

Whipple's procedure and retrocolic gastroenteric anastomosis

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Abstract

Aim: Pancreatoduodenectomy (PD) is the only treatment option in patients with periampullary region tumors. Gastroenterostomy (GE) is carried out with or without Braun's anastomosis according to preference.

Material and Methods: Prospectively recorded files of 17 patients who underwent Whipple operation between September 2015 and March 2017 were retrospectively investigated for morbidity, mortality, and the way of GE anastomosis.

Results: The youngest patient was 44 and the oldest was 75 years old with a mean age of 63.4. Six were male and 11 were female. Five cases (26%) were ductal adenocarcinoma, 11 (68%) were ampullary adenocarcinoma, and one (6%) was ampullary NET. Classical Whipple procedure was performed in all patients. Retrocolic GE was applied in all cases with Braun's anastomosis in 6 and without in 11 patients. There were only two cases of pancreatic fistula (grade B) (11.7%).

Conclusion: Retrocolic gastroenterostomy under the omentum can provide more protected anatomical position providing advantage for lower and upper abdominal quadrant drainage in case of possible pancreaticojejunal leakages during pancreatoduodenectomy.

Keywords: Whipple's Procedure; Gastroenterostomy; Retro-colic.

INTRODUCTION

Pancreatoduodenectomy (PD) is the only treatment option in patients with periampullary region tumors. Looking to the history of pancreatic surgery, it has been proven to be a surgery with high rates of morbidity and mortality. Today, with development of diagnosis and treatment methods, mortality has decreased below 5% in high-volume centers, but the morbidity remains high. Development of pancreatic surgery can be safely achieved by the specialists in high-volume centers who have completed their training. As in all centers, presence of a multidisciplinary team is essential for PD. Advancements in imaging modalities is helpful for earlier diagnosis of

periampullary tumors, and for achieving better outcomes. In PD surgery, after the surgical specimens are removed, gastro-enterostomy (GE) may be performed as ante-colic or retro-colic when the anastomoses are completed. Gastro-enterostomy is carried out with or without Braun's anastomosis according to preference of the surgeon. In a randomized controlled study, Eshuis WJ et al. investigated postoperative incidence of Delayed Gastric Emptying (DGE) in patients who underwent antecolic and retrocolic gastro-enterostomy after PD. They evaluated 125 patients in the retrocolic gastro-enterostomy group, and 121 patients in the antecolic gastro-enterostomy group. Forty-five (36%) of the patients in the retrocolic group, and 41 (34%) patients in the antecolic group developed Delayed

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Gastric Emptying. The authors reported that no significant difference was found postoperatively between the groups in terms of enteral nutritional support, other complications, in hospital mortality, and duration of hospitalization (1). Intra-abdominal organ localizations after PD differ from the normal anatomy, depending on revascularizations. In patients undergoing retrocolic gastro-enterostomy, the anastomosis line is attached to a separate opening in the mesocolon with sutures. The omentum to take normal anatomic position postoperation will provide anastomoses in the upper and lower positions of the mesocolon to remain apart. The team of Academic Medical Center Department of Surgery also performed retrocolic gastro-enterostomy, and attached the anastomosis line to a distinct opening in the transverse mesocolon with sutures as mentioned above, and provided it not to be localized in the same abdominal section with pancreaticojejunostomy and hepaticojejunostomy. However, some retrospectively and small studies do not provide convincing evidence about antecolic anastomosis preferred for GE (2).

MATERIAL and METHODS

Prospectively recorded files of 17 patients who underwent Whipple operation in our clinic between September 2015 and March 2017 were retrospectively investigated for morbidity, mortality, and the way of GE anastomosis. Patients' age, gender, postoperative complications, the way of GE application, type and localization of the lesion were evaluated. In addition, preoperative CT findings, distance between the tumoral lesion and vascular structures, and related difficulty degree of the operation were determined.

RESULTS

The youngest patient was 44 year old and the eldest was 75 years old with a mean age of 63.4 years. Of all patients who underwent pancreatoduodenectomy (PD), 6 were male and 11 were female. Five cases (26%) were ductal adenocarcinoma, 11 cases (68%) were ampullary adenocarcinoma, and one case (6%) was ampullary NET. Demographics and tumor localizations of the patients are given in Table 1.

