Optimal timing for precutting in cases with difficult biliary cannulation

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Authors
Yuichi Takano, Masatsugu Nagahama, Fumitaka Niiya, Takahiro Kobayashi, Eiichi Yamamura, Naotaka Maruoka

Institution
Division of Gastroenterology, Department of Internal Medicine, Showa University Fujigaoka Hospital, Yokohama, Kanagawa, Japan

Corresponding author
Yuichi Takano, 1-30 Fujigaoka, Aoba-ku, Yokohama-shi, Kanagawa 227-8501, Japan
Fax: +81-45-9731019
yuichitakano1028@yahoo.co.jp

ABSTRACT

Background and study aims In endoscopic retrograde cholangiopancreatography (ERCP), precutting is widely used when achieving biliary cannulation is difficult. However, no consensus has been reached with regard to the best time to initiate precutting.

Patients and methods We retrospectively examined 63 patients who underwent precutting for naïve papilla with difficulty in biliary cannulation between 2009 and 2016. The outcomes of the early precut group (≤20 min from cannulation until initiating precutting) and the late precut group (>20 min) were compared.

Results Of the 63 patients, 17 (27%) were in the early precut group and 46 (73%) were in the late precut group; median time until the initiating precutting was 28 minutes (7–50). No significant difference was observed between the two groups in terms of clinical features (age, sex, and indication for ERCP), precutting method, and rate of pancreatic duct stent placement. Significantly higher rates of successful biliary cannulation were observed in the early precut group (16/17; 94%) than in the late precut group (32/46; 70%) ($P < 0.05$). In 13 patients in whom precutting was commenced after 40 minutes, the rate of successful biliary cannulation was very low at 53% (7/13). No significant difference was found between the two groups in terms of incidence of complications (pancreatitis in 5 patients and bleeding in 1 patient).

Conclusion In actual clinical practice, precutting is commenced approximately 30 minutes after cannulation; however, to successfully achieve biliary cannulation, precutting is recommended to be performed within 20 minutes. Precutting is effective when little inflammation and swelling of the ampulla of Vater is observed. This study was limited in that it was single-center, retrospective and had a small subject sample.

Introduction

Endoscopic retrograde cholangiopancreatography (ERCP) is essential for treating pancreaticobiliary diseases, and biliary and pancreatic duct deep cannulation is the most fundamental technique involved in ERCP. In ERCP, performing biliary cannulation is difficult in 5% to 18% of patients [1, 2]. Therefore, various techniques such as wire-guided cannulation (WGC) [3–5], pancreatic guidewire-assisted cannulation [6], double guidewire technique [7,8], precutting [9], and endoscopic ultrasound-guided rendezvous technique [10] have been developed to improve the rate of successful cannulation. Precutting is cur-rently an established technique that is widely performed for biliary cannulation. However, the optimal time to initiate precutting remains controversial [11].

Several trials have recently compared an early precut group against a late precut group for cases with difficult biliary cannulation [12–17]. Meta-analyses [18–21] revealed no difference between the two groups with regard to the rate of successful biliary cannulation; however, the rate of pancreatitis could be low in the early precut group, i.e., early precutting effectively helped in preventing pancreatitis but did not help in improving the rate of biliary cannulation. However, these studies were prospective trials that were conducted at high-volume centers,

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where even in the late precut group, precutting was performed relatively early at 12 to 20 minutes after cannulation. In routine clinical practice, some cases often require, for various reasons, ≥ 20 minutes before precutting is initiated. This study retrospectively assessed precutting for cases with difficult biliary cannulation to determine the optimal time to initiate precutting.

Patients and methods

Among 3,260 patients who underwent ERCP at our hospital between 2009 and 2016, 72 were excluded for surgically altered anatomy, 116 were excluded for the purpose of pancreatography, and 1621 were excluded for post-EST (endoscopic sphincterotomy) or EPBD (endoscopic papillary balloon dilation) papilla. Of 1451 patients with naïve papilla and for biliary cannulation, 63 who underwent precutting for difficult biliary cannulation were retrospectively examined. The patients were divided into the early precut group (≤ 20 min from cannulation until initiating precutting) and the late precut group (> 20 min), and the outcomes of each group were compared (▶ **Fig. 1**).

Examination items included clinical features (e.g., age, sex, and indication for ERCP), precutting method, rate of pancreatic duct stent placement, rate of successful biliary cannulation, and complications. For complications, the classification of Cotton et al. [9] was used.

