

Combination of Precut Techniques in Difficult Biliary Cannulation

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ABSTRACT

Background: Selective biliary cannulation (SBC) is a prerequisite for successful endoscopic retrograde cholangiopancreatography (ERCP). SBC has the potential to fail in as many as 20% of cases, even with skilled endoscopists. Precut incision techniques like needle-knife sphincterotomy (NKS) and transpancreatic septotomy (TPS) can be used in cases where standard cannulation techniques fail. However, these precut techniques may also fail in some cases. We aimed to evaluate the procedural success of the combined TPS + NKS technique in difficult biliary cannulation.

Patients and methods: The study included 289 patients who underwent ERCP with precut techniques from 2017 to 2022. Patients were classified into the following three groups and evaluated retrospectively in terms of cannulation success, and ERCP-related adverse effects: Transpancreatic septotomy, NKS, and TPS + NKS; statistical package for the social sciences (SPSS), version 29.0, software was used to analyze the data.

Results: The success rate of SBC was 69% in the TPS group, 75.3% in the NCS group, and 87% in the TPS + NCS group. There was no significant difference between the NKS and TPS + NKS groups. Cannulation success in both NKS group and NKS + TPS groups was significantly higher than in the TPS group ($p < 0.001$). Complication rates were similar.

Conclusion: In cases where standard sphincterotomy and precut techniques fail, a second precut technique can be used. A previous TPS does not prevent NKS.

Keywords: Difficult biliary cannulation, Needle-knife sphincterotomy, Transpancreatic septotomy.

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INTRODUCTION

To perform endoscopic retrograde cholangiopancreatography (ERCP), it is necessary to cannulate the common bile duct and/or the main pancreatic duct through the major duodenal papilla. If biliary cannulation fails, the entire procedure will be unsuccessful since many procedures are done for therapeutic purposes. Cannulation is the most time-consuming stage of ERCP in clinical practice. In up to 20% of cases, selective biliary cannulation (SBC) is reported to fail, but in experienced hands, the rate decreases to 5%.¹ Precut incision techniques such as needle-knife sphincterotomy (NKS) and transpancreatic septotomy (TPS) can be used in cases where standard cannulation techniques fail. However, these precut techniques may also fail in 10–40% of cases.² Our knowledge about the combination of two precut incision techniques in the same procedure is limited. We aim to evaluate the success rate in difficult biliary cannulation cases when both precut incision techniques are used together.

PATIENTS AND METHODS

We conducted a retrospective analysis of ERCP procedures performed between 2017 and 2022 in our advanced endoscopy unit. During this period, ERCP was performed on 1,697 different patients by an experienced endoscopist (MK). Among these patients, 1,350 had naive papillae and 289 were patients for whom precut incision techniques were used. As a result, 289 patients who had a precut incision were included in the study. All patients signed the consent form for the ERCP procedure.

In our clinic, we always try cannulation with a guidewire in all patients who have undergone ERCP. When attempts to

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cannulate the biliary duct led to more than 5 contacts or more than 5 minutes spent after visualization, it was considered difficult biliary cannulation. If the anatomy was appropriate, an NKS was done in such cases. When more than one pancreatic duct was cannulated using standard methods, TPS, and biliary cannulation were attempted. In cases where TPS failed, NKS was performed

