Original article

The efficacy of limited endoscopic sphincterotomy plus endoscopic papillary balloon dilation for removal of common bile duct stones in elderly patients

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Received: 28/06/2025; **Accepted:** 14/03/2026; **Published:** 30/04/2026

DOI: 10.34071/jmp.2026.2.771

Abstract

Background: Bile duct stones are prevalent in tropical regions, including Vietnam, and can lead to serious complications such as cholangitis, septic shock, and mortality. The treatment of common bile duct (CBD) stones through endoscopic retrograde cholangiopancreatography (ERCP) has significantly enhanced the management of bile duct stones, resulting in reduced complications and facilitating quicker recovery, particularly in elderly patients.

Methods: This study is a cross-sectional descriptive analysis involving follow-up on 34 patients (≥ 60 years) diagnosed with common bile duct (CBD) stones who underwent ERCP.

Results: The stone clearance rate was 97.1%. Larger stones (≥ 20mm) had a lower success rate than smaller stones. The overall complication rate was 8.8%, with the most common being self-limiting bleeding after Oddi sphincterotomy. The average hospital stay after ERCP was 5.53 ± 3.33 days.

Conclusion: Limited endoscopic sphincterotomy plus endoscopic papillary balloon dilation during ERCP is a minimally invasive, effective, and safe technique for elderly patients with CBD stones.

Keywords: *Endoscopic retrograde cholangiopancreatography, Endoscopic papillary balloon dilation, Elderly patients.*

1. INTRODUCTION

Common bile duct (CBD) stones are a relatively common condition that can cause serious complications, particularly in elderly patients. Modern medicine always aims for minimally invasive techniques with high success rates. ERCP is the preferred approach in cases of CBD stones, especially when there are no accompanying intrahepatic or gallbladder stones, due to its convenient access, high treatment efficacy, and low complication rates [1].

ERCP remains the most advanced technique for managing CBD stones, offering high success rates with minimal complications. The approach of limited endoscopic sphincterotomy (EST) combined with endoscopic papillary balloon dilation (EPBD) has demonstrated the ability to preserve the function of the sphincter of Oddi while facilitating the removal of large and difficult CBD stones with minimal complications [2], [3]. This technique is particularly advantageous for elderly patients, as well as those with severe chronic illnesses or coagulopathy, where the preservation of sphincter function and reduction of procedural risks are paramount [2].

For these reasons, we conducted this study to evaluate the effectiveness and safety of limited endoscopic sphincterotomy combined with endoscopic papillary balloon dilation in the treatment of common bile duct stones in elderly patients.

2. SUBJECTS AND METHODS

2.1. Study subjects:

- Patients over 60 years old are diagnosed with common bile duct stones based on:

+ Clinical symptoms related to common bile duct stones: Biliary colic/ Right upper quadrant pain, jaundice, biliary tract infection.

+ Laboratory findings: elevated liver enzymes, bilirubin,

+ Imaging: transabdominal ultrasound, CT-Scan, or Endoscopic ultrasound showing common bile duct stones or biliary dilation.

- ERCP for common bile duct stone removal is indicated.

2.2. Study Time and Location

- Time from April 2021 to July 2024.

- Location: Gastroenterology and Endoscopy Center of Hue University of Medicine and Pharmacy Hospital.

2.3. Research Methodology

- Study Design: A descriptive cross-sectional

study with follow-up

- Sampling Method: convenient sampling.

- Technical success: all stones removed via endoscopy.

- Acute pancreatitis: based on the Revised Atlanta Classification.

2.4. Data Analysis Method

- Data were processed using medical statistical methods with SPSS 22.0 software.

- Differences in proportions were compared using the $\chi 2$ test.

2.5. Ethical consideration

- The research topic was approved by the Ethics Committee of the University of Medicine and Pharmacy, Hue University, and the Board of Directors of the University of Medicine and Pharmacy Hospital, Hue. The benefits and risks of the procedure were clearly explained to the patients. The patients agreed to participate in the study. The research did not harm the health or treatment of the patients. The information and data of the research participants were kept confidential.