Classical Whipple procedure was performed in all patients. However, retrocolic GE was applied with Braun's anastomosis in 6 and without Braun's anastomosis in 11 patients. The distance between the tumor and vascular structures (SMV, SMA, PV) or any involvement was evaluated on CT views in all patients with radiologists as a multidisciplinary team. (Figure 1-4)

Intraabdominal pancreatico-jejunostomy, hepatico-jejunostomy, and gastro-enterostomy anastomoses were drained using Jackson Pratt (JP) drain in all patients. It was proven by our follow-up results that these drains are superior over the classical silicon drains, and have a lower risk of occlusion. Unlike silicon drains that are likely to be occluded by fatty tissues, in our follow-up results no collection and abscess were found with Jackson Pratt drains except one patient.

Nasogastric decompression was performed for 6 days in one patient who developed gastric emptying difficulty, and signs and symptoms of the patient were resolved with medical therapy. Total parenteral nutrition (TPN) was applied in all patients who underwent Whipple procedure from the fourth day of the operation until oral opening was provided. Oral food intake was gradually initiated at the 7th day in patients without discharge from the drain or suspicion of a leakage.

When postoperative pathology results were evaluated, surgical margin was negative in all cases and ampullary NET was detected in one patient. Postoperative follow-up was carried out with outpatient clinic control visits, and one-to-one interview. Of the patients referred to the oncology outpatient clinic, chemotherapy was administered in 8 (47%) cases, radiotherapy and chemotherapy in 2 (11%) cases and follow-up without any adjuvant therapy was conducted in 7 (42%) patients.

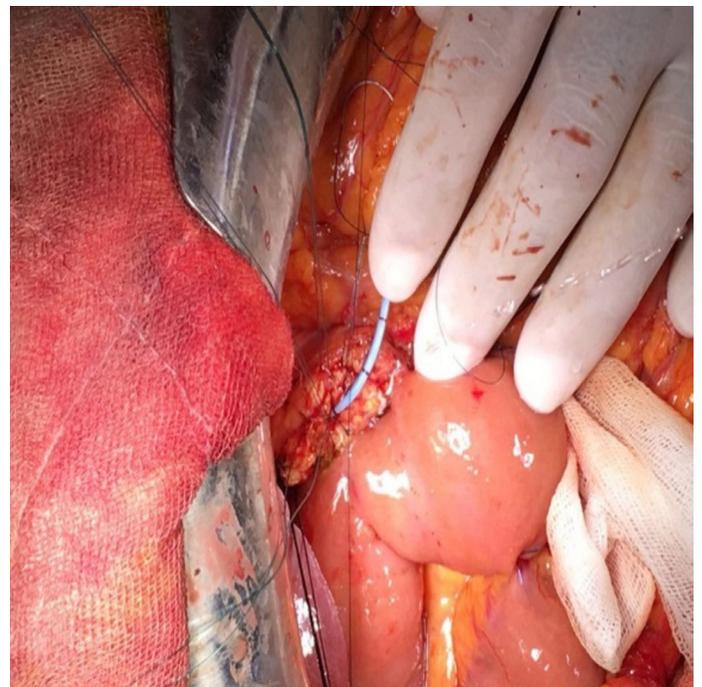


Figure 1. Pancreatic anastomosis was carried out with double suturing by inserting internal stent in form of Wirsung jejunostomy (WJ)

