INTRODUCTION
Pancreatic cancer is an aggressive malignancy with a very poor prognosis. It is the fourth most common cause of death from cancer. Because of its asymptomatic nature, patients are diagnosed mostly at a later, incurable stage. Only around 20% of pancreatic cancers are resectable at the time of diagnosis, giving an overall five-year survival rate of 15-20%. On the other hand, survival rates of other neoplasms like distal bile duct cancer (20-25%), ampullary cancer (30-40%), and duodenal cancer (50-60%) are higher. The exact cause of pancreatic cancer is unknown, but a few well-known risk factors include smoking and tobacco usage, alcohol consumption, coffee, history of diabetes or chronic pancreatitis. Surgery remains the only curative treatment.

Pancreateicoduodenectomy (PD) is the most commonly used surgical treatment for resection of most malignant and benign neoplasms in the periampullary region. Local recurrence and distant metastasis are the most common causes of treatment failure after pancreatic cancer resection and has been seen in as many as 80% of patients who have undergone curative resection. Even in centers where pancreateicoduodenectomy is routinely performed postoperative morbidity remains high (30-50%). Postoperative pancreatic fistula (POP) remains the foremost cause of morbidity following PD, which is about 5-30% (6-9), affecting not only the quality of life of the patients but also increases the length of hospital stay, medical costs, and even adds to postoperative mortality (3-15%).

This has led to development of various methods for performing the pancreateicenteric anastomosis in order to decrease the risk of POP. The most commonly used pancreateicenteric anastomoses are pancreateicentericoduodenostomy (PD) and pancreateicentericogastrostomy (PG). Though some studies have favored PG over PD, this is currently not an agreement regarding the best method.

The aim of this study was to report the experience in the treatment of pancreatic and periampullary neoplasms with emphasis on surgical technique and the clinical postoperative outcomes and lessons learnt in a tertiary level dedicated cancer hospital.
METHODOLOGY

The study was carried out in a dedicated hepatopancreato-biliary unit at Shaukat Khanum Memorial Cancer Hospital and Reserch Centre, Lahore. Prospective data was collected from October 2014 to May 2016. Patients’ characteristics like age, gender, presenting symptoms, past medical history and presence of comorbidty with American Society of Anesthesiology (ASA) score, operative time, postoperative complications, were registered. Only resectable pancreatic cancer and periampullary neoplasms were considered, defined by absence of distant metastases, absence of local tumor extension to the celiac axis and hepatic artery and lack of involvement of the superior mesenteric artery on preoperative scans. Patients with a short segment involvement (<3 cm) of portal or superior mesenteric vein (SMV) were accepted for trial of dissection and portal/SMV resection reconstruction.

A histologic or cytologic diagnosis of cancer was confirmed in all patients prior to surgery by means of endoscopic biopsy, biliary brush cytology or endoscopic ultrasound-guided fine needle aspirate (EUS-FNA). All patients were staged preoperatively by computed tomography (CT) scanning and endoscopic ultrasonography. Preoperative biliary drainage at ERCP was carried out only where patients had deep jaundice or episodes of cholangitis. Staging laparoscopy was also performed routinely before the definitive surgery.

Patients underwent a standard pancreatico-duodenectomy (PD). For pancreaticojejunostomy (PJ), an end-to-side anastomosis was used where a two-layered anastomosis was constructed with interrupted non-absorbable suture material (polypropylene), beginning with a posterior row of seromuscular sutures securing the jejunum to the pancreas, followed by completion of an anterior layer of seromuscular sutures between anterior aspect of jejunum and pancreatic capsule. In pancreatico-gastrostomy (PG), the posterior wall of the stomach was opened and end-to-side posterior pancreatico-gastrostomy was created using interrupted non-absorbable sutures. Pancreatic duct stent was only used if the duct size would accommodate 5-6 Fr feeding tube. It was followed by end-to-side hepaticojejunostomy, gastro-jejunostomy and finally jejunojejunostomy. Abdominal drains were placed, along with nasogastric for gastric decompression and naso-jejunal tubes for feeding. Patients whose lesions were found irresectable on trial of dissection underwent palliative bypass and were excluded from analysis.

