Is Endoscopic Retrograde Cholangiopancreatography Safe in Patients 90 Years of Age and Older?

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Background/Aims: This case-control study evaluated the safety and efficacy of endoscopic retrograde cholangiopancreatography (ERCP) in patients 90 years of age and older. **Methods:** From January 2005 to August 2011, 5,070 cases of ERCP were performed at our institution. Of these, 43 cases involved patients 90 years of age and older (mean age, 91.7±1.9 years). A control group of 129 cases (mean age, 65.7±14.8 years) was matched by the patient sex, sphincterotomy, and presence of choledocholithiasis using a propensity score. The patients' medical records were retrospectively reviewed for comorbidity, periampullary diverticulum, urgent procedure, conscious sedation, technical success, procedure duration, ERCP-related complication, and death. **Results:** Between the case and control groups, there was no significant difference with regard to comorbidity, periampullary diverticulum, and urgent procedure. Conscious sedation was performed significantly less in the patient group versus the control group (28 [65%] vs 119 [92%], respectively; p=0.000). There was no significant difference in the technical success, procedure duration, or ERCP-related complications. In both groups, there was no major bleeding or perforation related to ERCP. Post-ERCP pancreatitis occurred significantly less in the patient group compared to the control group (0 vs 13 [10%], respectively; p=0.004). One death occurred from respiratory arrest in the case group. **Conclusions:** ERCP can be performed safely and successfully in patients aged 90 years and older without any significant increase in complications. **(Gut Liver 2014;8:552-556)**

Key Words: Cholangiopancreatography, endoscopic retrograde; Safety; Aged, 90 and over

INTRODUCTION

According to the World Health Organization 2013 statistics,[1] life expectancy at age 60 was 24 years in South Korea. Twenty years ago, life expectancy at age 60 in South Korea was 18 years. Life expectancy has increased by 6 years. This is a worldwide phenomenon. For example, life expectancy at age 60 in Japan increased from 23 years to 26 years over a period of 20 years. Similarly, life expectancy at age 60 in United States of America increased from 21 to 23 years over the same period of time.[1] With longer life expectancy, progressive increase in elderly population is expected.

With advancing age, increased incidence of pancreaticobiliary disease is seen.[2] Therefore, endoscopic retrograde cholangiopancreatography (ERCP) would be increasingly required in elderly patients. ERCP has been established as a less invasive procedure for diagnosis and management of various pancreaticobiliary diseases, but its safety and efficacy in the elderly patients have been evaluated in various countries and age groups.[3-13] Although diagnosis may be obtained noninvasively with transabdominal ultrasonography, computed tomography, and/or magnetic resonance cholangiopancreatography, none of these methods allow therapeutic intervention. And therapeutic role of ERCP has been established firmly as a less invasive alternative to surgery for management of pancreaticobiliary disease. There have been studies on ERCP in elderly patients, but most focused on patients who are 80 years of age and older.[3,5,6,10,11] In these studies, incidence of comorbidities and malignancy was higher, but ERCP-related complication was similar to that of younger patients.

Since there have been only a few studies on safety and efficacy of ERCP in patients 90 years and older[7-9,12-14] and none in Korean population, we evaluated safety and efficacy of ERCP in Korean patients 90 years and older in this retrospective case

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control study.

MATERIALS AND METHODS

1. Study design and subjects

This was a retrospective case control study at a single academic tertiary hospital. From January 2005 to August 2011, 5,070 patients underwent ERCP at our institution. Of these, there were 43 patients who were 90 years of age and older (case group) and 129 patients who were less than 90 years and matched by sex, sphincterotomy, and presence of choledocholithiasis using a propensity score (control group). Medical records of the case group and control group were reviewed retrospectively. Data including demographic characteristics, medical history, clinical features, laboratory findings, ERCP findings, and its related complications were gathered. All the patients underwent ERCP for diagnosis and treatment of suspected and established pancreaticobiliary diseases.

2. Definition

Comorbidity was defined as presence of one or more of the following conditions: hypertension, diabetes mellitus, ischemic heart disease, heart failure, cerebrovascular disease, dementia, chronic liver disease, chronic obstructive pulmonary disease, bronchial asthma, chronic renal failure, malignancy, organ transplantation, arrhythmia, and thromboembolism. Urgent procedure was defined as ERCP done during emergency room stay or on the day of admission. Post-ERCP complications included one or more of the followings which was described in the previous consensus guidelines: major and minor bleeding, hyperamylasemia and post-ERCP pancreatitis, perforation, and death.[15] Duration of procedure was calculated by subtracting time at facing the major duodenal papilla from time at withdrawal of the duodenoscope. Technical success was defined as the achievement of deep cannulation for diagnostic and/or therapeutic ERCP.

