Experience on Endoscopic Retrograde Cholangiopancreatography at Tertiary Referral Center in Thailand: Risks and Complications

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Background: *Several complications from ERCP have been described, including pancreatitis, hemorrhage, perforation, and cholangitis. The actual incidences and risk factors in Thailand have never been analyzed.*
Material and Method: *The authors retrospectively reviewed the outcome of ERCP at Chulalongkorn University Hospital between September 2000 and December 2002. Potential risk factors were statistically assessed.*
Results: *The incidence of post-ERCP pancreatitis, hemorrhage, perforation and cholangitis was 3.6%, 2.1%, 1.2% and 6%, respectively. Risk factors of pancreatitis were the suspected diagnosis of sphincter of Oddi dysfunction and pancreatic interventions, especially through minor papilla. Prophylactic pancreatic duct stent prior to precut sphincterotomy may reduce the incidence of pancreatitis. Hemorrhage was associated with duodenal diverticulum. The incidence of cholangitis was higher in biliary duct dilation and cholangiocarcinoma, especially hilar involvement.*
Conclusion: *Incidence of these complications was comparable to international series with similar risk factors. Cholangitis developed more frequently probably due to a higher incidence of cholangiocarcinoma.*

Keywords: *ERCP, Complication, Risk factor*

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Since the introduction of endoscopic retrograde cholangiopancreatography (ERCP) in 1974[1-3], endoscopic biliary sphincterotomy has become one of the most common procedures performed in approximately more than 200,000 annually in the United States and European countries[4]. Sphincterotomy is most commonly performed to remove common bile duct (CBD) stones and is often substituted for surgical exploration of the CBD in patients undergoing laparoscopic cholecystectomy[5-8]. Sphincterotomy is also performed to facilitate the placement of either plastic or metallic stents through malignant and benign biliary strictures. This procedure is also gaining acceptance as an effective therapeutic intervention for patients suffering from sphincter of Oddi dysfunction (SOD)[9-13].

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Sphincterotomy, or papillotomy, is one of the technically complex endoscopic procedures performed under visual and fluoroscopic guidance[1]. The usual approach involves deep insertion of a cannula into the bile duct through the ampulla of Vater, subsequently incised by electrocautery[1]. This biliary selective cannulation can sometimes be difficult and leads to inadvertent repeated cannulation or injection into the pancreatic duct[1]. In a case in which the bile duct cannot be accessed by the usual approach, the alternative approach will be attempted if access to the bile duct is felt to be necessary. The papilla can be carefully dissected with the use of various techniques such as precut sphincterotomy, to expose the bile duct[14-17].

ERCP with endoscopic sphincterotomy is one of the most difficult gastrointestinal endoscopic procedures. Success rates depend on proper training, skills, and experiences of the endoscopists. The success rate of 90 to 95 percents, had beau reported form

many world-class endoscopy centers[18,19]. The importance of proper training, experience, and technical advances has been highlighted[20-22]. Several previous reports demonstrated that this sophisticated procedure should not be performed by a general gastroenterologist who has not received the adequate formal training in ERCP. The estimated number of ERCP and biliary sphincterotomies have to be performed to achieve the adequate competency equal to 180 and 69 procedures, respectively[23].

Due to its difficulty, several complications following biliary sphincterotomy and related pancreatic and biliary instrumentation are described including pancreatitis, hemorrhage, perforation and cholangitis[9]. Many factors, such as a small diameter of the common bile duct, have been suggested as increasing the risk of these complications in both retrospective and prospective studies[24-31].

In Thailand, ERCP has been performed mainly in tertiary referral centers for almost 20 years. However, the actual incidence and risk factors of these complications has never been analyzed and reported. The authors retrospectively reviewed the outcome of diagnostic and therapeutic ERCP performed at, Chulalongkorn University Hospital, compared to the results from previous international series.

