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An Evaluation of the Whipple's Procedure: A Retrospective Study in Dhaka, Bangladesh.

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Abstract
Background: *Basically, the Whipple's procedure also known as pancreaticoduodenectomy is an operation to remove the head of the pancreas, the first part of the small intestine (duodenum), the gallbladder and the bile duct. The Whipple's procedure is the most common operation for periampullary neoplasms like distal bile duct cancer, ampullary cancer, duodenal cancer and also in chronic pancreatitis involving head, pancreatic injury and some benign lesions in pancreaticoduodenal junction.*
Aim of the study: *The aim of this study was to evaluate the Whipple's procedure in Bangladesh.*
Methods: *This retrospective study was conducted in Department of Hepatobiliary, Pancreatic and Liver Transplant Surger, Bangabandhu Sheikh Mujib Medical University (BSMMU) and several private hospitals in Dhaka, Bangladesh during the period from January 2010 to December 2019. Three hundred and fifty (350) cases of Whipple's procedures performed at BSMMU from January 2010 to December 2019 were selected to analyse.A predesigned questioner were used in collecting data, SPSS version 16 was used to analyse data and several tales and charts were used to disseminate the findings.*
Result: *In this study, we found in 143 patient's adenocarcinoma of pancreas were associated which was the highest in ratio (40.86%). Then adenocarcinoma of duodenum, solid pseudo papillary neoplasm of pancreas, cholangiocarcinoma of terminal CBD, chronic pancreatitis, and serous adenoma of pancreas was found in 101 (28.86%), 46 (13.14%), 39 (11.14%), 28 (8%) and 21 (6%) cases respectively. We found 10 cases of mortality which was 2.86% of the total patients. As the causes of mortality, we found septicaemia associated shock due to pancreatic/biliary leak, haemorrhage and respiratory complication in 1.43%, 0.86% and 0.57% patients respectively.*
Conclusion: *We have concluded that, applying of ultrasonic scalpel, avoidance ofpreoperativestenting experience of surgeon and supporting staff has led to decrease in operative duration and blood loss. Pulmonary complications and septicemia secondary to anastomotic leakage are the most common causes of morbidity and mortality.*
Keywords:*Whipple's operation, Pancreaticoduodenectomy, Pancreatic cancer, Gastrojejunostomy.*

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I. Introduction

Basically, the Whipple's procedure also known as pancreaticoduodenectomy is an operation to remove the head of the pancreas, the first part of the small intestine (duodenum), the gallbladder and the bile duct. The Whipple's procedure is the most common operation to remove pancreatic cancers and/or to treat some benign pancreatic lesions, or cysts of bile duct and beginning part of duodenum. We have very few data

regarding this procedure of treatment. The Whipple's Procedure or pancreaticoduodenectomy was first described in 1940 by Allen Whipple. The Whipple's procedure has undergone a gradual evolution in the last 20 years. The mortality of pancreaticoduodenectomy, approximately 2.1%[1], has decreased precipitously in high-volume referral centres after decade. Near zero mortality rates are now common. Day by day, the morbidity, mortality and length of stay have also been reduced. Cardiac and pulmonary complications have been markedly reduced also. Modifications of the procedure have been introduced to improve long-term outcome of pancreatic cancer and to lessen digestive sequelae. 5-year survival rates of 22% are now reported by several centres for periampullarytumors tumour, 10 year survival rates for periampullary tumours are approximately 14%.[1].Cancer of ampulla of Vater incidence[2,3]adenocarcinmaof2nd part of duodenum[4]cholangiocarcinomaof lower 1/3 of CBD, cancer of head of pancreas[5] chronic pancreatitis with dominant head mass are the major indications of Whipple's procedure. Obstructive jaundice is the most common presenting symptom of ampullary cancer (85%)[6]Serum CA 19-9 is elevated in 86.4% of ampullary carcinoma patient.[7]On the other hand, diagnosis of periampullary cancers based on MDCT and EUS GUIDED FNAC but definitive tissue diagnosis not always required as negative biopsy or FNAC will not alter the decision of exploration. Recent MDCT techniques enable the production of three-dimensional images, which make clear the anatomical relationship of a tumour with the bile duct and vessels. EUS is an excellent procedure to determine pancreatic invasion and to evaluate for vascular invasion.Definitive treatment for periampullary carcinomas at our centre is PD. PD, either with conventional or pylorus-preserving approach (PPPD), is considered the standard of care. A recent meta-analysis of six randomized trials showed no significant differences in mortality and morbidity between the two procedures, although operating time and intraoperative blood loss are reduced in the PPPD group.[8] The rate of potentially curative resection has increased up to 90%.[9]However, significant complications occur in 20%-40% of patients, including pancreatic fistula, pneumonia, intra-abdominal infection, anastomotic leak and delayed gastricemptying.The mostimportantrisk factor ofpancreatic malignancy is smoking.The risk is directly proportional to the number ofpack years.Other less significant risk factors are chronic pancreatitis, diabetes, obesity and occupationalexposure.Hereditaryriskfactors are Familial Pancreatitis, Peutz-Jeghers syndrome, Familial atypical mole and multiple melanoma syndrome, cystic fibrosis[10].

