



# Comparative Analysis of ERCP Results in Two Elderly Cohorts: Late Elderly and Super-Aged Patients

## İki Yaşlı Kohortta ERCP Sonuçlarının Karşılaştırmalı Analizi: Yaşlı ve Süper Yaşlı Hastalar

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### Abstract

**Aims:** Endoscopists may generally avoid performing ERCP in super-aged patients. This is because these patients often have comorbid conditions and reduced physiological function. The aim of this study was to evaluate the efficacy and safety of ERCP in the super-aged population over 85 years of age.

**Material and Method:** This study was retrospectively designed in a single tertiary care centre. Patients over 75 years of age with naive papillae who underwent ERCP between February 2019 and June 2022 were included in the study. Among the patients in the study, patients over 85 years of age were defined as super-aged, and patients aged 75-84 years were defined as late-elderly. The procedural data, efficacy and procedure-related adverse events of ERCP were compared between the two groups.

**Results:** A total of 260 patients were included, with 200 (76.9%) in the late elderly group and 60 (23.1%) in the super-aged group, of whom 37 were over 90 years old. According to the results of the analyses, only age and Charlson score showed a significant difference ( $p<0.001$ ) between the demographic variables. There was no significant difference between the two groups in terms of procedural success, cannulation time, difficult cannulation, cannulation techniques and other procedural data. Cardiopulmonary complications were significantly more frequent in the super-aged group (8.3% versus 2%,  $p=0.033$ ). The length of hospital stay was also found to be higher in the super-aged group compared to the late elderly group ( $p=0.005$ ).

**Conclusion:** Our study demonstrated that ERCP is a safe and effective procedure in super-aged patients, with no significant difference in ERCP related adverse events between late elderly groups. However, cardiopulmonary complications warrant caution and may lead to longer, more complex hospitalizations for super-aged patients undergoing ERCP.

**Keywords:** ERCP, adverse events, pancreatitis, super-aged patients

### Öz

**Amaç:** Endoskopistler, genellikle süper yaşlı (85 yaş ve üzeri) hastalarda ERCP yapmaktan kaçınmaktadır. Bunun nedeni, bu hastaların sıklıkla komorbiditelerle sahip olması ve fizyolojik rezervlerinin azalmasıdır. Bu çalışmanın amacı, 85 yaş üstü süper yaşlı popülasyonda ERCP'nin etkinliğini ve güvenliğini değerlendirmektir.

**Gereç ve Yöntem:** Bu retrospektif çalışma, üçüncü basamak bir sağlık merkezinde gerçekleştirildi. Şubat 2019 ile Haziran 2022 tarihleri arasında naive papillae ile ERCP uygulanan 75 yaş ve üstü hastalar çalışmaya dahil edildi. Hastalar, süper yaşlı ( $\geq 85$  yaş) ve geç yaşlı (75-84 yaş) olarak sınıflandırıldı. Gruplar arasında işlem verileri, etkinlik ve ERCP'ye bağlı advers olaylar karşılaştırıldı.

**Bulgular:** Çalışmaya toplam 260 hasta dahil edildi: 200'ü (%76,9) geç yaşlı, 60'ı (%23,1) süper yaşlı grubunda yer aldı; bu gruptaki 37 hasta 90 yaşın üzerindedir. Süper yaşlı grubunda yaş ve Charlson skoru anlamlı derecede daha yüksekti ( $p<0,001$ ). İşlemsel başarı, kanülasyon süresi, zor kanülasyon oranları ve kullanılan teknikler açısından gruplar arasında anlamlı bir fark yoktu. Ancak, süper yaşlı grupta kardiyopulmoner komplikasyonlar daha sık görüldü (%8,3 vs. %2,  $p=0,033$ ) ve bu hastaların hastanede kalış süreleri daha uzundu ( $p=0,005$ ).

**Sonuç:** ERCP, süper yaşlı hastalar için güvenli ve etkili bir prosedür olarak görülmüştür ve geç yaşlı gruplar arasında ERCP'ye bağlı advers olaylar açısından anlamlı bir fark bulunmamıştır. Bununla birlikte, süper yaşlı hastalarda kardiyopulmoner komplikasyon riskinin artması, dikkatli bir ön değerlendirme ve yönetim gerektirmektedir.

