Advanced Research in Gastroenterology & Hepatology
ISSN: 2472-6400

Research Article
Volume 19 Issue 4 - May 2023
DOI: 10.19080/ARGH.2023.19.556018

Adv Res Gastroentero Hepatol

Management of Common Bile Duct Stones and Factors Influencing their Removal

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Submission: May 3, 2023; **Published:** May 18, 2023

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Abstrcat

Aim: The aim is to evaluate the results of endoscopic drainage for biliary lithiasis in terms of stone removal, improvement of morbi-mortality in our department and to assess the risk factors associated with failure of primary clearance of common bile duct.

Materials and methods: This are a retrospective descriptive and analytical study conducted over a period of 20 years between April 2002 and April 2022 on 1080 patients who underwent ERCP for bile duct stones

Results: The initial success rate of bile duct clearance was 77.4%, it had risen to 91.2% as the overall success rate after additional maneuvers. Factors associated with statistically significant decrease in the success of primary bile duct clearance were age (p =0,04), cholangitis (p<0,001), biliary endoscopic sphincterotomy (p =0,009), main bile duct stenosis (p<0,001), presence of large stones (p= 0,001) and main bile duct diameter (p<0.001).

Conclusion: Our study showed that the overall success rate of major bile duct clearance is 91.2%, this rate was influenced by the presence of associated factors.

Keywords: Common bile duct stones; ERCP; Sphincterotomy; Gallstones

Introduction

Common bile duct lithiasis is a frequent phenomenon, mainly in patients with gallstones which are a major public health problem, affecting up to 20% of the population [1]. Nowadays the treatment of primary gallstones involves endoscopic biliary catheterization as the first line of treatment. Endoscopic retrograde cholangio-pancreatography (ERCP) is an invasive, non-surgical technique for opacifying the biliary-pancreatic duct through a direct approach to the ampulla of Vater. Described by McCune for the first time in 1968, it is said to be retrograde because it is performed against the flow of the bile [2]. According to Croizet, despite the development of ultrasound and CT, ERCP is the reference technique used for the exploration and diagnosis of biliopancreatic diseases [3]. Its diagnostic value has been challenged by the improvement of less invasive imaging techniques (MRI, CT, echo-endoscopy [4]. Its place has become almost exclusively therapeutic. Improved techniques and equipment have allowed even the most difficult gallstones to be removed [5,6]. However, a significant risk (6-15%) of adverse events associated with ERCP treatment of gallstones has also been found [7,8]. The aim of this study is to evaluate the results of endoscopic drainage in cases of gallstones in terms of stone removal and improvement in morbidity and mortality, and to assess the risk factors associated with failure of primary clearance of common bile duct.

Material and Methods

Presentation of the study

This is a retrospective descriptive and analytical study conducted over a period of 20 years between April 2002 and April 2022, involving patients who underwent ERCP for bile duct stones. We analyzed the epidemiological data of the patients, the results of the ERCP, as well as the morbidity and mortality after endoscopic biliary sphincterotomy.

Patients

1080 patients were admitted for common bile duct stones (CBDS). The positive diagnosis was established by abdominal ultrasound and/or abdominal CT and/or Bili-MRI. Simple CBDS was defined as the presence of one or two or more (>3 stones) non-obstructive stones. A large stone was defined as an obstructive stone measuring more than 15mm on cholangiography. Ill patients

underwent therapeutic ERCP with stone removal either after the first attempt or after use of additional maneuvers or after patient recovery. All patients included in the study had a pre-anesthetic consultation. They were hospitalized at least the day before the endoscopic examination. They received a complete clinical examination and a biological check-up, mainly the hemostasis test. They were informed about the course of the examination, and all gave their consent for the procedure. The procedure was performed in fasting patients, under general anesthesia in dorsal or lateral decubitus position.

Inclusion criteria

a) Patients over 18 years of age

b) With simple or complicated CBDS (acute pancreatitis and/or acute cholangitis).

Exclusion criteria

I. Patients with non-lithiasis biliary pathology (tumor or malignant stenosis)

II. Patients with a contraindication to endoscopic biliary sphincterotomy (hemostasis disorder for example)

Data collection

For each patient who underwent ERCP during this study period, a medical file was filled out in which the following parameters were collected and studied: age, sex, reason for consultation, medical and surgical history, radiological assessment before ERCP, indication for ERCP, evolution and possible occurrence of complications. And an operative report filled in by the operator explaining the different stages of the endoscopic procedure.

Statistical analysis

For the statistical study, we reported all the data on the SPSS software version 21.0. Initially, we carried out a descriptive analysis of the collected data, including the different variables studied. An analytical study with uni and multivariate analysis of the factors associated with failure of primary clearance of common bile duct was performed using logistic regression. A p-value <0.05 was considered statistically significant.