The first choice of cannulation method was using a catheter cannula with a contrast medium, and if that was impossible, WGC was performed. If a guidewire was inserted into the pancreatic duct, pancreatic guidewire cannulation was performed 5 to 10 times. However, when this technique proved unsuccessful, double guidewire technique was performed 5 to 10 times in all cases. When pancreatic intubation proved impracticable, cannulation was attempted 10 to 20 times prior to precutting.
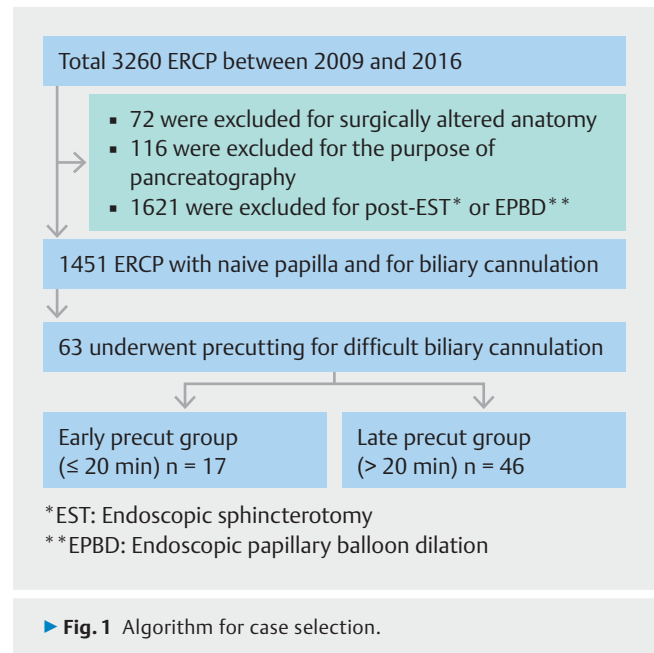
For precutting, transpancreatic biliary sphincterotomy (TPBS) is performed using a pull-type sphincterotome when the guidewire can be inserted into the pancreatic duct. When the guidewire cannot be inserted into the pancreatic duct, the conventional precut technique (cutting from the orifice of the ampulla of Vater toward the bile duct using a needle knife) is performed.

At our hospital, before being allowed to precut, endoscopists should have performed at least 100 endoscopic sphincterotomies with a biliary cannulation rate for naïve papilla of at least 80 %. The timing of precutting and pancreatic duct stent placement is determined at the discretion of the endoscopist.

Statistical analyses were performed using the student's *t* test and chi-square test to compare the two groups, and probability (*P*) values < 0.05 were considered to indicate a statistically significant difference.

Results

Mean age of the patients was 73.6 (32 – 95) years, and the male-to-female ratio was 34:29. The indication for ERCP was choledocholithiasis in 30 patients, malignant biliary stricture in 28 (pancreatic cancer in 19 and bile duct carcinoma in

Total 3260 ERCP between 2009 and 2016

- 72 were excluded for surgically altered anatomy
- 116 were excluded for the purpose of pancreatography
- 1621 were excluded for post-EST* or EPBD**

1451 ERCP with naive papilla and for biliary cannulation

63 underwent precutting for difficult biliary cannulation

Early precut group (≤ 20 min) n = 17

Late precut group (> 20 min) n = 46

*EST: Endoscopic sphincterotomy
**EPBD: Endoscopic papillary balloon dilation

▶ **Fig. 1** Algorithm for case selection.

nine), benign biliary stricture in four (chronic pancreatitis), and bile leakage in one. The precutting method employed was TPBS in 52 patients and the conventional precut technique in 11 patients (▶ **Fig. 2**, ▶ **Fig. 3**).

