"OUTCOME ANALYSIS OF PANCREATIC ANASTAMOSIS AFTER WHIPPLE'S OPERATION -OVER 3 YEARS"

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CERTIFICATE

This is to certify that the dissertation titled **"OUTCOME ANALYSIS OF PANCREATIC ANASTAMOSIS AFTER WHIPPLE'S OPERATION-OVER 3 YEARS"** submitted by **Dr.S.KARTHIKEYAN** appearing for **M.Ch. (Surgical Gastroenterology and Proctology)** degree examination in August 2012, is a bonafide record, of work done by him under my guidance and supervision in partial fulfilment of requirement of the Tamil Nadu Dr.M.G.R.Medical University, Chennai. I forward this to the Tamil Nadu Dr.M.G.R.Medical University, Chennai.

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DECLARATION

I solemnly declare that this dissertation titled **"OUTCOME ANALYSIS OF PANCREATIC ANASTAMOSIS AFTER WHIPPLE'S OPERATION-OVER 3 YEARS"** was prepared by me in the Department of Surgical Gastroenterology and Proctology, Centre of Excellence for Upper Gastrointestinal Surgery, Madras Medical College & Rajiv Gandhi Government General Hospital, Chennai under the guidance and supervision of **Prof.S.M.Chandramohan,** M.Ch, FACS, Professor & Head of the Department of Surgical Gastroenterology and Proctology, Centre of Excellence for Upper Gastrointestinal Surgery, Madras Medical College & Rajiv Gandhi Government General Hospital, Chennai. This dissertation is submitted to The Tamil Nadu Dr. MGR Medical University, Chennai in partial fulfillment of the university requirements for the award of the degree of M.Ch Surgical Gastroenterology and Proctology.

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INTRODUCTION

Early series of pancreatic operations for cancer published in the late 1960s reported postoperative morbidity rates of 60% and mortality rates approaching 25% with dismal long term outcomes. Consequently, Crile (1970) suggested that patients would be served better by a bypass procedure, rather than a futile and risky resection. Such a nihilistic approach was the prevailing attitude before the 1980s, to the point that surgeons asked themselves whether pancreaticoduodenectomy should be abandoned as treatment of pancreatic cancer (van Heerden et al, 1980). In the ensuing decades, however, dramatic declines in surgical mortality and morbidity rates were witnessed. High volume pancreatic surgical centres consistently reported mortality rates of less than 2% and morbidity rates of 36% (Buchler et al, 2003). Continual improvements in surgical techniques have played a role, but credit cannot be claimed solely by the surgical profession because significant advances were achieved in tandem in other fields, including better patient selection, and improvements in perioperative care. Perhaps one of the main contributors to this phenomenon was the emergence of high volume centers (Beger et al, 2003). Such centers tend to boast larger facilities and have a broader range of specialist and technology-based services,

with better-staffed intensive care units. The implication is that complications are better recognized and managed.

Our hospital is a high volume centre for pancreatic surgery, and both pancreaticogastrostomy and pancreaticojejunostomy is done after a standard pancreaticoduodenectomy. The purpose of this study is to analyse and evaluate the influence of perioperative factors and type of pancreaticoenteric anastomosis after pancreaticoduodenectomy and measure the short-term outcome in terms of morbidity and mortality.

AIM OF THE STUDY

To analyse the pattern of morbidity and mortality between patients undergoing pancreaticogastrostomy and pancreatico jejunostomy for a pancreatic remnant anastomosis following a standard pancreaticoduodenectomy.

To analyse the perioperative variables predicting the outcome and hence formulate a standard method of patient selection, type of anastomosis and perioperative care to achieve good outcome after a whipple operation.

REVIEW OF LITERATURE

Periampullary cancer includes adenocarcinoma of the head, neck, and uncinate process of the pancreas; ampulla; distal common bile duct; and ampullary duodenum. Often, the precise site of origin cannot be determined until the tumor has been resected[1]. Pathologic examination of resected pancreaticoduodenectomy specimens reveal that 40–60% are adenocarcinomas of the head of the pancreas, 10–20% are adenocarcinomas of the ampulla of Vater, 10% are distal bile duct adenocarcinomas, and 5–10% are duodenal adenocarcinomas. Since these data represent resected specimens, and since the resectability rate of the nonpancreatic periampullary cancers is much higher, it is likely that pancreas is the site of origin in up to 90% of cases[2].

HISTORY

Of the many indications for pancreatic resection, cancer has been the most intensely researched and the most meticulously documented. Ductal adenocarcinoma is the most prevalent tumor of the pancreas, with a predominant localization within the pancreatic head (78%) [3]. It is an undisputed fact, however, that pancreatic resection ranks as one of the most complicated and technically challenging surgical procedures through the ages.

The study of the history of pancreatic surgery also offers insight into the evolution of the surgical techniques. Pancreaticoduodenectomy probably had its origins in papillectomy, with Halsted (1899) being the first to report a successful resection of the ampulla in 1898. This accomplishment emboldened other investigators to experiment with more extensive excisions of the ampulla, duodenum and pancreas. Also in 1898, Codivilla (1898) reported the first pancreaticoduodenectomy, which he had performed in one stage. His patient died on the 21st postoperative day, however, from complications arising from what seemed like a pancreatic leak[4]. The first successful pancreaticoduodenectomy was performed by a German surgeon, Kausch, 11 years after Codivilla's landmark effort[5]. Kausch, a student of Von Mickulicz-Radecki, performed the operation in two stages. In the first, he decompressed the biliary tree, and 6 weeks later, he completed the extirpation and the reconstruction, including a pancreaticoduodenal anastomosis to the third part of the duodenum.

In their 1935 landmark publication, Whipple and co-workers reviewed their series of 80 patients who had surgical treatment for ampullary carcinoma, among which were 2 cases of pancreaticoduodenectomy. Whipple's maiden attempt was a two-stage procedure, with biliary and gastric decompression in the first stage and

tumor extirpation in the second stage. With increasing experience. Whipple's technique eventually evolved into a one-stage procedure complete with a pancreaticojejunostomy[6] . This metamorphosis was bolstered by the discovery of Vitamin K in 1929 and the "fat metabolizing hormone" in 1936. His one-stage innovation ensured a clean surgical field devoid of scars and adhesions that were the trademarks of a preliminary operation. In tribute to his efforts in this seminal work, Hunt (1941) labeled this method Whipple's procedure[7].

Even with advances in multimodality treatment, surgery is a crucial part, if not the centerpiece, of the treatment algorithm for pancreatic cancer because no truly effective chemotherapeutic agents for treating nonresectable disease have been developed yet. The American Gastroenterological Association (1999) endorsed pancreaticoduodenectomy as the recommended operation for patients with resectable tumors. Technical refinements have led to the advent of a variety of surgical techniques that allowed a more individualized, disease-directed approach. These modifications were partly responsible for the decline in surgical morbidity.

EPIDEMIOLOGY AND RISK FACTORS

In 2004, an estimated 31,270 deaths were attributed to pancreatic cancer, making it the fourth leading cause of cancer mortality in the

Unites States[10] . There is a slightly higher incidence in men than in women (relative risk 1.35) and in African American men (30-40% higher). Advancing age is perhaps the stronger risk factor. The peak incidence of pancreatic cancer is in the 60s and 70s, and mean age at diagnosis is 60 to 65 years[11]. Other risk factors include Ashkenazi Jewish heritage, cigarette smoking, diabetes mellitus, chronic pancreatitis, obesity, low level of physical activity, and occupational exposure to carcinogens. Six genetic syndromes have been linked to pancreatic adenocarcinoma: hereditary pancreatitis, hereditary nonpolyposis colorectal cancer, hereditary breast and ovarian cancer, familial atypical multiple molemelanoma syndrome, Peutz-Jeghers syndrome, and ataxiatelangectasia. The relationship between diabetes, pancreatitis, and pancreatic cancer is complex and controversial because pancreatic cancer itself can cause pancreatitis and hyperglycemia, through destruction of the pancreatic parenchyma and other poorly understood mechanisms [12].