II. Objectives

General Objective:

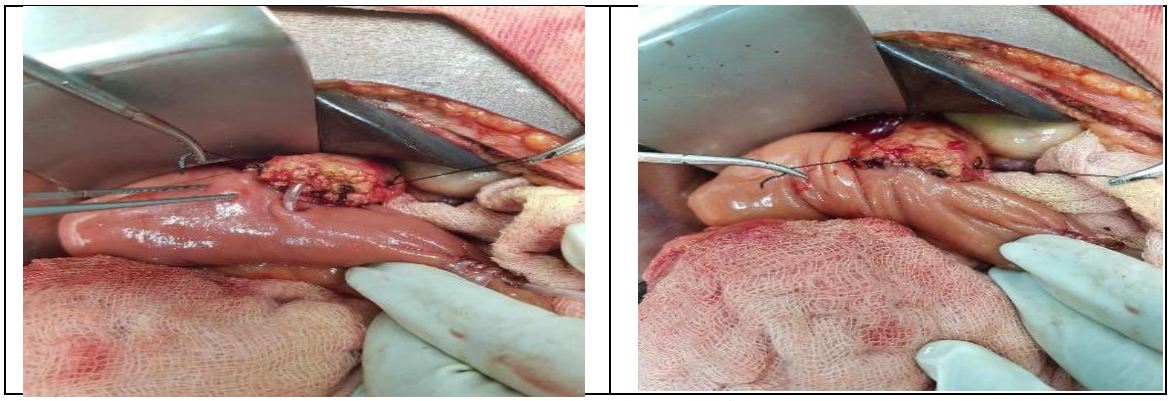
- To evaluate the Whipple's procedure in Bangabandhu Sheikh Mujib Medical University (BSMMU) and several private hospitals in Dhaka, Bangladesh.

Specific Objective:

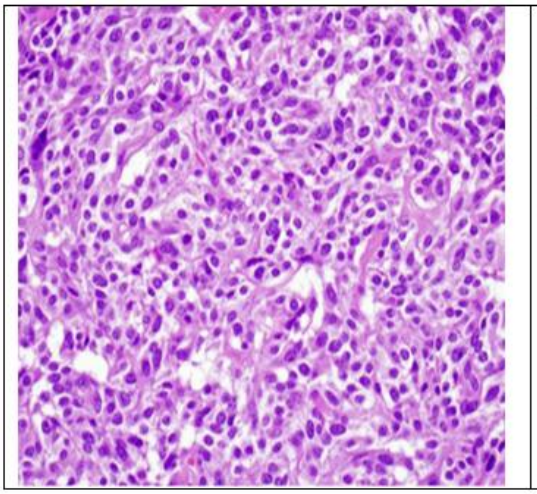
- To evaluate the findings of histological diagnosis in participants.

