

CASE REPORT

## 팽대부 주위 계실로 인해 담관 삽관이 어려운 환자에서 캡 장착 내시경적 역행성 담체관 조영술의 유용성

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### The Usefulness of Cap-assisted Endoscopic Retrograde Cholangiopancreatography for Cannulation Complicated by a Periapillary Diverticulum

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Endoscopic retrograde cholangiopancreatography (ERCP) is an advanced therapeutic procedure to manage choledocholithiasis and pancreatobiliary malignancy. On occasion, ERCP failure is encountered due to difficulties in cannulation. We assessed the safety and feasibility of cap-assisted ERCP via analyzing cases in which cannulation was complicated by periampullary diverticulum. Between November 2013 and March 2014, ERCP procedures were performed in 346 patients in our tertiary medical center. Among the 73 patients who had a periampullary diverticulum, conventional ERCP failed in 5 patients due to hidden papilla (n=3) or use of tangential approach (n=2). As a rescue method, needle knife fistulotomy and selective biliary cannulation using cap-fitted forward-viewing endoscopy were successfully used in 4 patients without major complications. Based on our experience, cap-fitted forward-viewing endoscopy was relatively easy to measure the exact position of papilla and to perform biliary cannulation properly. Therefore, we recommend using cap-assisted ERCP by forward-viewing endoscopy as a useful and safe alternative to manage patients in whom cannulation is complicated by periampullary diverticulum. (**Korean J Gastroenterol 2018;71:168-172**)

**Key Words:** Cap-assisted endoscopy; Endoscopic retrograde cholangiopancreatography; Diverticulum

#### INTRODUCTION

Endoscopic retrograde cholangiopancreatography (ERCP) is a widely used procedure that is not only useful to evaluate the anatomy and the condition of pancreatobiliary tract, but also to plan proper mode of treatment, including the local surgical approach, for achieving internal drainage.<sup>1</sup>

Successful biliary cannulation is an essential step in therapeutic ERCP that plays an important role in avoiding and

minimizing complications, such as post-ERCP pancreatitis.<sup>2</sup> However, we frequently encounter difficulties with ERCP associated with abnormal anatomy, presence of a diverticulum, lack of space, or bulky papillae. In cases of difficult cannulation, other methods are needed to properly perform cannulation and ERCP procedure.<sup>1-4</sup> Various methods depending on the preference of the endoscopist have been developed to overcome such difficulties. Among them, the cap-assisted technique has been widely adopted in various endoscopic

