

ERCP in the Very Elderly: Outcomes Among Patients Older than Eighty

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Abstract Life expectancy is rising, which is increasing the demand for endoscopic retrograde cholangiopancreatography (ERCP) in the elderly. Little data, particularly on complex procedures, has been reported. In this study, we compare the differences in the success and complications in ERCP between patients older and younger than 80 years old. We used a large endoscopic database reviewing the ERCPs performed and 30-day complications addressing age, degree of difficulty of procedures, and complications. A total of 2,606 patients underwent 3,924 ERCPs. Six hundred and twenty-eight were octogenarians undergoing 728 procedures. Mean age was 83.5 years in the octogenarian group and 59.0 years in the younger group. The endoscopic success rate was lower in octogenarians (96.9 vs. 98.3%, $P = 0.004$). Overall, complication rates between both groups was significantly less in older compared to younger patients (1.64 vs. 3.50%, $P = 0.006$). Complication and failure rates were higher as procedure complexity increased in all patients. ERCP in the elderly carries a high degree of success with low complication rates. Elderly patients carry similar risks of bleeding and perforation and a lower risk of pancreatitis.

Keywords ERCP · Endoscopic retrograde cholangiopancreatography · Elderly · Octogenarians · Pancreatitis · Complications

Introduction

The number of persons over 80 years of age continues to grow rapidly. Once an individual reaches age 80, his or her life expectancy is an additional 8.3 years [1]. In the United States, the number of persons aged 80 years or greater is expected to increase from 9.3 million in 2000 to 19.5 million in 2030 [2].

Pancreaticobiliary tract disease is common in the elderly. This relates to an increasing prevalence of cholelithiasis, choledocholithiasis, and malignancy with advancing age [3]. Common bile duct stones and cancer account for more than 70% of cases of jaundice in patients over the age of 75 [4]. Biliary tract disease is the most common indication for abdominal surgery in the elderly [5]. In octogenarians, biliary tract surgery carries mortality as high as 9.5% and a complication rate as high as 62% [6]. In view of the high morbidity of this surgical procedure in the elderly, endoscopic alternatives may be preferred for the management of certain biliary tract disorders. Unfortunately, little information is available on the safety and outcome of endoscopic retrograde cholangiopancreatography (ERCP) in patients aged 80 years or older. These data are needed as these patients represent a growing segment of the United States population and an increasing number of patients who are expected to be referred for ERCP. The aims of this study were to retrospectively examine the differences between octogenarians and non-octogenarians with respect to success and complications of diagnostic and therapeutic ERCP.

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Materials and Methods

Consecutive patients who underwent ERCP in the Pancreaticobiliary Center at Maine Medical Center were included over a 10-year period. The patients were identified using a prospectively compiled database. All complications and outcomes were judged and recorded 1, 7, and 30 days following each procedure. Medical records were also retrieved and reviewed. These procedures were performed either by a staff gastroenterologist or by a fellow under direct supervision. Patients were continuously monitored during the procedure using a pulse oximeter and an automatic blood pressure recording device. Intravenous sedation with diazepam or midazolam and analgesia with meperidine or fentanyl were selectively administered at the discretion of the endoscopist.

Patients were divided into two groups: octogenarians and non-octogenarians. Age, sex, indication for ERCP, oxygen saturation, and blood pressure were reviewed. Risk factors for complications were also examined. Cardiac disease was defined as prior myocardial infarction, heart disease, or arrhythmia. Pulmonary disease was defined as a history of asthma or chronic obstructive pulmonary disease. Coagulopathy was defined as International Normalized Ratio (INR) >1.5 or platelet count less than 150 K/CMM at the time of procedure. Diabetes was defined as a previous clinical diagnosis of diabetes.

Procedures were classified by degree of difficulty into one of three categories: Level I included standard diagnostic cholangiogram and pancreatogram, standard biliary sphincterotomy, removal of 1–2 small common bile duct stones (<1 cm), and nasobiliary drain placement. Level II included diagnostic cholangiogram or pancreatogram in a Billroth II anatomy, biliary or pancreatic cytology and minor papilla cannulation. Level III included precut biliary sphincterotomy, stone removal with lithotripsy, intrahepatic stone removal, intrahepatic stricture dilation, biliary therapy in a Billroth II anatomy, cholangioscopy, all pancreatic therapy (pancreatic sphincterotomy, stenting, stricture dilation, stone removal or any minor papilla therapy), any pseudocyst drainage or pancreatoscopy [7].

The success rate in completing the study, defined as the achievement of the pre-procedural defined goal, was recorded. Early complications (within 30 days) were noted and classified according to Consensus guidelines [8]. Follow-up information was obtained from the patient, the medical record, and/or the primary care provider. Results were analyzed by means of Fisher's exact test. Differences were considered significant when $P < 0.05$.

Results

A total of 2,606 patients underwent 3,924 procedures during our study period. There were 628 octogenarians

(238 men and 390 women) and 1,978 non-octogenarians (752 men and 1,226 women) undergoing 728 and 3,196 procedures, respectively. The mean age in the octogenarian group was 83.5 years (range 80–98 years) and 59.0 years (range 4–79 years) ($P < 0.001$) in the non-octogenarian group. Of note, 68 (11%) patients were 90 years of age or older.