Material and Method

Between September 2000 and December 2002, 584 ERCP were performed in 498 patients at Chulalongkorn University Hospital, Bangkok, Thailand. All procedures were performed by advanced senior gastroenterology fellows under close supervision of the ERCP-specialized faculty. A careful retrospective review of medical records, procedure reports, and hospital courses in all 584 ERCP was performed. Patient demographic characteristics (age and gender distribution), indication for ERCP, endoscopic and ERCP findings, final diagnosis, biliary therapy (sphincterotomy, dilation, stone extraction, and stent placement), and pancreatic therapy were evaluated and analyzed for any association with development of complications, especially post-ERCP pancreatitis.

Post-ERCP pancreatitis was defined as a new or worsened abdominal pain and an increased serum concentration of pancreatic enzymes (amylase or lipase) equal or greater than 2 times the upper limit of normal, which required hospitalization more than 1 night. Severity of pancreatitis was also graded according to the length of hospitalization and the intervention required. Mild degree required 2 to 3 days of hospitalization; moderate degree required 4 to 10 days of hospitalization; and severe degree required more than 10 days of hospitalization, which necessitated surgical or invasive radiologic intervention, or contributed to death[1].

Hemorrhage was considered clinically significant only if there was clinical evidence of bleeding, such as melena or hematemesis, with an associated decrease of at least 2 g/dL in the hemoglobin concentration, or the need for blood transfusion. This can also be classified according to severity into three categories. Mild degree dropped hemoglobin less than 3 grams and no blood transfusion was required; moderate degree required endoscopic treatment and blood transfusion less than 4 units; severe degree required blood transfusion equal or more than 5 units with or without surgical or angiographic treatment[1].

Gastrointestinal perforation can be classified into 3 types, namely wire or stent perforation, intraperitoneal perforation, and retroperitoneal perforation[1]. Cholangitis was defined as an elevation in the temperature to more than 38 C occurring in a jaundiced patient without concomitant evidence of other infections[1].

All evaluated data were entered into SPSS (Statistic Packages for the Social Sciences, Chicago, IL) 10.0 software and analyzed. Statistical analyses were performed using the Wilcoxon Mann-Whitney U test for continuous variables. Potentially relevant risk factors were assessed by univariate analysis by using Fisher's exact test and chi-square statistic in the case of categorical variables. Significance was indicated by a p value less than 0.05 in two-tailed analysis. Results were displayed as median, range, mean $\pm$ standard error (SE) and 95% confident intervals (CI). Due to the small number of patients in the present series, the authors did not have enough statistic power to perform multivariate analysis to confirm any associations demonstrated in these univariate analyses.

Results

Of 584 ERCP procedures with 303 sphincterotomies performed in 498 patients, post-ERCP pancreatitis developed after 21 procedures (3.6%). These comprised of mild degree in 20 procedures (3.4%) and moderate degree in 1 procedure (0.2%). No severe pancreatitis developed in the present series. Bleeding developed after 12 procedures (2.1%), which required epinephrine injection in 7 procedures, surgical exploration in 1 procedure, and no intervention was needed

in 4 procedures. Perforation was diagnosed after 7 procedures (1.2%), which were bile duct perforation (n = 1), intraperitoneal perforation (n = 5), and retroperitoneal perforation (n = 1). Of those 5 intraperitoneal perforations, the patients were managed by medically conservative treatment in 2 patients (40%), whereas the other 3 patients required surgical exploration (60%). Cholangitis was diagnosed after 35 ERCP procedures (6%), required treatment with intravenous antibiotics and additional biliary drainage in some. Unfortunately, 1 unexpected death (0.2%) during the ERCP procedure occurred. This patient was a 91 year-old male with several coexisting medical illnesses, he underwent ERCP with the diagnosis of common bile duct (CBD) stones and biliary sepsis.

Pancreatitis

Procedure-induced pancreatitis occurred in 21 patients, mostly mild degree. Moderate degree of pancreatitis developed in only 1 patient who was a 46 year-old male with the suspected diagnosis of SOD. In addition, he also developed intraperitoneal perforation which required surgical exploration and subsequently, developed post-operative retroperitoneal necrosis from pancreatitis.