CLINCIAL PRESENTATION

Because most pancreatic cancers arise in the right side of the gland, the hallmark clinical presentation for periampullary and pancreatic cancer is jaundice, resulting from obstruction of the intrapancreatic portion of the common bile duct. The jaundice is often

progressive and associated with dark urine, light stool, and pruritus. Although some patients exhibit vague, intermittent epigastric pain, locally advanced pancreatic cancer with tumor invasion of the celiac plexus typically causes a constant dull epigastric pain, often accompanied by back pain.

In 15% to 20% patients with pancreatic cancer, new-onset diabetes mellitus is observed[11] . The suspicion of pancreatic carcinoma should be raised in patients older than 60 years who develop mild diabetes. Similarly, the possibility of a pancreatic neoplasm causing partial pancreatic duct obstruction should be considered in elderly patients with newly diagnosed pancreatitis, particularly in the absence of cholelithiasis and ethanol abuse. Obstruction of the pancreatic duct also may cause pancreatic exocrine insufficiency, manifested by malabsorption and steatorrhea.

Nonspecific symptoms, such as nausea, anorexia, weight loss, and fatigue, are common in many patients with periampullary cancer. Obstruction of the C loop of the duodenum and at the ligament of Treitz can develop as a result of local tumor involvement from the periampullary region and midbody of the pancreas. On initial presentation, jaundice is the most common physical finding. Evidence of cutaneous scratching is commonly present, secondary to the pruritus.

Patients with disseminated pancreatic cancer may exhibit left supraclavicular adenopathy (Virchow's node), ascites, palpable hepatic metastases, periumbilical lymphadenopathy (Sister Mary Joseph's nodules), or drop metastases surrounding the perirectal region (Blumer's shelf).

Laboratory analysis often reveals elevated liver function studies, reflecting the degree of biliary obstruction. Hyperglycemia is commonly seen, but the mechanism for this is unclear. In deeply jaundiced patients with malabsorption of fat-soluble vitamins, prolongation of the prothrombin time may be seen.

Serum carbohydrate antigen 19-9 (CA 19-9) may be elevated; however, this tumor marker is neither sensitive nor specific for pancreatic cancer because 15% of patients do not secrete CA 19-9 owing to their Lewis antigen status. CA 19-9 levels may not be elevated early in the disease. Using a cutoff of 37 U/ml, the sensitivity and specificity for pancreatic ductal adenocarcinoma have been reported to be 81% to 85% and 85% to 90% (Tamm et al, 2003). Levels greater than 120U/ml have been predictive of metastatic disease (Cooperman, 2001). The main value of CA 19-9 is in follow up of patients after curative resection and in monitoring their response to chemotherapy.

DIAGNOSIS AND ASSESSMENT OF RESECTABILITY

Clinical staging should define the extent of disease reliably, avoiding unnecessary intervention and the accompanying morbidity, mortality and diminished quality of life in patients with advanced disease[13]. Although the TNM staging system is used most often in clinical trials, in practice physicians typically classify patients as having resectable, locally unresectable and metastatic disease[14]. Resectable pancreatic cancer is universally defined, based on preoperative workup, as a pancreatic tumor without evidence of involvement of the superior mesenteric artery or the celiac axis, a patent superior mesenteric-portal venous confluence, and no evidence of distant metastasis[15]. Portal vein involvement is controversial, and resectability often depends on the operating center. Imaging is the mainstay for diagnosing and staging pancreatic tumors, in contrast to the traditional approach of surgical exploration and a hands-on intraoperative examination to determine resectability.

COMPUTED TOMOGRAPHY

Helical computed tomography (CT) has been established as the most efficacious initial staging study [16]and often is used as the entry point to a management algorithm. The experience, cost, popularity, and

ease of interpretation favor helical CT as the most sensitive initial test to diagnose and stage pancreatic cancer[17].Multiplanar three-dimensional reconstructions can provide involvement of vascular structures and the degree and level of dilation of the pancreatic and biliary ducts[18]. Although the superior mesenteric vein is best seen with axial cuts, sagittal reformatting is best for showing superior mesenteric artery involvement[19]. Coronal reformatting can show possible tumor extension into the adjacent duodenum or stomach. Duodenal assessment is enhanced further with the use of a negative oral contrast agent such as water.

Regarding resectability, spiral CT scan has been reported to have a positive predictive value of 100%, negative predictive value of 56%, and overall accuracy of 70% for unresectable pancreactic carcinoma [19]. This ability to predict unresectability preoperatively is superior to the ability to predict resecability, particularly because the detection of small (<5mm) liver and peritoneal metastases is limited even with today's CT technology. Vascular involvement is the next most common reason for unresectability. Tumor encasement is inferred from narrowing or obliteration of vascular lumen, and radiologic grading criteria have been developed for circumferential vessel involvement[20,21]. Generally if the tumor surrounds more than half the circumference of a named vessel, it

is deemed unresectable. Additional radiologic features that suggest vascular invasion include perivascular cuffling, described as increased attenuation of the normal perivascular fat, and the presence of dilated collateral veins. The “teardrop” sign, which describes the deformity of the otherwise round shape of the superior mesenteric vein, suggests venous invasion[22]. An added bonus afforded by the excellent overview of pertinent anatomy and structures is the use of the multidetector CT as a valuable preoperative planning tool[23].

MAGNETIC RESONANCE IMAGING & MRCP

Magnetic resonance imaging (MRI) has been compared extensively with CT for the detection of vascular invasion and distant metastases, and most studies have shown equivalent accuracy between the two modalities[24]. MRCP offers a noninvasive delineation of the pancreatic and biliary ducts. It detects pancreatic or ampullary carcinoma by showing the effect of a space occupying lesion on the ducts – obstruction or displacement. The classic feature is the “double-duct” sign. Even a strictly defined double-duct sign is only 80% to 85% specific for malignancy, however (Menges et al, 2000). Most recent applications include secretin-enhanced MRCP, which can improve pancreatic duct and side branch delineation. Such pharmacologic stimulation of pancreatic juice secretion potentially can allow the

evaluation of pancreatic flow dynamics and assessment of pancreatic exocrine function[19].

ENDOSCOPIC ULTRASOUND

EUS is more sensitive in detecting small lesion (<20 mm), with a sensitivity of 93% to 100%. In a meta-analysis of studies comparing staging by EUS with other modalities, EUS (without fine-needle aspiration) more accurately predicted T stage, N stage, and portal vein involvement than CT. One of the greatest attributes of EUS is the ability to perform EUS-guided fine-needle aspiration of the primary tumor and the regional lymph nodes without the risk of tumor seeding along the needle tract, as opposed to the percutaneous route[26]. EUS guided fine-needle aspiration is only of diagnostic value, however, if histology confirms a pancreatic tumor. The major limitations of this technology are operator dependence and a limited field of visualization for the detection of distant metastasis.

ERCP

With the advent of MRCP, EUS, and multidetector CT with multiplanar three-dimensional reconstruction, the role of endoscopic retrograde cholangiopancreatography (ERCP) as a diagnostic tool is becoming increasingly limited. Besides the everpresent risk of

pancreatitis, the use of ERCP in an obstructed system might induce cholangitis. A normal pancreatogram does not equate absence of malignancy, and this can occur in approximately 20% of patients with pancreatic cancer. Potential “blind spots’ on ERCP include the uncinate process, the accessory duct, and the tail. In a study comparing ERCP with MRCP in evaluating patients with suspected malignant bile duct obstruction, it was found that the presence and site of the biliary stenosis were assessed correctly in 100% of cases using MRCP, as opposed to 95% with ERCP[27]. MRI has an additional advantage given its ability to provide cross-sectional anatomic evaluation of the upper abdomen.