3. Endoscopic procedure

Before ERCP, informed consent was obtained from each patient and/or caregiver. All ERCPs were performed by two experienced dedicated endoscopists (J.H. and H.G.K) who perform more than 500 cases of ERCP annually. During each session of ERCP, all the patients underwent continuous monitoring with pulse oxymetry and electrocardiogram. All the patients received 2 L/min of oxygen through a nasal cannula throughout the procedure. Pharyngeal anesthesia was induced with a spray of 10% lidocaine (Xylocaine®; AstraZeneca, Södertölje, Sweden). Conscious sedation was administered after informed consent and only when the patient's condition was stable (e.g., $SaO_2 \geq 90\%$, alert and oriented mental status, systolic blood pressure ≥90 mm Hg). For conscious sedation, intravenous injection of midazolam and pethidine was used at the discretion of the endoscopist.

Butylscopolamine was given for duodenal relaxation if needed. Olympus EVIS system, JF-V, or TJF 200 series (Olympus, Tokyo, Japan) was used for ERCP. A pull-type papillotome (Autotome™ RX44; Boston Scientific Corp., Natick, MA, USA) and an electrosurgical generator with an automatically controlled cutout system (Endocut mode) were used for sphincterotomy.

4. Data collected

Information gathered on each patient from case and control groups consisted of comorbidity, periampullary diverticulum, need for urgent procedure, biliary and/or pancreatic malignancy, conscious sedation, duration of procedure, technical success rate, details of ERCP procedures and ERCP-related complications including death.

5. Statistical analysis

Various parameters were compared between case and control groups. Values were presented as mean±SD. Descriptive statistics for discrete variables are presented as frequencies and percentages. Differences between age groups for categorical variables were tested using the chi-square test. Continuous variables were compared by two samples t-test for variables with normal distributions and Mann-Whitney U test for variables with non-normal distributions. The p-values less than 0.05 were considered statistically significant. Statistical analyses were performed with an IBM SPSS version 19.0 package (IBM Co., Armonk, NY, USA).

RESULTS

1. Baseline characteristics of study subjects

A total of 172 patients were included in the study. There were 43 in case group (male, 19 [44.2%]) and 129 in control group (male, 57 [44.2%]). The mean age in the case group was 91.7±1.9 and 65.7±14.8 years in the control group. Case and control groups were similar in regard to presence of comorbidity and periampullary diverticulum, need for urgent procedure, biliary and/or pancreatic malignancy. However, the case group had significantly lower prevalence of diabetes mellitus (1/43 [2.3%] vs 25/129 [19.4%]; p=0.006) and higher prevalence of chronic obstructive pulmonary disease and/or asthma (6/43 [14.0%] vs 2/129 [1.6%]; p=0.003). Also, the case group underwent conscious sedation significantly less often than control group (28/43 [65%] vs 119/129 [92%]; p<0.001) (Table 1).

2. ERCP-related outcomes

ERCP-related parameters and details of the procedure are described in Table 2. Technical success was achieved in 86% of the case group and 94% of the control group, but there was no significant differences between two groups (p=0.117). The duration of ERCP procedure was 14.7±7.6 minutes in the case group and 15.1±10.1 minutes in the control group (p=0.244). Percent-

Table 1. The Clinical Characteristics of the Patients

Characteristic	Case group (n=43)	Control group (n=129)	p-value
Comorbidity	19 (43.2)	66 (51.2)	0.428
Hypertension	51 (34.9)	51 (39.5)	0.718
Diabetes mellitus	1 (2.3)	25 (19.4)	0.006
Ischemic heart disease	9 (7.0)	1 (2.3)	0.454
Heart failure	3 (7.0)	2 (1.6)	0.100
Cerebrovascular disease	5 (11.6)	13 (10.1)	0.777
Dementia	2 (4.7)	1 (0.8)	0.155
Chronic liver disease	0	6 (4.7)	0.339
Chronic obstructive pulmonary disease and/or asthma	6 (14.0)	2 (1.6)	0.003
Chronic renal failure	3 (7.0)	2 (1.6)	0.100
Malignancy other than biliary and/or pancreatic	3 (7.0)	2 (1.6)	0.100
Organ transplantation	0	4 (3.0)	0.573
Arrhythmia	0	3 (2.3)	0.574
Thromboembolism	0	1 (0.8)	1.000
Periampullary diverticulum	15 (34.9)	40 (31.0)	0.637
Biliary and/or pancreatic malignancy	11 (25.6)	40 (31.0)	0.500
Urgent procedure	18 (41.9)	52 (40.3)	0.858
Conscious sedation	28 (65.1)	119 (92.2)	<0.001

Data are presented as number (%).