**Anahtar Kelimeler:** ERCP, olumsuz olaylar, pankreatit, süper yaşlı hastalar



## INTRODUCTION

Endoscopic retrograde cholangiopancreatography (ERCP) is now a common procedure for the treatment of many conditions affecting the pancreas and bile ducts. The global increase in life expectancy in recent years has also led to a gradual rise in the proportion of the elderly population. In 2010, an estimated 8% of the global population was aged 65 and over. This proportion is projected to rise to 16% of the world's population by 2050.<sup>[1]</sup> With the growing elderly population, it is crucial to understand the specific challenges that various medical interventions pose for this age group. In particular, developments in endoscopic techniques and instrumentation are expected to lead to a gradual increase in the use of ERCP in the elderly population.

ERCP is thought to have a higher risk of side effects than other gastrointestinal endoscopic procedures.<sup>[2]</sup> Recently, studies investigating the efficacy and safety of ERCP in the elderly population have been increasing in the literature. The age ranges of the populations compared in these studies vary. Although some have taken 80 years of age as cut off in comparison,<sup>[3,4]</sup> fewer studies have investigated the efficacy of ERCP procedures in the super-aged population over 85 years of age.<sup>[5,6]</sup> In current clinical practice, endoscopists may generally avoid performing ERCP in super-aged patients. This is because these patients often have comorbid conditions and reduced physiological function.

The aim of this study was to evaluate the efficacy and safety of ERCP in the super-aged population over 85 years of age. By comparing ERCP-related adverse events and technical success between super-aged patients over 85 years of age and late elderly patients aged 75-84 years, we wanted to shed light on whether age is a limiting factor for ERCP.

## MATERIAL AND METHOD

### Study design and Patients

Ethical approval was obtained from the local ethics committee (Date: 22.12.2021, Decision No: E2-21-1153) and the study was conducted in accordance with the guidelines of the Declaration of Helsinki.

This study was retrospectively designed in a single tertiary care centre. Patients over 75 years of age with naive papillae who underwent ERCP between February 2019 and June 2022 were included in the study. A retrospective analysis of data from consecutive elderly patients undergoing ERCP was performed using electronic medical records and the endoscopy database. Patients with surgically altered anatomy (such as Billroth II gastrectomy or Roux-en-Y anastomosis), individuals who received percutaneous biliary drainage prior to ERCP, individuals under 75 years of age, and those who had previously undergone sphincterotomy were excluded from the study. Additionally, patients with incomplete records and missing data were also excluded.

### ERCP procedures

Endoscopic retrograde cholangiopancreatography (ERCP) was performed in cases where common bile duct stones (CBDS) or sludge were identified by imaging techniques, including abdominal ultrasound (USG), magnetic resonance cholangiopancreatography (MRCP), endoscopic ultrasound (EUS) or computed tomography (CT). In this study, all patients underwent USG and additional imaging was only used if the USG results were inconclusive or raised suspicion. All ERCP procedures were conducted using a lateral scope (TJF 190; Olympus Optical, Tokyo, Japan) by an experienced endoscopist who performs over 800 therapeutic ERCPs annually. Patients were sedated with propofol and midazolam by an anesthesiologist. Standard biliary cannulation was performed with a guide wire and sphincterotome. In cases where selective biliary cannulation was unsuccessful, alternative methods such as double guidewire and precut techniques were used. After the procedure, all patients were followed up with clinical, laboratory and imaging modalities if necessary.

### Definitons

In geriatric literature, people aged 65 and over are generally classified as elderly. Current classifications further divide this group into three sub-categories: "young-old" (65-74 years), "middle-old" (75-84 years) and "oldest-old" (85 years and older).<sup>[7]</sup> This refined categorisation allows for more precise health strategies that address the different needs of each age group. Among the patients in the study, patients over 85 years of age were defined as super-aged, and patients aged 75-84 years were defined as late elderly.<sup>[8]</sup> Successful cannulation was defined as the successful deep biliary cannulation. In cases where deep biliary cannulation could not be achieved during the initial session, a repeat ERCP was performed 48 hours later. Patients who failed to achieve deep biliary cannulation after the second attempt were classified as having failed cannulation. Cannulation time referred to the duration from the first visualization of the papilla until deep cannulation was achieved. Total procedure time was measured from the initiation to the completion of the procedure. As per a recently published guideline, difficult cannulation was characterized by an inability to achieve biliary cannulation within five minutes or by two or more inadvertent pancreatic cannulations.<sup>[9]</sup> ERCP-related complications were defined following the 2017 guidelines of the American Society for Gastrointestinal Endoscopy.<sup>[10]</sup> Additionally, cardiopulmonary complications, ICU admission, and mortality occurring during or after the procedure were considered adverse events (AE). In our study, cardiopulmonary complications were defined as the occurrence of hypotension, hypoxia, respiratory arrest, or cardiac arrest during the procedure, resulting in its interruption.

