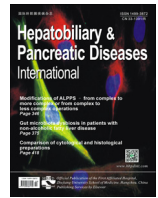




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Original Article/Biliary

Restoration of common bile duct diameter within 2 weeks after endoscopic stone retraction is a preventive factor for stone recurrence

Jin Jeon^a, Sung Uk Lim^b, Chang-Hwan Park^{a,*}, Chung-Hwan Jun^a, Seon-Young Park^a, Jong-Sun Rew^a^a Department of Internal Medicine, Chonnam National University Hospital, Gwangju, Korea^b Department of Internal Medicine, Mokpo Hankook Hospital, Mokpo, Korea

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ABSTRACT

Background: Little information is available about the relationship between restoration of common bile duct (CBD) diameter after endoscopic stone retraction and recurrence of CBD stones in elderly patients. The present study was to determine whether restoration of CBD diameter is a preventive factor for CBD stone recurrence in elderly patients who underwent endoscopic retrograde cholangiopancreatography (ERCP).

Methods: From January 2006 to December 2010, 238 patients underwent the first and the second session of ERCP for the removal of CBD stones. Among them, 173 were over 65 years old. These patients were divided into recurrent group and non-recurrent group. Restoration of CBD diameter and patients' characteristics were compared.

Results: There was no statistical difference in patients' characteristics, associated diseases, or ERCP-related complications between the two groups. Reduction of CBD diameter was significantly larger in the non-recurrent group (2.7 ± 1.7 mm) compared to that in the recurrent group (1.4 ± 2.3 mm, $p = 0.002$). The proportion of patients with restoration of CBD diameter were significantly lower in the recurrent group (6/42, 14.3%) compared with that in the non-recurrent group (67/131, 51.1%) ($p < 0.01$).

Conclusions: There is an inverse relationship between restoration of CBD diameter and CBD stone recurrence. Therefore, patients without restoration of CBD diameter within 2 weeks after endoscopic stone removal should be monitored more frequently.

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Introduction

Gallstones are common in elderly patients in Western countries. Most gallstones are found in the gallbladder. They can pass through the cystic duct into bile duct. Primary bile duct stones formed in the absence of gallbladder stones are common in East Asia. Gallbladder stones are primary cholesterol or black pigmented stones. However, common bile duct (CBD) stones are brown-pigmented stones, formed as a consequence of bile stasis and infections [1]. The treatment of choice for CBD stones is endoscopic retrograde cholangiopancreatography (ERCP) [2–6]. Recurrence of CBD stones after ERCP has been reported in 4–24% of patients [7–13].

Risk factors for recurrent CBD stones are: cirrhosis, juxtapancreatic diverticulum, gallbladder stone, CBD diameter over 1.5 cm, endoscopic sphincterotomy and oblique bile duct [7,9,14,15]. CBD

stone is a non-symptomatic disease in most patients. It can be a life-threatening condition when it is associated with severe complications such as septic cholangitis. Although there are well-known risk factors for recurrent CBD stone as mentioned above, no study has evaluated the relationship between restoration of CBD diameter after ERCP and recurrence of CBD stones in elderly patients. Therefore, the aim of the present study was to determine whether restoration of CBD diameter is a defensive factor for CBD stone recurrence in elderly patients who underwent ERCP.

Patients and methods

Patients

From January 2006 to December 2010, a total of 1848 patients underwent 2511 ERCP procedures for endoscopic CBD stone removal at a single institute. Our inclusion criteria were: presence of CBD stones; patients underwent the second session of ERCP within 2 weeks after the first session of ERCP for complete removal of

* Corresponding author.

E-mail address: p1052ccy@jnu.ac.kr (C.-H. Park).<https://doi.org/10.1016/j.hbpd.2018.03.014>

