

Brief communication (original)

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# Outcomes of pancreaticoduodenectomy in patients with obstructive jaundice with and without preoperative biliary drainage: a retrospective observational study

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## Abstract

**Background:** Preoperative biliary drainage (PBD) in patients with obstructive jaundice from periampullary neoplasms may reduce the untoward effects of biliary obstruction and subsequent postoperative complications. However, PBD is associated with bile contamination and increases infectious complications after pancreaticoduodenectomy (PD).

**Objectives:** To determine whether PBD is associated with more complications after PD.

**Methods:** Patients with obstructive jaundice from periampullary lesions who underwent PD from 2000 to 2015 at our institution were retrospectively enrolled. The cohort was divided into a group with PBD and a group without. PBD was performed using one of the following methods: endoprosthesis, percutaneous transhepatic biliary drainage, surgical biliary-enteric bypass, or T-tube choledochostomy. PDs were performed by the first author using uniform surgical techniques. Postoperative complications were recorded. Statistical analyses were conducted using an unpaired *t*, Fisher exact, or chi-squared tests as appropriate.

**Results:** There were 26 with PBD and 28 patients without. Patients in the 2 groups were similar in age, presenting serum bilirubin level, operative time, operative blood transfusion, and hospital stay. The group with PBD had longer duration of jaundice, more patients presenting with cholangitis, and more patients with carcinoma of the ampulla of Vater. The overall complications were higher in patients in the group with PBD than in the group without.

**Conclusions:** PBD was associated with more complications overall after PD. However, PBD was necessary and lifesaving in certain clinical situations and improved the condition of patients before they underwent PD. Routine PBD in patients with obstructive jaundice without definite indications is not recommended.


**Keywords:** cholangitis; digestive system surgical procedures; drainage; jaundice; Pancreaticoduodenectomy

Pancreaticoduodenectomy (PD) is an operative procedure for treatment of periampullary neoplasms. Obstructive jaundice is the most common presentation in these patients owing

to obstruction of the distal common bile duct. The adverse effects of malignant obstructive jaundice have been well documented, i.e., hepatic dysfunction, coagulation disorder,

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cholangitis, impaired cellular immunity, and renal dysfunction [1–5]. Therefore, surgery on these patients may be associated with increased complications, especially, in a complex procedure such as PD [6–8]. Preoperative biliary drainage (PBD) was introduced in these patients to decrease serum bilirubin level with expected reduction of postoperative complications. The advantages of PBD in terms of decreasing postoperative complications have been reported and its use is recommended by several investigators early after initial introduction of PBD [9–12]. However, the major drawback of PBD is a bile culture positive for bacteria, which may increase postoperative infectious complications [13–15]. Furthermore, the PBD techniques (i.e., percutaneous transhepatic biliary drainage or PTBD, endoscopic biliary stenting or endoprosthesis, surgical biliary-enteric bypass, or T-tube choledochostomy) may contribute to complications related to the procedure. All of these negative impacts on PBD have led to reconsideration of routine use of PBD in patients with obstructive jaundice. Several studies of effects of PBD on postoperative outcomes in patients with periampullary tumors included both palliative internal bypass in unresectable patients and PD in those who were considered resectable. Therefore, results are difficult to interpret owing to different operative procedures. Examining effects of PBD with only one surgical procedure such as PD only would contribute to more meaningful analyses. Until now, the majority of studies directly concentrated to PBD and outcomes after PD have come from Europe and North America [16–24]. The purpose of this study was to compare outcomes of patients who underwent PD with and without PBD at our institution, a large established tertiary teaching hospital in Thailand.

## Methods

This was a retrospective observational study of a cohort of patients who had obstructive jaundice and underwent PD with and without PBD at Department of Surgery, General Surgery Division 2, King Chulalongkorn Memorial Hospital, Bangkok, Thailand from 2000 to 2015. The study protocol was approved by the Institutional Review Board (IRB) of the Faculty of Medicine, Chulalongkorn University (IRB No. 076/59, approval No. 313/2016) following the principles of the Declaration of Helsinki and its contemporary amendments. The inclusion criteria were patients who had obstructive jaundice and underwent PD with or without PBD. Patients were divided into 2 groups: group 1, with PBD and group 2, without PBD. PBD was performed using one of the following 4 methods: (1) endoscopic plastic or metallic stenting (endoprosthesis), (2) percutaneous transhepatic biliary drainage (PTBD), (3) biliary-enteric bypass, or (4)

T-tube choledochostomy. PD was uniformly performed by the first author in the same manner with external drainage of the pancreatic juice from the pancreatic remnant as previously described [25]. The reason for using external drainage to temporarily drain the pancreatic fluid out of the body was to prevent the pancreaticojejunostomy anastomotic leakage. When antrectomy was included in the operative procedure, the term “classical PD” was used. When the pylorus was preserved, the term “pylorus preserving PD or PPPD” was used. Postoperative complications were recorded and analyzed. Pancreatic fistula was defined as measurement of amylase level in the drainage fluid greater than 3 times the serum amylase on or after day 3 postoperatively [26]. Early delayed gastric emptying was defined as retained nasogastric tube of more than 10 days postoperatively or reintubation of the nasogastric tube after initial nasogastric tube removal and starting oral intake [27]. Results were expressed as range, median, and mean  $\pm$  SD. Statistical analyses comparing differences of variables and outcomes of patients who underwent PD with and without PBD were performed using a Fisher exact test, unpaired *t* test, or chi-squared test as appropriate.  $P < 0.05$  was considered statistically significant.

