhammedoğlu and Kale [10], who compared the two types of procedures under one and two anaesthetics and found a statistically significant difference ( $p < 0.001$ ). This advantage can be explained by the use of a single anaesthesia.



**Figure 5:** Endoscopic treatment of LVBP in one of our patients (Inoculum Pr A. Benkirane, HUICZ).



**Figure 6:** Right posterior sectoral slippage (Inoculum Pr A. Benkirane, HUICZ).

The clearance rate of the common bile duct in the single-stage procedure is 95.1%. The main performance indicator of our procedure is to ensure that the CBD is empty by extracting all stones, thus achieving clearance of the CBD. Our results are relatively similar to those of the meta-analysis by Tan et al. [5], which shows that performing intraoperative ERCP is associated with a CPB clearance rate of 93%. However, Lahkim et al. [8] achieved BPV emptying in 91.2% of patients and noted a failure rate of 8.8% related to failure of papillary catheterisation due to excessive duodenal peristalsis and failure to extract large stones ranging from 15 to 40 mm.

Our high rate of CBD clearance can be explained mainly by continuous improvements in endoscopic technology and equipment [21]. The success rate of ERCP cannulation in our study is comparable to others (greater than 85%) (5). In other series, such as that of Barreras et al. [22], the inability to cannulate the cystic duct was the main cause of failure of intraoperative cholangiography. During our study, the operating time factor was not measured; however, data from the literature show [22] that it is reduced during a single anaesthetic procedure.

Our study found zero mortality and an overall morbidity rate of

7.6%. This result is relatively consistent with data in the literature, including that of Rabago et al. [20] and the meta-analysis by Nie et al. [21], which reported morbidity rates of 8.5% and 9.7% respectively. Furthermore, according to Imane et al. [23], single-stage treatment carries the morbidity specific to sphincterotomy, which is 5 to 11%. In the study by El Geidie et al. [9], which compared single-stage treatment with two-stage treatment, the reported morbidity and mortality rates were 3% and 4.5% respectively.

**Table 4:** Comparison of different parameters with data from the literature.

	Parameters			
	Effect	Length of hospital stay (days)	Overall morbidity rate (%)	Hospital cost
<b>Our study</b>	144	4 [3-5]	12 (7.6%)	27,606
				[23,070 - 33,677] dhs
<b>Liu et al. [19]</b>	32	7.5 ± 1.7	-	-
<b>Muham- medoğlu and Kale [10]</b>	39	5 (24)	-	\$2,141.93 (4,721.81)
<b>Rabago et al. [20]</b>	64	5 ± 3	-	2414±776 Eu
<b>El Geidie et al. [9]</b>	100	-	3	-

The telephone survey conducted among our patients showed that the satisfaction rate for this single-stage anaesthesia procedure is 95.2%. These results are corroborated by other authors, such as Del Rio et al. Their study also reveals that patient compliance is better with a single-stage procedure, as it prevents them from abandoning treatment, particularly when the procedure requires two separate hospitalisations [24]. The single-stage method reduces the number of anaesthesias, the post-ERCP waiting time, and the patient's pain and anxiety while waiting for cholecystectomy [19].

Numerous risk factors were identified in this study, but only the presence of a thin VBP is statistically significant in terms of complications, and the presence of a diverticular papilla is a statistically significant factor in failure. Indeed, the study of subgroups of patients with and without technical difficulties showed that the presence of a thin VBP is associated with the highest complication rate (23.5%) and a high failure rate (11.8%), and that diverticular papilla has the highest failure rate (33.3%). The study conducted by Sabbah et al. [25] also investigated these predictive factors and found that age over 65 years OR 0.516 [0.272- 0.979], intra-diverticular papilla OR 0.179 [0.035-0.914], a common bile duct diameter greater than 15 mm OR 0.161 [0.068-0.385] and common bile duct stenosis OR 0.068 [0.008- 0.605]. It is therefore important to be aware of these predictors of difficulty and to carefully assess the indications in order to prevent risks and complications, while keeping the patient informed.

Our study reported zero mortality. Several other studies have shown that mortality after endoscopic sphincterotomy is rare, ranging from 0.2 to 2.3% [26].

### Limitations of single-stage anaesthesia management

Despite the advantages of performing endoscopic sphincterotomy concomitantly with cholecystectomy, there are certain limitations to this procedure, including the severity of the clinical picture (acute pancreatitis, severe acute cholangitis or sepsis), the need for a long learning curve and a certain degree of expertise to make the right indication and overcome difficulties [10], and the difficulty of ensuring the immediate availability of an endoscopist and endoscopy staff if stones are unexpectedly discovered during cholangiography, hence the importance of accurately detecting the possibility of gallbladder stones and PBC and preparing for the dual procedure before scheduling the operating theatre.

### Conclusion

The concomitant approach is 95% effective. Morbidity and mortality rates are low, as is the length of hospital stay. It reduces the number of general anaesthetics and hospital costs, thereby contributing to early rehabilitation and healthcare savings. The limitations of this technique, complications and failures, even at low rates, are linked to high-risk patients. The risks identified are the presence of a thin VBP, choledochal stone formation, stones lodged in the lower choledochal duct, diverticular papilla or pediculitis. Therefore, close collaboration between trained surgeons and interventional endoscopists allows high-risk cases to be selected and patients to be advised accordingly. This highlights the value of offering patients with cholecysto-choledocholithiasis the option of a single session from the outset. No deaths were recorded in this group, despite the patients' comorbidities and risk factors, demonstrating the success of the treatment in this series.

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