POSITION EMISSION TOMOGRAPHY

Position Emission Tomography (PET) is being used to detect the primary malignant tumor, to detect regional and distant metastases, to differentiate benign disease from malignant disease or recurrent cancer from treatment-related scarring, and to document response to therapy[28]. In an extensive review of the FDG PET literature in the year 1993-2000, the overall sensitivity and specificity of FDG PET as an oncologic imaging tool were 84% and 86%, respectively.

FDG PET has been found to be more accurate than other imaging methods in detecting pancreatic cancer. It is especially useful in localizing the disease when CT is equivocal owing to treatment-related

anatomic alteration[29]. PET provides an alternative in tumors less than 2 cm in diameter.

By changing the radiotracer to carbon 11-labeled 5-hydroxyl L-tryptophan, PET imaging also has found a niche in the detection of neuroendocrine tumors. 5-Hydroxyl-L-tryptophan PET has been reported to fare better than CT and somatostatin receptor scintigraphy for tumor visualization and has allowed the detection of many small, previously overlooked lesions.

PET is not without pitfalls. False negative results have been reported in patients with hyperglycemia and patients with very early stage cancer or well-differentiated tumors. Because of limited spatial resolution and the absence of anatomic landmarks, PET is inferior to CT in assessing surgical resectability, in particular, vascular encasement. It is believed that PET performed in isolation has only a limited role in the workup of pancreatic cancer. The findings should be correlated with CT scans to obtain complementary information. This need has led to the development of hybrid PET-CT scanners, a combined physiologic and anatomic diagnostic modality.

DIAGNOSTIC LAPAROSCOPY

Diagnostic laparoscopy was introduced as a minimally invasive strategy for the detection of peritoneal carcinomatosis and liver

metastases to avoid unnecessary laparotomies in patients with advanced disease. Used in conjunction with helical CT, laparoscopic assessment can have a positive predictive value of 100%, a negative predictive value of 91% and an overall accuracy of 94%[30]. Laparoscopic ultrasound was added as an adjunct to laparoscopy to allow the detection of intraparenchymal lesions and vascular invasion or encasement. With ultrasound, the accuracy of determining resectability is improved to 98%. Advocates have reported that laparoscopy can identify occult metastases, which were not detected by a preceding CT scan, in 30% of patients. Consequently the resection rates after laparoscopy have been reported to be 75% to 95%. Because of these results, some centres strongly recommend the use of diagnose laparoscopy as a routine procedure. But the same is not justified[31] and laparoscopy is performed for patients at high risk of occult metastatic disease and in whom a palliative procedure is not required. In addition, laparoscopy can be performed for patients with ascites, larger primary tumors, and whose clinical or laboratory findings suggest an already advanced disease[31].

STAGING

Currently, only a few patients with pancreatic cancer are candidates for surgical resection, the only potentially curative therapy.

In most patients, accurate preoperative staging of periampullary and pancreatic cancer is achieved by multidetector CT with three-dimensional reconstruction. A resectable tumor is characterized by no evidence of metastatis disease, a clear tissue (fat) plane between the tumor and the visceral arteries (celiac axis and superior mesenteric artery), and less than or equal to 180-degree-circumferential involvement of the superior mesenteric vein-portal vein confluence. In contrast, patients with unresectable disease exhibit distant metastases, ascites, involvement of the superior mesenteric artery or celiac axis, or total occlusion of the superior mesenteric vein-portal vein confluence. Using three-dimensional CT to stage patients who subsequently underwent laparotomy for periampullary cancer, 98% of patients with three-dimensional CT scans interpreted unequivocally as resectable underwent resection. For patients with nondefinitive three-dimensional CT criteria of unresectability (e.g., questionable superior mesenteric artery involvement or near-complete superior mesenteric vein-portal vein encasement with preserved patency), only 22% underwent resection. Patients with nondefinitive radiographic criteria for unresectability should not be committed to nonoperative therapy.

TREATMENT

Surgical resection of periampullary and pancreatic cancer remains the only potentially curative therapy. Only a few patients currently diagnosed with pancreatic cancer are candidates for curative resection. It is hoped that as early detection schemes improve and gain widespread use, the percentage of patients who are candidates for resection will increase. Approaches for resection are based on tumor location and extent. Resection of right-sided tumors typically requires pancreatic-oduodenectomy.

In many instances, preoperative biliary decompression is unnecessary and may result in increased postoperative complications[32]. Selected patients with biliary sepsis, advanced malnutrition, or significant time delay before surgery may benefit from preoperative biliary decompression, which can be accomplished endoscopically with a plastic endoprosthesis in most instances. If endoscopic decompression cannot be accomplished, placement of a percutaneous transhepatic biliary drainage catheter can be pursued.

PREOPERATIVE MANAGEMENT

Preoperative Workup and Preparation

General

Pancreatic resections exert a significant physiologic stress on patients. Many patients are elderly (the peak incidence of pancreatic cancer falls in the 65-75 year age group)[33]. In such patients, there also is a higher incidence of comorbidities.

Cardiopulmonary exercise testing and lung function testing has been shown to examine accurately the ability of the cardiorespiratory system to deliver oxygen under stress and the need for postoperative ventilator support. Weight loss and dehydration are frequent features of patients with pancreatic disease, and in such patients, the initial effort is to maximize preload. Optimization of after load and myocardial contractility is equally important, and occasionally pulmonary artery catheters are inserted to facilitate this.

Before any major procedure involving resection, the patient's blood is matched for 2 units. Routine blood investigations and serum tumor marker assay, specifically CA 19-9 are done.

Meta-analysis of the role of low molecular weight heparin in the prevention of venous thromboembolic events in general surgery has

shown that low molecular weight heparin can reduce significantly the incidences of asymptomatic deep vein thrombosis, clinical venous thromboembolism, and pulmonary embolism with a trend toward a reduction in overall mortality rate. Consequently, a prophylactic dose of low molecular weight heparin to patients starting from the evening before the day of surgery until the patients are ambulant postoperatively is advised. In addition, patients are prescribed compression stockings, which they wear intraoperatively and for their entire inpatient stay. Stockings are believed to reduce pooling of blood in deep veins by mechanically preventing venous distension and are a simple, inexpensive method of deep vein thrombosis prophylaxis.

Antibacterial prophylaxis has been instrumental in the reduction of infection-related morbidity with clean contaminated procedures[34], and as such, it is recommended for all patients undergoing hepatobiliary or pancreatic surgery. Drugs with antianaerobic activity are added if there is an anticipated encounter with anaerobes during the procedure, in particular, with procedures involving the gastrointestinal tract. The general guideline is to use the highest licensed dosage of the chosen antimicrobial agent. This agent should be administered at induction of anesthesia to achieve high peak tissue concentration at the site of the wound before the first incision and should be maintained until the time

of closure. Redosing should be done when the procedure lasts more than 2 antibiotic half-lives. In all procedures in which the biliary tract is entered, the bile is sent for microbiologic examination to guide postoperative antimicrobial treatment should this need arise.

Pancreatic cancer is notorious in its association with significant metabolic and nutritional disturbances. Weight loss of 10% or more is well known to affect outcome adversely with an overall increased susceptibility to postoperative complications. Clinical trials addressing the role of preoperative nutritional therapy have found no reduction in morbidity or mortality using either total parenteral nutrition (TPN) or enteral nutrition. The controversy is fuelled further by the observation that the surgical mortality or morbidity has decreased significantly without emphasis on prior perioperative nutrition. Perhaps only patients with severe malnutrition, in particular patients with physiologic impairment, would have a tangible benefit from perioperative and postoperative nutritional support[35].