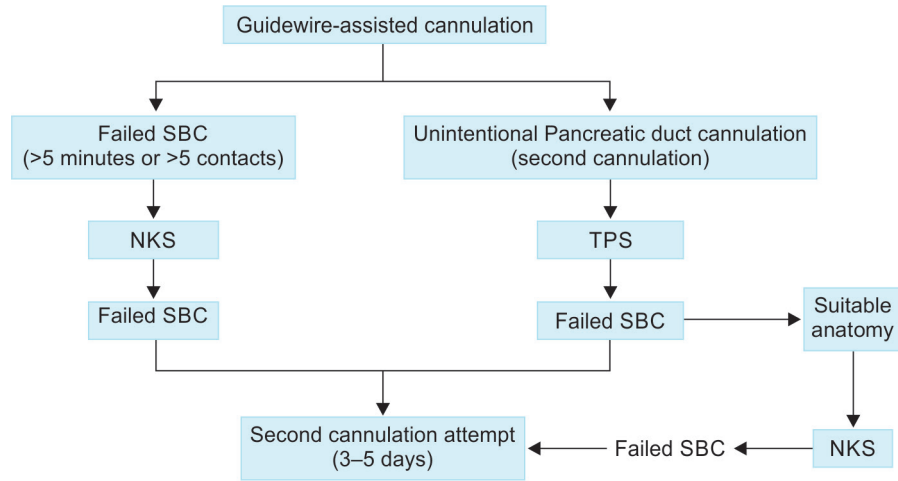


Fig. 1: Our strategy in difficult biliary cannulation cases
 NKS, needle-knife sphincterotomy; SBC, selective biliary cannulation; TPS, transpancreatic sphincterotomy

if the anatomy was suitable; if the anatomy was not suitable, the procedure was repeated 3–5 days later (Fig. 1). Accordingly, the patients were classified into three groups and evaluated retrospectively in terms of cannulation success, and ERCP-related adverse effects.

The patient files and hospital database were scanned retrospectively to obtain data about adverse effects related to ERCP. The definition of post-ERCP pancreatitis (PEP) is as new or worsening abdominal pain that lasts more than 24 hours after ERCP and a more than 3-fold increase in amylase-lipase levels, as recommended by the European Society of Gastrointestinal Endoscopy (ESGE).³ Cholecystitis was defined according to the revised Tokyo guideline 2018, while other side effects were defined according to the American Society for Gastrointestinal Endoscopy (ASGE) guideline 2017.^{4,5} The severity of PEP was evaluated by the length of hospital stay according to the definition made by Cotton and colleagues.⁶ The severity of cholangitis and cholecystitis was determined by the Tokyo Guideline 2018 and the severity of other adverse effects was determined by the ASGE 2017 guideline.^{4,5}

Olympus TJF-Q190V (Tokyo, Japan) therapeutic duodenoscopes, Boston Scientific Autotome RX-44 canculotomes and Micro-Tech canculotomes (Nanjing, China), and Boston Scientific Jagwire 0.035-mm guidewires were used in the procedures. Also, TPS was performed with the cannulotome used in standard cannulation, and NKS was performed with Cook Medical (Bloomington, Indiana, USA) HPC-2 needle-tipped sphincterotomy. Furthermore, ERBE ICC-200 diathermy generator was used in all cases. The incision was made using 120 W in level-2 endocut modes and the coagulation was done using 60 W in soft coagulation mode.

Numbers (n) and percentages (%) are the means by which descriptive statistics are displayed in qualitative data. For quantitative data, mean and standard deviation are given for data that has a normal distribution, while median and minimum–maximum values are given for data that has a nonnormal distribution. Comparisons of categorical variables between groups were made using Chi-square or Fischer’s exact tests. In comparing continuous variables in two independent groups, Student’s t-test was used when the assumption of normal distribution was met, and the Mann–Whitney U test was used when the assumption of normal distribution was not met. The type 1 margin of error (alpha)

Table 1: Efficacy of precut cannulation techniques

Cannulation	n	Success	Failed SBC	Rate (%)
TPS	68	45	23	69
NKS	198	149	49	75.3%
TPS + NKS	23	20	3	87
Total	289	214	75	75

NKS, needle-knife sphincterotomy; SBC, selective biliary cannulation; TPS, transpancreatic sphincterotomy

was accepted as 0.05 for all statistics. The analysis was carried out with statistical package for the social sciences (SPSS), version 29.0, software.

RESULTS

Endoscopic retrograde cholangiopancreatography (ERCP) was performed on 1,697 different patients between 2017 and 2022. A total of 347 were excluded from the study due to having a previous ERCP history at a different center and their papillae not being naive. Selective biliary cannulation was performed using a standard technique in 1,061 patients. The cannulation success rate in these patients was 78.5%. Selective biliary cannulation was attempted in 289 patients with TPS, NKS, and combined TPS + NKS precut techniques. The median age of these patients was 62 years (12–96 years). The female:male ratio was 170:119. The success of cannulation in the first procedure was 75%. This increased the first-attempt cannulation success rate in all ERCP procedures to 94.6%. Median cannulation time was 2.7 minutes, number of unintentional guidewire passage into the main pancreatic duct was 1.1. The periampullary diverticulum rate was 12%.