Results

Clinical features (Table 1)

Success rates and additional maneuvers (Table 2)

Factors influencing the success of primary clearance of the common bile duct (Table 3)

Table 1: Clinical features

Characteristics		N=1080
Age (Years)[b]		**59,09±14,34**
Sex[a]	Male	641 (59,4)
	Female	437 (40,5)
Surgical history[a]	None	651 (60,4)
	Cholecystectomy	354 (32,9)
	Surgery of common bile duct	3 (0,3)
	Gastroduodenal surgery	5 (0,5)
	Endoscopic sphincterotomy	64 (5,9)
Indications for ERCP[a]	Simple CBDS	773 (71,5)
	Acute pancreatitis	100 (9,3)
	Acute cholangitis	207 (19,2)
Periampullary diverticulum[a]		98 (9,1)
Endoscopic sphincterotomy[a]		1041(96,5)
Cholangiography findings	Stenosis of common bile duct a	75 (7,0)
	Large stones a	153 (14,2)
	Diameter of common bile duct b	13,34 ± 4,32

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Complications[a]	None	1015(94,1)
	Bleeding	51(4,7)
	Acute pancreatitis	8(0,7)
	Perforation	1(0,1)
	Infection	2(0,2)
	Impacted Dormia	2(0,2)

[a]expressed as number (percentage)

[b]expressed as mean ± standard deviation

Table 2: Primary vacuity of the BPV and after additional maneuvers.

Characteristics		N= 1077
Primary clearance of common bile duct[a]		835 (77,4)
Additional maneuvers[a]	None	856(79,5)
	Endoscopic nasobiliary drainage	81(7,5)
	Extension of previous endoscopic sphincterotomy	30(2,8)
	Endoscopic papillary large-balloon dilation	43(4)
	Mechanical lithotripsy	23(2,1)
	Extracorporeal shock wave lithotripsy	2(0,2)
	Biliary stent	42(3,9)
Secondary clearance of common bile duct[a]		965(91,2)

[a]expressed as number (percentage)

Table 3: Factors influencing the primary vacuity of the PVB.

Factors OR		Univariate Analysis			Multivariate Analysis		
		IC à 95%	p Value	OR	IC à 95%	p Value	
Age		0,971	0,960 - 0,982	<0,001	0,987	0,974 - 1,000	0,044
Sex		0,786	0,591 - 1,045	0,098			
Surgical history	Cholecystectomy	0,919	0,495 – 1,707	0,789			
	Surgery of common bile duct	0,592	0,308 – 1,139	0,116			
	Gastroduodenal surgery	0,000	0,000	0,999			
	Endoscopic sphincterotomy	0,000	0,000	0,999			
Acute pancreatitis		1,276	0,757 – 2,148	0,360			
Acute cholangitis		0,386	0,278 – 0,537	<0,001	0,470	0,319 – 0,692	<0,001
Periampullary diverticulum		0,749	0,469 – 1,196	0,226			
Endoscopic sphincterotomy		3,845	1,990 – 7,428	<0,001	3,263	1,337 – 7,968	0,009

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Stenosis of common bile duct	0,282	0,175 – 0,455	<0,001	0,329	0,181 – 0,600	<0,001
Large stone	0,274	0,192 – 0,393	<0,001	0,490	0,315 – 0,760	0,001
Diameter of common bile duct	0,831	0,799 – 0,863	<0,001	0,870	0,832 – 0,910	<0,001

After univariate analysis, only age, acute cholangitis, endoscopic sphincterotomy, stenosis of common bile duct, presence of large stones and diameter of common bile duct seem to be statistically significantly associated with the success of the primary clearance of the common bile duct (threshold of significance retained: p value < 0.05). After multivariate analysis, the factors influencing the success of the primary clearance of the common bile duct in a statistically significant way were age (p =0.04), acute cholangitis (p<0.001), SBE (p =0.009), PVB stenosis (p<0.001), presence of large stones (p= 0.001) and the diameter of the common bile duct (p<0.001).

Discussion

Gallstones are a major health problem, affecting up to 20% of the population. Gallstones are the most common gastrointestinal disease requiring hospitalization [1]. The multidisciplinary management of patients with gallstones has progressed considerably in recent decades due to a growing interest in pathophysiological mechanisms and remarkable technical developments in endoscopic and surgical procedures. Lithiasis of the common bile duct is a frequent phenomenon in patients with gallstones (prevalence 3%-16% of cases). Considered a benign disease, they are most often asymptomatic, in some cases they cause biliary pain. However, acute cholangitis and pancreatitis can be seen in up to 25% of cases and represent the main complication of common bile duct stones [9-15]. Treatment has undergone multiple changes since the advent of ERCP and endoscopic sphincterotomy. One of the elements in deciding on the appropriate treatment is the time of diagnosis (before, during, or after cholecystectomy) and local expertise [16,17].