The authors performed statistical analysis to demonstrate potential risk factors for the development of post-ERCP pancreatitis. No significant differences were found between 21 procedures with post-ERCP pancreatitis and the other 563 procedures in demographic characteristics (age and gender distribution), some indications for ERCP (pancreatitis, CBD stone and cholangitis), the presence of duodenal diverticulum, ERCP findings (CBD stone, pancreatic stone, and chronic pancreatitis), biliary therapy (biliary duct dilation, biliary tract brushing, biliary tract biopsy, metallic stent placement, nasobiliary tube placement, and balloon extraction), type of sphincterotomy performed (standard vs. precut) (Table 1).

Interestingly, the incidence of post-ERCP pancreatitis was significantly higher in the patients who had "suspected diagnosis of SOD" as an indication for ERCP (2 of 4, 50%), compared to only 19 of 580 (3.3%) in the other indications group (p = 0.007) with the odd ratio of 29.5 (95%CI = 3.9-220.9) (Fig. 1). This finding was similar to the other international studies. On the other hand, none of 37 patients who had suspected pancreatic cancer and only 1 of 83 patients who had suspected cholangiocarcinoma developed post-ERCP pancreatitis, however these were not statistically significant.

Besides the aforementioned above, some pancreatic interventions also were found to be associated with development of post-ERCP pancreatitis.

Table 1. Potential Risk Factors in Development of Post-ERCP Pancreatitis

Potential Risk Factors	No pancreatitis n = 563 (96.4%)	Pancreatitis n = 21 (3.6%)	p value
Demographics (n = 498)			
Median age (Range)	60.0 (16.0-97.0)	50.5 (25.0-78.0)	0.3[1]
Male gender	264 (55.4%)	11 (52.4%)	0.8[2]
Indication of ERCP (n = 584)			
Common bile duct stone	207 (36.8%)	6 (28.6%)	0.5[2]
Cholangitis	149 (25.6%)	4 (19.0%)	0.6[2]
Endoscopic findings (n = 584)			
Duodenal diverticulum	67 (11.9%)	3 (14.3%)	0.7[2]
Common bile duct stone	125 (22.2%)	1 (6.3%)	0.2[2]
Pancreatic stone	19 (3.3%)	1 (6.3%)	0.4[2]
Chronic pancreatitis	60 (10.7%)	5 (21.4%)	0.2[2]
Biliary therapy (n = 584)	334 (59.3%)	9 (42.9%)	0.2[2]
Biliary duct dilation	120 (21.4%)	4 (19.0%)	1.0[2]
Biliary tract brushing	9 (1.6%)	0 (0.0%)	1.0[2]
Biliary tract biopsy	8 (1.4%)	0 (0.0%)	1.0[2]
Metallic stent placement	32 (5.7%)	0 (0.0%)	0.6[2]
Nasobiliary tube placement	4 (0.7%)	0 (0.0%)	1.0[2]
Stone extraction	152 (27.0%)	5 (21.4%)	1.0[2]
Sphinterotomy (n = 584)	293 (52.0%)	11 (52.4%)	1.0[2]
Standard sphincterotomy	331 (68.8%)	9 (42.9)%	0.1[2]
Needle-knife precut	153 (27.1%)	11 (52.4)%	0.1[2]

[1] Wilcoxon Mann-Whitney U test, [2] Fisher's exact test

The incidence of pancreatitis was significantly higher in patients who received pancreatic treatment, such as pancreatic stone removal, pancreatic stent placement (8 of 60, 13.3% vs 5 of 319, 1.6%; p < 0.001) with the odd ratio of 9.7 (95%CI = 3.0-30.7) (Fig. 2). Moreover, the authors subcategorized these pancreatic interventions into two groups, depending on which papilla was accessed (major vs minor papilla). The incidence of pancreatitis was higher in patients who received pancreatic intervention through minor papilla (4 of 10, 40%) compared to major papilla (4 of 50, 8%; p = 0.02) with the odd ratio of 7.7 (95%CI = 1.5-39.0).

Finally, the authors also evaluated the benefit of prophylactic insertion of pancreatic duct stent prior precut sphincterotomy to reduce the incidence of post-ERCP pancreatitis. The authors subcategorized the patients who underwent precut sphincterotomy (n = 85) into two groups according to the use of prophylactic pancreatic duct stent. The incidence of post-ERCP pancreatitis was lower in the patients who received prophylactic insertion of pancreatic duct stent (1 of 26, 3.8%) compared to the patients who did not (5 of 59, 8.5%), however, not statistically significant (p = 0.6).