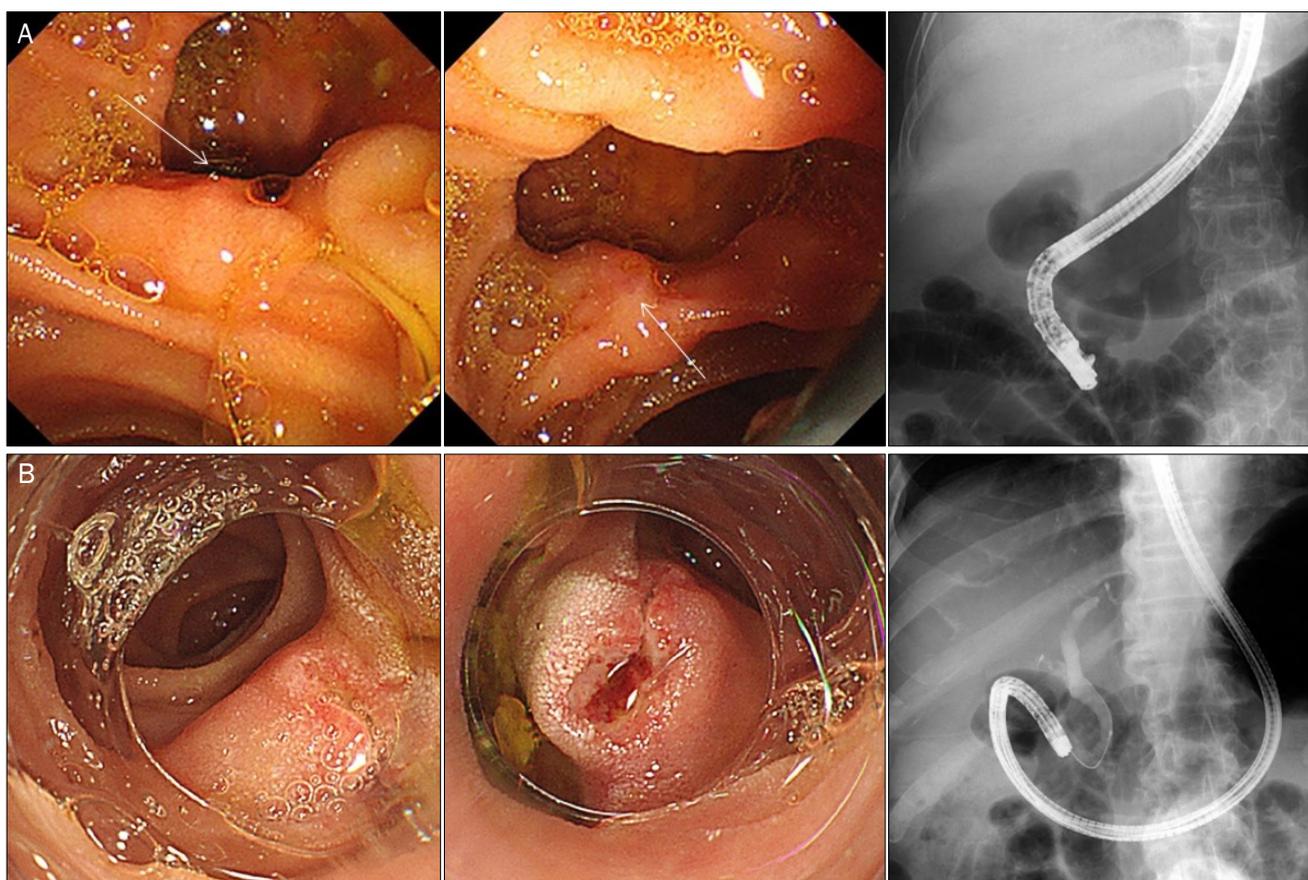
Received August 31, 2017. Revised January 12, 2018. Accepted February 8, 2018.

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Financial support: None. Conflict of interest: None.



**Fig. 1.** Biliary cannulation with cap-fitted forward-viewing endoscope in patients with periampullary diverticulum. (A) Biliary cannulation by side-viewing endoscope failed due to tangential approach toward papilla. (B) Observation of papilla and biliary cannulation with needle-knife infundibulotomy overcoming tangential approach by cap-fitted forward-viewing endoscope.

procedures. For example, the use of cap-fitted forward-viewing endoscopy for ERCP in patients with anatomical variations after Billroth II gastrectomy has been proposed.<sup>5-7</sup>

Herein, we report a retrospective case series of patients in whom cannulation was complicated by periampullary diverticulum and assess the utility and safety of cap-assisted ERCP for biliary cannulation.

## CASE REPORT

Between November 2013 and March 2014, ERCP procedures were performed in 346 patients at a tertiary medical center. Among these patients, 73 had periampullary diverticulum, of whom 5 (6.8%) underwent therapeutic ERCP using a cap-fitted forward-viewing endoscope as a rescue method due to difficult biliary cannulation. The inclusion criteria were as follows: (a) a documented periampullary diverticulum and (b) use of cap-assisted ERCP as a rescue method during the

first endoscopic encounter after failed attempts to perform ERCP using a standard side-viewing endoscope. The size of diverticulum was estimated by measuring the longest diameter on computed tomography image.

