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ERCP outcomes in an aging population: single-center observations

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ABSTRACT

Aims: Endoscopic retrograde cholangiopancreatography (ERCP) is a critical procedure for diagnosing and treating biliary and pancreatic disorders, particularly in elderly populations where these conditions are prevalent. This study aims to evaluate the outcomes and complications of ERCP in an elderly cohort at a single center.

Methods: This retrospective study included 169 patients who underwent ERCP, with a mean age of 66 years (range 19-92). The majority were female (51.5%). Indications, procedural success rates, and complications were analyzed, with a focus on the presence of periampullary diverticula and previous sphincterotomies.

Results: The overall procedural success rate was 85.8%. The most common indication was cholangitis (63.9%), followed by biliary pancreatitis (15.4%) and asymptomatic choledocholithiasis (11.2%). Periampullary diverticula were present in 16.3% of patients, predominantly among older individuals. Difficult cannulation occurred in 20% of cases, with successful biliary cannulation achieved using various techniques. Stones were found in the common bile duct in 95% of patients and were successfully cleared in the same percentage. The overall complication rate was 13.8%, with bleeding (9.5%), pancreatitis (1.8%), and perforation (0.6%) being the most common. Complication rates were not significantly associated with age, gender, or the presence of diverticula, but were lower in patients with prior sphincterotomies.

Conclusion: ERCP is effective in managing biliary and pancreatic diseases in elderly patients, with a high success rate and manageable complication profile. Prior sphincterotomy significantly reduces the risk of complications. These findings underscore the importance of experienced endoscopists and tailored approaches for elderly patients undergoing ERCP.

Keywords: ERCP, elderly, cholangitis, biliary pancreatitis, periampullary diverticulum, sphincterotomy, complications

INTRODUCTION

Since its 1968 inception, endoscopic retrograde cholangiopancreatography (ERCP) has become crucial for treating biliary and pancreatic disorders. Initially a diagnostic tool, therapeutic ERCP began in 1974. Demand has grown, particularly for therapeutic procedures, driven by advances in gastrointestinal imaging and the procedure's minimally invasive nature. Improved outcomes in life-threatening conditions and higher survival rates in cancers like cholangiocarcinoma also fuel this trend.[1]

ERCP uses endoscopy to locate major and minor papillae, perform cannulation, and administer contrast material to visualize biliary and pancreatic ducts. It enables diagnostic procedures like cholangiopancreatoscopy, biopsy, and brush cytology, with optional intraductal ultrasonography. Therapeutic applications include sphincterotomy, stent insertion, and stone extraction. Common complications include post-ERCP pancreatitis (PEP), hemorrhage, cholangitis, cholecystitis, and sphincterotomy-related perforations, with mortality rates around 0.3%. Additional risks involve cardiovascular events, analgesia-related incidents, and various anatomical complications such as emphysema, pneumothorax, hepatic hematoma, air embolism, splenic injury, post-sphincterotomy restenosis, duodenal obstruction, and catheter entrapment during stone extraction.[2]

In comparison to younger patients, elderly patients have a significantly higher number of comorbid conditions. When comparing the clinical outcomes and safety of ERCP in geriatric patients to those of younger age, the results are inconsistent. The general opinion is that the ERCP procedure is as safe in older patients as it is in younger ones. Even in systematic review, it is calculated that PEP is more common in younger patients because of the increased sensitivity of the pancreas to trauma at a younger age.[3]

We conducted a study to present the outcomes of ERCP procedures performed predominantly in elderly patients due to the location of the center in a city where the average age of the general population is higher than in other cities in Turkiye."

METHODS

One hundred sixty-nine patients admitted to Kastamonu Training and Research Hospital and underwent ERCP

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(endoscopic retrograde colangiopancreatography) procedures between September 10, 2022, and September 30, 2023, were included in the study. Patient files were analyzed retrospectively. This study was performed per the principles of the Declaration of Helsinki. Ethics committee approval for the study was obtained from Kastamonu Training and Research Hospital Clinical Researches Ethics Committee (Date: 01.11.2023, Decision No: 2023-KAEK-96). Written informed consent was obtained from each participant in the study for participation in the study. The demographic characteristics of the patients, details of the ERCP procedure (including the presence of previous sphincterotomy, presence of duodenal diverticula, cannulation rate, difficult cannulation rate, methods used to achieve cannulation in difficult cases, complete stone removal rate, and biliary and pancreatic stent placement rate), indications for the ERCP procedure, complication rates and types, management methods and their success rates for complications, morbidity, and mortality were recorded, ensuring the anonymity of the patients.