Patients in whom, for some reason, surgical extirpation has to be delayed and have a demonstrable loss of weight, or patients with severe malnutrition with physiologic dysfunction are candidates for nutritional support. The latter group can be identified using physiologic function tests, such as hand grip strength. Even lung function testing can serve as

a simple assessment for voluntary muscle function. Serum markers, such as transferin, peralbumin and retinol binding protein, also are invaluable in confirming significant malnutrition. These are more accurate than albumin as a marker of nutritional well-being. If perioperative nutritional support is required, the enteral route is preferred.

ROLE OF SOMATOSTATIN

The pancreaticoenteric anastomosis is nicknamed the “Achilles heel” of pancreaticoduodenectomy because of the potentially disastrous sequelae of life-threatening intra-abdominal sepsis and haemorrhage in the event of a pancreatic leak. Based on the findings of the trials conducted by Buchler et al, 1992 & Friess et al, 1995b all patients scheduled for pancreatic resections, were given a prophylactic subcutaneous octreotide (Sandostatin), beginning with the first dose of 200 µg given at induction. If the pancreas is deemed to be high risk by the surgeon, because of a soft consistency or a pancreatic duct size of less than 3 mm in diameter, the postsurgical regimen would be three daily doses of 200 µg of octreotide for the next 5 days. Conversely, if the gland is firm with a relatively wide duct, each individual dosage would be 100 µg.

ROLE OF PREOPERATIVE BILIARY DRAINAGE

Patients with pancreatic cancer who have jaundice also are at risk for associated coagulopathy, malabsorption, malnutrition, and immue dysfunction. There have been at least two meta-analyses published on this subject. Sewnath and colleagues (2002) found that there was no difference in the overall death rate between patients who had PBD and patients who had surgery without PBD[38]. Instead, the overall complication rate was significantly adversely affected by PBD. The length of hospital stay also was prolonged. The investigators concluded that PBD carries no benefit. In a more recent review, Saleh and associates (2002) found no evidence of either a beneficial or an adverse effect of preoperative biliary stent placement on the outcome of surgery in patients with pancreatic cancer[39]. The role of PBD in patients with biliary obstruction undergoing pancreatic resection is controversial at best. What is clear is that endoscopic drainage is better than percutaneous methods. So preoperative biliary drainage, as a routine practice, is not warranted rather than, it can be done for patients with cholangitis or other severe complications of jaundice that would preclude a safe resection. Another indication would be jaundiced patients requiring induction therapy before surgical extirpation.

EPIDURAL ANALGESIA

Studies on “fast track” gastrointestinal surgery have shown that epidural analgesia, combined with an intensive and standardized regimen of early feeding and mobilization, can reduce hospital stay[40]. Epidural analgesia has been found to have many attributes, including a shorter duration of postoperative ileus, attenuation of the stress response, fewer pulmonary complications, improved postoperative pain and mobility. Thoracic epidural analgesia is of particular benefit to patients with a high risk of cardiac or pulmonary morbidity and is able to reduce the hospital stay and costs in this subgroup of patients.

OPERATIVE MANAGEMENT

Panceraticoduodenectomy

Technique

The patient’s abdomen is cleansed from the nipple level down to the level of the symphysis pubis, and the operative field is squared off with sterile drapes. By either a midline or roof-top incision peritoneal cavity is entered. The ligamentum teres and the adjoining falciform ligament is routinely divided to facilitate a thorough examination of the liver. The peritoneal surfaces also are inspected carefully for metastatic deposits. Particular attention is paid to the pelvis for drop metastasis and

the root of the mesenteric artery. Resection is proceeded only if there is no evidence that would preclude an R0 resection.

Access into the lesser sac is achieved by division of the gastrocolic ligament. On the left side, the gastrocolic ligament is divided as far as the most medial branch of the short gastric vessels. This is to ensure an alternative venous egress for the splenic blood flow in the event of any venous resection of the superior mesenteric vein-portal vein trunk. Moving toward the right, the hepatic flexure is mobilized caudally. Careful dissection in the avascular plane between the hepatic flexure and the duodenum and extension of the Kocher maneuver allows the third part of the duodenum to be freed from the colonic mesentery. The gastrocolic venous trunk of Henle is encountered here, and tracing it down leads to the superior mesenteric vein. Alternatively, the superior mesenteric vein can be identified through a Cattell Braasch maneuver. The gastropiploic vein is divided where it empties into the gastrocolic trunk. The superior mesenteric vein is traced to the inferior margin of the pancreas. The peritoneum overlying the inferior border of the pancreas is divided to allow better definition of the pancreatic margins. Two stay sutures are placed at the inferior border of the pancreas to aid in the creation of the tunnel between the pancreatic neck and the

superior mesenteric vein-portal vein trunk. Attention is now turned to the supraduodenal compartment.

Cholecystectomy is performed in a fundus-first approach. The cystic duct is traced to its origin from the common bile duct, and the common bile duct is transected just cephalad to this point. Extreme care is taken at this point to avoid any iatrogenic injury to the right hepatic artery, which usually runs posterior to the hepatic duct[41]. The distal end of the common bile duct and its adjoining fibrofatty tissues are dissected free from the rest of the hepatoduodenal ligament and retracted caudally. A small noncrushing clamp is applied to the proximal bile duct stump to prevent any further bile spillage for the rest of the operation. The proper hepatic artery is identified and looped. This is traced proximally toward the common hepatic artery. The gastroduodenal artery can be isolated during this dissection. Nodal tissues surrounding the proper hepatic artery and the common hepatic artery are excised. The gastroduodenal artery is divided near its origin. A potential pitfall here is the misidentification of a replacing common hepatic artery or even a replacing right hepatic artery as the gastroduodenal artery. A technique to avoid this mistake is to place a vascular clamp across the presumed gastroduodenal artery and checking for pulsations at the porta hepatis before this vessel is divided. The stomach is then divided and retracted

to the left upper quadrant of the abdomen. The suprapancreatic portion of the portal vein is now widely exposed. Two stay sutures are similarly placed on the superior border of the pancreas. These sutures at the superior and inferior pancreatic borders also serve to ligate the superior and inferior pancreatic vessels running longitudinally in the parenchyma and reduce bleeding from the cut edges after transaction. Using peanut swabs and blunt forceps, a tunnel is created cautiously between the superior mesenteric vein-portal vein trunks posteriorly and the pancreatic neck anteriorly. A silicon drain is insinuated into this tunnel to loop up the neck.

The venous trunk is examined for any tumor involvement on its posterolateral aspect. If venous resection is required, this is reserved as the last step in the extirpative phase. The portal vein is gently retracted medially to expose the underlying tissues, and any venous branches are divided. At the same time, the specimen is retracted to the right. The tissue and branch arteries arising from the superior mesenteric artery are serially clamped, divided, and stitch ligated. During this step, the specimen is cupped within the left hand of the surgeon, and the fingers continuously appraise the position of the superior mesenteric artery to avoid any injuries to it. The anterolateral aspect of the superior mesenteric artery is completely skeletonized of its investing tissues. The

third part of the duodenum is transected using a linear stapler, freeing the entire specimen. Margins are harvested from the proximal pancreatic stump and the bile duct for margin analysis by frozen section.

The ligament of Treitz is mobilized, and the mesenteric branches to the fourth part of the duodenum are divided to allow it to be delivered into the inframesocolic compartment under the superior mesenteric artery. The pancreatic stump is rotated toward the left, and a collar of investing tissue is cleared for a distance of 2 cm from the cut end to provide a clear all-round visualization of the pancreatic capsule; this facilitates the subsequent construction of the pancreaticoenteric anastomosis. Hemostasis is ensured, and the operative field is washed with warm water before proceeding to the reconstructive phase.

