

## **Pancreatic Duct Sphincterotomy: A Valuable Technique Applied to Difficult Common Bile Duct Cannulation**

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### **Abstract**

**Significance:** In certain instances, cannulating the common bile duct (CBD) remains to be a challenge to therapeutic endoscopist. Pancreatic duct sphincterotomy, a technique referred also as transpancreatic precut sphincterotomy, has been used to access difficult cannulation of CBD with an immediate success rate of 60 - 90% [1]. The aim of this study is to present a single center's experience of such technique along with its success rate, indications and identified complications.

**Methods:** Eighty three patients who underwent endoscopic retrograde cholangiopancreatography using pancreatic duct sphincterotomy technique to access the CBD was retrieved from the endoscopy unit's patient's record from January 2014 to December 2018. Only 72 were retrospectively analyzed due to the unavailability of charts. Pancreatic duct sphincterotomy was used on cannulations that were deemed difficult and when initial standard technique failed.

**Results:** The success rate of CBD cannulation was 96.4% while failed access to CBD was only 3.6%. A periampullary diverticulum, an anatomic obstacle to sphincterotomy, was noted among 27% of successfully cannulated patients. Procedure-related complications was 18% in which bleeding (mild: 2.7%, moderate: 4.1%) and pancreatitis (mild: 8.3%, moderate: 4.2%) were the only ones identified while 81.9% did not have any complications.

**Conclusion:** Pancreatic duct sphincterotomy is an effective technique for difficult bile duct cannulation with minimal mild to moderate bleeding and pancreatitis as the only procedure-related complication.

**Keywords:** *Pancreatic Duct Sphincterotomy; Difficult Bile Duct Cannulation; Successful Cannulation*

### **Introduction**

In most endoscopic retrograde cholangiopancreatography (ERCP) cases, successful cannulation of the common bile duct (CBD) is necessary in which access is easily achieved in most patients with few cannulation attempts. However, in certain instances, cannulation of the CBD for various indication can be difficult and at times unsuccessful with the standard sphincterotome, thus requiring a more advanced technique.

Pancreatic duct sphincterotomy, a technique that is the same as Transpancreatic duct sphincterotomy (TPS), has been used to access difficult CBD cannulation with an immediate success rate of 60 - 96% [1]. It is first described by Goff in 1995, in which a guide wire is used to access the main pancreatic duct and a small precut is performed using the standard sphincterotome over the guide wire directed towards the bile duct through the septum between the two ducts [2,3]. It is an uncommonly used technique with limited data regarding its outcome when used during difficult biliary cannulation. A meta-analysis by Pesci et.al shows that TPS is more effective than needle-knife precut papillotomy (NKPP) in terms of successful biliary tract cannulation and can be safely performed in certain types of papillary

tracts. In terms of complication rates, post-ERCP pancreatitis does not differ between TPS and NKPP and bleeding rate was lower in the analysis of all studies [4].

With the use of such advanced technique in our locality, the aim of this study is to present a single center's experience with regards to its success rate, indications and outcome so as to present adaptation of this strategy for higher rate of cannulation success and lower complication rate.

### Methodology

#### Study population

This is a retrospective observation study of 83 patients who underwent ERCP using pancreatic duct sphincterotomy to access the CBD. Data were retrieved from the endoscopy unit's patient's record in a private tertiary hospital in Cebu City from January 2014 to December 2018. Inclusion criteria includes adult patients ages 18 years old and above to whom: 1. Pancreatic duct sphincterotomy was used to access the CBD after a standard sphincterotome cannulation was attempted and abandoned due to deemed difficulty and 2. primary cannulation of the biliary tract was achieved. Exclusion criteria are patients who had a prior gastric and pancreatic surgery and those not admitted in the said institution. Age, gender and indications for ERCP are tabulated along with the baseline laboratory parameters as to bilirubin, alkaline phosphatase, amylase, lipase, hemoglobin and white blood cell count on admission. No prophylactic drugs were administered for the prevention of post-ERCP pancreatitis (PEP) in all patients and no placement of a pancreatic stent after ERCP was done as well.