A total of 289 patients who underwent SBC using precut techniques were evaluated in three groups (Table 1). In the TPS group, SBC was successful in 45 of 68 patients, and the cannulation success rate was 69%. In the NKS group, SBC was successful in 149 of 198 patients and the cannulation success rate was 75.3%. Transpancreatic septotomy and NKS were performed on 23 patients in the TPS+NKS group, with SBC successfully achieved in 20 patients and a cannulation success rate of 87%. When the cannulation success rates were compared between the groups, no significant

Table 2: Distribution of ERCP-related adverse effects

	Overall	TPS	NKS	TPS + NKS
Total	47	9	32	6
Pancreatitis	24	8	15	1
Cholangitis/cholecystitis	16	0	13	3
Bleeding	3	1	2	0
Aspiration	1	0	0	1
Stent migration	2	0	2	0
Pneumothorax	1	0	0	1

NKS, needle-knife sphincterotomy; TPS, transpancreatic sphincterotomy

difference was detected between the NKS and TPS + NKS groups. Cannulation success in both the NKS group and the NKS + TPS groups was significantly higher than in the TPS group ($p < 0.001$). It was observed that cannulation success did not affect age, gender, or disease diagnosis in all three groups.

In all three groups of patients who underwent the precut incision technique, 242 of 289 patients did not experience any complications. The total complication rate was 16.2%. A total of 24 patients developed pancreatitis, 16 patients had cholangitis/cholecystitis, 3 patients had bleeding, 2 patients had stent migration, 1 patient had aspiration, and 1 patient had pneumothorax. Perforation was not observed. Complications developed in 9 patients (20%) in the TPS group. Eight of these patients had pancreatitis and 1 had bleeding. A total of 32 patients (16.2%) in the NKS group experienced complications. Fifteen of these patients had PEP, 13 had cholangitis/cholecystitis, 2 had bleeding, and 2 had stent migration. In the TPS + NKS group, complications occurred in 6 patients (26.1%). Three of these patients had cholangitis/cholecystitis, 1 had pancreatitis, 1 had aspiration, and 1 had pneumothorax. The three groups did not have a statistically significant difference in terms of total complication rates when compared ($p > 0.05$). Since the number of patients in the TPS + NKS group was low, comparisons could not be made in terms of complication subgroups. The distribution according to complications in all three groups is shown in [Table 2](#).

When evaluated in terms of PEP severity, 7 out of 8 patients in the TPS group had mild disease, while 1 had severe disease. Mild pancreatitis was present in 13 patients in the NKS group, moderate pancreatitis in 1 patient, and severe pancreatitis in 1 patient. In the TPS + NKS group, one patient had mild pancreatitis. Pancreatitis and all other complications were treated conservatively. Surgical and radiographic methods were not required. Three bleeding patients were managed endoscopically. There was no mortality observed in any patient.

DISCUSSION

Selective biliary cannulation is essential for successful ERCP. However, even with experienced endoscopists, SBC can fail in up to 20% of cases.⁷ Multiple attempts for SBCs increase procedure time and risks of complications, such as pancreatitis.⁸ In the latest ESGE guideline, difficult biliary cannulation is defined as the duration of cannulation attempt exceeding 5 minutes or more than five contacts to the papilla or more than one unintentional main pancreatic duct cannulation.¹ When SBC becomes challenging, the endoscopist has the option of placing a guidewire or stent in the main pancreatic

duct, using precut techniques, or postponing the procedure until 3–5 days for re-attempt SBC. The decision is influenced by the safety of the patient, the urgency of the procedure, the time spent for cannulation, and the cost of the instruments.⁹