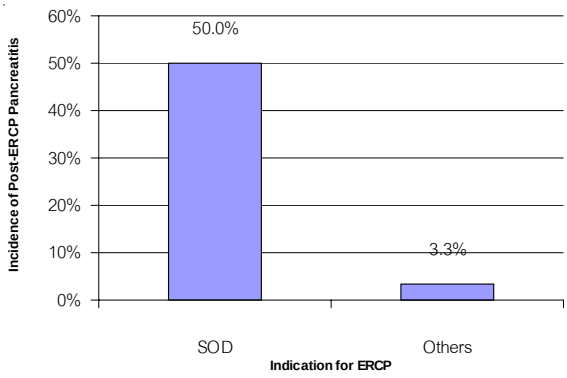

Fig. 1 Incidence of Post-ERCP Pancreatitis and Suspected Diagnosis of Sphincter of Oddi Dysfunction (SOD) (n = 584)

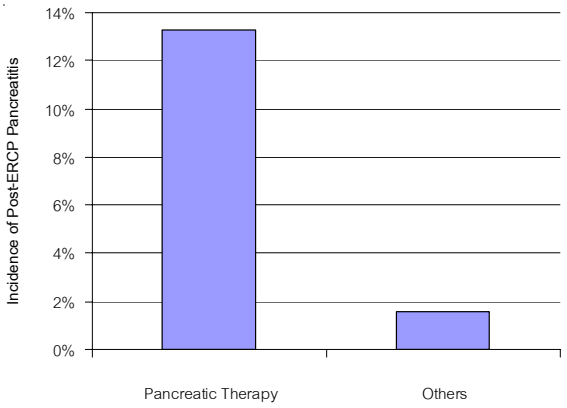

Fig. 2 Incidence of Post-ERCP Pancreatitis and Pancreatic Therapy (n = 584)

Hemorrhage

Clinically significant gastrointestinal bleeding developed in 12 patients (2.1%). Most of these patients, 11 of 12 (91.7%) underwent sphincterotomy. The incidence of bleeding was not associated with type of sphincterotomy. No significant associations were found between development of bleeding and patient demographics (age and gender), indication of ERCP, ERCP findings, biliary therapy, and pancreatic therapy (Table 2). Interestingly, the incidence of bleeding was significantly higher in patients who had duodenal diverticulum identified in the endoscope (4 of 70, 5.7%), compared to only 8 of 514 (1.6%) in patients without duodenal diverticulum (p = 0.04) with the odd ratio of 3.8 (95% CI = 1.1-13.1)

Perforation

Procedure-related perforation occurred in 7 patients (1.2%). Due to the small number of patients who developed perforation, the authors were not able to further characterize and identify potential risk factor associated with this complication.

Cholangitis

Thirty-five patients (6%) developed cholangitis following ERCP. The incidence of cholangitis was not associated with patient demographics (age and gender), ERCP and endoscopic findings (CBD stone, pancreatic stone, chronic pancreatitis, and duodenal diverticulum), stent placement (biliary and pancreatic), and sphincterotomy. Interestingly, cholangitis developed in 16 of 125 patients (12.8%), who underwent biliary duct dilation by either Soehendra dilation or balloon dilation, significantly higher than patients without this procedure (19 of 459, 4.1%; p = 0.001) with the odd ratio of 3.4 (95%CI = 1.7-6.8). Furthermore, the patients with the diagnosis of cholangiocarcinoma were found to have a significantly higher incidence of cholangitis following ERCP (14 of 83, 16.9%), compared to the other patients (21 of 501, 4.2%; p < 0.001) with the odd ratio of 4.6 (95%CI = 2.3-9.5) All of these 14 cholangiocarcinoma patients who developed cholangitis in the present series suffered from hilar involvement, whereas none of the patients