### Statistical analysis

In our study, the data were analysed using SPSS 27 (Armonk, NY: IBM Corp) software. Mean, standard deviation, median (Q1-Q3), frequency and percentage values were used for descriptive statistics. Normality assessment was performed by Kolmogorov

Smirnov test. Chi-square (Pearson, Yates' corrected, Fisher's Exact and likelihood ratio) tests were used to analyse the relationship between nominal variables. Mann Whitney U test was used to analyse numerical variables according to groups. The significance level was set as 0.05 for all tests.

## RESULTS

A total of 1,238 ERCP patients were retrospectively reviewed and 260 patients were included in the study, including 200 patients (76.9%) in the late elderly group and 60 patients (23.1%) in the super-aged group. Of these, 37 patients were over 90 years old. Although the groups were stratified by age, the overall mean age of the patients was 81.7±5.7 years (range: 75-104), with 38.8% of the sample being male. The majority of patients (83.8%) had no history of cholecystectomy and the most common indication for ERCP was related to common bile duct disease (83.8%). Hypertension was the most common comorbidity, observed in 72.3% of cases, while orthopaedic disorders were the least common (5%). The baseline characteristics of the patients are summarised in **Table 1**.

Table 1. Baseline characteristics of the study	
Variables	Statistics
<b>Age</b>	81.7±5.7
<b>Gender (Female)</b>	159 (61.2)
<b>History of cholecystectomy</b>	42 (16.2)
<b>Charlson score</b>	4 (4-5)
<b>Indication of ERCP</b>	
Common bile ducts	218 (83.8)
Malignant biliary structure	22 (8.5)
Others	20 (7.7)
<b>Comorbidities</b>	
HT	188 (72.3)
DM	77 (29.6)
Cardiac diseases	78 (30)
COPD/ Asthma	27 (10.4)
CKD	19 (7.3)
Orthopaedic diseases	13 (5)
Neurological diseases	33 (12.7)
<b>Antiaggregant/anticoagulant medication use</b>	
<b>Antiaggregant</b>	
Single	79 (30.4)
Dual	2 (0.8)
Anticoagulant	22 (8.5)
<b>Laboratory data's</b>	
Tbil	2.5 (1.15-4.3)
GGT	272.5 (123-523.5)
WBC	8.89 (6.71-12.2)
CRP	29.6 (7.25-89.7)
<b>Radiological data's</b>	
Common bile duct dilatation on USG	6 (2.3)
Common bile duct stone or sludge	179 (68.8)

ERCP, Endoscopic retrograde cholangiopancreatography; HT, Hypertension; DM, Diabetes mellitus; COPD, Chronic obstructive pulmonary disease; CKD, Chronic kidney disease; Tbil, Total bilirubin; GGT, Gama-glutamyl transferase; WBC, White blood cell; CRP, C-reactive protein; USG, Ultrasonography

Patients in both groups were compared according to demographic, comorbid diseases, antiaggregant/anticoagulant use, laboratory and radiological data (**Table 2**). According to the results of the analyses, only age and Charlson score showed a significant difference ( $p < 0.001$ ) between the variables. Although cardiac and neurological comorbidities were observed at high rates in the super-aged group, they did not reach a statistically significant level ( $p = 0.077$  and  $p = 0.086$ , respectively). Similarly, although antiaggregant and anticoagulant use was more frequent in the super-aged group compared to the late elderly group, no significant result was found ( $p = 0.293$  and  $p = 0.200$ , respectively).