Octracetide 100 mcg TDS was given subcutaneously to all patients for five days. The nasogastric tube was removed on the first postoperative day and sips were started. The amylase concentration in the drain fluid was measured on the fourth postoperative day. The patients were discharged from the hospital when solid diet was tolerated, and postoperative pain was controlled with oral analgesics. All measurable complications needing medical or surgical intervention were recorded. Perioperative mortality was defined as all the deaths within 30 days of surgery or in the same admission, irrespective of any cause. All procedures were performed by the same surgeon (FH).

POPF was defined and classified in accordance with the International Study Group of Pancreatic Fistula (ISGPF) classification. PPOPF was defined as output via operatively placed drain (or subsequently placed percutaneous drain) of any measurable volume of drain fluid on or after postoperative day 3, with an amylase level more than three times the upper normal serum value. The ISGPF definition of POPF provides three levels of severity.

Grade A was given when the patient is clinically well, there was no peri-pancreatic collections on CT scan, but slow removal of operatively placed drains. There was no change in management plan.

Grade B was given when patient was clinically fairly well, degree of infection requiring specific treatment, peripancreatic drains placed or repositioned prolongation of hospital stay. Change in management plan was required and patient was often discharged with drains in situ and observed as outpatients.

Grade C was assigned when patient was clinically unwell, associated with sepsis requiring antibiotics, octracetide and other intensive care support. Major change in management plan was required with prolongation of hospital stay, associated with complications and possibility of mortality.

SPSS version 20 was used for all statistical analyses. Kolmogorov-Smirnov test was executed to check the normality assumption of all quantitative variables. Major proportion of all quantitative variables showed statistically significant results (<0.05). For age and operative time, mean was used and median (IR) was utilized for other quantitative variables. Frequencies and percentages were employed to summarize all qualitative variables. POPF was compared between two operative techniques (PG vs. PJ). Fischer exact test was used to compare the frequencies between the two age groups (<40 and above 40 years). P-value < 0.05 was taken as significant.

RESULTS

A total of 50 patients were included in the study after exclusion of 15 patients who underwent trial of dissection but found to have irresectable disease. Among them, 32 (64%) were males and 18 (36%) were females. Mean age was 52.92 ±13.27 years. Seventeen patients (25.8%) were smokers. Jaundice was the most common presenting symptom which was found in 38 (76%) patients, followed by weight loss and pain. On preoperative scans, the median (IR) size of the tumor was 25 (18-35) mm. Five (7.6%) patients had neoadjuvant chemotherapy. In 44 (88%) patients, pre-operative biliary drainage was done by ERCP and stenting. Staging laparoscopy was done in 36 (72%) patients. Histological
confirmation of the diagnosis was obtained in all except four (08%) patients whose cytology was uncertain but a decision to operate was made, based on CT scan findings in multidisciplinary meeting recommendation. Fifteen (23%) patients were found irresectable during the course of procedure due to disease progression. Mean operating time was 470 ±358.28 minutes and median blood loss was 400 (287-500) ml. Among the resectable patients, 13 (26%) had pancreatico-jejunostomy and 37 (74%) had pancreatico-gastrostomy. Four (08%) patients needed portal vein and two patients replaced right hepatic artery resection and reconstruction due to tumor involvement. Median (IR) ICU stay was 1 (1-2) days with one (02%) patient had a prolonged stay of 7 day in ICU due to postoperative pancreatitis and acute renal injury. Twelve (24%) patients had wound infection. Nine (14.1%) patients had postoperative pancreatic leak. Seven (14%, Table II) had grade A minor leaks which did not require any intervention, one (02%) patient had grade B and was managed with radiological drainage, and one (02%) patient with grade C was reexplored needing washout and surgical drains. Patients who underwent PG reconstruction had lower incidence of POPF in comparison to PJ group (p=0.04). Five (7.6%) patients had postoperative GI hemorrhage from pancreatic stump, 3 of them required endoscopic intervention (Figure 1). Chyle leak was observed in 5 (10%) patients. One patient died on the seventh postoperative day because of myocardial infarction. The median (IR) postoperative hospital stay was 11 days (9-13). Anatomically, the most common tumor was periampullary (n=29, 58%) followed by pancreatic head (n=14, 28%). Histologically adenocarcinoma (n=44, 88%) was the commonest, followed by neuroendocrine tumors (n=4, 8%) and GIST (n=2, 4%). Median (IR) lymph node yield was 16 (12-21) nodes.