Octogenarians were more likely to have underlying comorbidities than non-octogenarians. Octogenarians were more likely to have cardiac disease (34.23 vs. 8.00%), pulmonary disease (9.08 vs. 3.19%), diabetes mellitus (17.99 vs. 10.36%) and coagulopathy (14.81 vs. 8.10%). Patients with ERCP-related complications in both groups had co-morbidity rates similar to patients without complications ($P > 0.05$).

Indications for ERCP are shown in Table 1. The most common endoscopic indication in the octogenarian group was the presence or suspicion of common bile duct stones. The most common indication in the non-octogenarian group was obstructive jaundice.

Success rates for ERCP were high in both groups. ERCP was successfully completed in 3,141 (98.3%) of the planned procedures from the non-octogenarian group and in 73 (96.6%) from the octogenarian group ($P = 0.004$).

Analysis of the procedural level of difficulty revealed that procedures were almost equally divided into the three levels. However, there was a slight increase in the number of procedures at the highest level of difficulty among younger patients (Table 2).

The overall complication rate was significantly higher in the younger group when compared to the older group. A total of 110 (3.45%) non-octogenarians had some type of post-ERCP complication compared to 12 (1.65%) octogenarians ($P = 0.006$). When the different complications were sub-analyzed, the only two that differed were pancreatitis and infection (Table 3). When the different complications were separated by level of difficulty, there was a trend in both groups towards higher rates of

Table 1 Indications for ERCP procedures *N* (%)

Indication	Non-octogenarian	Octogenarian
Obstructive jaundice	895 (28%)	160 (22%)
Multiple ^a	639 (20%)	124 (17%)
CBD stones	544 (17%)	167 (23%)
Cholangitis	447 (14%)	124 (17%)
Abdominal pain	415 (13%)	66 (9%)
Pancreatitis	256 (8%)	87 (12%)
Total	3,195 (100%)	728 (100%)

^a Multiple includes abnormal hepatic biochemical markers, weight loss, post-operative complications, and abnormal imaging study
 CBD common bile duct

Table 2 Procedural degree of difficulty

	Non-octogenarian procedures <i>N</i> (%)	Octogenarian procedures <i>N</i> (%)	<i>P</i> -value
Level I	1,247 (39%)	285 (39%)	0.49
Level II	878 (27%)	258 (35%)	<0.001
Level III	1,071 (34%)	185 (26%)	<0.001
Total	3,196 (100%)	728 (100%)	

Table 3 ERCP complications

Complication	Non-octogenarians (<i>N</i> = 3,196 procedures)	Octogenarians (<i>N</i> = 728 procedures)	<i>P</i> -value
Pancreatitis	37 (1.16%)	1 (0.14%)	0.003
Bleeding	24 (0.75%)	4 (0.55%)	0.387
Perforation	13 (0.41%)	5 (0.69%)	0.231
Infection	16 (0.50%)	0 (0.0%)	0.037
Death	0 (0%)	1 (0.13%)	0.185
Other ^a	20 (0.63%)	1 (0.13%)	0.07
Total	110 (3.45%)	12 (1.65%)	0.006

^a Cardiopulmonary events, pain, and extremity trauma

complication as procedures became more difficult. However, at all three levels, higher complication rates were noted in the younger age group. These trends did not reach statistical significance for each of the three levels, but the total complication rate was statistically different (Table 4). Our mortality rate was 0.1% for the older group and 0% for the younger ($P = 0.185$). Individual complications in the octogenarian group are described in Table 5. Perforation occurred in five (0.69%) patients: duodenal ($N = 3$), cervical esophagus ($N = 1$), and small bowel in Billroth II anatomy ($N = 1$).

Discussion

We are reporting that diagnostic and therapeutic ERCP in the very elderly is safe and effective when treating pancreaticobiliary disorders. Octogenarians with these disorders often present with complications of acute disease such as choledocholithiasis, biliary pancreatitis, and

Table 4 Complications by degree of difficulty

	Non-octogenarians (<i>N</i> = 3,196 procedures)	Octogenarians (<i>N</i> = 728 procedures)	<i>P</i> -value
Level I	27 (0.86%)	2 (0.27%)	0.421
Level II	21 (0.64%)	3 (0.42%)	0.43
Level III	62 (1.95%)	7 (0.96%)	0.57
Total	110 (3.45%)	12 (1.65%)	

obstructive jaundice. However, surgical therapy in these patients carries a higher complication and mortality rate when compared to the younger patients [6]. For this reason, endoscopic alternatives are favored. Little has been reported on the safety and outcomes of ERCP in this age group.

In a retrospective analysis reviewing the utility and safety of gastrointestinal endoscopy in extremely elderly (≥ 85 year) patients, Clare et al. [9] reported an incidence of post-ERCP pancreatitis of 5% among the 21 patients who underwent this procedure. No other ERCP-related complications were reported and there was no procedure-related mortality.