Table 2. Potential Risk Factors in Development of Post-ERCP Hemorrhage

Potential Risk Factors	No hemorrhage n = 572 (97.9%)	Hemorrhage n = 12 (2.1%)	p value
Demographics (n = 498)			
Median age (Range)	59.0 (16.0-97.0)	62.0 (23.0-73.0)	0.8[1]
Male gender	278 (55.6%)	4 (33.3%)	0.2[2]
Indication of ERCP (n = 584)			
Suspected cholangiocarcinoma	83 (14.5%)	0 (0.0%)	0.2[2]
Suspected pancreatic carcinoma	37 (6.5%)	0 (0.0%)	1.0[2]
Cholangitis	145 (25.3%)	3 (25.0)%	1.0[2]
Pancreatitis	63 (11.0%)	0 (0.0%)	0.6[2]
Suspected SOD	4 (0.7%)	0 (0.0%)	1.0[2]
ERCP findings (n = 584)			
Common bile duct stone	124 (21.7%)	3 (25.0%)	1.0[2]
Pancreatic stone	22 (3.8%)	0 (0.0%)	1.0[2]
Chronic pancreatitis	63 (11.0%)	0 (0.0%)	1.0[2]
Biliary therapy (n = 584)			
Biliary duct dilation	125 (21.9%)	0 (0.0%)	0.1[2]
Metallic stent placement	32 (5.6%)	0 (0.0%)	1.0[2]
Plastic stent placement	193 (33.7%)	1 (8.3%)	0.1[2]
Stone extraction	151 (26.4%)	6 (50.0%)	0.1[2]
Miscellaneous (n = 584)			
Pancreatic therapy	83 (14.5%)	2 (16.7)%	1.0[2]

[1] Wilcoxon Mann-Whitney U test, [2] Fisher's exact test

who suffered from non-hilar involvement developed this complication ($p < 0.001$).

Discussion

This retrospective review of patients who underwent ERCP in Chulalongkorn Hospital is the first large series from a tertiary referral center in Thailand. With a large number of patients who underwent ERCP, more than 200 procedures per year, the authors believe that this series could represent the close-to-actual incidence of complications developed following ERCP from other tertiary centers in Thailand. From the present series, the authors performed the comparison of the incidence of procedure-related complications with previous published international series. The authors also reviewed and analyzed the potential risk factors that could contribute in the development of these complications in the presented population.

Generally, incidence of post-ERCP pancreatitis varies between 2-10%[1,32-35], and found to be substantially higher (up to 11-31%) in patients undergoing sphincterotomy with a suspected diagnosis of SOD[36,37]. Several approaches have been taken toward avoiding this common complication. The pharmacologic prevention of post-ERCP pancreatitis has been sought for many years[36]. However, to date, no agent has been found to be consistently effective in a single dose[38,39]. These agents include platelet-activating factor inhibitors[40], glucagon[41], interleukin 10[42-44], somatostatin[45,46], gabexate (protease inhibitor)[47], and recently, diclofenac[48]. In addition, epidemiologic analyses of patients with post-ERCP pancreatitis demonstrate patient- and procedure-related risk factors so that ERCP can be avoided or modified in a technique for high-risk patients[49]. These patient-related contributing factors include suspected diagnosis of SOD[9,36,37], young age[36], normal bilirubin level[1], and history of prior post-ERCP pancreatitis[36]. Moreover, difficult cannulation, pancreatic duct injection, pancreatic sphincterotomy, precut sphincterotomy, and balloon dilation of biliary orifice were described to be procedure-related contributing factors[36].

Besides post-ERCP pancreatitis, bleeding and perforation are also possible complications. They were found to be associated with the difficulty in performing these procedures with the incidence of 2%[1,37,38] and 0.3%[1,39], respectively. Cholangitis was also found to be another significant complication following the procedure increasing morbidity and mortality in these patients with the incidence of approximately 1-3%[39]. Most of these patients required intravenous antibiotics to control infection.