Table 2. Comparison of the Endoscopic Retrograde Cholangiopancreatography-Related Parameters and Procedure Details

	Case group (n=43)	Control group (n=129)	p-value
Technical success	37 (86.1)	121 (93.8)	0.117
Duration of procedure, min	14.7±7.6	15.1±10.1	0.244
Sphincterotomy	23 (53.5)	72 (55.8)	0.791
Details of procedures			
Biliary stone removal	14 (32.6)	45 (34.9)	0.854
Biliary stent insertion for biliary stone	19 (44.2)	51 (39.5)	0.596
Stent insertion for malignant obstruction	4 (9.3)	14 (10.9)	1.000
Stent insertion for benign biliary stricture	0	2 (1.6)	1.000
Miscellaneous*	0	9 (7.0)	0.114
Failed cannulation	6 (13.9)	8 (6.2)	0.117
ERCP-related complication	5 (11.6)	29 (22.5)	0.122

Data are presented as number (%) or mean±SD.
ERCP, endoscopic retrograde cholangiopancreatography.
*Includes brush cytology, biopsy, sphincterotomy, nasobiliary drainage.

Table 3. Comparison of Endoscopic Retrograde Cholangiopancreatography-Related Complications and Death

	Case group (n=43)	Control group (n=129)	p-value
Total	5 (12)	29 (22)	0.122
Major bleeding	0	0	1.000
Minor bleeding	1 (2)	6 (5)	0.682
Post-ERCP pancreatitis	0	13 (10)	0.004
Hyperamylasemia	3 (7)	10 (8)	1.000
Perforation	0	0	1.000
Death*	1 (2)	0	0.25

Data are presented as number (%).
ERCP, endoscopic retrograde cholangiopancreatography.
*Death of a 92-year-old male patient from respiratory arrest.

age of patients who underwent sphincterotomy was also similar in both groups (53% vs 56%; p=0.791). There was no significant difference between two groups in regard to details of the procedure such as biliary stone removal and stent insertion. The overall ERCP-related complications were observed in five of the case group (12%) while in 29 of control group (22%) without significant difference between two groups (p=0.122).

When specific ERCP-related complications and death were compared between two groups, the only one that differed significantly was post-ERCP pancreatitis (Table 3). In the case group, there was significantly lower incidence of post-ERCP pancreatitis (0/43 vs 13/129 [10%]; p=0.004). One death occurred in the case group while none occurred in the control group (1/43 [2%] vs 0/129; p=0.25). A 92-year-old male with choledocholithiasis, acute cholangitis, and sepsis initially underwent percutaneous transhepatic biliary drainage. After the patient became hemodynamically stable, elective ERCP with conscious sedation was done. Respiratory arrest occurred after technical success. Immediate resuscitation with endotracheal intubation and mechanical ventilation was done. Despite 5 days of intensive care, the patient died from multiorgan failure.

DISCUSSION

With aging of the population, incidence of pancreaticobiliary diseases is increasing.[2] The elderly patients with these diseases often present with complications such as acute cholangitis, biliary pancreatitis, and obstructive jaundice. However, surgery in these patients carries a higher complication and mortality rate when compared to the younger patients.[16] For this reason, ERCP is favored as a useful alternative for urgent and/or inoperable situations in elderly patients. There have been studies from various countries and populations regarding safety and efficacy of ERCP in elderly patients.[3-13] However, there are only a few stud-

ies that focused on patients who are 90 years and older.[7-9,12-14]

In Korea, there have been two retrospective studies on safety of ERCP in the elderly patients. Kim et al.[10] evaluated the clinical outcomes of ERCP in 802 patients. The patients were divided into three groups according to ages: less than 65, 65 to 79, and 80 years and older. There were 90 patients who were 80 years and older. Among three groups, there was no statistically significant difference in complication rate (22/382 [5.8%] vs 15/330 [4.5%] vs 1/90 [1.1%]; p=0.078) and death (2/382 [0.5%] vs 1/330 [0.3%] vs 1/90 [1.1%]; p=0.735). Cho et al.[11] compared outcomes, safety and complications associated with ERCP between patients who were between 50 and 74 years and 75 years of age and older. There were 132 patients who were 75 years of age and older. Overall ERCP-related complication occurred significantly more often in patients who were 75 years of age and older (11/132 [8.3%] vs 16/464 [3.4%]; p=0.011). There was no death in patients who were 75 years of age and older, but one death in patients who were between 50 and 74 years. From results from these studies, it seems that ERCP can be performed safely in patients who are 75 years of age and older. Since number of patients who are 90 years of age and older is not described in these studies, safety and efficacy of ERCP in this particular age group cannot be assessed. Also, these studies may harbor a bias from nonmatched control group. In this case control study, bias from confounding variables was minimized by matching two control patients to each case patient using a propensity score.