There were 17 (27 %) patients in the early precut group and 46 (73 %) in the late precut group; median time from cannulation until initiating precutting was 28 minutes (range 7 – 50). Pancreatic duct stents were placed in 39 patients (62 %).
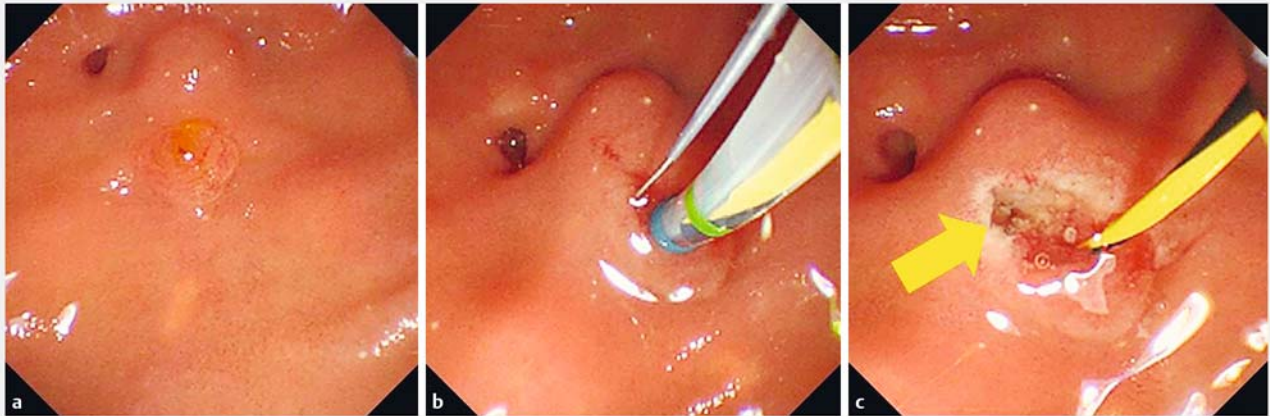
A comparison of the outcomes of the early and late precut groups is presented in ▶ **Table 1**. For both groups, clinical features (age, sex, and indication for ERCP), precutting method, and rate of pancreatic duct stent placement were comparable. Significantly higher rates of successful biliary cannulation were observed in the early precut group (16/17; 94 %) than in the late precut group (32/46; 70 %) (*P* < 0.05). In 13 patients in whom precutting was initiated after 40 minutes, the rate of successful biliary cannulation was very low at 53 % (7/13).

Complications included pancreatitis (5 patients) and bleeding (1 patient). Among patients with pancreatitis, the condition was moderate according to Cotton's classification in one patient and mild in all other patients. The incidence of post-ERCP pancreatitis (PEP) was 1/17 (5.9 %) in the early precut group and 4/46 (8.7 %) in the late precut group. No significant difference was observed between the two groups in terms of complications.

Discussion

Precutting is an established technique that is widely performed in ERCP for cases with difficult biliary cannulation. However, the optimal time to initiate precutting remains controversial.

Several studies have recently compared outcomes in the early precut group with those in the late precut group (precutting performed after continuing normal cannulation) for cases with difficult biliary cannulation cases [12 – 17]. Meta-analyses re-

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► **Fig. 2** **a** Ampulla of Vater before cannulation. **b** The ampulla at 9 minutes after cannulation. The guidewire is inserted into the pancreatic duct. Negligible swelling and inflammation are observed in the ampulla of Vater. **c** The ampulla after transpancreatic biliary sphincterotomy. Biliary cannulation was successful. The arrow indicates the bile duct orifice.
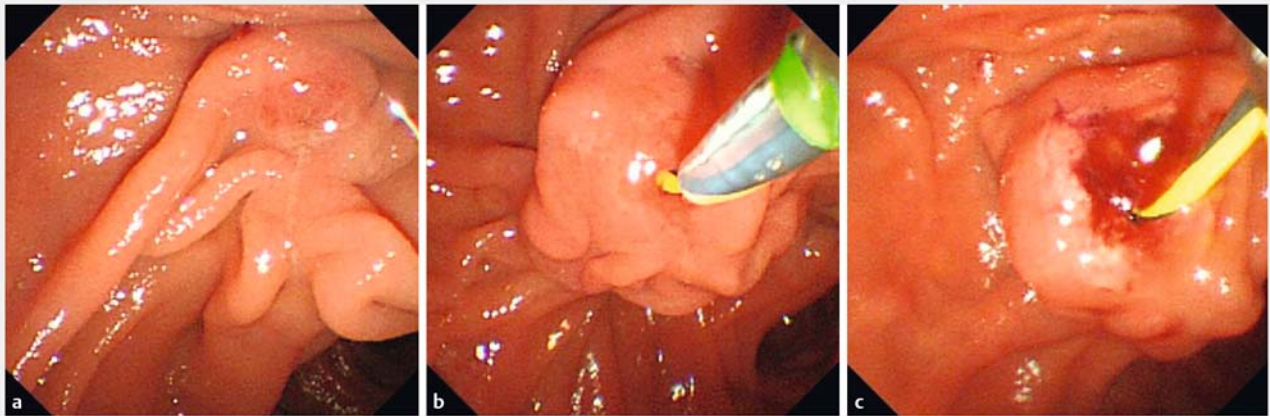
► **Fig. 3** **a** The ampulla of Vater before cannulation. **b** The ampulla at 43 minutes after cannulation. Swelling of the papilla is observed as a result of cannulation for a long period. The guidewire is inserted into the pancreatic duct. **c** The ampulla of Vater after transpancreatic biliary sphincterotomy. Even after precutting, biliary cannulation was unsuccessful.