III. Methodology & Materials

This retrospective study was conducted in Department of Hepatobiliary, Pancreatic and Liver Transplant Surgery, Bangabandhu Sheikh Mujib Medical University (BSMMU) and several private hospitals in Dhaka, Bangladesh during the period from January 2010 to December 2019. Three hundred and fifty (350) cases of Whipple's procedures performed at BSMMU from January 2010 to December 2019 were selected to analyse. Data related to the 'pancreaticoduodenectomy' or 'Whipple' procedures were collected according to the pro forma designed for the study. The parameters and variables of the study were patient demographic data, presenting symptoms, physical signs, past medical history, preoperative stenting details, weight loss, intra-operative duration and difficulties, postoperative course and complications, pathology, causes of post-operative death, cause of re-exploration, and cause of readmission. Cases in which superior mesenteric artery was invaded, extensive portal vein involvement was there or had distal metastasis were considered as non-resectable hence excluded from the study. None of the patients received neo-adjuvant therapy. All patients underwent Whipple's procedure through rooftop incision by open resection of specimen and triple anastomosis. All patients underwent pancreaticojejunostomy and duct to mucosal anastomosis. A predesigned questioner were used in collecting data, SPSS version 16 was used to analyse data and several tales and charts were used to disseminate the findings.



Duct to mucosa anastomosis



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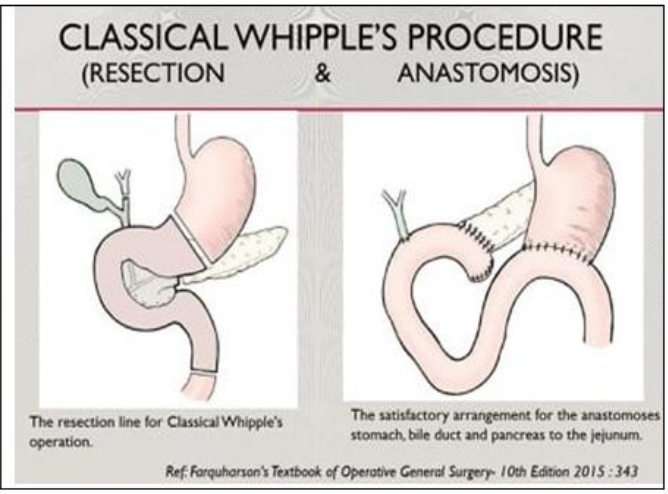

Classical whipples operation

IV. Result

In this study, the highest number of patients was found from 51-60 years' age group which was 26.57% (n=93). Besides this, 6.86%, 11.71%, 14.57%, 22.29% and 18% patients were found from 10-20 (n=24), 21-30 (n=41), 31-40 (n=51), 41-50 (n=78) and >60 (n=63) years' age groups respectively. In analysing the findings of histological diagnosis, we found in 143 patients adenocarcinoma of pancreas were associated which was the highest in ratio (40.86%). Then adenocarcinoma of duodenum, solid pseudo papillary neoplasm of pancreas, cholangiocarcinoma of terminal CBD, chronic pancreatitis, and serous adenoma of pancreas was found in 101 (28.86%), 46 (13.14%), 39 (11.14%), 28 (8%) and 21 (6%) cases respectively. In our study, we found some major as well as minor complications among the participants. In analysing major complications, we observed that the highest number of patients were associated with pneumonia as a major complication which was 26% (n=79). Besides this 22% (n=68), 19% (n=57), 14% (n=44), 12% (n=37) and 7% (n=22) were with haemorrhage, pancreatic leak, biliary leak, intra-abdominal sepsis and Gastrojejunalleak as major complications respectively. On the other hand, in this study we found 29%, 26%, 23% and 22% patients with wound infection, delayed gastric emptying, abdominal discomfort and vomiting as the minor complications respectively. In this study, we fund 10 cases of mortality which was 2.86% of the total patients. In analysing the causes of mortality, we found septicaemia associated shock due to pancreatic/biliary leak, haemorrhage and respiratory complication in 1.43%, 0.86% and 0.57% patients respectively.