ERCP Procedure

All procedures were conducted with the use of anesthesia, utilizing a combination of propofol, midazolam, and ketamine. During the procedure, patients were carefully observed while positioned semi-prone and provided with nasal oxygen at a rate of 2 L/min. ERCP procedures were done with a standard duodenoscope (FUJIFILM, ED-530XT) and fluoroscopy X-Ray machine (Brivo OEC Essential).

Statistical Analysis

The data collected in the study were analyzed using the Statistical Package for Social Science for Windows 26 software program. Categorical variables were quantified using numerical values (n) and percentages. The chi-square test (and/or Fisher's exact test) was employed for statistical analysis. Numerical variables were presented as either the mean plus or minus the standard deviation, the median with the range (minimum to maximum), or as percentages, depending on the normality of the data distribution. The comparison of means between two independent groups was analyzed using either the student's T test or the Mann-Whitney U test.

Multivariate logistic regression analysis was used to establish which predictor variables were significantly related to the post-ERCP complications. Odds ratio (OR) with corresponding 95% confidence intervals (95% CIs) were reported. A threshold level of <0.05 was considered for statistical significance in all obtained results.

RESULTS

A total of 169 patients were included in the study. The mean age was 66, ranging from 19 to 92 years. Of the patients, 51.5% (n=87) were female. The procedures were successful in 85.8% (n=145) of the cases. Twenty-six percent of the cases had a prior sphincterotomy (**Table 1**). The most common indication for ERCP was cholangitis, accounting for 63.9%. Other indications included biliary pancreatitis (15.4%), asymptomatic choledocholithiasis (11.2%), malignancy (4.1%), postoperative bile leak (3%), stent removal (1.8%), and hydatid cyst (0.6%) (**Figure 1**). Periampullary diverticulum was present in 16.3% (n=27) of the patients. The ampulla orifice was located at the edge of the diverticulum in 69.2% of cases, in the center of the diverticulum in 26.9%, and outside the diverticulum in 3.8%. An analysis of the characteristics of patients with diverticula revealed that they were of advanced age, with mean ages of 77 years (p=0.000) (**Table 2**). Furthermore, the prevalence of prior sphincterotomy was significantly higher among patients without diverticula (4.3% vs. 20.7%; p=0.017)."Considering all cases, 20% were observed to have difficult cannulation. Biliary cannulation was successfully achieved in ten cases within the difficult cannulation group, utilizing various methods. For cannulation, short and long position maneuvers were performed in three patients, double-guidewire technique in three patients, precut sphincterotomy or precut sphincterotomy over a pancreatic stent in three patients, and septotomy with a normal sphincterotome in one patient. Stones were detected in the common bile duct in 95% of the patients. Stones were cleared in 95% of these patients. In 5% of the patients, large stones could not be removed, and biliary drainage was achieved with a biliary stent, directing them to a second session or a different center. At the end of the procedure, biliary stents were placed in 56% of the patients for various reasons (presence of gallbladder stones, residual stones, bile leak, continued drainage of purulent bile, compression for bleeding, etc.). Pancreatic stents were placed in 6.8% (n=10) of the patients due to repeated Wirsung cannulations. No mortality or morbidity was observed in any of the patients. The overall complication rate was 13.8%. Bleeding occurred in 9.5% (n=16), pancreatitis in 1.8% (n=3), and type 2 perforation in 0.6% (n=1) (**Figure 2**). Eighty percent of these complications were detected and managed perioperatively, while 20% were observed and managed postoperatively. The type 2 perforation case was diagnosed by computed tomography and managed with the placement of a fully covered metal stent at the 14th hour after ERCP (**Figure 3**). All cases of pancreatitis were mild and resolved with conservative treatment. Bleeding was controlled with adrenaline alone in 25% of cases, adrenaline and balloon tamponade in 18%, adrenaline and biliary stent placement with tamponade in 50%, and temporary metal stent placement in 0.6%. The complication rate was independent of gender (female: 45%; male: 55%; p=0.4) and age (p=0.8). We classified patients into two groups based on age: elderly (age ≥65) and non-elderly (age <65). In comparing the epidemiological data and ERCP procedure outcomes, the presence of periampullary diverticulum was significantly higher in the elderly group (22.9% vs. 3.5%; p=0.001) (**Table 3**). Subsequently, complications were examined. **Table 4** illustrates the relationship between potential associated factors and complications. The complication rates were similar between the elderly and non-elderly groups (65% vs. 35%; p=0.9). Additionally, the presence of a diverticulum (p=0.7; 13% with diverticulum, 16% without diverticulum) and difficult cannulation (p=0.1; 30% in difficult cannulation, 12.6% in normal cannulation) were not associated with complications, whereas the complication rate was significantly lower in patients with previous sphincterotomies (p=0.007; 18% without sphincterotomies, 2.3% with sphincterotomies) (**Table 3**). Logistic regression analysis revealed that the complication rate in naive papillae was 9.9 times higher (95% CI: 1.290-76.967) compared to those with previous sphincterotomies.