VASCULAR RESECTION:

Fuhrman and co-workers (1996) found that tumors adherent to the superior mesenteric vein – portal vein trunk did not exhibit more aggressive biology, suggesting that venous adherence was a function of tumor location rather than an indicator of aggressiveness. Subsequently, studies have reported that the need for portal vein resection does not affect overall patient survival. In 2004, new evidence emerged to suggest that portal vein resection might confer some survival benefits. In a prospective randomized study, Lygidakis and associates (2004)

showed that patients with portal-mesenteric venous invasion who were randomized to venous resection had far better 2-year and 5-year survivals compared with patients who were randomized to only palliative bypass. Venous involvement can be described as short segment or long segment. As with all vascular surgery, proximal and distal control must be secured first. For short segment involvement, a cuff resection is done. The strategy would be to dissect circumferentially around the point of involvement to allow side clamping of the vein. The involved area is excised with a longitudinal bielliptical incision with clear margins, and the venotomy subsequently is closed in a transverse fashion using nonabsorbable monofilament sutures in a continuous fashion (Prolene 5-0). If a segmental resection is necessary to ensure clear margins, reconstruction of the portal vein and superior mesenteric vein can be accomplished in most instances by an end-to-end anastomosis. Otherwise, a generous Cattell-Braacsh maneuver with or without a caudal mobilization of the liver, usually would allow a tension-free anastomosis, failing which a vein graft can be used.

LYMPHADENECTOMY:

Several studies exist concerning extended lymph node dissection and its potential benefits. Three level I studies hailed from centers from three different continents – Europe[42], North America (United States)[43,44],

and Asia (Japan)[45]. They all were unanimous in their verdicts – that despite the increased radicality of lymphadenectomy, survival rates were not prolonged. Ishikawa and colleagues (1997) provided a possible explanation for these disappointing results. They found that patients with lymph node metastases confined to the anterior and posterior panceraticoduodenal groups fared as well as patients without any lymph node involvement. In contrast, patients with involvement of other, more distant lymph node groups did not benefit from an extended lymphadenectomy (Ishikawa et al, 1997). A standard lymphadenectomy, which would include the removal of the anterior and posterior pancreaticoduodenal groups, would suffice.

MANAGEMENT OF PANCREATIC REMNANT:

The aftermath of a pancreatic leak can be devastating, particularly when it results in retroperitoneal sepsis. This is found to be a major cause of procedure-related mortality[46]. Simply occluding the duct has been shown to result in higher fistula rates, in addition to increasing the risk of pancreatic exocrine and endocrine insufficiency. Drainage of the pancreatic remnant to the gastrointestinal tract is a crucial step, but it runs the risk of anastomotic breakdown. The pancreaticoenteric anastomosis has fascinated surgeons, motivating them to search for a more reliable technique to avoid this dreaded complication. Many

techniques have been described, and the literature will continue to report novel techniques that promise to be even safer. Rather than the choice of the variant used, however, the successful management of the pancreatic anastomosis depends more on the surgeon's concentration on the meticulous execution of the technique with which he or she is familiar[47]. As long as the basic tenets of a safe anastomosis are met, including careful handling of the pancreatic tissues, a tension-free adaptation, good perfusion, and no distal obstruction, any pancreaticoenteric anastomotic technique can have a good outcome.

One of the most commonly employed technique is a pancreatic ojejunal anastomosis. This anastomosis can be performed by invaginating the transected pancreas into the end of the jejunum, the so-called dunking procedure; another variant is to anastomose the pancreatic duct directly to a proper opening in the jejunum, the so-called duct-to-mucosa technique. The technique of pancreaticojejunal anastomosis, whether end-to-side or end-to-end, and whether duct-to-mucosa or dunking, does not seem to influence the anastomotic leak rate significantly. Another strategy is to anastomose the pancreatic stump to the stomach. Preponents of the pancreaticogastrostomy cite various reasons[48]. First, it is easier to perform, given the close proximity of the stomach to the pancreas. Second, the anastomosis is less prone to

ischemia because of the rich gastric perfusion. Third, because the exocrine enzymes enter an acidic environment, the leak rate is theoretically lower as the enzymes do not get activated. The last statement has been debunked, however. In a prospective randomized trial comparing pancreaticojejunostomy with pancreaticogastrostomy, the leak rates were not significantly different (pancreaticojejunostomy 11%; pancreaticogastrostomy 12%)[49].

In a prospective randomized trial[50] of pancreaticogastrostomy versus pancreaticojejunostomy after pancreaticoduodenectomy Yeo et al has concluded that pancreatic fistula is a common complication after pancreaticoduodenectomy, with an incidence most strongly associated with surgical volume and underlying disease and the data do not support the hypothesis that pancreaticogastrostomy is safer than pancreaticojejunuostomy or is associated with a lower incidence of pancreatic fistula. In a metaanalysis[51] by Wente MN and Shrikande SV et al they concluded that all non randomized observational clinical studies have reported superiority of pancreaticogastrostomy over pancreaticojejunostomy but all randomized controlled studies has shown equally good results. In a study by H Ramesh et al results suggested that pancreaticogastrostome deserves wider application[52]. In another prospective randomized trial Bassi et al has showed that both type of

anastamosis does not significantly change the risk of overall complications or the incidence of pancreatic fistula. However, significant decreases in the risk of associated complications, biliary fistulas, postoperative collections and DGE were observed using pancreaticogastrostomy. A Chinese metaanalysis[53] of all four randomized controlled trials has evidence suggesting that pancreaticogastrostomy is better than pancreaticojejunostomy after pancreaticoduodenectomy.

BILIARY-ENTERIC ANASTOMOSIS:

In contrast to the pnacreaticoenteric anastomosis, there are fewer variations to the technique employed for the biliary-enteric anastomosis. This anastomosis usually is constructed in an end-to-side fashion with a single layer of sutures using monofilament absorbable sutures (PDS 5-0) with C1 needle.

The anastomosis is positioned at about 20 to 30 cm downstream from the pancreaticojejunostomy.

RECONSTITUTION OF GI CONTINUITY:

Depending on whether a distal gastrectomy or a PPPD was performed, the reconstruction is done with a gastrojejunostomy (distal gastrectomy) or a duodenojejunostomy (PPPD).

Abdominal Drains and Nasogastric Tube. Intraperitoneal drains have been placed in relation to the biliary and pancreatic anastomosis with the intention of controlling leakage of blood or biliary, lymphatic, or pancreatic secretions. This practice has been prophylactic in nature, and it is based more on habit rather than evidence. This practice has been challenged more recently. A randomized trial addressing the value of drains after pancreatic resection found that placement of drainsdid not translate into a reduction in surgical morbidity[54]. Rather, a significantly higher proportion of patients randomized to the drain group development intraperitoneal sepsis, fluid collection, or fistula.

RESULTS

After resection of periampullary and pancreatic cancer, longterm survival is determined largely by the site of tumor origin. In an evaluation 242 patients with resected periampullary adenocarcinoma at the Johns Hopkins Hospital, the 5-year actual survival rate for the entire cohort was 20%[55]. Actual 5-year survival rates were the best for duodenal adenocarcinoma (59%) compared with the rest: ampullary (39%), distal bile duct (27%) and pancreas (15%). For the entire group of patients surviving 5 or more years, there were statistically more duodenal and ampullary primaries, fewer node-positive resections,

fewer margin-positive resections, and more well differentiated tumors compared with patients who failed to survive 5 years.