## Results

We entered data from 54 patients including 34 (63%) men and 20 (37%) women into the present study. Details of age, duration of jaundice before treatment, the presence of cholangitis, the serum bilirubin level at presentation, the operative procedure (classical PD or PPPD), the operative time, operative blood transfusion, and the length of hospital stay of all patients, and patients in groups 1 and 2 are shown in **Tables 1 and 2**. Patients in the 2 groups were similar in age, presenting serum bilirubin level, operative time, operative blood transfusion, and hospital stay. Duration of jaundice was longer in group 1 (with PBD,  $P = 0.0035$ ).

In group 1, the PBD was performed with endoprosthesis in 17 patients (65%), PTBD in 5 patients (19%), biliary-enteric bypass in 3 patients (12%), and T-tube choledochostomy in 1 patient (4%). Of the 26 patients who had PBD, 11 (42%) had cholangitis before PBD. Of the 28 patients who underwent PD without PBD, no patient had cholangitis before the operation. Group 1 (with PBD) had significantly higher number of patients with cholangitis than in group 2 ( $P < 0.0001$ ; **Table 2**). Carcinoma of the head of the pancreas, carcinoma of the ampulla of Vater, and carcinoma of the distal common bile duct were the 3 leading pathological diagnoses. Carcinoma of the ampulla of Vater was more frequently found in group 1 than in group 2 ( $P = 0.029$ ; **Table 3**).

**Table 1.** Demographics and perioperative data of patients undergoing pancreaticoduodenectomy

	All patients			Group 1			Group 2			P
	Range	Mean	Median	Range	Mean	Median	Range	Mean	Median	
Age (years)	33–89	62.9 ± 12.7	63.5	36–78	59.7 ± 11.0	62	33–89	65.9 ± 13.5	67	NS
Presenting serum bilirubin (mg%)	5.5–52.7	21.4 ± 11.5	20.6	8.7–52.0	24.4 ± 12.2	21.2	5.5–52.7	19.3 ± 10.5	20.3	NS
Duration of jaundice (days)	7–120	38.5 ± 34.0	30	7–120	52.5 ± 43.1	42	8–60	26.1 ± 14.5	30	0.0035
Operative time (minute)	300–780	420.6 ± 82.8	420	300–780	423.5 ± 96.8	420	300–540	417.9 ± 67.1	420	NS
Operative blood transfusion (unit)	0–7	2.7 ± 1.7	3	0–7	2.8 ± 2.0	3	0–5	2.6 ± 1.4	2.5	NS
Hospital stay (days)	12–106	28.9 ± 17.8	22.5	12–106	31.8 ± 23.3	23.5	15–45	26.1 ± 9.5	21	NS

NS, not significant; PBD, Preoperative biliary drainage. Group 1 with PBD and group 2 without PBD.

**Table 2.** Cholangitis at presentation and operative procedure (classical PD or PPPD)

	Group 1 (n = 26)	Group 2 (n = 28)	P
PPPD	20	26	NS
Classical PD	6	2	NS
Cholangitis	11	0	< 0.0001
No cholangitis	15	28	NS

Classical PD, classical pancreaticoduodenectomy; NS, not significant; PPPD, pylorus preserving pancreaticoduodenectomy; group 1 with PBD and group 2 without PBD.

**Table 3.** Pathological diagnosis of the periampullary lesions

Pathological diagnosis	All patients	Group 1	Group 2	P
Carcinoma of the head of the pancreas	23	10	13	NS
Carcinoma of the ampulla of Vater	20	14	6	0.029
Carcinoma of the distal common bile duct	5	0	5	NS
Chronic pancreatitis	2	0	2	NS
Carcinoma of the duodenum	1	0	1	NS
Acute pancreatitis	1	1	0	NS
Sarcoma of the pancreatic head	1	0	1	NS
Neuroendocrine tumor of the pancreas	1	1	0	NS
Total	54	26	28	

NS, not significant.

**Table 4.** Postoperative complications

Complication	Group 1 (12 in 26)*	Group 2 (7 in 28)*	P
Wound infection	3	3	NS
Grade A pancreatic fistula	5	1	NS
Early delayed gastric emptying	2	2	NS
Intraabdominal bleeding	2	1	NS
Intraabdominal collection	5	1	NS
Congestive heart failure	0	1	NS
Overall complications	17	9	0.03

\*Some patients had more than one complication.

