

## Outcome of Braun Enteroenterostomy after Pancreaticoduodenectomy

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### Abstract

**Background:** Importance of Braun anastomosis after pancreaticoduodenectomy (PD) is ignored by surgeon as it requires extra time and anastomosis related complications. This study is undertaken to check the outcome of braunenteroenterostomy after PD. **Methods:** Nineteen patients who underwent PD in BSMMU from July 2018 to June 2019 were included in the study. They were divided into two groups; Group 1: patient with Braun anastomosis after PD (n=9) and Group 2: patient without Braun anastomosis after PD (n=10). Each patient was followed up to three months (1visit/month) after surgery. Clinical symptoms were recorded in every visit. On the 3rd visit endoscopic examination was performed and biopsy was taken from remnant gastric mucosa reports were recorded. All these findings were compared between two groups. **Results:** Clinical symptoms related to gastric alkaline reflux were noted only in one patient (11.1%) of Group 1, in contrast it was noted in 5 (62.5%) patients of Group 2. No bile reflux to remnant stomach occurred in Group 1 patients, in contrast it occurred in 6 (75%) patients of Group 2 (p <0.05). Gastritis was noted in 2 (25%) patients of Group 1, in contrast it was noted in 5 (62.5%) patients of Group 2. Gastric epithelial changes are seen (hyperplasia, metaplasia) in 2 (25%) patients of Group 1 and in 3 (37.5%) patients of Group 2. **Conclusion:** Braun anastomosis after PD can reduce the ARG in the remnant stomach and thus it can improve the early postoperative quality of life and can prevent dysplasia-carcinoma sequence in the future.

**Keywords:** Outcome, Braun Enteroenterostomy, Pancreaticoduodenectomy.

## INTRODUCTION

The most common practice of reconstruction after pancreaticoduodenectomy is pancreatojejunostomy, hepaticojejunostomy and gastrojejunostomy using single loop of jejunum. This reconstruction leads to reflux of bile and pancreatic juice to stomach which causes alkaline reflux gastritis (ARG).<sup>[1]</sup> As a result, patient after pancreaticoduodenectomy frequently complains of upper abdominal discomfort or pain. The typical feature of this syndrome is continuous dull epigastric pain unrelieved by food or antacid, weight loss, and non-projectile bilious vomiting. Various reconstructive procedure are adopted for preventing such complication such as retro colic jejunal loop gastrojejunostomy,<sup>[2]</sup> Child's procedure,<sup>[3]</sup> modified Child's procedure,<sup>[4]</sup> Roux-en-Y gastrojejunostomy,<sup>[5]</sup> Braun's anastomosis.<sup>6</sup> Braun's anastomosis is an effective method of diverting the alkaline fluid reflux to stomach first reported 100 years ago. It is an anastomosis between the afferent and efferent limbs, which is distal to a gastroenterostomy [Figure 1]. Braun anastomosis is not usually practiced after pancreaticoduodenectomy in our country and the alkaline reflux gastritis related poor post-operative quality of life is ignored most of the time. Surgeons are reluctant to do this procedure after pancreaticoduodenectomy, because it

required extra time and extra anastomosis related complications. Moreover changes of gastric epithelium due to alkaline reflux are rarely investigated after pancreaticoduodenectomy worldwide. This study is undertaken to check the clinical symptoms caused by ARG to stomach, endoscopic & histopathological changes of gastric epithelium with or without Braun enteroenterostomy after pancreaticoduodenectomy. We believe that the result of this study will clarify the advantage of Braun anastomosis and it will be adopted by the surgeon in spite of the risk of additional operative time and extra-anastomotic related complications which are practically negligible.

## MATERIALS AND METHODS

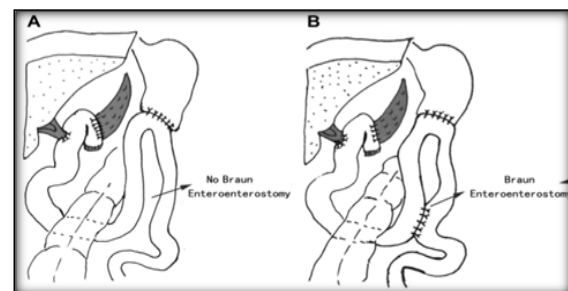
This is a cross sectional prospective study; 19 patients who underwent pancreaticoduodenectomy for periampullary carcinoma in the Department of Bangabandhu Sheikh Mujib Medical University from July 2018 to June 2019 were included in the study. Ethical clearance for the study was taken from the Department of Hepatobiliary Pancreatic and Liver Transplant Surgery and central ethical committee (Institutional Review Board), Bangabandhu Sheikh Mujib Medical University. Written informed consent was taken from the patients after explaining aims, objectives, advantage and disadvantage of the study. The patients were divided into two groups; they were selected for each group as randomize selection