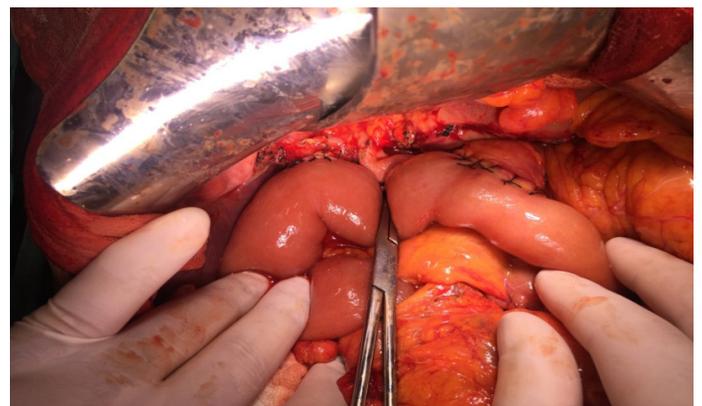


Figure 2. Hepaticojejunostomy was performed with a 3/0 Maxon or silk suture

Table 1. Demographic characteristics and tumor localization of patients

Age	Sex	Albumin Preop (mg/dL)	Postop 0. Day Bilirubin Total (mg/dL)	Postop 3. Day Bilirubin Direct (mg/dL)	Postop 3. Day Bilirubin Total (mg/dL)	Pathology	Tumor in CT	Common Bile Duct Diameter (mm)	Pancreatic Duct Diameter (mm)	CA 19-9	Operation TIME (min)	Hospitalisation Length (DAY) and anastomosis type	Pancreatic Fistula (ISGPS) and bile leak	Cheomotherapy (CT) Radiotherapy (RT)
73	F	3.36	4.2	1.21	1.35	DA	Pancreas	19	3.5	1000	503	17 RCBA	-	RT partial CT NONE
44	F	4	0.37	0.11	0.2	NET	Ampulla	20	12	33.99	518	13 RC	-	NONE
71	F	3.3	9.71	6.63	7.28	DA	DA	21	3 <	327.5	253	24 RCBA	-	CT NONE
64	M	3.29	0.49	0.21	0.7	AA	Ampulla	15	3 <	16.05	493	30 RCBA	Bile leak	CT NONE
57	F	3.9	17.2	11.87	14.58	DA	DA	16	6	1.03	613	21 RCBA	-	CT NONE
63	M	3.43	0.65	0.58	1.5	AA	Ampulla	12	5	9.06	513	18 RCBA	grade B	CT +
56	M	2.55	23.6	11.31	10.6	DA	Pancreas	22	3 <	242.6	420	31 RC	-	CT +
73	M	3.47	6.6	2.26	2.5	AA	Pancreas	15	6	371	398	24 RC	-	CT +
57	F	4.1	6.13	0.48	0.99	AA	Periampullary	17	3 <	43.05	358	27 RC	-	CT +
59	F	3.67	0.9	0.49	0.6	AA	Pancreas	17	4.5	27.18	468	30 RC	Bile leak	RT +
69	M	3.8	11.62	8.09	9.1	AA	Periampullary	16	3 <	2.33	360	27 RC	grade B	RT +
75	F	4.3	4.72	1.43	1.7	AA	Ampulla	18	8	<0.600	330	16 RC	-	Unknown
62	M	4.9	0.46	0.22	0.6	DA	DA	12	4	230.4	300	7 RC	-	CT +
65	M	2.34	7.3	1.98	2.3	DA	DA	12	4	50	300	29 RC	-	Unknown
80	M	3.8	0.45	0.45	0.7	AA	Ampulla	24	5	37	300	17 RC	-	CT NONE
86	F	3.8	0.37	0.5	0.8	AA	Ampulla	16	5	47	360	28 RCBA	-	CT NONE



Figure 3. GE was passed through a distinct opening in the transverse mesocolon as retrocolic, and fixed to the remnant stomach and thus, it was provided to remain in an abdomen section apart from the other anastomoses

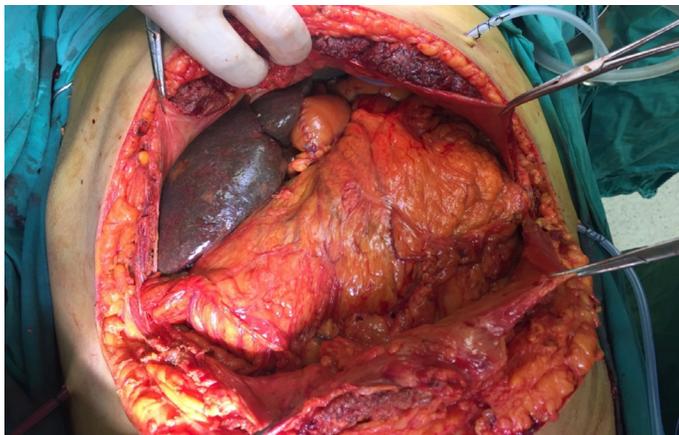


Figure 4. Omentum was provided to protect its anatomical position thus the anastomotic structures in the lower and upper abdomen to remain apart, and the small intestines are protected by the omentum

DISCUSSION

Pancreatic cancer surgery is a continually developing field. The only chance of treatment is surgery in the tumors of pancreas and periampullary region. Despite advancements in imaging modalities, the chance for surgery is available only in a few patients because of the lack of screening. Pancreatic surgery has been developed more compared with the past years with a mortality rate dropping below 5%, but the morbidity is still high. Despite enormous developments in peri-operative outcomes,

pancreas resection is still associated with serious morbidity, and mortality is not zero.