Table I: Age distribution of participants (n=350)

Age (Yrs.)	**n**	**%**
10-20	24	6.86
21-30	41	11.71
31-40	51	14.57
41-50	78	22.29
51-60	93	26.57
>60	63	18.00
Total	**350**	**100**

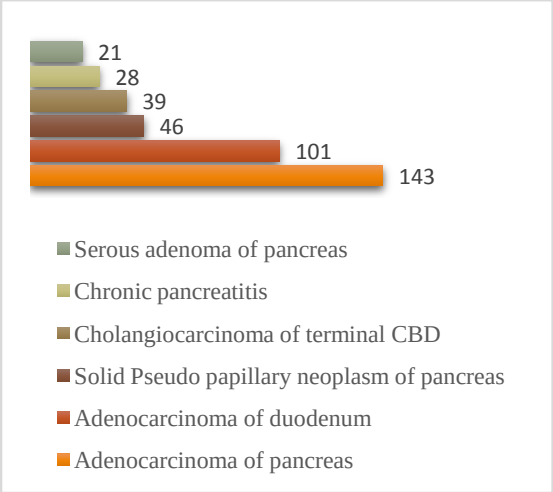

Figure I: Findings of histological diagnosis among participants (n=350)

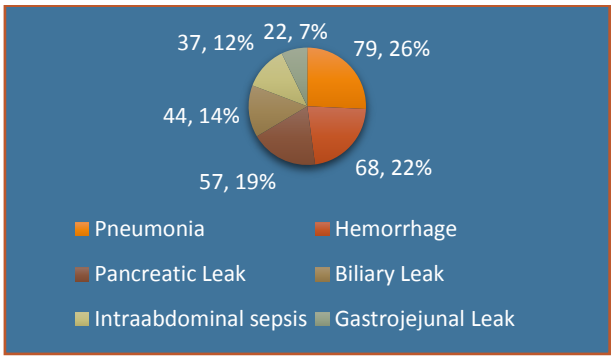

Figure II: Major complications among participants (n=350)

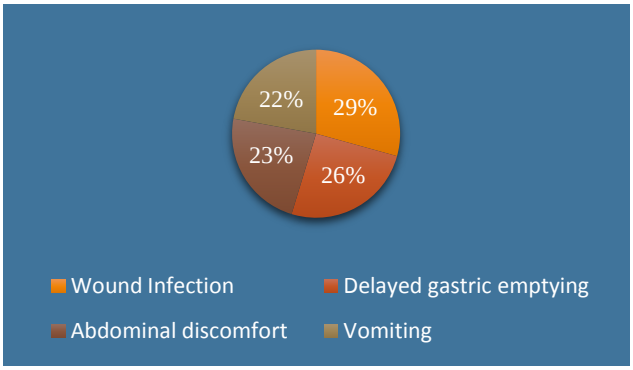

Figure III: Minor complications among participants (n=350)

Table II: Distribution of mortality & causes of participants (n=350)

Causes	n	%	Total	% (Total)
Septicaemic shock due to pancreatic/biliary leak	5	1.43	10	2.86%
Hemorrhage	3	0.86		
Respiratory complication	2	0.57		

V. Discussion

Pancreatic malignancy is the fourth most common fatal malignancy in the United States [5] and 6th most common fatal malignancy in Europe[11]. Earlier surgeons used to get histological diagnosis done preoperatively but now with clinical and radiological diagnosis surgeons are ready to do the surgery due to enhancement of experience of surgeons and supporting staff. This change in approach is working in favour of patients as they are now less prone to the ascending infections involved in endoscopic techniques or peritoneal seeding in transcoelomic techniques of tissue sampling.Inthis study, we havefound that age group of patients undergoing this surgery is most commonly from middle age group. Our youngest patient was 15 years old who