The type and frequency of complications of ERCP varied widely depending on the clinical context and situation in which the procedure was performed. The incidence of pancreatitis was estimated to be 3.6% from the present series, comparable to the other international series (2-10%)[1,32-35]. Half of the patients (50%) with suspected diagnosis of SOD in the present series developed pancreatitis following ERCP, higher than the other series (11-30%)[36,37]. This may be due to the small number of patients with suspected dysfunction of sphincter of Oddi in the present series (only 4 patients), causing inadequate power in accurate prediction of the actual incidence of pancreatitis in this subgroup. The present series also demonstrated the incidence of hemorrhage and perforation of 2.1% and 1.2%, accordingly, comparable to 2%[1,37,38] and 0.3%[1,38] in other studies. Interestingly, 6% of our patients developed cholangitis following ERCP, significantly higher than other series from Western countries (1-3%)[39].

Pancreatitis is one of the common procedure related complications. In a landmark study reported by Freeman et al[1], they reported the overall risk of post ERCP pancreatitis in all comers was as high as 6%. Suspected SOD independently increases the risk of pancreatitis to be as high as 5 fold (30%). The overall risk of pancreatitis is similar for diagnostic and therapeutic ERCP. Moreover, biliary sphincterotomy does not appear to add significant risk.

Identifying the index cases at risk for pancreatitis especially before attempting diagnostic ERCP is important since magnetic resonance cholangiopancreatography (MRCP) has been proved as a new standard test for diagnosis of pancreaticobiliary tract diseases[40]. Therefore, this high risk population can be safe from post ERCP pancreatitis by undergoing for MRCP if they only need a diagnostic cholangiopancreatogram.

Even though, somatostatin and gabexate have been confirmed to reduce the risk of post ERCP pancreatitis[41-43] but it is not practical to use since these agents need to be administered continuously 12 hours prior to the procedure. In reality, many patients undergo ERCP as emergency setting. Therefore prophylactic treatment in this situation is impossible.

From the presented univariate analyses, suspected diagnosis of SOD as an indication for ERCP seemed to be the potential risk factor in developing post-ERCP pancreatitis in the presented population with the odd ratio of 29.5. The patients who underwent pancreatic interventions were also found to be at risk for post-ERCP pancreatitis (odd ratio of 9.7), especially the intervention performed through minor papilla (odd ratio of 7.7). These findings are somewhat consistent with previous international series, which confirmed that these risk factors can be generally applied to the presented population in Thailand. However, the authors did not demonstrate any significant association between development of pancreatitis with patient demographics, bilirubin level, and type of sphincterotomy (standard vs precut) as shown in those studies. This could be due to the inadequate number of patients in the present series. Furthermore, though it was not statistically significant in the present series, the trend of reduction in the incidence of post-ERCP pancreatitis was demonstrated in the patient who underwent precut sphincterotomy following prophylactic insertion of pancreatic duct stent (3.8% vs 8.5%) similar to previous international series[42-46].

Interestingly, clinically significant hemorrhage was found to be associated with the presence of duodenal diverticulum, adjacent to major or minor papilla (odd ratio of 3.8). It could be due to technical difficulty in performing the procedure. This finding suggests that the endoscopist should pay attention and be cautious in patients with duodenal diverticulum undergoing ERCP and sphincterotomy to avoid inadvertent bleeding. Perforation developed in only 7 patients in the present series, therefore the authors were unable to review and analyze for any risk factors.

In the present series, cholangitis was found to be the most common complication following ERCP with the incidence of 6%. Univariate analyses identified that the incidence of cholangitis was significantly higher in patients with a diagnosis of cholangiocarcinoma, as well as patients who underwent biliary duct dilation by either Soehendra dilation or balloon dilation with the odd ratio of 3.4 and 4.6, respectively. Moreover, all of the patients who developed cholangitis with a diagnosis of cholangiocarcinoma had hilar involvement compared to none of the patients with non-hilar cholangiocarcinoma. These findings were consistent with the other series, which reported the strong association between development of post-ERCP cholangitis and diagnosis of cholangiocarcinoma, especially hilar involvement[47,48]. Intravenous antibiotics are indicated in the patients with a suspicion of obstruction or poorly draining CBD, especially from primary sclerosing cholangitis and cholangiocarcinoma[39].