Minimal invasive approaches are widely used for pancreas resection in cancer patients. However, the level of evidence in this area remains low. Data on perioperative and oncologic outcomes for minimal invasive pancreaticoduodenectomy (Whipple resection) are yet to be matured, but it has been demonstrated that good results similar to open surgery can be achieved in selected patient at high-volume centers. In contrary, unexceptional adoption of this method by inexperienced surgeons and institutions has detrimental effect from the steep learning curve. There are studies showing increased chance of curative surgery with regression of the tumor through newer neoadjuvant treatment protocols in advanced stage tumors. Conversely, assumed benefits of neoadjuvant treatment in patients with technically resectable tumors is quite controversial (3). Enomoto LM et al. reported that improved rates of mortality following pancreaticoduodenectomy in high-volume centers were documented, but there is less information about its effects on duration of hospitalization and costs. The authors investigated the relationships between mortality, duration of hospitalization and costs in 3137 patients after PD. They reported that the risk of mortality was lower in high-volume centers (OR 0.32, $p < 0.001$), and duration of hospitalization was 5 days shorter ($p < 0.001$), and costs were significantly reduced (US\$ 12,275, $p < 0.001$) in high-volume centers and with experienced surgeons (4). We believe that surgeons that have completed their training in high-volume centers can achieve good outcomes also in low-volume hospitals similar to high-volume centers by creating a multidisciplinary team. There were no mortalities and the mean cost was 4000 US\$.

Even if curative resection was performed under elective conditions in patients with primary pancreatic cancer; although the 5-year survival is less than 10%, this procedure still provides the only hope for the long term treatment. Although centralization of this procedure decreases morbidity and mortality the PD remains one of the surgical operations with relatively higher rate of mortality (1,5). Biliary leakage is a rare complication after PD (2-9%). Percutaneous drainage or re-operation is performed for its treatment. Rapp GA et al. reported a successful treatment by inserting an internal-external stent with a new approach utilizing percutaneous and endoscopic rendezvous technique. Clinically successful percutaneous treatment of biliary leakages is achieved in 70% of the cases, but this rate falls to approximately 25% in leakage involving the resection plane (6). Kaya B et al. achieved successful outcomes with a simple method which is by inserting a nasogastric tube in the hepaticojejunostomy for prevention of bile leakage following PD. Using the nasogastric tube as a stent is a simple method, which may be useful in risky hepaticojejunostomy procedures (7). Malgras B et al. found early biliary complications (EBC) in 49 of 352 patients who underwent PD. EBCs included bilioenteric stricture in 7 (2%), transient jaundice in 15 (4%),

biliary leakage in 9 (3%), and cholangitis in 20 (6%) patients. In that study, no mortality occurred and re-operation was needed in 18%. EBCs were more commonly seen in male gender, benign disease, patients with preoperative chemotherapy, and in patients with a choledochal diameter ≤ 5 mm; whereas the transient jaundice and cholangitis showed positive results, re-intervention was needed for bilio-enteric stricture or biliary leakage (8). In the present study, biliary leakage was seen in 12% of the patients (2/17), and only one patient developed intraabdominal abscess. Intraabdominal abscess was treated with a percutaneous drainage and IV antibiotherapy without a need for an additional surgical intervention. Fistula of the other patient with biliary leakage closed with a medical follow-up, and the patient was discharged without a need for any additional interventional procedure. Non-chylous discharges after PD performed in patients with pancreatic cancer cause serious fluid and protein losses, and may lead to complications. Preoperative low BMI, low hemoglobin level, intraoperative excessive hemorrhage, and high (>10 mL/Kg) non-chylous discharge are the independent predictive factors. Improvement of preoperative general status and nutritional status may decrease the incidence of high chylous discharge (9). In our study, daily discharge amounts in drain monitoring were under 50-80 cc in all patients except two cases; causing no loss of fluid or protein. Preoperative nutritional status of the patients was good, and albumin level was more than 3 mg/dL. Initiation of TPN following Whipple operation is beneficial, although its benefits may be limited for the patients with isolated delayed gastric emptying (10). In the present study, TPN was initiated on the postoperative 4th day, with a mean duration of 9 days. These durations were consistent with the literature.