Sugiyama and Atomi [10], in another small retrospective study, evaluated the role of endoscopic sphincterotomy (ES) for bile duct stones in 22 patients 90 years old and older. It retrospectively compared ES results in a group of patients of this age range to a younger (between 70 and 89 years old) group. Endoscopic sphincterotomy was technically successful in 100% of the older group and in 98% of the younger group. The rate of early (≤ 30 days) complications in the older and younger groups was similar (5 and 7%, respectively). Importantly, no single case of post-ERCP pancreatitis was reported in the older group. Nine (2%) patients out of a total of 381 of the younger group had this complication. They concluded that ES was safe and effective for the treatment of choledocholithiasis in patients 90 or older.

Similarly, Cocking et al. [11] evaluated the success rate of bile duct clearance in 25 consecutive elderly (≥ 80 year) patients with benign biliary disease. They reported a success rate of 88% and a complication rate of 8%, none of which had post-ERCP pancreatitis.

In another study that evaluated the safety and efficacy of ERCP in the diagnosis and treatment of both benign and malignant biliary obstruction in 101 patients aged ≥ 75 year, Ashton et al. [12], reported a complication rate of 6%. The most common complication was cholangitis (4%) followed by pancreatitis (1%) and biliary perforation (1%). No patient died as a result of the ERCP.

Finally, Beaugerie et al. [13] compared two groups of patients who underwent endoscopic papillotomy for choledocholithiasis. One group was composed of 116 patients 65–80 years of age, and the other group was composed of 161 patients ≥ 80 years of age. Morbidity and mortality rates related to endoscopic papillotomy were not different between the two groups (6.9 and 0.8% in the younger group and 8.7 and 3.1% in the older group, respectively).

From this literature review, the reported ERCP-related overall complication rate in patients aged 80 years or older ranges between 5 and 8.7% and the rate of post-ERCP pancreatitis in this age group ranges between 0 and 5%. In our much larger experience, our overall complication rate

Table 5 Complications and their management in octogenarians

Patient	Age	ERCP indication	Level	Complication	Severity ^a	Management
1	80	Jaundice	III	Bleeding	Mild	Conservative
2	82	PSC ^b	III	Perforation	Mild	Conservative
3	82	Abnormal liver tests	III	Perforation	Mild	Conservative
4	83	Common duct stones	III	Bleeding	Moderate	Endoscopic
5	83	Jaundice	III	Bleeding	Mild	Conservative
6	84	Jaundice	II	Death	Severe	–
7	84	Common duct stones	II	Perforation	Mild	Conservative
8	85	Jaundice	III	Pancreatitis	Mild	Conservative
9	85	Pancreatitis	III	Other ^c	Severe	Surgical
10	86	Abdominal pain	I	Bleeding	Severe	Embolization
11	88	Cholangitis	II	Perforation	Mild	Conservative
12	96	Common duct stones	I	Perforation	Mild	Conservative

^a Severity of complications based on consensus criteria [8]

^b Primary sclerosing cholangitis (PSC)

^c Upper extremity trauma

in this age group was 1.65%, which is less than the previously reported figure. Our post-ERCP pancreatitis rate was 0.14%.

Furthermore, this is the first study to stratify ERCP by level of difficulty in elderly patients. Increasing difficulty only slightly increased complications, but no greater degree than in the younger patients. We did not experience a large number of complications unique to the elderly such as cardiopulmonary or those related to anatomic changes commonly seen in this age group (i.e., Zenker's diverticulum). However, of the 12 complications that occurred in 728 procedures in the elderly, two were unusual, including a cervical esophageal perforation (mild) and a serious finger laceration (severe) when a confused patient reached under the X-ray table while it was in motion. Overall, only two other severe complications were noted, including a single death that occurred after surgical repair of a perforation.

We postulate that increased age may be a protective factor for the development of post-ERCP pancreatitis. Older patients may be less responsive to pancreatic trauma at the time of the procedure. This could relate to the anatomical changes that the pancreas undergoes with age. Atrophy of the pancreas occurs with age, and its weight may fall from normal 60–100 to 40 g or less by 85 years of age [14]. Also, changes in pancreatic histology can be found in most elderly patients. These include proliferation of ductal epithelial cells with stratified squamous epithelium replacing normal ductal epithelium, fatty infiltration (up to 80%) and fibrosis (60%) [14, 15]. Functionally, reduced levels of pancreatic enzymes have been noted in the duodenal aspirates of elderly patients [16].

Infection, as a procedure-related complication, was significantly less common in the older group compared to

the younger one. The higher rate of infection in younger patients may well represent a much higher rate of pancreatic endotherapy for the indications of necrotizing pancreatitis or pancreatolithiasis in this group, which carries a higher risk for this complication [17].

In summary, ERCP in the elderly carries a high degree of success with a low complication rate. The mix of complications in the elderly reveals a lower risk of pancreatitis, while the risk of bleeding and perforation is similar. More difficult procedures are as successful and well tolerated as in younger patients. ERCP for pancreaticobiliary disorders should remain the therapeutic option of choice in octogenarians.

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