Table 1. Epidemiological data of patients undergoing ERCP

Parameters	
Age (mean, min-max)	66 (19-92)
Gender (female, %)	51.5
Cannulation rate (%)	85.8
Patients with previous sfincterotomy (%)	26
Difficult cannulation rate (%)	20
Periampullary diverticulum (%)	16.3
CBD stones rate (%)	95
Non-removable large biliary stones (%)	5
Biliary stent insertion rate (%)	56
Pancreatic stent insertion rate (%)	6.8
Complication rate (%)	13.8
Morbidity rate (%)	0
Mortality rate (%)	0

ERCP: Endoscopic retrograde cholangiopancreatography, min-max: Minimum-maximum; CBD: Common bile duct

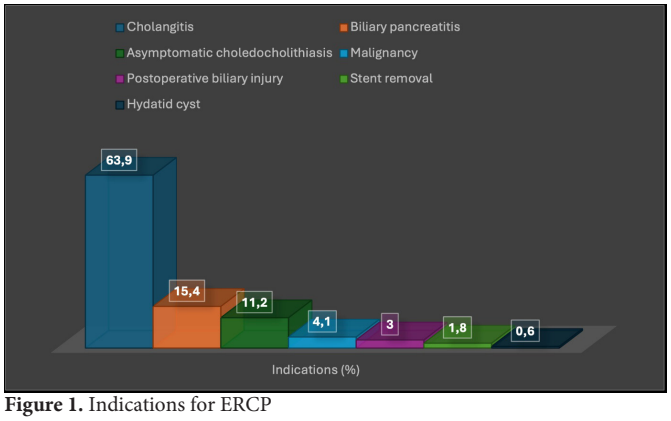

Figure 1. Indications for ERCP

ERCP: Endoscopic retrograde cholangiopancreatography

Table 2. Characteristics of patients with periampullary diverticulum

Parameters	PAD (+)	PAD (-)	p
Age	77	63	0.000
Gender (F/M) (%)	40.7/59.3	54/46	0.200
Cannulation rate (%)	86	88	0.72
Previous sphincterothomy (%)	7.4	29.5	0.017
Difficult canulation (%)	18.5	19.4	0.91
Biliary stent placement (%)	66.7	53.8	0.24
Pancreatik stent placement (%)	8	6.6	0.80

PAD (+): Periampullary diverticulum presence, PAD (-): Periampullary diverticulum absence, F/M: Female/male