Precut incision, as a term, refers to the sphincter incision made prior to biliary cannulation. The two main types of precut incision techniques that are widely employed are NKS and TPS. Needle-knife sphincterotomy is the process of dissecting the sphincter using a biliary catheter with a guide wire at the tip. This can be done by two techniques. The classical approach involves making an incision in the cephalad direction, starting from the papilla orifice, and attempting to access the biliary duct. The suprapapillary fistulotomy technique aims to enter the common bile duct by creating a fistula on the sphincter at a point on the orifice.¹ In the precut incision method with TPS, the tip of the sphincterotome is turned toward the biliary duct while it is in the pancreatic duct, the septum in between is cut and biliary access is provided. The advantage of this incision is that it does not require instrument changes because it is done with a standard sphincterotome.¹ There are no clues to guide endoscopists when choosing between TPS and NKS. Moreover, TPS is better than NKS in controlling the depth and position of the incision in the presence of a small papilla. Conversely, in the presence of a protruding papilla with a visible intraduodenal CBD segment, NKS may be easier to perform safely.¹ In 3.8–19.2% of ERCP procedures, precut sphincterotomies are used, and early success rates can range between 35% and 96% based on different studies.^{10–13} According to the ESGE recommendations, if biliary cannulation fails after TPS and the papillae are prominent in these patients, NKS can be performed.¹ However, there are few studies in which TPS and NKS techniques are used together. We aimed to evaluate the procedural success and complication rates of the combined TPS + NKS technique in this group of patients.

In the ERCP procedures we performed on 1,061 patients in 5 years, the initial success rate of SBC in sphincterotomy performed with standard methods in the first procedure was 78.5%. Adding the precut techniques used for ERCP cases, which were 75% successful in the first procedure, resulted in a higher success rate of 94.6%. Although similar rates are reported in the literature, the rate may be slightly lower in patients who underwent sphincterotomy with the standard technique because we excluded from the study patients who underwent re-procedure and patients whose papillae were not naive. The initial success rate of SBC was 69% in the TPS group, 75.3% in the NKS group, and 87% in the combined TPS + NKS group. In the combined TPS + NKS group, cannulation failed in the first procedure in 3 of 23 patients, and SBC success was achieved in these patients in the second and third attempts, but since the number of patients in this group was low, final success evaluation was not made. As stated above, no angiography or surgical procedures were required in any patient included in the study.

Even though the TPS + NKS group had a higher success rate than the other two groups, a significant difference was only observed with the TPS group. There was no significant difference in the success rates of SBC between the combined TPS + NKS and NKS groups. When previous studies in the literature are reviewed, similar rates are observed. In the study conducted by Espinel-Díez et al., 83.3% SBC success was observed in the first procedure using combined precut techniques. The initial SBC success was found to be 93.6% in the TPS group and 82.4% in the NKS group. The final SBC success rate increased to 100% after performing the second

and third procedures.¹⁴ In the study of Morena et al., the initial SBC success was found to be 70% in the TPS group, 87% in the NKS group, and 80% in the combined precut group.²

It is known that ERCP-related adverse effects are more common in precut techniques than in standard sphincterotomy. It has been seen with a frequency of 2–34% in studies. Precut incision is a risk factor for PEP and perforation. When all ERCP cases were evaluated, regardless of the sphincterotomy technique, the PEP rate was reported as 3.5–9.7%, cholangitis/cholecystitis 1.4%, bleeding 1.3%, and perforation 0.6%. The rate of complications among our patient groups using combined precut techniques was 26.1%. Similar to the literature, in our study, the PEP rate was low in the combined precut group. Only one of 26 patients (2.3%) was observed with PEP. In general, no significant difference was observed in terms of complications between the TPS, NKS, and TPS + NKS groups.

Our study has some limitations, including its retrospective nature and a small number of patients in the combined precut group, which prevents us from comparing final SBC success between groups. The strengths of our study are that all procedures were performed by a single experienced endoscopist and that repeated procedures and patients with nonpapillae naive were excluded from the study.

CONCLUSION

In cases where standard sphincterotomy and precut techniques fail, a second precut technique can be used as an alternative to the delayed strategy. A previous TPS is not a barrier to NKS. The complication risks of the combined technique are similar to those of separate precut techniques.

AVAILABILITY OF DATA

Patient's data was obtained from the hospital data system.

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