**DISCUSSION**

Pancreaticoduodenectomy have been associated with high morbidity, mortality and poor prognosis, so it was not the most popular procedure among surgeons in its initial days. But with better understanding of the disease process and the improvement in postoperative care has been adopted worldwide. Even in elderly population, Riall et al. showed survival benefits to be the same after resection. The results of the present study have shown comparable short-term outcome with published literature in terms of 30-day morbidity and mortality.

There has been a lot of work done on the type of pancreatic anastomosis and comparison has been made between PG vs. PJ, but still there has been no consensus regarding the best method. A study conducted by Lee et al. showed transgastric pancreatico-gastrostomy to be better than either dunking or duct-to-mucosa pancreatico-jejunostomy. Apart from the method of anastomosis, pancreatic texture has also been attributed to the development of pancreatic fistula. Numerous studies have been done which shows association of soft texture of pancreas and non-dilated pancreatic duct with increasing risk of POPF. Most of the presently reported patients had periampullary tumors with soft pancreas and non-dilated pancreatic duct; therefore, PG was preferred over PJ and PG was associated with lower incidence of POPF. One relatively common problem with PG is a higher incidence of haemorrhage from pancreatic stump which can be managed endoscopically as none of these patients required re-exploration. Traditionally, portal vein or SMV involvement was considered as contraindication to surgery but with increasing expertise, one can safely resect and reconstruct portal vein or SMV in order to achieve a curative resection, as we performed in four of these patients. Long-term results of these patients’ follow-up are needed to compare their outcome with patients who

| Table I: Patients characteristics who underwent pancreaticoduodenectomy (n=50). |
|------------------------|-----------------|
| Characteristics values | Age (mean age) 52.9 (±13.27) years |
|                        | >40 40 (80%) |
| Presenting symptom     | Jaundice 38 (76%) |
|                        | Pain 04 (08%) |
|                        | Weight loss 08 (16%) |
| Tumor type             | Periampullary 29 (58%) |
|                        | Pancreatic head 14 (28%) |
|                        | Duodenal 07 (14%) |
| Preoperative biliary drainage | 44 (88%) |
| Mean operative time    | 470 (±358.28) |

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<th>Table II: Postoperative complications.</th>
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<td>Overall complications</td>
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<td>POPF</td>
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<td>Grade B</td>
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<td>GI hemorrhage</td>
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POPF = Postoperative pancreatic fistula

![Figure 1](A) Pancreatic stump seen in stomach with an endoscope. (B) A large haematoma in the background.
had less advanced tumors. Two patients had aberrant right hepatic artery arising from superior mesenteric artery and was involved in tumor process needing resection and reconstruction. Preoperative identification of vascular aberration with a triple-phase CT scan is important to prevent any inadvertent injury to aberrant hepatic artery which can result in liver ischemia and biliary anastomotic failure study limitations here.

There is country-wide need to develop specialized hepato-pancreato-biliary units in order to achieve results comparable to international standards for this complex procedure.

CONCLUSION

Pancreaticoduodenectomy evolved as a safe procedure with excellent postoperative outcome, if carried out in a dedicated specialized HBP unit. For patients having periampullary tumors with soft pancreas and non-dilated pancreatic duct, a PG reconstruction can be a safer alternative to PJ. Suitable patients with short segment portal vein involvement may benefit from surgery and should be given chance for curative resection.

REFERENCES