In conclusion, this retrospective review of complications related to diagnostic and therapeutic

ERCP from Chulalongkorn Hospital demonstrated a similar incidence of pancreatitis, hemorrhage, and perforation, comparable to international series. Cholangitis is more prevalent in Thailand compared to Western countries, probably due to the higher incidence of cholangiocarcinoma from liver flukes causing obstruction of CBD. The potential risk factors are also identified in the presented population and seem to be similar with previous published literatures.

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ปัจจัยเสี่ยงและภาวะแทรกซ้อนจากการส่องกล้องท่อน้ำดีและตับอ่อน: รายงานจากโรงพยาบาลจุฬาลงกรณ์

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ที่มา: *ภาวะแทรกซ้อนจากการส่องกล้องตรวจท่อน้ำดีและตับอ่อนที่บรรยายในวารสารทางการแพทย์นานาชาติ ได้แก่ ภาวะตับอ่อนอักเสบ ภาวะเลือดออกในระบบทางเดินอาหาร ภาวะระบบทางเดินอาหารทะลุ และภาวะการติดเชื้ออักเสบของท่อน้ำดี อย่างไรก็ตามอุบัติการณ์และปัจจัยเสี่ยงของภาวะเหล่านี้ในประเทศไทย ยังไม่เคยมีการศึกษาวิเคราะห์มาก่อน*

วิธีการศึกษา: *การศึกษาย้อนหลังทบทวนผลลัพธ์ของการส่องกล้องตรวจท่อน้ำดีและตับอ่อนของโรงพยาบาลจุฬาลงกรณ์ ในระหว่างกันยายน 2543 และธันวาคม 2545 เพื่อวิเคราะห์ปัจจัยเสี่ยงที่มีความสำคัญทางสถิติ*

ผลการทดลอง: *จากการศึกษาพบว่าอุบัติการณ์ของตับอ่อนอักเสบ เลือดออกในระบบทางเดินอาหาร ระบบทางเดินอาหารทะลุ และการติดเชื้ออักเสบของท่อน้ำดีที่เกิดขึ้นภายหลังการส่องกล้องตรวจท่อน้ำดีและตับอ่อน เท่ากับ ร้อยละ 3.6 ร้อยละ 2.1 ร้อยละ 1.2 และ ร้อยละ 6 ตามลำดับ ของคนไข้ 498 คน ปัจจัยเสี่ยงที่สำคัญในการเกิดภาวะตับอ่อนอักเสบได้แก่ ภาวะสงสัยการทำงานที่ผิดปกติของกล้ามเนื้อหูรูดของท่อน้ำดี และหัตถการที่เกี่ยวกับตับอ่อน โดยเฉพาะอย่างยิ่ง หัตถการทางรูเปิดท่อน้ำดีเล็ก (minor papilla) การใส่ท่อระบายในท่อตับอ่อนก่อนการตัดกล้ามเนื้อหูรูดของท่อน้ำดีอาจสามารถช่วยลดอุบัติการณ์ของภาวะตับอ่อนอักเสบได้ นอกจากนี้พบว่าภาวะเลือดออกในระบบทางเดินอาหารมีความสัมพันธ์กับ duodenal diverticulum ส่วนภาวะการติดเชื้ออักเสบของท่อน้ำดีนั้น พบว่าอุบัติการณ์สูงขึ้นในผู้ป่วยที่ได้รับการขยายท่อน้ำดี และโรคมะเร็งของท่อน้ำดี โดยเฉพาะอย่างยิ่งมะเร็งบริเวณขั้วตับ*

สรุป: *อุบัติการณ์ของภาวะแทรกซ้อนที่เกิดขึ้นภายหลังการส่องกล้องตรวจท่อน้ำดีและตับอ่อนในประเทศไทย พบว่ามีความใกล้เคียงกับรายงานในวารสารทางการแพทย์นานาชาติ รวมถึงปัจจัยเสี่ยงในการเกิดภาวะแทรกซ้อนเหล่านี้ด้วยเช่นกัน ส่วนภาวะการติดเชื้ออักเสบของท่อน้ำดีพบว่า อุบัติการณ์ในประเทศไทยมีสูงกว่า แต่ทั้งนี้ก็อาจเนื่องมาจากอุบัติการณ์ของโรคมะเร็งของท่อน้ำดีที่สูงกว่า*