3. RESULTS

3.1. General characteristics of the study patients

Table 1. General characteristics of the study population (N=34)

General characteristics		N	%
Gender	Male	16	47.1
	Female	18	52.9
Age group	60 - 69	10	29.4
	70 - 79	12	35.3
	≥ 80	12	35.3
Average age		75.03 ± 10.45	

The majority of the patients were aged ≥80, and most were female.

3.2. Characteristics of the common bile duct stones

Table 2. Characteristics of CBD stones on cholangiopancreatography

Characteristics of CBD stones		N	%
Stone size (N = 34)	< 10 mm	24	70.6
	11 - 15 mm	7	20.6
	16 - 20 mm	2	5.9
	> 20 mm	1	2.9
Number of stones (N = 34)	Sludge	2	5.9
	1 stone	16	47.1
	2 stones	6	17.6
	≥ 3 stones	10	29.4

Most cases had a single stone, and the majority of the stones were smaller than 20mm.

3.3. Effectiveness of ERCP in the treatment of common bile duct stones in elderly patients

Table 3. Effectiveness of CBD stone removal via ERCP

Results of CBD stone removal		N	%
Success rate after the first attempt		33	97.1
Access to the bile duct	Successful	34	100
	Unsuccessful	0	0
Stone removal effectiveness	Complete removal	33	97.1
	Incomplete removal	1	2.9

Cause of incomplete removal	Large stone	1	2.9
	Diverticulum	0	0
	Distal CBD stricture	0	0
Management	Stent placement	1	2.9
	Second intervention	0	0
	Other methods	1	2.9
	No intervention	0	0
Overall success rate		33	97.1

The success rate for complete stone removal and overall success rate was 97.1%.

3.4. Safety of ERCP in the treatment of common bile duct stones in elderly patients

Table 4. Complications of ERCP

	Complications	**N**	**%**
Early complications	Bleeding		
	- Self-limited bleeding	2	5.8
	- Hemostatic injection	1	2.9
	- Coagulation	1	2.9
	Perforation	0	0
Complications after 24-48h	Acute pancreatitis	2	5.8
	Bleeding	0	0
	Infection	1	2.9
	Perforation	0	0
Overall complication rate		8.8%	

The overall complication rate during and after the procedure was 8.8%.

3.5. Stay in the hospital after the procedure

Table 5. Stay in the hospital after the procedure

		Hospital stay duration	**N**	**%**	**p**
ASA classification	I, II	5.24 ± 3.87	21	61.8	> 0.05
	III	6 ± 2.27	13	38.2	
Complications during stone removal	Yes	6.4 ± 3.13	3	8.8	> 0.05
	No	5.38 ± 3.40	31	91.2	
Total		5.53 ± 3.33	34	100	

There was no statistically significant difference in hospital stay between patients with or without complications.

4. DISCUSSION

4.1. General characteristics of the study population

In our study, the mean age of the patients was 75.32 ± 10.15 years, which is comparable to the findings of Duong Xuan Nhuong (73 ± 8) [4] and Kuo C.M. (73.5) [2]. The gender distribution was also consistent with previous studies, with the majority of patients being female. In addition to advanced age, comorbidities presented significant risks for medical interventions in general, and ERCP procedures specifically.

4.2. Outcomes of CBD stone treatment

4.2.1. Characteristics of CBD stones

In our study, the majority of stones were ≤ 20 mm in size (97.1%), a result comparable to that of Duong Xuan Nhuong's study (86.8%) [4]. Regarding the number of CBD stones, most patients had a single stone (47.1%), consistent with the findings of Mohammed H.I. (47%) [3], Kuo C.M. (48.3%) [2], Duong Xuan Nhuong (52.9%) [4] and Guo S.B. (53.12%) [5].

4.2.2. Success rate

Among the 34 cases treated with limited endoscopic sphincterotomy (EST) combined with endoscopic papillary balloon dilation (EPBD) via ERCP, 33 cases (97.1%) achieved complete stone clearance in the initial intervention. Access to the bile duct was successful in all cases on the first attempt (100%). These success rates align with the results of studies by Kuo C.M. (98.3%) [2], Mohammed H.I. (94%/100% bile duct access) [3], and Yu T. (95%) [6]. In the one case where complete stone clearance was not achieved, the cause was a large stone, and the patient was managed with stent placement, awaiting a second intervention or alternative treatment. The overall success rate was 97.1%, comparable to the findings of Mohammed H.I. (94%) [3] and Yu T. (95%) [6]. The incidence of difficult stones in our study was 8.8%, lower than the 10-15% commonly reported in the literature [1].