In an analysis of 616 patients with resected adenocarcinoma of the pancreas at the Johns Hopkins Hospital, several factors were found to influence long-term survival[56] shows that lymph node involvement, margin positivity; tumor size greater than or equal to 3 cm, and poor tumor differentiation all resulted in worse survival. Although there is some controversy over whether patients do worse with pancreatic adenocarcinoma arising from the left side versus the right side of the gland, for patients who undergo resection, there seems to be no statistical difference in survival. By multivariate analyses, pathologic factors identified as prognostically favorably affecting outcome were, negative resection margin, tumor diameter less than 3 cm, and good to moderate tumor differentiation. Particularly for pancreatic primaries, an important observation is that the survival rate continues to decline after 5 years, mostly owing to recurrent disease; 5-year survival does not indicate a cure of pancreatic cancer, although the decrement in survival beyond 5 years is less steep than the decrement in survival from the time of surgery to 5 years postoperatively.

ADJUVANT THERAPY : POSTOPERATIVE CHEMORADIATION AND CHEMOTHERAPY

Overall, the 5-year survival for all patients diagnosed with pancreatic cancer is only 3%. After resection, approximately15% to 20% of patients can be expected to survive 5 years, with most dying as a result of recurrent disease, manifesting locoregionally and distantly. These patterns of disease recurrence and general poor outcome support the rationale for adjuvant chemoradiation. The first randomized controlled trial evaluating adjuvant therapy for pancreatic cancer was reported by the Gastrointestinal Tumor Study Group (GITSG). A survival benefit was seen in patients randomly assigned to radiation therapy combined with 5-fluorouracil (5-FU) compared with surgery alone (median survival 20 months versus 11 months). Despite limited accrual, the GITSG trial was the first to show a potential benefit for adjuvant therapy after the first to show a potential benefit for adjuvant therapy after resection of pancreatic cancer. Subsequent reports from the GITSG and single institutions supported the use of adjuvant chemo radiation. A randomized controlled trial conducted by the European Organization for Research and Treatment of Cancer showed a trend toward improved survival with adjuvant 5-FU-based chemo radiation compared with surgery along in patients with periampullary and

pancreatic cancer (Klinkenbijl et al, 1999); however, this study was statistically underpowered and reported as a negative trial.

The results of the European Study Group for Pancreatic Cancer (ESPAC-1) trial were reported by Neoptolemos and colleagues (2004). Compared with the observation group, however, patients who received chemoradiation alone seemed to have a worse median survival, suggesting a possible role for treatment-related toxic radiation effects.

Although controversy surrounds the use of adjuvant chemoradiation, several on-going clinical trials are exploring various regimens.

NEOADJUVANT THERAPY

In theory, there are several potential advantages of therapy administered in the neoadjuvant (preoperative) versus the post operative adjuvant setting. In a series of 132 patients with resectable pancreatic cancer at the M.D. Anderson Cancer Center, the investigators reported that various neoadjuvant chemoradiation regimens followed by pancreaticoduo- denectomy can be completed successfully with a median survival of 21 months. Currently, there is no proven survival benefit of neoadjuvant chemoradiation compared with postoperative therapy; however, numerous trials are ongoing.

MATERIALS AND METHODS

All patients attending the outpatient department of Surgical Gastroenterology, Rajiv Gandhi Government General hospital between August 2009 to December 2011 with symptoms and signs of obstructive jaundice were evaluated by imaging studies and those patients found to have distal obstruction due to malignancy were segregated.

All data were collected prospectively and the clinical parameters were noted in a proforma. Besides age and gender, the chief complaints, co-morbid illness, nature of diet, habit of smoking and alcohol consumption were also noted. Findings on Physical examination such as jaundice, pallor, pedal edema and other signs of liver failure if present were noted. Clinical examination of the abdomen done to look for a palpable gallbladder, hepatomegaly and free fluid. All patients were subjected to a per rectal examination to rule out any possibility of rectal deposits. All basic biochemical investigations including a complete blood count, Renal function tests and Liver function tests were noted. Coagulation profile and serum tumour marker study was done for all patients. After an initial ultrasonogram of abdomen an upper GI endoscopy and contrast enhanced computerised tomography was done for all patients.

Fifty patients with operable growth in the pancreatic head, ampullary, distal bileduct and duodenum in the periampullary region were included in the study group. Informed consent was obtained from all the patients explaining the nature of illness and the magnitude of morbidity and mortality. Whenever possible if a growth is seen at endoscopy or side viewing scopy a biopsy was attempted. We do not call for an MRI routinely, but if a patient comes with an MRI and the information needed to assess the resectability is sufficient we don't call for CECT abdomen. The performance status of the patient is assessed and the cardiorespiratory status evaluated. Hydration status, nutritional status and coagulation profile are noted and corrected if necessary with injection vitamin K and fresh frozen plasma. All patients were encouraged to have incentive spirometry for 2 weeks before surgery. For patients with bilirubin more than 20mg% , poor performance status, poor nutritional status and for those presenting with cholangitis a pre-operative endoscopic biliary drainage was performed except for one patient for whom we have performed an operative biliodigestive bypass before pancreaticoduodenectomy.

All patients in the study were subjected for a standard whipple's pancreaticoduodenectomy. With the patient in supine position abdomen is opened by a rooftop incision and thorough laparotomy done. After

ascertaining the operability once more resection is proceeded. In the process of reconstruction pancreaticoenteric anastamosis is done either as a pancreaticogastrostomy or pancreaticojejunostomy as per the choice of operating surgeon. Pancreaticogastrostomy is done usually by the invaginating(dunking) technique in two layers. Pancreaticojejunostomy is done as an end to side anastomosis by Buchler's technique. Hepaticojejunostomy is done using 3-0 vicryl interrupted sutures by parachute technique. An antecolic gastrojejunostomy is done in either cases. The duration of surgery, blood loss, number of transfusions, the technique of pancreaticoenteric, bilioenteric and gastrojejunal anastomosis were noted.

The day of removal of nasogastric tube, drainage tube and urinary catheter in the post-operative period were noted. The values of serum amylase and drainage tube amylase were noted on the 3rd and if necessary on the 5th postoperative day. A complete blood count and Liver function tests were obtained at the time of discharge. The length of postoperative stay was noted along with major complications like delayed gastric emptying, early and late haemorrhage, pancreatic leak, intra-abdominal collection and other minor complications like wound infection, pneumonitis and urinary tract infection.

The complications after whipple's operation as noted in the proforma were defined as follows:

Delayed Gastric Emptying

All patients who were unable to start oral fluids by 7^{th} day and those who required ryles tube for more than 10 days or who required reinsertion after 10 days were considered to have delayed gastric emptying.

Haemorrhage

Bleeding complication following pancreaticoduodenectomy requiring monitoring, transfusion, radiological and surgical intervention were noted. Early haemorrhage occur within 24 hrs and late haemorrhage occurred after 24 hrs.

Pancreatic leak

Any measurable amount of fluid after day 3 in the drainage tube with amylase level more than 3 times that of serum values is suggestive of pancreatic leak and has been graded A,B & C according to the severity and plan of management.

Intra-abdominal collection

Any collection detected by ultrasonogram or CECT of more than 5 cm is noted as intra abdominal collection and planned for percutaneous drainage.

Wound infection

Any collection of pus or fluid at the operated site with mild fever, leucocytosis and local inflammatory signs in the absence of any major complications is defined as wound infection. It was managed by letting out the pus or fluid, sending it for culture and sensitivity treating with appropriate antibiotics.

Pneumonitis

Any post-operative lung signs with fever and diminished air entry is defined as basal pneumonitis and aggressively treated by ambulation, chest physiotherapy, antibiotics and nasal oxygen.

Urinary Tract Infection

Patients presented with fever with no other sources and positive urinary culture. Treated by hydration, antibiotics and adequate glycemic control.