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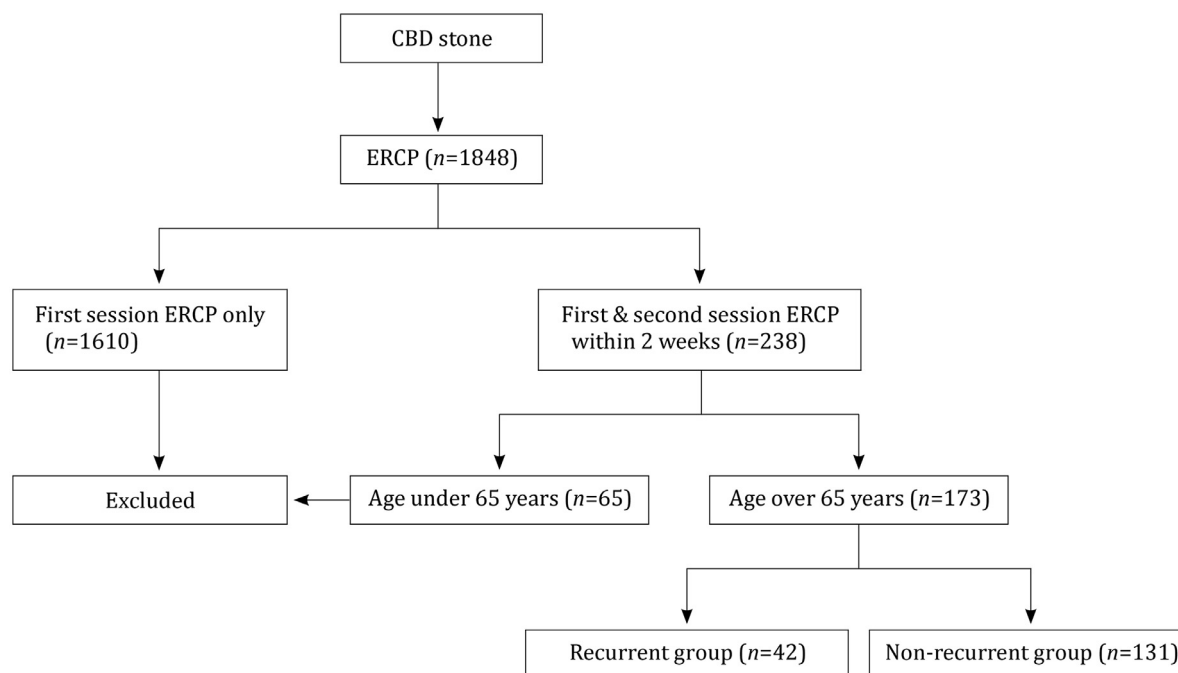


Fig. 1. Flow diagram showing patients selected for this study.

CBD stones; age > 65 year old. A second session of ERCP was performed in the following condition: within 1 week after the first session of ERCP in patients who had residual stones; patients with double antiplatelet agents within 2 weeks after the first session of ERCP who did not undergo endoscopic sphincterotomy and endoscopic stone removal at the first session of ERCP due to bleeding tendency. Therefore, they usually had residual or naïve stones at the second session of ERCP. Among the 2511 procedures, 238 had the second ERCP within 2 weeks, 173 patients who were over 65 years old were enrolled in this study.

Study design

Restoration of CBD diameter as a preventive factor for CBD stone recurrence was retrospectively evaluated in elderly patients who underwent the second session of ERCP for CBD stone removal within 2 weeks after the first session ERCP. The maximum follow-up duration was 115 months (47.0 ± 29.6).

These patients were divided into two groups: recurrent group and non-recurrent group (Fig. 1). Patients' characteristics and clinical outcomes were compared between two groups. The following patients' characteristics were evaluated in this study: underlying or associated disease such as hypertension, diabetes mellitus, cerebrovascular accident, coronary artery disease, gallbladder stone, liver cirrhosis, previous cholecystectomy, and periampullary diverticulum.

Clinical outcomes evaluated in this study included serum white blood cells, total bilirubin level, and alkaline phosphatase and alanine aminotransferase levels to estimate improvement of cholestasis, and occurrence of complications.

Restoration of CBD diameter was defined as more than 3 mm of CBD diameter reduction between the first session ERCP and the second session ERCP (Fig. 2). CBD diameter was assessed on cholangiogram after optimum opacification of the CBD. Three points of CBD diameter were measured on the cholangiogram: the largest diameter, above 1 cm from the largest point, and below 1 cm from the largest point. The diameter of CBD was defined as

average diameter of the three points to minimize measurement error.

Recurrent CBD stones were defined as CBD stones with symptoms due to complications such as cholangitis, laboratory findings of increased total bilirubin, alkaline phosphatase, and alanine aminotransferase levels, and those found in regular follow-up abdomen computed tomography (CT) in follow-up durations. However, CBD stone detected within 6 months from ERCP was considered residual stone, not recurrent stone.

Co-existing conditions of CBD stone such as pneumobilia and periampullary diverticulum were also evaluated. Procedures performed during ERCP such as endoscopic sphincterotomy, endoscopic papillary balloon dilatation, mechanical lithotripsy, infundibulotomy, and precut sphincterotomy were also compared between the recurrent group and the non-recurrent group.

Statistical analysis

Continuous variables were described as mean \pm standard deviation (SD) and compared with Student's *t* test or Mann-Whitney *U* test when suitable. Categorical variables were described as number and percentage. Differences between groups were tested for significance by using Chi-square test. Univariate and multivariate logistic regression analyses were used to define independent risk factors for CBD stone recurrence. A *p* value of less than 0.05 was considered statistically significant. Statistical analyses were performed using IBM SPSS software, version 23 (IBM Corp, Armonk, NY, USA).

Results

A total of 173 patients who met the inclusion criteria were included in this study. Among them, 98 (56.6%) were male and 75 (43.4%) were female. There were 42 patients in the recurrent group and 131 patients in the non-recurrent group. Between the two groups, there was no statistically significant difference in age, gender, hypertension, diabetes mellitus, cerebrovascular accident, coronary artery disease, gallbladder stone, liver cirrhosis, previous gastrectomy, or intrahepatic bile duct stones.

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