4.2.3. Factors affecting success rate

The mean age in our study was 75.32 ± 10.15 years, with 35.3% of patients aged over 80. Elderly patients often present with multiple comorbidities and compromised health, complicating interventions. Prolonged procedures are not recommended in this population due to an increased risk of complications and mortality compared to younger patients [7]. The incidence of periampullary diverticula in our study was 41.2%, which can distort bile duct anatomy, complicating access and preventing wider sphincterotomy due to the risk of perforation [8]. In such cases, we performed limited EST with EPBD, removed part of the stone, placed a stent, and scheduled a second intervention after three months. No cases of perforation were recorded, highlighting the advantages of this approach.

4.3. Complications of ERCP

The complication rate of limited EST combined with EPBD for CBD stone removal reportedly ranges from 3% to 46%, with an average of approximately 10.9% and post-ERCP bleeding rate is reported to range from 0.6% to 38%, with an average of 5.5% [1]. In our study, the overall complication rate was 8.8%, which is slightly lower than other studies. Immediate bleeding 4 patients (11.6%): 2 cases were self-limiting, 1 required adrenaline injection, and 1 required coagulation. One patient (2.9%) had significant bleeding, controlled by coagulation, which is consistent with the rates reported by Kuo C.M. (2%) [6] and Mohammed H.I. (2%) [3]. The mild and self-limiting nature of most bleeding cases was likely due to the appropriate selection of balloon size relative to CBD diameter, underscoring the importance of choosing the correct balloon size [1]. No cases of severe bleeding requiring further intervention were observed, which aligns with Kuo C.M.'s study [2] and is notably lower than the rates reported for wide EST by Guo S.B. (5.6%) [5] and Mohammed H.I. (6%) [3]. These findings demonstrate that limited EST combined with EPBD is a safe procedure for elderly patients, including those with coagulopathies or end-stage chronic diseases such as cirrhosis and chronic kidney disease. The incidence of post-ERCP pancreatitis (PEP) is reported to range from 1% to 8%, with an average of 2.6% [1]. In our study, 34 patients used NAISD for the prophylaxis of acute pancreatitis following ERCP. We had 2 patients developed PEP (5.8%), and 4 patients showed signs of pancreatic irritation (11.8%), which is comparable to the results of Kuo C.M. (4.7% PEP/10.9% pancreatic irritation) [2] and Yu T. (5.5% PEP) [6]. Limited EST reduces the force exerted on the main pancreatic duct during EPBD, potentially lowering the risk of PEP. In our study, the PEP cases had a history of pancreatitis, and most cases of pancreatic irritation resolved with supportive care following the procedure. The incidence of post-ERCP biliary infection in our study was 2.9%, compared to 1% in Kuo C.M.'s study. This infection was present prior to the procedure and was treated aggressively thereafter. Wide sphincterotomy is associated with a higher risk of bacterial reflux into the bile duct, but limited EST with EPBD optimizes large stone removal while preserving sphincter function [2]. According to Zhang's study, 15mm - EPLBD combined with limited EST reduced the procedure time, reduced the rate of PEP, and without increase the rate of long-term biliary tract infection compared with limited EST with 12mm – EPLBD [9].

4.4. Stay in the hospital after ERCP and patient condition upon discharge

The average hospital stay in our study was 5.53 ± 3.33 days. Compared to laparoscopic surgery for CBD stone removal, ERCP resulted in a shorter hospital stay, which is a key advantage of this method, offering faster recovery, lower complication rates, and higher success rates. However, the duration of hospitalization in our study was slightly longer than that reported by Duong Xuan Nhuong (3.9 ± 2.6 days) [4], possibly due to the smaller sample size in our study.

5. CONCLUSION

Limited endoscopic sphincterotomy combined

with endoscopic papillary balloon dilation during ERCP is a minimally invasive, effective, and quite safe technique for elderly patients with common bile duct stones.

Conflict of Interest Statement: All conflicts of interest have been fully disclosed; otherwise, we declare no conflicts of interest.

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