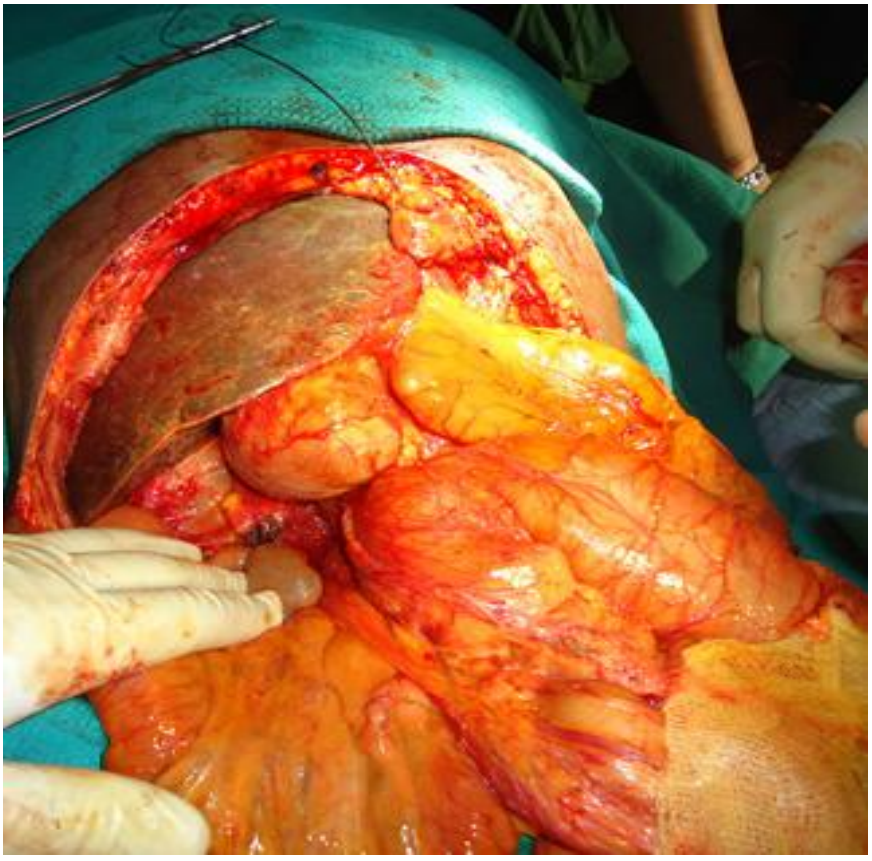
STATISTICAL ANALYSIS:

The data collected in the proforma were entered in an excel sheet of Microsoft Office software and inference obtained after statistical analysis. The mean and standard deviation were reported for continuous variables and for categorical variables proportions were computed. To compare and find the statistical significance between the two group proportions chi-square test was used and to compare between the two

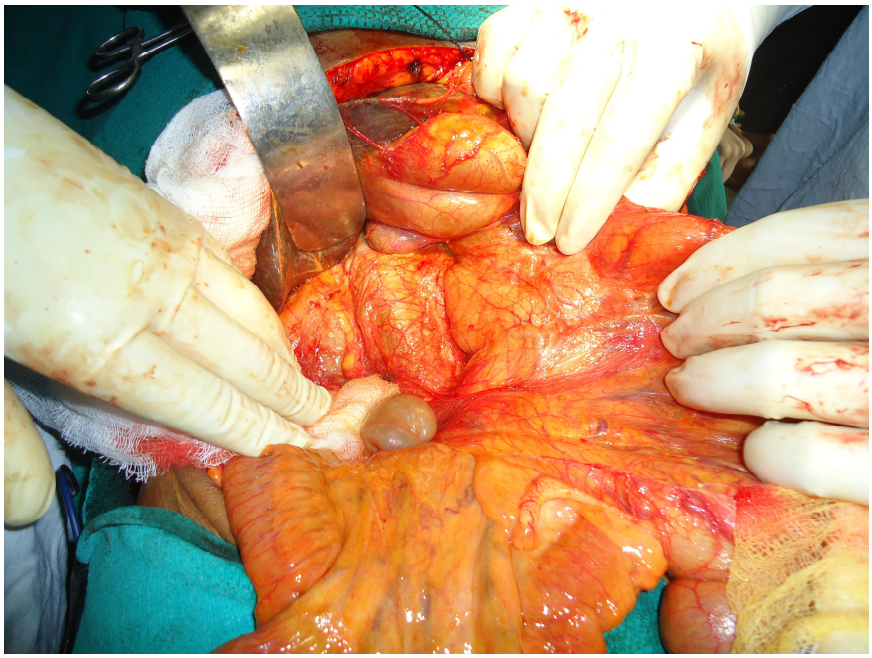
group means independent t-test was used. The P-values <0.05 were considered to indicate statistical significance. All analyses were performed by using SPSS version 16.0.