procedure. Group 1: patients who underwent reconstruction procedure after pancreatoduodenectomy with Braun anastomosis (n=9) and Group 2: patients who underwent reconstruction procedure after pancreatoduodenectomy without Braun anastomosis (n=10). Each patient was followed up to three months (total 3) visits at one month interval) after surgery. Clinical symptoms (epigastric pain, heartburn, biliary vomiting, postprandial bloating, and nausea) were recorded in every visit. On the 3rd visit endoscopic examination was performed and biopsy was taken from remnant gastric mucosa. Endoscopic findings and histopathological examination reports were recorded. Endoscopic findings were recorded as presence or absence of bile reflux. Endoscopic grading of gastritis were recorded as Grade 0: normal mucosa without erythema, Grade 1: erythema confined to the anastomotic area, Grade 2: intermediate between grades 1 and 3 and Grade 3: erythema of the entire remnant stomach. Histopathological assessment of gastric mucosa was recorded as presence or absence of mucosal ulceration. Inflammation is recorded as mild, moderate and severe. Epithelial changes are recorded as hyperplasia, metaplasia, parietal cell hyperplasia. All these findings were compared between two groups (two patients were lost from follow up from group 2; one died at 10th postoperative day from Group 1). Statistical analysis of the results was done using computer based statistical software SPSS version 23. It was done by unpaired t-test for quantitative variable Chi square ( $\chi^2$ )

test and Fisher exact test for qualitative variable. Probability value  $p < 0.05$  was considered as level of significance.

## RESULTS

There were no demographic differences (age, sex, body mass index, associated comorbidities) between two groups of patients [Table 1]. The diagnosis was periampullary carcinoma in 8 patients of both groups and chronic pancreatitis involving the head in 1 patient in Group 1 and 2 patients in Group 2. The time required for operation was  $5.5 \pm 1.2$  hours in Group 1 and  $4.9 \pm 0.9$  hours in Group 2 patients. Whole blood transfusions requirement were 1-3 units in each group of patients.



**Figure 1: Showing anastomotic procedure A: reconstruction method without Braun anastomosis, B. reconstruction method with Braun anastomosis**





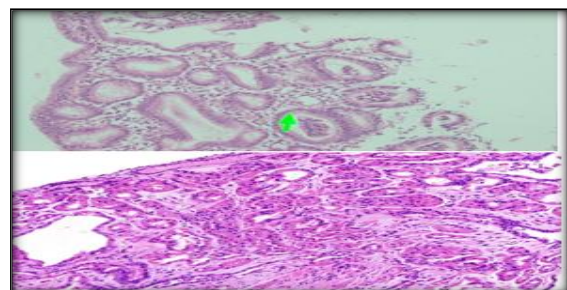
**Figure 2:** A shows absence bile in stomach, B shows presence of bile in stomach.



**Figure 3:** Endoscopic grade of remnant gastritis. A: grade 0; no erythema of remnant gastric mucosa, B: grade 1; mild erythema around the anastomosed region, C: grade 2; marked erythema of the greater curvature on the oral side of the anastomosed area, D: grade 3; diffuse severe redness and marked oedema.

One patient died on postoperative day 10 because of acute myocardial infarction in Group 1 and there was no mortality in Group 2. Morbidity occurred in 1 (11%) patient (biliary leak) of Group 1 and 4 (40%) patients (wound infection; 3, intraabdominal bleeding; 1) of Group 2. The patients who developed postoperative biliary leakage and intraabdominal bleeding recovered spontaneously with conservative treatment. In postoperative follow up, clinical symptoms related to gastric alkaline reflux were noted only in one patient (postprandial bloating and nausea) but none in 7 patients (87.5%) of Group 1. In contrast, symptoms related to gastric alkaline reflux were noted in 5 (62.5%) patients (epigastric pain; 2, heart burn

1, postoperative bloating 5, nausea; 2) of Group 2. The incidence of experience of clinical symptoms related gastric alkaline reflux is more in Group 2 than Group 1 patients although it was not statistically significant [Table2]. In upper GI endoscopic examination [Figure 2] no bile reflux to remnant stomach was found of Group 1 patients, in contrast it was found in 75% (6/8) patients of Group 2 and the difference was statistically significant ( $p < 0.05$ ). Gastritis [Figure 3] was noted in 2 patients (grade 1; 1, grade 2; 1) and none in 6 (75%) patients of Group 1 in contrast gastritis was noted in 5 patients (grade 1; 3, grade 2; 1, grade 3; 1) and none in 3 (37.5%) patients of Group 2. Although the differences of incidence of gastritis between two groups were not statistically significant but the number was much higher in Group 2 patients than Group 1. Histopathological examination of gastric mucosa revealed epithelial changes in 2 (25%) patients (metaplasia; 1 and parietal cell hyperplasia; 1) of Group 1 and in 3 (37.5%) patients (metaplasia; 1, parietal cell hyperplasia; 2) of Group 2 [Figure 4].