**Table 2. Comparison of demographic, laboratory and radiological data between groups**

Variables	Late elderly Group	Super-aged Group	p
	Statistics		
<b>Age</b>	79.1±2.9	90.5±3.6	<0.001
<b>Gender (Female)</b>	121 (60.5)	38 (63.3)	0.693
<b>History of cholecystectomy</b>	32 (16)	10 (16.7)	0.902
<b>Charlson score</b>	4 (4-5)	5 (4-5)	<0.001
<b>Indication of ERCP</b>			
Common bile ducts	167 (83.5)	51 (85)	
Malignant biliary structure	17 (8.5)	5 (8.3)	0.952
Others	16 (8)	4 (6.7)	
<b>Comorbidities</b>			
HT	141 (70.5)	47 (78.3)	0.234
DM	64 (32)	13 (21.7)	0.124
Cardiac diseases	54 (27)	24 (40)	0.077
COPD/ Asthma	18 (9)	9 (15)	0.274
CKD	12 (6)	7 (11.7)	0.158
Orthopaedic diseases	8 (4)	5 (8.3)	0.185
Neurological diseases	21 (10.5)	12 (20)	0.086
<b>Antiaggregant/anticoagulant medication use</b>			
<b>Antiaggregant</b>			
Single	59 (29.5)	22 (36.7)	0.293
Anticoagulant	14 (7)	8 (13.3)	0.200
<b>Laboratory data's</b>			
Tbil	2.5 (1.2-4.3)	2.3 (1-4.3)	0.586
GGT	278 (147.5-544)	260.5 (60.5-449)	0.118
WBC	8.9 (6.7-11.8)	9.9 (6.8-13.4)	0.212
CRP	29.1 (7.6-86.5)	46.9 (5.9-116)	0.631
<b>Radiological data's</b>			
Common bile duct dilatation on USG	5 (2.5)	1 (1.7)	1.000
Common bile duct stone or sludge	140 (70)	39 (65)	0.463

HT, Hypertension; DM, Diabetes mellitus; COPD, Chronic obstructive pulmonary disease; CKD, Chronic kidney disease;

When both groups were compared in terms of procedure-related data (**Table 3**), it was found that all variables showed a similar distribution. The higher rates of cannulation success in the first session (93.3% and 91%) and cannulation time less than 5 minutes (77.6% vs. 68.7%) in the super-aged group were noteworthy ( $p = 0.597$  and  $p = 0.423$ , respectively). However, there was no significant difference between the two groups in terms of procedural success, cannulation time, difficult cannulation, cannulation techniques and other procedural data.

**Table 3. Comparison of procedural data between groups**

Variables	Late elderly Group	Super-aged Group	p
	Statistics		
Successful cannulation in the first session	180 (91)	56 (93.3)	0.597
Overall cannulation success	193 (98.5)	57 (95)	0.701
Difficult cannulation	66 (33)	17 (28.3)	0.496
<b>Cannulation time</b>			
<5 minutes	136 (68.7)	45 (77.6)	
5-10 minutes	23 (11.6)	5 (8.6)	0.423
10> minutes	39 (19.7)	8 (13.8)	
<b>Total procedure time</b>	27 (23-33)	27 (24-33)	0.913
<b>Presence of PAD</b>	52 (26)	18 (30)	0.54
<b>Cannulation technique</b>			
Wire-guided cannulation	151 (75.5)	45 (75)	
Double guidewire technique	34 (17)	11 (18.3)	0.764
Precut techniques	8 (4)	1 (1.7)	
Failed	7 (3.5)	3 (5)	
<b>Sphincterotomy</b>	192 (96)	60 (100)	0.204
<b>Stone removal (Balloon or basket)</b>	140 (70)	39 (65)	0.463
<b>Plastic stent placement</b>	137 (68.5)	40 (66.7)	0.789
<b>Covered metal stent placement</b>	2 (1)	2 (3.3)	!
<b>EBD</b>	5 (2.5)	1 (1.7)	1.000

!: Not calculated; PAD, Periampullary diverticulum; EBD, Endoscopic biliary dilatation.

When both groups were compared in terms of adverse events after ERCP (Table 4), it is noteworthy that all adverse effects except pancreatitis (14.5% vs. 8.3%) were more common in the super-aged group but did not reach a significant level. However, cardiopulmonary complications were significantly more frequent in the super-aged group (p=0.033). The length of hospital stay was also found to be higher in the super-aged group compared to the late elderly group (p=0.005).

**Table 4. Comparison of both groups in terms of adverse events**

Variables	Late elderly Group	Super-aged Group	p
	Statistics		
Pancreatitis	29 (14.5)	5 (8.3)	0.306
Bleeding	10 (5)	4 (6.7)	0.744
Perforation	2 (1)	2 (3.3)	0.229
Cardiopulmonary complications	4 (2)	5 (8.3)	0.033
ICU admission	11 (5.5)	6 (10)	0.236
Mortality	7 (3.5)	3 (5)	0.701
LHS	7 (5-12)	11 (6.5-15)	0.005

ICU, intensive care unit; LHS, Length of Hospital Stay

## DISCUSSION

This study showed that the efficacy and safety of ERCP in patients over 85 years of age were similar to late elderly patient groups. In terms of adverse effects after ERCP, cardiopulmonary complications during or after the procedure were significantly higher in the super-aged group. In addition, the length of hospitalisation was significantly higher in the super-aged patients, which is among the other important findings of the study.

