

Intraoperative Biliary Drainage in Pancreaticoduodenectomy

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INTRODUCTION

Surgery for obstructive jaundice due to periampullary tumors is associated with a higher risk of postoperative complications compared with surgery for without jaundice^[1-3]. The increased risk of surgery in jaundiced patients in pancreaticoduodenectomy (PD) was recognized already in 1935 by Whipple^[4] and he proposed a two staged procedure for surgery in deeply jaundiced patients. With regard to serum bilirubin level greater 10 mg/dL has been associated with increased risk following surgery^[1,5-11]. The effect of preoperative biliary drainage (PBD) in preventing the operative complications after PD has been addressed in patients with obstructive jaundice^[12]. PBD prior to PD continues to be routine in many centers, however, many studies have examined the issue with inconsistent results^[13-15]. Thus, whether PBD is beneficial in reducing complications after PD is still controversial. It is generally accepted that biliary decompression should be performed before surgical operations on patients with deeply obstructive jaundice, however, in cases of serum bilirubin level <5 mg/dL and without cholangitis, surgery without PBD is acceptable. Moreover, when surgery is performed without PBD with serum bilirubin level <5 mg/dL, biliary clumping time is longer during operation, and it may be one of the causes liver damage. In this study, we compared the influence of with or without intraoperative biliary drainage for decreasing the incidence of complication in PD with preoperative serum bilirubin level <5 mg/dL.

PATIENTS AND METHODS

Patients

Between September 1999 and October 2010, 40 patients (33 men and 7 women) underwent modified subtotal stomach-preserving

ABSTRACT

AIM: It is generally accepted that preoperative biliary drainage (PBD) in preventing the operative complications after pancreaticoduodenectomy (PD) in patients with deeply obstructive jaundice. However, whether PBD is beneficial in reducing complications after PD is still controversial. In this study, we compared the influence of with or without intraoperative biliary drainage (IBD) for decreasing the incidence of complication in PD without PBD.

METHODS: We retrospectively analyzed 40 patients who underwent PD without PBD with preoperative serum bilirubin level <5 mg/dL, either with IBD (IBD group) or without IBD (NIBD group).

RESULTS: The serum level of bilirubin at the 7 d after the surgery was significantly higher in the NIBD group than in the IBD group ($p < 0.0176$). However, no differences were observed between the 2 groups with respect to the serum level of AST, ALT, γ -GTP, and ALP at the 7 d after the surgery. There were no significant differences in postoperative complications between the 2 groups.

CONCLUSIONS: We consider IBD is useful to prevent postoperative liver damage; however, there is no significant differences in terms of postoperative complications with or without IBD in PD without PBD with preoperative serum bilirubin level <5 mg/dL.

pancreaticoduodenectomy (MSSPPD) without PBD with preoperative serum bilirubin level <5 mg/dL. Ages ranged from 54 to 76 years, with a mean age 66.8±5.5 years. Carcinomas of the pancreatic head, lower bile duct, and the ampulla of Vater were diagnosed in 12, 16, and 12 patients, respectively. The patients were divided into the following 2 groups: intraoperative biliary drainage group (IBD group) and non- intraoperative biliary drainage group (NIBD group).

Technique of intraoperative biliary drainage

After division of the common hepatic duct, a retrograde transhepatic biliary drainage tube (RTBD tube, Sumitomo Bakelite, Tokyo, Japan) was inserted into the hepatic duct and drainage clamp was placed on it with bulldog vessel clamp (Mizuho C., Ltd., Tokyo, Japan). Bile selected through the drainage tube was collected in a sterilized plastic bag. Before biliary reconstruction, the margin of clamped hepatic duct with bulldog vessel clamp was resected.

Technique of pancreaticoduodenectomy

All patients underwent modified subtotal stomach-preserving pancreaticoduodenectomy (MSSPPD) with pancreaticogastrostomy. Our MSSPPD technique involved re-resection of the distal part of the remnant stomach which was preserved after the subtotal stomach resection according to the angle from the choledochojejunostomy to the gastrojejunostomy. Gastrointestinal reconstruction after MSSPPD was performed in the following order: PG, end-to-side choledochojejunostomy, and end-to-side gastrojejunostomy. An end-to-side choledochojejunostomy was then performed using a single layer of interrupted 4-0 absorbable monofilament sutures with inserting a biliary drainage tube. Subsequently, the distal stomach was re-resected according to the angle from the choledochojejunostomy to the gastrojejunostomy. The resected part was small and triangular. Finally, the stomach was anastomosed end-to-side to the jejunum in the antecolic or retrocolic route. The same 3 senior surgeons performed all the operations in this series^[16,17].