Currently, preoperative ERCP and laparoscopic cholecystectomy are the recommended treatment strategies in the management of patients with concurrent gallbladder and main bile duct stones, although there is evidence to suggest that intraoperative ERCP results in a lower incidence of post-ERCP pancreatitis and a shorter duration of hospitalization, and is cost-effective compared with separating the procedures [15,18,19]. In recent decades, surgical experience in open exploration of the common bile duct has decreased considerably and the number of surgeons experienced in laparoscopic exploration of the bile duct is limited. As a result, endoscopic stone removal is currently preferred in most countries. However, the ideal time to perform sphincterotomy remains controversial. Two studies indicate a lower number of endoscopic procedures and shorter hospital stay, with no increase in morbidity with initial cholecystectomy (and postoperative ERCP) compared to initial endoscopic assessment of the common bile duct followed by subsequent cholecystectomy [20,21]. In the most recent studies, patients with an established gallbladder were the predominant candidates for endoscopic treatment of gallbladder disease, as shown in the study by Ando & Mayedo et al. [22,23] and in our series, which constituted 74.8%, 71.6% and 67.1% respectively.

In 4% to 8% of patients with gallbladder stones, the stones migrate into the main bile duct causing acute pancreatitis when they pass into the duodenum or act on the sphincter of Oddi [24,25]. In our series, 9.3% of patients had acute pancreatitis. Cholangitis can be mild to moderate and usually responds to antibiotics. However, 15-30% have severe disease requiring urgent extraction [26]. In our study, 19.2% of patients had cholangitis. The Tokyo guidelines revised in 2013, [26] and confirmed by the 2018 revision [27], have made it possible to classify acute cholangitis as severe, moderate or mild. The results of endoscopic treatment for acute cholangitis following gallstone migration were superior to surgical treatment in retrospective studies and in prospective randomized studies [24,28]. In addition, a non-randomized study comparing percutaneous transhepatic biliary drainagé with ERCP in elderly patients with cholangitis showed that mortality and morbidity were significantly reduced with endoscopic drainage [25].

Twelve retrospective studies (18,206 patients) analyzed the relationship between the timing of biliary drainage and different outcomes. An international study, of 260 patients with septic shock, found that waiting more than 12 hours between the onset of shock and successful biliary drainage was associated with higher in-hospital mortality (OR 3.4, 95%CI 1.12 - 10.31) [29]. Overall, in-hospital mortality was 37% and the median time to biliary drainage was 12 hours, with 10% of patients being drained after 48 hours [29]. In our study, the initial success rate for the clearance of the common bile duct was 77.4%, which rise to 91.2% as the overall success rate after additional maneuvers, which is close to the results found in the literature, where the success rate varied from 79% to 96% [30-35]. Multivariate analysis of the factors influencing the success rate in our series showed that the presence of large stones (i.e., the size of the stones) was a factor related to the common bile duct clearance in a statistically significant way (p=0.001). This result is in line with that of Kim et al. [20] (p= 0.002) and Lauri et al. [36] (p < 0.001). Other factors influencing successful sphincter clearance in our study were age (p=0.04), acute angiocholitis (p<0.001), endoscopic sphincterotomy

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(p=0.009), stenosis (p<0.001) and diameter (p<0.001) of common bile duct. The success rate of endoscopic sphincterotomy in our series was 96.5%, this rate varies in the literature from 86.1% to 100% [37-41]. Even if gallstones are not found, sphincterotomy performed during endoscopic decompression leads to a faster recovery and shorter hospital stay [42].

Conclusion

Common bile duct lithiasis is a frequent phenomenon mainly in patients with gallstones. Although they may spontaneously migrate into the small intestine in many cases, there is a significant risk of biliary pain and complications such as jaundice, acute cholangitis and pancreatitis. Therefore, it is established that symptomatic common bile duct lithiasis should be treated.

In recent decades, there has been an increasing role for endoscopic treatment of gallstones (sphincterotomy and stone removal). In our study, the overall success rate of common bile duct clearance was 91.2%, which was influenced by the presence of associated factors, namely age (p =0.04), acute angiocholitis (p <0.001), presence of large stones (p=0.001), SBE (p =0.009), stenosis (p <0.001) and diameter of common bile duct (p <0.001). Morbidity in our series was estimated at 5.9% with a zero-mortality rate.

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DOI: 10.19080/ARGH.2023.19.556018

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