Classical PD, classical pancreaticoduodenectomy; NS, not significant; PBD, preoperative biliary drainage; PD, pancreaticoduodenectomy; PPPD, pylorus preserving pancreaticoduodenectomy. Group 1 with PBD and group 2 without PBD.

Twelve patients in group 1 (65.4%) had 17 complications, while 7 in group 2 (25%) had 9 complications. Details of complications are shown in **Table 4**. There was no difference in occurrence of postoperative wound infection, pancreatic fistula, early delayed gastric emptying, intraabdominal bleeding, and intraabdominal collection between the 2 groups. However, group 1 (with PBD) had significantly higher overall complications than group 2 ( $P = 0.03$ ).

## Discussion

The present study demonstrated that patients with PBD had more complications overall after PD than patients with surgery alone. These findings are consistent with previous reports from

Europe and North America [16, 20, 22, 23]. Although highly elevated serum bilirubin level has been shown to be associated with negative host-defense mechanisms with increased postoperative complications, the negative impact of PBD in terms of increased postoperative infectious complications and procedure-related complications should also be considered when PBD is contemplated. Currently, most investigators are in agreement that jaundiced patients may safely undergo PD without PBD and routine PBD in these patients is no longer recommended [28]. Although the duration of jaundice of patients with PBD in this study was significantly longer than those without PBD, the serum bilirubin levels at presentation were not different. Early surgery without PBD in our patients was successfully performed even in patients with serum bilirubin level as high as 52.7 mg%. However; in our opinion, selective use of PBD may be necessary. Currently, it is generally accepted that PBD may be used in patients with one or more of the following indications: (1) cholangitis, (2) delayed surgery to improve conditions of patients, (3) delayed surgery to manage other more urgent conditions, and (4) delayed surgery for neoadjuvant therapy. Despite the disadvantages of PBD, i.e., bile contamination and complications related to the PBD procedures, the authors frequently experienced remarkable advantages to PBD. On several occasions, PBD was a lifesaving procedure in patients with obstructive jaundice presenting with cholangitis. In the PBD group, 11 (42%) patients had cholangitis at presentation and these patients benefited from PBD to improve their conditions before undergoing PD. One patient with carcinoma of the ampulla of Vater in this study presented with deep jaundice. On preoperative evaluation, she also had significant coronary artery disease necessitating coronary artery bypass grafting (CABG) and delayed PD. She immediately received PBD (with an endoprosthesis) and uneventful CABG. One month later she underwent successful PD. She is alive and well at the time of preparing this manuscript, 8 years after PD. These examples emphasize the benefit of PBD in some special circumstances.

The shortcomings of the present study are its retrospective methodology, relatively small number of patients in each group, and 4 different methods of PBD rendering a less convincing interpretation of results. Endoscopic retrograde cholangiopancreatography (ERCP) with insertion of endoprosthesis was most commonly performed in our study (17 patients, 65%), followed by PTBD (5 patients, 19%), biliary-enteric bypass (3 patients, 12%), and T-tube choledochostomy (1 patient, 4%). ERCP with insertion of endoprosthesis is generally accepted as a procedure of choice when PBD is considered necessary [20, 22, 23, 28]. In our present study, PTBD was performed when insertion of endoprosthesis is unsuccessful.

For 4 patients who had surgical PBD, i.e., biliary-enteric bypass (3 patients) and T-tube choledochostomy (1 patient), all the procedures had been performed elsewhere before referring the patients to our institution for PD. Nevertheless, an obvious advantage of this study was the uniformity of the surgical techniques in both groups. All operations were performed by the first author using the same surgical techniques, which helped to lessen the confounding factors related to the various surgical techniques used by different surgeons as commonly seen in most reports. In our opinion, the consistency of surgical techniques is important when outcomes after PD are compared between the 2 groups of patients. Because PD is a complex and technically demanding surgical procedure; to our knowledge, this type of study is seldom published in Thailand and the South East Asian region.

## Conclusion

We found that patients who had undergone PBD before PD had higher overall complications than those who had surgery alone. However, those in the PBD group had significantly longer duration of jaundice and more patients presented with cholangitis rendering PBD a necessary procedure to improve the condition of patients. The authors agree with many investigators that patients with obstructive jaundice may safely undergo PD without PBD if no definite indications for PBD exist.

**Author contributions.** All authors contributed substantially to the conception and design of the study. All authors analyzed and interpreted the data. Suvit S substantially drafted the manuscript. Sukanya S, RP, KK, SP, PS, and NN critically revised the manuscript. All authors approved the final version submitted and take responsibility for statements made in the published article.

**Acknowledgments.** The authors thank King Chulalongkorn Memorial Hospital and the Thai Red Cross Society for providing invaluable supports to all participating patients. We did not receive any specific grant for this research from any funding agency in the public, commercial, or not-for-profit sectors.

**Conflict of interest statement.** The authors have each completed and submitted an International Committee of Medical Journal Editors Uniform Disclosure Form for Potential Conflicts of Interest. None of the authors have any potential conflict of interest to disclose.

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