Statistical analysis

Univariate analysis was performed using Student's *t*-test for continuous variables and Fisher's exact test and chi-square test for categorical variables. A *p* value of less than 0.05 was considered significant.

RESULTS

Table 1 shows the patient characteristics and preoperative variables. No differences were observed between the 2 groups with respect to mean age, sex ratio, diameter of the pancreatic duct, and preoperative diameter of the common bile duct. The indications for PD were similar in both groups. No differences were observed between the 2 groups with respect to the serum levels of total bilirubin (T-Bil), γ -glutamyl transpeptidase (γ -GTP), and alkaline phosphatase (ALP). However, the serum levels of aspartate amino transferase (AST) was significantly lesser in the NIBD group (84.2±24.5 mg/dL) than in the IBD group (114.0±31.0 mg/dL) (p <0.0017), and the serum levels of alanine transaminase (ALT) was significantly lesser in the NIBD group (102.2±30.7 mg/dL) than in the IBD group (127.2±33.6 mg/dL) (p <0.0188). Table 2 shows the intraoperative and postoperative variables. No differences were observed between the 2 groups with respect to the mean operative time, blood loss, and the mean intraoperative biliary clumping time. No deaths occurred in either group. The serum level of T-Bil at the 7 days after the surgery was significantly higher in the NIBD group (1.7±0.4 mg/dL) than in the IBD group (1.4±0.5 mg/dL) (p <0.0176). However, no differences were observed between the 2 groups with respect to the serum

level of AST, ALT, γ -GTP, and ALP at the 7 days after the surgery (p <0.0052, p <0.0660, p <0.4246, p <0.1219). No differences were observed between the 2 groups with respect to postoperative diameter of the pancreatic duct. Postoperative complications in the NIBD group included the following: 1 patient (5.0%) had pneumonia, 1 patient (5.0%) had wound infection, 2 patients (10%) had cholangitis, and 1 patient (5.0%) had leakage of choledochojejunostomy. In the IBD group, 1 patient (5.0%) had wound infection and 1 patient (5.0%) had cholangitis. There were no significant differences in postoperative complications between the 2 groups. Moreover, pancreatic leakage was not observed in either group.

Table 1 Characteristics of patients.

	NIBD group (n=20)	IBD group (n=20)	P value
Age	65.4±5.9	66.1±5.3	0.6947
Sex ratio (man:woman)	16:4	17:3	1.00
Diagnosis			
Pancreatic cancer	6 (30%)	6 (30%)	1.00
Low bile duct cancer	7 (35%)	9 (45%)	0.5186
Vater carcinoma	7 (35%)	5 (25%)	0.4902
Initial disease			
HT	5 (25%)	6 (30%)	0.7232
DM	5 (25%)	2 (10%)	0.4075
Preoperative diameter of pancreatic duct (mm)	3.49±0.83	3.52±0.61	0.9141
Preoperative diameter of common bile duct (mm)	18.0±2.3	18.0±2.0	0.9420
Preoperative T-Bil (mg/dL)	3.3±1.3	3.5±1.2	0.6335
Preoperative AST (mg/dL)	84.2±24.5	114.0±31.0	0.0017 [†]
Preoperative ALS (mg/dL)	102.2±30.7	127.2±33.6	0.0188 [†]
Postoperative γ -GTP (mg/dL)	195.8±89.9	163.1±57.1	0.1786
Preoperative ALP (mg/dL)	594.6±142.4	569.7±119.2	0.5523

HT: hypertension; DM: diabetes mellitus; [†] significant difference

Table 2 Outcomes

	NIBD group (n=20)	IBD group (n=20)	P value
Operative time (min)	406±44	419±42	0.3637
Blood loss (mL)	552±209	535±190	0.8012
Blood transfusion	1 (5%)	2 (10%)	1.00
Biliary clumping time (min)	281±36	291±44	0.4615
Postoperative T-Bil (mg/dL)	1.7±0.4	1.4±0.5	0.0176 [#]
Postoperative AST (mg/dL)	82.8±21.5	64.2±18.1	0.0052
Postoperative ALT (mg/dL)	94.2±36.3	76.6±20.0	0.0660
Postoperative γ -GTP (mg/dL)	96.7±25.4	103.9±30.8	0.4246
Postoperative ALP (mg/dL)	470.6±67.9	436.2±69.6	0.1219
Postoperative diameter of pancreatic duct (mm)	5.04±1.22	5.08±0.58	0.9083
Complications			
Pneumonia	1 (5%)	0 (0%)	1.00
Wound infection	1 (5%)	1 (5%)	1.00
Cholangitis	2 (10%)	1 (5%)	1.00
Leakage of choledochojejunostomy	1 (5%)	0 (0%)	1.00

[†] significant difference.