underwent the surgery for solid pseudopapillary neoplasm of pancreas. The most common presentingcomplaint was pain abdomen followed by jaundice. Endoscopic route was employed to get histological specimen in 31 out of 76 cases while in 21 cases transcoelomic route was employed, 25 cases were operated without any histological evidence suggesting the latest trend among surgeons. 18 out of 33 patients who hadjaundice underwent preoperative biliary stenting. Stenting was associated with decreased bilirubin levels at the time of surgery hence was associated with a favourable coagulation profile[12], but increased difficulty in surgery and prolonged time for resection of specimen. Endoscopic retrograde biliary drainage was the only kind of stenting done in all patients with jaundice without any criterion of bilirubin levels. All patients were operated through a rooftop i.e.bilateral subcostal incision. Intraoperative bile culture studies are an exact way of deciding whether preoperative stenting has adversely affected the patient's pathological anatomy but it was not done at our centre. But it was routinely observed that stented patients had more fibrosis hence difficult and prolonged dissection with a mean operating time of 330 min as compared to the rest of 310 min. Usage of ultrasonic scalpel in the farther two years of the study has leadto a decrease in the mean duration of surgery to 280 min compared to previous cases with a mean duration of 335 min. Usage of ultrasonic scalpel has also lead to decrease in the quantity of blood required during the surgery from a mean of 2.8 pints to 2.1 pints. Postoperatively most common major complication was pneumonia (26%) which is probably attributable to prolonged duration for which patient was kept under anesthesia. Hemorrhage was the nextmost common complication which accounted for 22%. Pancreatic leak was seen in 19% of patients ISGPF Definition: "Output via an operatively placed drain (or a subsequently placed percutaneous drain) of any measurable volume of drain fluid on or after postoperative day-3, with an amylase content greater than 3 times the upper normal serum value"[13]. Bile leakage was seen in 14% of the patients. Bile leakage was defined as major if it was >50 ml/day from abdominal drain with drain fluid bilirubin levels more than that of serum bilirubin levels and minor if <50 ml/day or if the patient had any interventional or radiological evidences of biliary peritonitis[14]. Intra-abdominal sepsis as defined by local signs of infection or systemic signs such as fever, tachycardia, leukocytosis or computed tomography scan of abdomen revealed intra-abdominalsepsis. Intra-abdominal sepsis was seen in 12% of the patients. Gastrojejunal leak was identified among four patients by clinical signs of tachycardia and increased drain output and dye studies. Among minor complications wound infection was most common seen in 29% followed by delayed gastric emptying in 26% of the patients. Delayed gastric emptying is defined as removal of Ryle's tube after day-5 or inability to start the patient on fully oral diet after day 7[15]. Septicemic shock due to biliary leak and pancreatic leak was the most common which was occurred in5 (1.43%) patients. Three patients initially had bile leak and 2 had pancreatic leak but patients gradually developed leak from both sites thereby suggesting the toxic nature of leak contents causing disruption of other anastomosis. Three patients died due to haemorrhage and two patients died due torespiratory complications in this study.

VI. Conclusion and Recommendations

By this study, we have understood that preoperative stenting should be avoided as far as possible as it leads to difficulty in resecting the tumor due to fibrosis and altered patho-anatomy thereby prolonging the duration of surgery. The usage of equipment like ultrasonic scalpel has led to decrease in blood loss and duration of surgery. Endoscopic means of histological diagnosis like endoscopic biopsy and endoscopic ultrasound guided FNAC were preferred rather than transcoelomic approach. Pneumonia and hemorrhage are the most common major complications while wound infection and delayed gastric emptying are the most common minor complications. It can be concluded that though Whipple's procedure is an extensive surgical procedure with high mortality and morbidity, however with proper preoperative workup and preparation, proper surgical technique, usage of modern equipment, intensive postoperative care, good antibiotic coverage, this procedure can be performed in patients with pancreatic and duodenal adenocarcinoma and other distal lesions which cause obstructive jaundice with reasonably good outcomes. For getting more specific findings we would like to recommend for conducting more studies regarding the same issue with larger sized sample.

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