The ERCP procedure was performed initially using a standard side-viewing endoscope (Olympus TJF Q260; Olympus Optical Co., Ltd., Tokyo, Japan). All procedures were performed by two endoscopists with more than five years of experience at a single tertiary center. Periampullary diverticulum was defined as extraluminal outpouchings of the mucosa occurring within a 2-3 cm from the ampulla of Vater or the hepatopancreatic ampulla.<sup>8</sup> Difficult biliary cannulation was defined as a cannulation time exceeding five minutes or as five or more passes or injections into the pancreatic duct. If the conventional endoscopic method failed due to hidden papilla or tangential approach, cap-fitted forward-viewing endoscopy (Olympus GIF Q260; Olympus Optical Co., Ltd.) with selective cannulation was performed (Fig. 1). The channel size of scope

was 2.8 mm, which was sufficient for planned procedure. For the cap-assisted method, a cap (distal attachment; D-201-10704; Olympus Optical Co., Ltd.) was attached to the tip of the endoscope.

## DISCUSSION

A total of 5 patients were included in our case review; three males and two females, with a median age of 69 years (range 53-90 years). The indications for ERCP were bile duct stones (n=4) and common bile duct stricture (n=1) (Table 1). The first attempt using the conventional ERCP failed in these five patients due to a periampullary diverticulum; after the first attempt, therapeutic ERCP was completed using a cap-fitted forward-viewing endoscope in four patients. The main causes of difficulty were hidden papillae (n=3) and tangential approach (n=2). In case of hidden papilla, because papilla was located behind the wall of periampullary diverticulum, it was difficult to measure the exact position of the papilla, and consequently, accurate cannulation was not possible. In cases of tangential approach, it was also difficult to make frontal view of papilla or angular approach even if papilla was observed in the diverticulum. In all five patients, the ampulla of Vater was located at the 6 o'clock position. The mean diameter of the long axis of periampullary diverticula was 30 mm (range 15-50 mm). As a rescue method, needle knife fistulotomy and selective biliary cannulation using a cap-fitted forward-viewing endoscopy were successfully achieved in 4 patients. As the policy of our clinic, fistulotomy was performed after more than five attempts for cannulation with a standard cannula. The mean number of ERCP sessions was 1.8 per patient, and the mean procedure time was 38 minutes. Repeated procedures were performed in three cases. In two cases, fistulotomy under cap-fitted forward scope was performed in the first session, and biliary drainage was completed through the second session. In one case, which failed in first session, successful cannulation with cap fitted forward-viewing endoscope was achieved under the rendezvous method with a percutaneous transhepatic cholangiography. There were no major complications, including bleeding or perforation, and planned procedures (fistulotomy and stone removal in all cases, ERBD insertion in two cases, balloon dilatation in one case) were successfully completed. Only two patients experienced complications of mild post-ERCP pan-

Table 1. Results of Cap-assisted ERCP in Patients with Difficult Cannulation due to Periampullary Diverticulum

Patient number	Age (years)	Sex	Indication	Types of diverticulum <sup>a</sup>	The size of diverticulum (mm)	Procedure	Procedure time (min) <sup>b</sup>	Sessions	Causes of difficulty	Cannulation <sup>c</sup>	Complications
1	76	Female	CBD stone	Type I	25	Fistulotomy, EPBD, stone removal, ERBD stent	40	2	Tangential approach	Success	Post-ERCP pancreatitis
2	53	Male	CBD stone	Type I	15	Fistulotomy, EPBD, stone removal, balloon dilatation, rendezvous method with PTC	30	3	Hidden papilla	Fail <sup>d</sup>	None
3	69	Male	CBD stone	Type I	40	Fistulotomy, EPBD, stone removal,	20	2	Tangential approach	Success	None
4	63	Female	CBD stricture	Type II	20	Fistulotomy, biopsy	60	1	Hidden papilla	Success	None
5	90	Male	CBD stone	Type II	50	Fistulotomy, EPBD, stone removal, ERBD stent	40	1	Hidden papilla	Success	Hyperamylasemia

ERCP, endoscopic retrograde cholangiopancreatography; CBD, common bile duct; EPBD, endoscopic papillary balloon dilatation; PTC, percutaneous transhepatic cholangiography.