DISCUSSION

Surgery for obstructive jaundice is still associated with significant morbidity and mortality. Obstructive jaundice can cause tissue damage by various inflammatory mediators including oxygen free radicals^[18]. Animal experiments suggested that the inflammatory mediators have a deleterious effect on not only the hepatic sinusoidal endothelium and then the hepatic function, but also the functions of other remote organs^[19,20]. Both clinical and experimental studies have also shown that obstructive jaundice impairs the healing of abdominal wounds^[21]. Arnaud *et al*^[22] observed that the healing of gastric wounds and abdominal wounds is delayed in experimentally jaundiced animals. Because of the significant risks associated with an operation for biliary tract obstruction, several authors have

recommended PBD^[6,7,23-30]. However, complications and deaths after PBD, is reported in 5-72%^[6,25,26,28,31-36] and in 0-6%^[33,34] respectively. Moreover, several retrospective and prospective randomized studies reported that no effect of PBD on postoperative morbidity or mortality rates in PD^[32,34,37-44]. Thus, whether PBD is beneficial in reducing complications after PD is still controversial. With regard to serum bilirubin level greater 10 mg/dL has been associated with increased risk following surgery^[1,5-11]. It is generally accepted that biliary decompression should be performed before surgical operations on patients with deeply obstructive jaundice. Lin *et al*^[45] reported that the rate of infectious complications increased in patients with PBD and their preoperative serum bilirubin level was higher than 5 mg/dL. Also, Takahashi showed that the incidence of anastomotic leakage is lower with their concentration of serum bilirubin <5 mg/dL in dogs^[46]. In cases of preoperative serum bilirubin level <5 mg/dL and without cholangitis, surgery without PBD is acceptable. However, when surgery is performed without PBD with preoperative serum bilirubin level <5 mg/dL, biliary clumping time is longer during operation, and it may be one of the causes liver damage. Thus, we use intraoperative intraoperative biliary drainage to avoid liver dysfunction during the surgery in PD without PBD with preoperative serum bilirubin level <5 mg/dL. In this study, we compared the influence of with or without intraoperative biliary drainage for decreasing the incidence of complication in PD with preoperative serum bilirubin level <5 mg/dL. In our study, preoperative serum levels of bilirubin, γ -GTP, ALP did not differ between the 2 groups, however, preoperative serum levels of AST and ALT were significantly lesser in the NIBD group than in the IBD group ($p < 0.0017$, $p < 0.0188$). Although, the serum levels of AST and ALT at the 7 days after the surgery trend to lesser in IBD group than NIBD group ($p < 0.0052$, $p < 0.0660$). The serum level of bilirubin at the 7 d after the surgery was significantly higher in the NIBD group than in the IBD group ($p < 0.0176$). The incidence of postoperative complications did not differ between the 2 groups. However, leakage of choledocojejunostomy was revealed in a patient of NIBD group. Suzuki *et al*^[47] and Doi *et al*^[48] reported that intraoperative continuous external drainage failed to improved to the overall morbidity and mortality rates, however, IBD could reduce intraoperative liver damage and prevent postoperative liver dysfunction. Our results were similar to those of them, however, in our serum preoperative bilirubin level was higher (NIBD group: 3.3 ± 1.3 mg/dL, IBD group: 3.5 ± 1.2 mg/dL) than those of Suzuki *et al* (0.9 ± 1.0 mg/dL)^[47] and those of Doi *et al* (< 1.5 mg/dL)^[48], moreover, the serum level of bilirubin at the 7 days after the surgery was significantly lesser in the IBD group than in the NIBD group ($p < 0.0176$).

In conclusion, the findings of our study showed that IBD is safe and easy procedure to reduce postoperative liver damage who underwent PD without PBD with preoperative serum bilirubin level <5 mg/dL.

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