► **Table 1** Comparison of early and late precut groups.

	Early precut group (n = 17)	Late precut group (n = 46)	*P* value
Age, median (range)	78 (59 – 90)	76 (32 – 95)	n.s[1]
Sex (male:female)	10, 7	24, 22	n.s[2]
Indication for ERCP	Benign disease 9, malignant disease 8	Benign disease 26, malignant disease 20	n.s.[2]
Precutting method	TPBS 14, CP 3	TPBS 38, CP 8	n.s.[2]
Pancreatic stent placement	9/17 (53 %)	30/46 (65 %)	n.s[2]
Success of biliary cannulation	16/17 (94 %)	32/46 (70 %)	< 0.05[2]
Complication	2 (one pancreatitis and one bleeding)	4 (pancreatitis)	n.s.[2]

TPBS, transpancreatic biliary sphincterotomy; CP, conventional precut; N.S., not significant
[1] Student's *t* test.
[2] Chi-square test.

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vealed no difference between the two groups in terms of the rate of successful biliary cannulation, and risk for pancreatitis could be lowered by early precutting [18–21]. In other words, early precutting helped in preventing pancreatitis but did not help in improving the rate of biliary cannulation. However, due care should be paid to the fact that these studies were prospective trials conducted at high-volume centers, where even in the late precut group, precutting was performed relatively early at 12 to 20 minutes after cannulation.

In this study, the rate of successful biliary cannulation was significantly higher in the early precut group (≤20 min) than the late precut group (>20 min) (94 % vs. 70 %). Among patients in whom precutting was initiated after 40 minutes, the rate of successful biliary cannulation was poor, accounting for approximately half of the patients (53 %). Thus, cannulation is difficult in the event of swelling and inflammation of the ampulla of Vater, which result from a long period of continued cannulation. Precutting is useful when the papilla has little damage, and precutting should be performed within 20 minutes.

However, in this study, the median time before initiating precutting was 28 minutes, and precutting was initiated within 20 minutes in only 17 patients (26 %). This finding is believed to reflect actual clinical practice. The reasons for which time is required before precutting are that several cannulation techniques were performed before precutting and there is some resistance toward simply precutting.

Precutting requires a high level of skill, and only experts are permitted to perform the procedure [22, 23]. Reported risks for precutting include pancreatitis, bleeding, and perforation, and precutting is reportedly an independent risk factor for pancreatitis [24]. Some endoscopists hope to avoid precutting if possible and hesitate to precut early.

Incidence of PEP was 1/17 (5.9 %) in the early precut group and 4/46 (8.7 %) in the late precut group. Although the difference was not statistically significant, the late precut group exhibited a higher incidence of pancreatitis. A significant difference was possibly not found because the study included a small subject sample. As mentioned above, in meta-analyses, early precutting is suggested to be useful to prevent pancreatitis [18–21]. Pancreatitis recently has been considered to be caused by attempting cannulation for a long period, which damages the ampulla of Vater, rather than by precutting itself [18]. Performing early precutting is recommended to prevent pancreatitis.

In recent years, precut fistulotomy (incision of the mucosa starting directly over the roof of the papilla followed by upward or downward cut until the underlying biliary sphincter is visualized) has been the preferred modality for precutting using needle-knife, because incidence of PEP has been reported to be lower in patients who undergo fistulotomy than those who undergo conventional precutting [22, 23]. Use of conventional precutting in the current study might have contributed to the relatively high incidence of PEP.

In the current study, a duration of 20 minutes was set as an index for precutting. However, many factors other than duration may dictate timing of precutting, such as frequency of attempted cannulation and guidewire insertion or injection of contrast agent into the pancreatic duct. Future research needs to further explore the correlation between these factors and the timing for precutting initiation.

Conclusion

In actual clinical practice, precutting is performed approximately 30 minutes after initiating cannulation. However, the rate of successful biliary cannulation is significantly higher when precutting is performed within 20 minutes than when it is performed after 20 minutes. For successful biliary cannulation, performing precutting is useful when the ampulla of Vater has little damage, and precutting should be performed within 20 minutes after initiating cannulation. This study was limited in that it was single-center, retrospective and had a small number of subjects in the sample. Because the experiment was not randomized, patient selection might have been biased.

Competing interests

None

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