**Figure 4:** Gastric mucosal metaplasia (A), and parietal cell hyperplasia (B).

**Table 1: Shows the demographic difference between two groups of patients.**

Variables	Group-1		Group-2		P-Value
	N	%	N	%	
Age (mean±SD)	55.3±14.0		48.8±12.9		NS
Sex (M:F)	5:04		6:04		NS
Body Mass Index (BMI)	19.8±1.5		21.0±3.6		NS
Co-morbidity					
Diabetes N (%)	4	44.4	4	40	NS
Hypertesion N (%)	1	11.1	2	20	NS
CKD N (%)	1	11.1	0		NS

**Table 2: Shows the difference of clinical symptoms related to alkaline gastric reflux between two groups of patients.**

Variables	Group-1(N=8)		Group-2(N=8)		P-Value
	N	%	N	%	
No symptoms	7	87.5	3	37.5	NS
symptoms					
Epigastric pain	0		2	25	NS
Heartburn	0		1	12.5	NS
Bilious vomiting	0		1	12.5	NS
Postprandial blotting	1	12.5	5	62.5	NS
Nausea	1	12.5	2	25	NS

## DISCUSSION

Surgical procedure that removes the pylorus permits increased reflux of duodenal fluid into the stomach or gastric remnant produces alkaline reflux gastritis (ARG). The symptoms related to ARG may sometimes become intractable and surgery may be required in a selected group of patients. Diverting the duodenal content with creation of a Roux-en-Y anastomosis or Braun anastomosis which diverts duodenal contents away from the stomach is recommended for preventing ARG. This fact of ARG mostly reported after distal gastrectomy for gastric ulcer complication or antral carcinoma with

Billroth II gastrojejunostomy.<sup>[7,8]</sup> In pancreatoduodenectomy operation except pylorus preserving<sup>9</sup> or duodenal preserving operation,<sup>[10,11]</sup> the distal 1/5th of the stomach is removed. The remnant pancreas, hepatic duct and remnant stomach is connected with single jejuna loop. After Billroth II operation, only bile is refluxed to stomach, but after pancreatoduodenectomy operation both bile and pancreatic juices are refluxed to remnant stomach that can cause more severe form of ARG. Interestingly, ARG that occurs after pancreaticoduodenectomy are very rarely addressed. The present study shows that ARG occurred in 75% (6/8) patients without Braun anastomosis

after pancreatoduodenectomy operation. In 1994, Stephen et al.<sup>[12]</sup> reported 57% patients developed ARG after pancreatoduodenectomy and other related operative procedures. In another report in 2013, Su et al.<sup>[13]</sup> showed that ARG and mucosal ulceration after pancreatoduodenectomy occurred between 10-38 % and 6-25 %, respectively, and these data are almost similar and support our result. Because of presence of bile and pancreatic secretion in remnant stomach ARG related symptoms are more in patients without Braun anastomosis than patients with Braun anastomosis in the present study but the difference is not significant. A previous study showed that ARG related symptoms and ulceration became prominent in 2-4 years of surgery.<sup>[14]</sup> As our follow up period is only three months after surgery, ARG related symptoms did not appear prominently in our patient. The reason why a statistically significant difference is not obtained between two groups patients with ARG related symptoms in our study. Similarly the present study also shows the incidence of inflammatory changes in remnant stomach associated with epithelial metaplastic and parietal cell hyperplastic changes were more in patients without Braun anastomosis than patient with Braun anastomosis in our study and the difference was not significant may be due to short duration study and of small number of patients. In 1987, Bechi et al.<sup>[15]</sup> studied with 44 partially gastrectomized patients to assess the gastric histologic changes after partial gastrectomy

related to ARG. They found hyperplastic changes typical of the perianastomotic area gradually decreased with increasing distance from the anastomosis in all patients who underwent Billroth II anastomosis. Another interesting study revealed that histologic findings in the biopsy specimens of 504 asymptomatic patients 15 to 46 years after partial gastrectomy,<sup>[16]</sup> the mucosa of the gastric remnant changed to hyperplasia, dysplasia, metaplasia and carcinoma.

#### Limitations of the Study

This study has some limitations, such as its cross sectional prospective study and small sample size.

### CONCLUSION

These studies including ours support that in the long run, the ARG may cause malignant changes into the remnant gastric mucosa. Therefore we conclude that the addition of Braun anastomosis after pancreatoduodenectomy can reduce the ARG in the remnant stomach and thus it can improve the early postoperative quality of life after pancreatoduodenectomy and can prevent dysplasia-carcinoma sequence in the future. However, a prospective randomized trial containing large sample size with long term follow up will be required to make a final conclusion.



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