Gilliland TM et al. summarized some peri-operative strategies in order to optimize patients' outcomes and to better guide patient care after pancreatic cancer and pancreas resection: (1) operation should be postponed and aggressive nutritional supplement should be done in patients with an albumin level < 2.5 mg/dL or $>10\%$ weight loss; (2) patients with an albumin level < 3 mg/dL or weight loss between 5-10% should receive nutritional support before surgery; (3) enteral nutrition (EN) should be preferred in addition to postoperative total parenteral nutrition (TPN); and a multidisciplinary approach should be used to improve patients' quality of life in order to allow early detection of the symptoms of endocrine and exocrine pancreas insufficiency (11). Availability of adequate departments in our hospital for the multidisciplinary team provided us a great advantage for management of our patients.

In a study published by Jin S et al. 28 (33.7%) of 83 patients that were operated developed postoperative pancreatic fistula (POPF). According to the criteria by International Study Group of Pancreatic Fistula (ISGPF); Grade A fistulas were identified in 8 (28%), Grade B in 16 (58%), and Grade C in 4 (14%) patients. They reported that high serum amylase

levels in POP 1 and POP 4 in abdominal drainage fluid in the postoperative period (POP) showed a significant correlation POPF in the univariate and multivariate logistic regression analysis ($p<0.05$), reflecting new biological markers (12). In our study, two patients (11%) developed pancreatic grade A fistulas, the diagnosis was established according to the criteria by International Study Group of Pancreatic Fistula (ISGPF) and these patients received medical therapy.

In a prospective randomized clinical trial Sun YL et al., compared patients who underwent end-to-side pancreaticojejunostomy (PJ) (Group A) with those that underwent conventional pancreaticojejunostomy (Group B), and the rate of POPF was lower in Group A with completely closed pancreatic section (4.8%) than in Group B (16.7%) ($p<0.05$) (13). In our study, end-to-side PJ was performed using an internal stent by completely closing the pancreatic section in all patients. The mean pancreatic duct diameter was 4.8 mm and performing a PJ anastomosis in wider ducts was easier compared to a duct diameter of 3 mm or less. Amylase values in the fluid from the right and left drains inserted in the patient during the surgery were controlled at postoperative days (POD) 1, 2, and 3; drain amylase outcomes were recorded, and no correlation was found with the pancreatic fistula.

Yamamoto T et al. evaluated clinical effect of long internal stent inserted in patients with a main pancreatic duct diameter ≤ 3 mm, on the development of POPF. Of total 108 patients, they applied internal stent in 54 and PJ anastomosis without stent in 54 patients, and found no significant difference in terms of the development of POPF (14).

Eshuis WJ et al. investigated postoperative incidence of Delayed Gastric Emptying (DGE) in 125 patients and forty-five (36%) of the patients in the retrocolic group, and 41 (34%) patients in the antecolic group developed DGE. However, some retrospectively and small studies do not provide convincing evidence about antecolic anastomosis preferred for GE (1,2).

CONCLUSION

In conclusion; retrocolic gastroenterostomy under the omentum provide more protected anatomical position when the operation is completed, providing advantage for lower and upper abdominal quadrant drainage in case of possible PJ leakages. We believe that the use of Jackson Pratt drain prevent the formation of collection and abscess. We also think that Whipple operation can be safely performed also in secondary city hospitals by experienced surgeons. This experience is provided by surgeons who have worked in high-volume centers and completed their training with; preoperative evaluation, operational experience and learning of postoperative patient care and management of surgical complications. Knowledge exchange with the experienced radiology teams to decide for the resectability is one of the most important parts of the preoperative evaluation.

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