<sup>a</sup>Type I was defined as papilla located inside the diverticulum, type II was defined as papilla located at the margin of diverticulum, type III was defined as papilla located outside the diverticulum;

<sup>b</sup>Time of first session with successful cannulation using cap-assisted ERCP; <sup>c</sup>Result of session performing cap-assisted ERCP; <sup>d</sup>Successful cannulation with cap fitted forward-viewing endoscope was achieved under the rendezvous method with PTC.

creatitis and hyperamylasemia. However, these complications were self-limited and not deemed clinically significant.

In this present case review, we present 5 patients who experienced difficulty in cannulation caused by periampullary diverticulum. The main causes of difficulty were hidden papillae (n=3) and tangential approach (n=2). In two patients with difficulty in biliary cannulation caused by tangential approach, a cap-assisted forward-viewing endoscope allowed for a better approach to get to the papilla at the inner brim of the periampullary diverticulum. The cap fitted onto the endoscope is useful for pushing aside the mucosal fold to enable a better view of the papilla and to stabilize the tip of the endoscope. By approaching the papilla at the right angle, endoscopic fistulotomy was performed successfully. In three patients with hidden papillae, a cap-fitted forward-viewing endoscope provided a clear view of the papillary roof. Biliary cannulation was achieved by regular cannulation via endoscopic fistulotomy.

Cap-fitted forward-viewing endoscopy is widely used for endoscopic submucosal dissection or endoscopic hemostasis to achieve a clear view and proper approach.<sup>9,10</sup> The efficacy of the cap-fitted forward-viewing endoscope was achieved by providing a better angle to approach the tangentially-positioned or blinded lesions as well as providing improved stabilization of the endoscope tip by positioning it against the mucosa or lesion. It also minimized the effects of movement during respiration and enabled proper estimation of the distance between the scope and lesion.<sup>11</sup>

Structural changes, including surgically altered anatomy and acquired lesions, such as a periampullary diverticulum, present a challenge for therapeutic endoscopists. Despite advances in the ERCP techniques over the past 25 years, biliary cannulation fails in about 5-20% of all cases.<sup>12</sup> Difficulty in cannulation can increase the risk of post-ERCP complications, such as pancreatitis.<sup>2,13</sup> As previously reported, the risk of post-ERCP pancreatitis after difficult cannulation is increased compared with that after standard cannulation.<sup>14,15</sup> Possible explanations for this include excessive manipulation that result in mechanical trauma, edema of the pancreatic sphincter, and repeated contrast injections into the pancreatic duct.<sup>2,13</sup>

Periampullary diverticulum is defined by extraluminal mucosal outpouchings of the duodenum arising near or encompassing the ampulla of Vater (major papilla), including the in-

traluminal portion of common bile duct within 2-3 cm of the ampulla of Vater.<sup>16</sup> The prevalence of duodenal diverticulum in the general population varies between 0.16 and 27% and increases with age, as indicated by previous reports.<sup>16-19</sup> It is usually acquired during middle ages as a result of duodenal wall motility disorders, advancing age, weakening of intestinal smooth muscle, and increased intraluminal pressure, all of which may lead to outpouching of the duodenum at a defect in the duodenal musculature.<sup>16,20</sup> A periampullary diverticulum hinders biliary cannulation by limiting the visual field caused by mucosal folds or inadequate angle between the ampulla and the scope, particularly during ERCP procedures. Previous reports by Myung et al. suggest that diverticula leading to a hidden papilla and tangential approach hamper biliary cannulation using a conventional side-viewing endoscope.<sup>3</sup> For these reasons, a cap-assisted forward-viewing endoscope was used as an alternative, and therapeutic ERCP was performed successfully.

The main limitations of this study are its single-center population, which was relatively small, and the lack of a control group. Differences in proficiency among physicians may also affect the efficacy of the procedure. Although long-term studies involving a greater number of cases are needed, our experiences suggest that cap-assisted endoscopy can be helpful to allow for proper cannulation at least in patients complicated with periampullary diverticulum.

As a rescue method, cap-assisted ERCP using forward-viewing endoscopy could be a useful and safe alternative in patients experiencing cannulation difficulty due to periampullary diverticulum.

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