#### Pancreatic duct sphincterotomy

The procedure was performed by a single experienced operator with more than 1000 cases of ERCP and endoscopic sphincterotomy. The choice to do such procedure was based on subjective assessment of difficult biliary tract cannulation such as the presence of an edematous ampulla, periampullary diverticulum, difficult scope position and when the pancreatic duct are initially cannulated 2 times subsequently. As mentioned, the procedure is the same with that of transpancreatic precut sphincterotomy described by Goff [2,3]. For the study population, the following instruments were used: 1. Olympus duodenoscope (TJF160VF) 2. Olympus Electrosurgical generator (ESG-100) 3. Olympus CV-145 video processor with Olympus CLV-160 light source and 4. Endoflex 0.025 inch guide wire. Once the main pancreatic duct is cannulated using the guide wire, a cut is made over the wire using the standard sphincterotome that is directed towards the bile duct (11 - 12 o' clock position) through the septum between the two ducts. Successful cannulation to the CBD is then confirmed through fluoroscopy (Figure 1).



**Figure 1:** Pancreatic Duct Sphincterotomy Technique. (A) After the main pancreatic duct has been cannulated by the guidewire, (B and C) a precut is performed using the standard sphincterotome over the guidewire directed toward the 11 to 12 o'clock position at the bile duct toward the septum between the 2 ducts. (D) Biliary cannulation then successfully achieved.

**Evaluating procedure- Related complications**

The charts were reviewed for complications related to pancreatic duct sphincterotomy such as bleeding, pancreatitis, cholangitis and perforation. Severity of certain complication were then graded according to the ‘consensus criteria’ as described by Cotton., *et al.* (See table 1) [5]. Procedure related death will also be tabulated if identified.

	Mild	Moderate	Severe
Bleeding	Clinical (not just endoscopic) evidence of bleeding, hemoglobin drop of < 3 g/dL, no need for transfusion	Transfusion (4 units or less), no angiographic intervention or surgery	Transfusion (5 or more) or intervention (angiographic or surgical)
Pancreatitis	Clinical pancreatitis, amylase, lipase of at least 3 times normal at more than 24 hours after the procedure, requiring admission or prolongation of planned admission to 2 - 3 days	Pancreatitis requiring hospitalization of 4 to 10 days	Hospitalization for more than 10 days, or hemorrhagic pancreatitis, phlegmon, or pseudocyst, or intervention (percutaneous or surgical)
Perforation	Possible or only very slight leak of fluid or contrast, treatable by fluids and suction for 3 days or less	Any definite perforation treated medically for 4-10 days	Medical treatment for more than 10 days or intervention (percutaneous or surgical)
Infection (cholangitis)	> 38°C for 24 - 48 hours	Febrile or septic illness requiring more than 3 days of hospital treatment or endoscopic or percutaneous intervention	Septic shock or surgery

**Table 1:** Grading for Complications of Endoscopic Sphincterotomy according to the “consensus criteria” by Cotton., *et al.*

**Results**

Among 83 retrieved ERCP data sheet, 3 out of 83 procedures (3.6%) in which pancreatic duct sphincterotomy was used to attempt CBD access, however, failed and surgical exploration and percutaneous transhepatic biliary drainage was used as a management option. The technique was successful in subsequent access to CBD in 80 of 83 (96.4%) patients (Table 2).

	n	%
Number of patients	83	100
Successful CBD cannulation	80	96.4
Failed CBD cannulation	3	3.6

**Table 2:** Cannulation Success with Pancreatic duct sphincterotomy.

The three failed CBD cannulations were not included in the data analysis, as well as eight cases whose charts were not retrieved because of unavailability. The mean age of the seventy-two patients included in the study is 59 with females comprising 56% of the study population. Baseline laboratory parameters are as follows: median bilirubin level of 8.09 mg/dl, alkaline phosphatase of 303.92 U/L, amylase of 529.77 U/L, lipase of 5,965.06 U/L, hemoglobin 12.7 g/dL, leukocytosis of 11.32 10<sup>3</sup>/uL and SGPT of 185.51 U/L (Table 3). Most of the ERCP procedures were done for biliary stones and malignant biliary obstruction comprising 38.9% and 29.1% respectively. Other identified pathogenesis includes biliary pancreatitis, cholecystolithiasis and suspected biliary stones as shown in table 4. There were also noted periampullary diverticulum in 20 of 72 patients (27.8%).