Research on the therapeutic effectiveness of ERCP in elderly patients has gained significant attention, largely due to the high incidence of pancreaticobiliary disease and the elevated risk of surgical complications associated with aging. Numerous studies across different countries and populations have examined the safety and success of therapeutic ERCP in older adults.<sup>[6,11]</sup> In recent years, many articles have been published in the literature stating that ERCP is effective and safe in elderly patients over 65 years of age.<sup>[12,13]</sup>

Previous studies have reported technical success rates for cannulation ranging from 80.5% to 100%.<sup>[14,15]</sup> In one study, the success rate of cannulation in elderly patients was significantly lower than in the control group.<sup>[16]</sup> However, it is often suggested that there is no significant difference between the older groups and the control groups in terms of cannulation success rates.<sup>[3,4,15,17]</sup> In this study, no significant difference in cannulation success was observed between the two elderly cohorts. Additionally, the cannulation success rate in both groups was over 95%. A recently published study also reported a cannulation success rate exceeding 95% in a cohort of patients aged over 90 years.<sup>[17]</sup> In our study, there were no significant differences between the groups in terms of cannulation time, procedure duration, difficult cannulation, or the cannulation techniques used during the procedure. A study investigating the efficacy and safety of ERCP in patients over 80 years of age also found no differences between groups regarding cannulation techniques, difficult cannulation, or cannulation time.<sup>[18]</sup> However, another study reported that total procedure time was longer in patients over 80 years old compared to the 65–80 age group.<sup>[3]</sup> Both studies noted a higher prevalence of periampullary diverticula (PAD) in patients over 80.<sup>[3,18]</sup> Unlike these studies, no difference in PAD prevalence was found between the groups in our study, which may be due to the closer age ranges of the two cohorts.

Multiple studies have demonstrated the safety of ERCP in elderly patients, showing no significant difference in the incidence of ERCP-related adverse events.<sup>[3,4,18]</sup> Similarly, in our study, patients aged ≥85 years did not exhibit a higher rate of overall adverse events compared to late elderly patients. Post-ERCP pancreatitis (PEP) was the most common adverse event observed, with elderly patients showing a lower incidence of pancreatitis. This reduction may be attributed to factors such as pancreatic fibrosis, atrophy, and decreased pancreatic enzyme secretion in older adults. Rates of ERCP-related perforation and bleeding were comparable across age groups, although elderly patients experienced a higher incidence of bleeding, likely related to the frequent use of antithrombotic medications. However, with the exception of cardiopulmonary complications, no significant differences in ERCP-related adverse events were observed between the groups. Cardiopulmonary complications were more frequent in the super-aged group, likely due to decreased cardiac and lung function associated with aging. These complications predominantly

arose during the procedure and were often related to anesthesia. Additionally, the length of hospital stay (LHS) was significantly longer in the super-aged group compared to the late elderly group. A similar study also found that LHS was notably longer for patients over 80 years of age compared to those under 80.<sup>[19]</sup> This may be attributed to the extended time needed for pre-procedural anesthesia preparation and the increased need for support and care in the postoperative period for super-aged patients. There was no difference in mortality between the two groups. In the late elderly group, one patient died due to sepsis associated with surgery for perforation and prolonged intensive care. All other patients who died succumbed to cardiopulmonary failure during or after the procedure.

### Limitations

This study has several limitations. The first was its single-center design and retrospective nature. Another important limitation is that the study was conducted in a tertiary referral ERCP centre. This may have led to bias in choosing to include more complex cases.

### CONCLUSION

Our study demonstrated that ERCP is a safe and effective procedure in super-old patients, with no significant difference in ERCP-related adverse effects between elderly groups. However, caution is advised regarding cardiopulmonary complications in this patient population, and it is important to keep in mind that hospital stays may be longer in super-aged patients. Healthcare providers should anticipate that the hospitalization period for super-aged patients undergoing ERCP may be extended and involve more complex care requirements.

### ETHICAL DECLARATIONS

**Ethics Committee Approval:** The study was carried out with the permission of Bilkent City Hospital Local Ethics Committee (Date: 22.12.2021 Decision No: E2-21-1153).

**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.

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