Previous studies of ERCP in elderly patients have shown that higher prevalence of comorbidities in elderly patients,[4,7,9-11] but no significant difference in presence of periampullary diverticulum.[4,7] Current case control study showed that there were no significant differences in respect to presence of comorbidities, periampullary diverticulum, biliary and/or pancreatic malignancy, and need for urgent ERCP between two groups. When specific comorbidities were compared between two groups, the case group had significantly lower prevalence of diabetes mellitus and higher prevalence of chronic obstructive pulmonary disease and/or asthma. This finding may result from difference in regions, patient population, or control group which was matched by sex, sphincterotomy and presence of choledocholithiasis using a propensity score.

There have been six retrospective studies that focused on ERCP in patients 90 year of age and older[7-9,12-14] However, some studies included small number of patients and were single arm study.[12,13] Sugiyama and Atomi[7] evaluated the role of endoscopic sphincterotomy for choledocholithiasis in 22 patients who are 90 years old and older. Outcomes of endoscopic sphincterotomy in patients who are 90 years and older were compared to those of patients who are between 70 and 89 years. 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 simi-

lar (5% and 7%, respectively). While there was no post-ERCP pancreatitis in the older group, there were 2% of younger group who had this complication. Although there was no death after the procedure in the older group, prolonged ventilatory supports were required in 9% of the older group who had severe acute cholangitis. Only 2% of the younger group required prolonged ventilatory supports. Also, the older group required emergent procedure more often than the younger group (32% vs 15%; p <0.05). Katsinelos et al.[8] evaluated efficacy and safety of therapeutic ERCP in 63 patients aged 90 years and older and 350 patients 70 to 89 years of age. Older group had higher prevalence of comorbidities, but there were no significant differences regarding rate of post-ERCP complications and ERCP-related deaths between two age groups. Post-ERCP complications occurred in 9% of the older group and 2% of the younger group. Deaths from bleeding occurred in 1.6% of the older group and 0.6% of the younger group. Christoforidis et al.[9] investigated the feasibility of therapeutic ERCP in patients 90 years and older with choledocholithiasis. Outcomes of 33 patients who were 90 years and older were compared to those of 272 patients aged between 75 and 89 years. Although the older group showed higher prevalence of acute cholangitis, comorbidities, emergent procedures, rate of post-ERCP complications did not differ significantly between the two age groups. There was no death related to ERCP in the older group. Hui et al.[14] compared outcome of emergent ERCP for acute cholangitis in patients 90 years and older to that in patients younger than 90 years. There were 64 patients in the older group and 165 in the younger group. Between two age groups, there were no differences regarding post-ERCP complications and deaths. All the deaths resulted from uncontrolled sepsis despite adequate biliary decompression with multiorgan failure, not from ERCP per se.

Previous studies on ERCP in patients aged 90 years and older showed overall complication rates of 5% to 8%.[7-9,14] In the present study, overall ERCP-related complication in the case group was 12%. This did not differ significantly from the overall complication rate in the control group. There was no occurrence of major bleeding and perforation in both groups. There was no occurrence of post-ERCP pancreatitis in the case group. Previous studies on ERCP in patients aged 80 years and older showed similar findings.[5,10] Atrophy of pancreatic parenchyma and decrease in activity of pancreatic enzyme seem to play protective roles against development of post-ERCP pancreatitis.[10] Except for one death from respiratory arrest in the case group, there had been no complication that affected the clinical outcome. Also, technical success rate of 86% was comparable to that from previous studies.[7,8]

Present study has several limitations. First of all, the study was retrospective in design. By doing case control study, bias from confounding variables was minimized. Secondly, the number of case group was not large since data from single institution were analyzed. Further study with prospective design and

multicenter involvement may overcome this limitation.

In conclusion, ERCP is a safe and effective procedure in patients over 90 years older in Korea. To perform ERCP safely in elderly patients, procurement of informed consent, monitoring during and after ERCP and prompt detection and management of complications are crucial. Larger, prospective multicenter studies with long-term follow-up on this important issue are needed in order to confirm findings from current study. Old age itself is not a reason to refrain from ERCP when indicated and necessary.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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