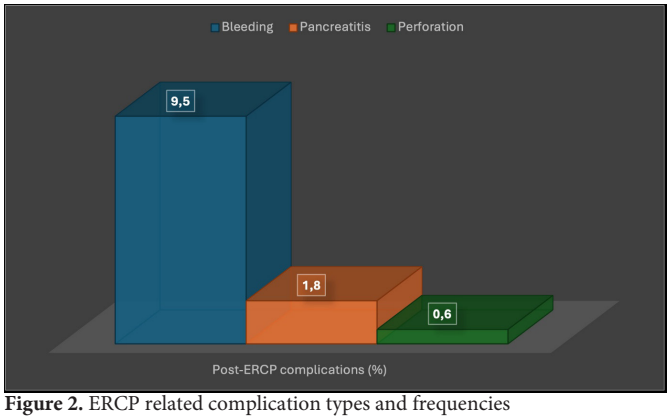

Figure 2. ERCP related complication types and frequencies

ERCP: Endoscopic retrograde cholangiopancreatography

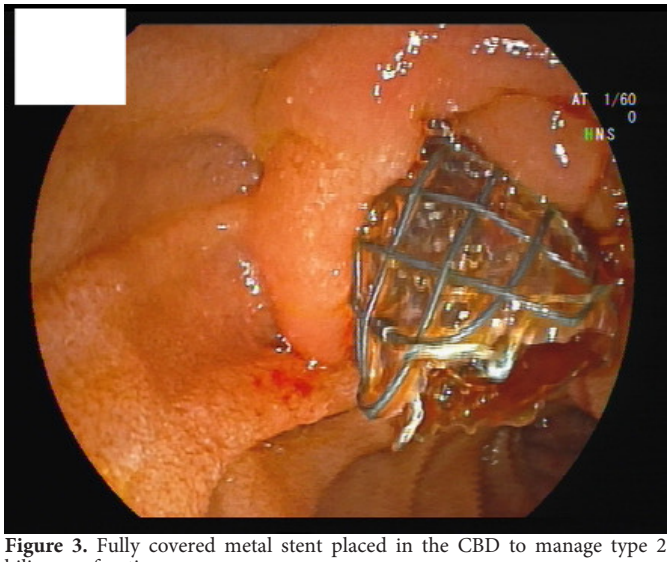

Figure 3. Fully covered metal stent placed in the CBD to manage type 2 biliary perforation

CBD: Common bile duct

Table 3. Comparison of elderly and non-elderly groups

Parameters	Elderly group (n=109)	Non-elderly group (n=60)	p
Gender (F/M) (%)	49.5/50.5	55/45	0.49
PAD presence (%)	22.9	3.5	0.001
Cannulation rate (%)	83.3	87.2	0.49
Previous sphincterothomy (%)	23.9	30	0.38
Difficult cannulation (%)	18.3	23.3	0.43
Biliary stent placement (%)	57.4	54	0.69
Pancreatik stent placement (%)	6.2	8	0.67

F/M: Female/male; PAD: Periampullary diverticulum

Table 4. Evaluation of conditions associated with post-ERCP complications

Parameters	Complication rate (%)		p
Age			0.8
Elderly (left) vs non-elderly (right) patients	13.7	14	0.9
Gender (F/M)	45	55	0.4
PAD presence (yes/no)	13	16	0.7
Difficult cannulation (yes/no)	30	12.6	0.1
Sphincterotomy presence (yes/no)	5	34	0.007

ERCP: Endoscopic retrograde cholangiopancreatography, F/M: Female/male; PAD: Periampullary diverticulum

DISCUSSION

One hundred and sixty-nine patients were included in the study. Cannulation success was achieved in 85.9 percent of the patient.

Deep cannulation of the targeted duct is a necessary step in ERCP to carry out procedures involving the pancreaticobiliary system. The success percentage of cannulation varies among different centers, ranging from 82.6% to 98%.[4] In a study conducted by Kıraç et al.,[5] involving 1155 patients who underwent an ERCP procedure, the success rate of biliary cannulation was 92%. Similarly, in a tertiary center showing their three years of experience with the ERCP procedure, data from 524 patients reveal a 96.6% success rate of biliary cannulation.[6] Prior to trainees being considered proficient in a

particular endoscopic skill, it has been proposed that technical success rates of 80% to 90% are necessary.[7] The success rate of the ERCP procedure at our center was nearing the lower limit. This was mainly because of the ERCP experience of the recently graduated endoscopist.

According to multiple studies, the primary indication for performing ERCP is the presence of common bile duct stones. These stones can present in various clinical scenarios, including choledocholithiasis, cholangitis, and biliary pancreatitis. In a study by Fidan et al.,[6] the primary indication was radiologically detected choledocholithiasis, accounting for 68.5% of cases. Similarly, in a tertiary referral ERCP center, where patients were referred due to failed cannulation, the predominant indication remained choledocholithiasis.[8] Demir et al.,[4] in their evaluation of ERCP success and complication rates relative to procedural difficulty, also identified choledocholithiasis as the leading cause for ERCP. However, in our patient cohort, the primary indication for ERCP was cholangitis, which contrasts with the existing literature. This discrepancy can be attributed to two factors: firstly, patients typically seek medical attention only when experiencing severe symptoms such as fever, chills, and severe abdominal pain. Secondly, a significant proportion of our patients are elderly and require caregiving, often resulting in delayed hospital presentation by their relatives.