	Patient Characteristic	Normal Reference Range
Number of patients	72	
Age	59.58 (19 - 88)	
Sex	Males: 32 (44%) Females: 40 (56%)	
Bilirubin	8.09 (0.1 - 39.4)	0.3 - 1.2 mg/dl
Alkaline phosphatase	303.92 (49 - 1065)	38 - 126 U/L
Amylase	529.77 (30 - 4672)	30 - 110 U/L
Lipase	5,965.06 (90 - 73760)	23 - 300 U/L
Hemoglobin	12.87 (9.4 - 16.3)	12.3 - 15.3 g/dL
Leukocytes	11.32 (4.8 - 31.4)	4.5 - 11.00 10 <sup>3</sup> /uL
SGPT	185.51 (18 - 683)	< 35 U/L

**Table 3A:** Patients’ characteristics and baseline laboratory parameters.

	Patients	%
Biliary Stones	28	38.9
Malignant biliary obstruction	21	29.1
Pancreatic head Mass	9	12.5
Periampullary Carcinoma	4	5.5
Cholangiocarcinoma	8	11.1
Klatskin Tumor	4	5.5
Cholecystolithiasis	11	15.3
Biliary pancreatitis	10	13.9
Suspected biliary stones	2	2.7

**Table 3B:** Pathogenesis of biliary obstruction.

In terms of complication rates, 59 out of 72 patients (81.9%) did not have any complications. Only bleeding and pancreatitis were the documented complications with incidence of pancreatitis, although mostly mild (8.3%), higher than bleeding episodes. None of the patients however required surgical or interventional to manage bleeding and none resulted to perforation, cholangitis and death (Table 4).

	Patients	%
Number of patients	72	100
Number of complications	13	18.0
None or No complications	59	81.9
Bleeding	5	6.9
Mild bleeding	2	2.7
Moderate bleeding	3	4.1
Pancreatitis	9	12.5
Mild pancreatitis	6	8.3
Moderate Pancreatitis	3	4.2

**Table 4:** Procedure-Related Complications using pancreatic duct sphincterotomy technique.

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### Discussion

Problems encountered during ERCP such as prolonged cannulation attempts and difficult cannulation are likely to increase the risk of post-ERCP bleeding, pancreatitis, cholangitis and even perforation that in some cases, puts the patients' life at risk in addition to added cost due to prolonged hospital day. With this, advanced techniques are introduced, such as double guidewire technique, needle-knife precut papillotomy and transpancreatic precut sphincterotomy.

The success rate of cannulation to difficult CBD access with TPS ranged from 60 - 96% [1]. Another study by Weber, *et al.* showed a successful cannulation with the same technique in 95.4% of patients [6]. In this study, the percentage of success does not differ from the results of other studies and shows that such technique has a high success rate of 96.4%. Furthermore, when compared to other techniques such as NKPP, a meta-analysis showed that NKPP is significantly inferior to TPS in terms of cannulation success.

Indications for TPS is not limited to biliary stones and in fact used in a great number of malignant obstruction such as in the study of Weber *et al.* where in 64% of patients had malignant biliary stenosis (cholangiocellular carcinoma, pancreatic cancer and liver metastasis) [6]. Around 37% of the case wherein malignant biliary obstruction as an indication of TPS was also shown in a study by Kim, *et al* [7]. The result in this study in terms of indications also showed a high number of malignant biliary causes showing the effectiveness of this technique in complex cases. Periampullary diverticulum, an anatomic deviant that contributes to cannulation difficulty is also noted in 27% of successfully cannulated patients in this study. In addition, such technique were also used in small papillary tracts, which in one study, has a success rate of 96% [4] and has been adopted as an alternative to precut in the presence of such small tracts [3]. This further adds to the advantage of the technique in facilitating access to difficult biliary cannulation.

Various studies showed that complication rate of TPS varies from 2% to 13% [7]. Although the complication rate in this study is higher (18%), it may be due to the small number of subjects being analyzed. However, it can be shown that bleeding rate was lesser compared to incidence of pancreatitis, with pancreatitis mostly having mild symptoms. The result is comparable to the stated bleeding incidence of 3.7 to 5% and that of post-ERCP pancreatitis of 5.5 to 21% [1]. In a meta-analysis, when TPS is compared to NKPP, significant bleeding is higher on the latter [4]. Still, TPS is considered a relatively safe procedure in the hands of expert endoscopists in which major complications, such as perforation and even death was not recorded in this study.

The study was limited to the few number of patients and involvement of only one tertiary hospital in Cebu City which may lead to underestimation or overestimation of results. Also, the data that were utilized in this study were based solely on what is provided in the patient's medical record.

### Conclusion

Pancreatic duct sphincterotomy is an effective technique for difficult cannulation with minimal mild to moderate bleeding and pancreatitis as the only procedure-related complications. Adaptation of this technique especially on difficult cases and certain indications such as malignant cause of obstruction or the presence of periampullary diverticulum can achieve a higher rate of cannulation success and lower complication rate.

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