A periampullary diverticulum (PAD) is a protrusion or herniation in the wall of the duodenum, specifically located around the main duodenal papilla.[9] The majority of periampullary diverticulum cases are asymptomatic and are often discovered accidentally during CT or ERCP procedures. Nevertheless, the sphincter of Oddi may become dysfunctional as a consequence of PAD, which leads to the reflux of pancreatic and intestinal fluid into the bile duct. In addition, it is worth noting that PAD has the potential to exert mechanical pressure on the distal part of the common bile duct. This can result in papillary spasm, which in turn can lead to the stagnation of bile and the development of common bile duct (CBD) stones.[10] PAD is uncommon in persons under the age of 40, but its prevalence increases with advancing age. Their prevalence ranges from 9% to 32%.[11] There is ongoing debate surrounding the impact of periampullary diverticulum on the success of cannulation and the occurrence of post ERCP complications such as bleeding, perforation, and pancreatitis. While some studies have highlighted the potential negative effects of cannulation and associated complications, other studies have found no significant differences in patients without periampullary diverticulum.[11-16] The presence of periampullary diverticulum in 16.3% of our patients is consistent with previous studies. Notably, the significant association between advanced age and periampullary diverticulum (mean ages of 63 vs. 77 years, p=0.000) underscores the importance of considering anatomical variations in older patients to mitigate procedural difficulties. However, as demonstrated in numerous studies, our own research also found no association between the presence of periampullary diverticulum and difficult cannulation or post-ERCP complications.

The complication rate of 13.8% observed in our study is within the expected range for ERCP procedures, which typically report complication rates between 4% and 16%.[17] The most common complication was bleeding (9.5%), followed by pancreatitis (1.8%) and perforation (0.6%). Our management strategies, including the use of adrenaline and balloon tamponade for bleeding control and conservative treatment for mild pancreatitis, are in line with standard ERCP complication management protocols.[18]

Interestingly, our analysis revealed that prior sphincterotomy was associated with a significantly lower complication rate (p=0.007). This finding is corroborated by study such as this by Holt et al.,[19] who reported that sphincterotomy reduces the risk of complications in subsequent ERCP procedures. The logistic regression analysis further supported this, indicating a 9.9 times higher complication rate in patients with naive papillae compared to those with previous sphincterotomies. This suggests that prior sphincterotomy may facilitate easier access and manipulation during ERCP, thereby reducing procedural risks.

The aging population is likewise experiencing a major increase in Turkiye, just like it does globally.[20,21] Simultaneously, the elderly population is more susceptible to diseases such as choledocholithiasis and malignancy, as well as the postoperative management of adverse events following biliary surgery. Hence, the prevalence of biliary and pancreatic diseases will persist to increase in tandem with the geriatric population.[22] Fortunately, numerous studies have demonstrated that age, by itself, is not a significant risk factor for difficult cannulation or adverse effects following ERCP. Therefore, ERCP is considered safe in the elderly population.[23-25] In our study, the rates of cannulation, difficult cannulation, and post-procedural complications were similar between the elderly and non-elderly groups (p=0.49; p=0.43; p=0.9, respectively). These findings are consistent with existing literature.

CONCLUSION

Our study underscores the feasibility and safety of ERCP in an elderly population, with outcomes comparable to those in younger cohorts. Prior sphincterotomy emerges as a significant factor in reducing complications, highlighting the need for careful pre-procedural planning. While advanced age and anatomical variations such as periampullary diverticulum pose challenges, they do not inherently increase the risk of complications when managed appropriately. Future studies should focus on further stratifying risk factors and developing tailored intervention strategies to optimize ERCP outcomes in elderly patients.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of Kastamonu Training and Research Hospital Clinical Researches Ethics Committee (Date: 01.11.2023, Decision No: 2023-KAEK-96).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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