CECT ABDOMEN SHOWING A PERIAMPULLARY LESION

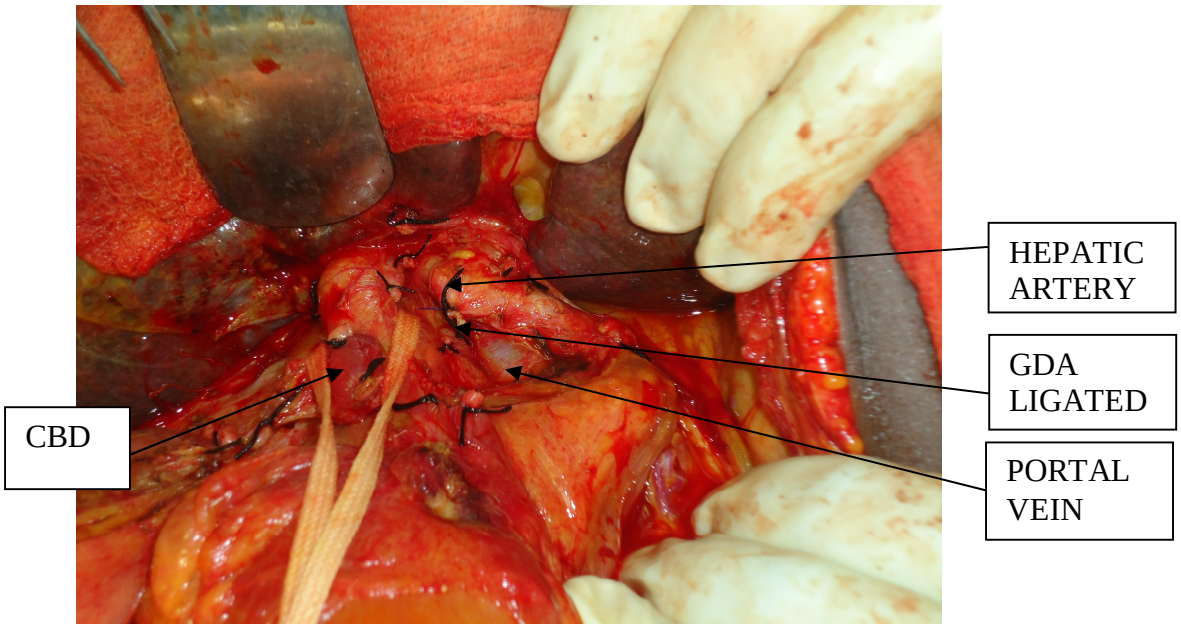
CHOLESTATIC LIVER WITH DISTENDED GALLBLADDER



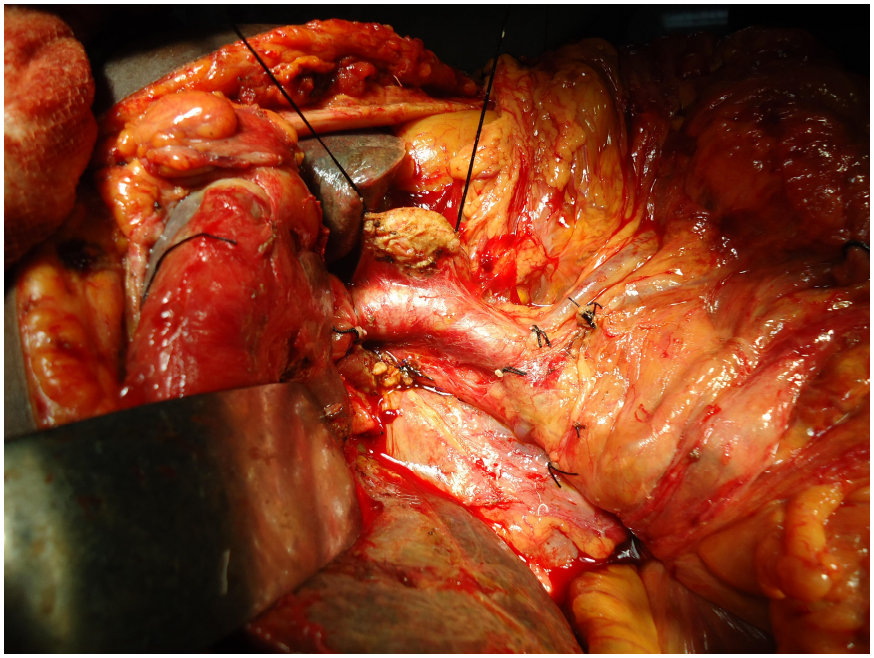
KOCHERISATION



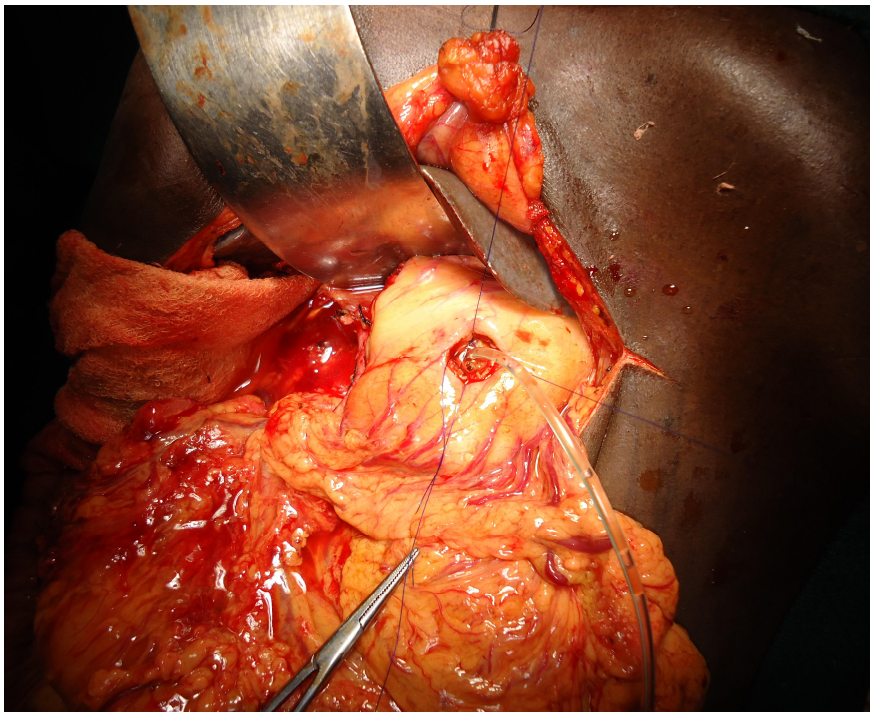
GASTRODUODENAL ARTERY LIGATION



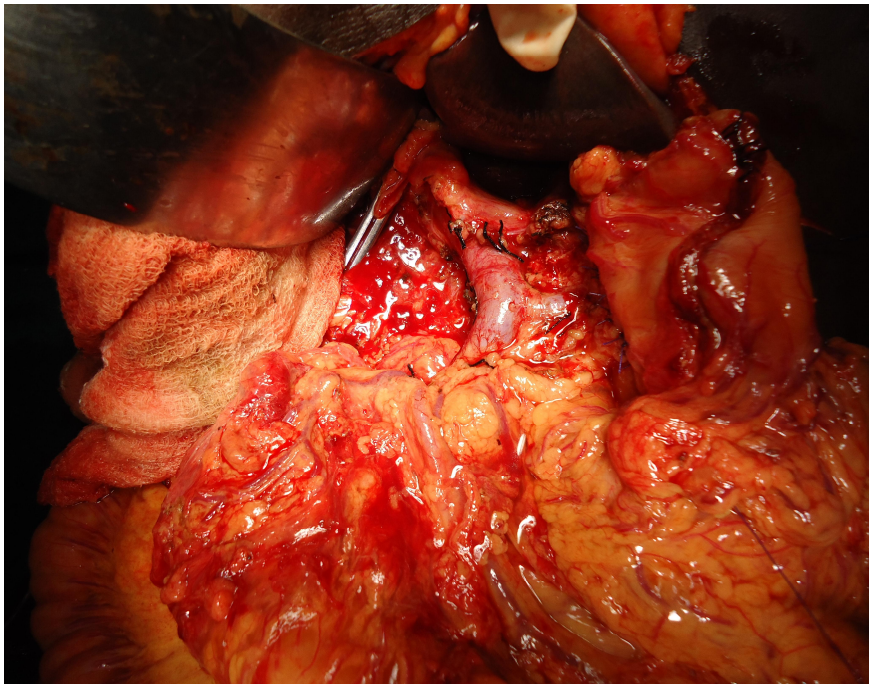
PANCREATIC REMNANT



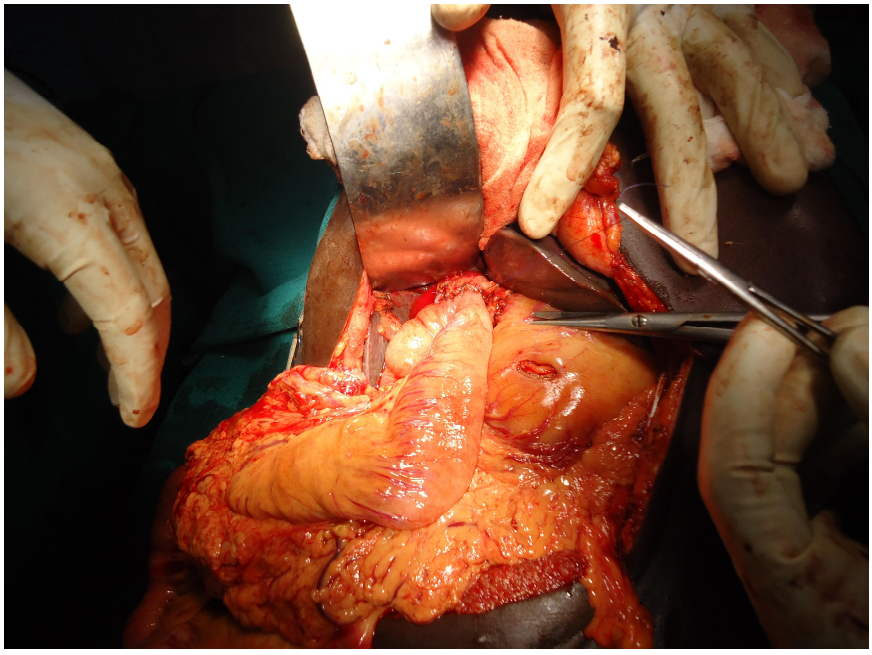
PANCREATICOGASTROSTOMY SEEN THROUGH AN ANTERIOR GASTROTOMY



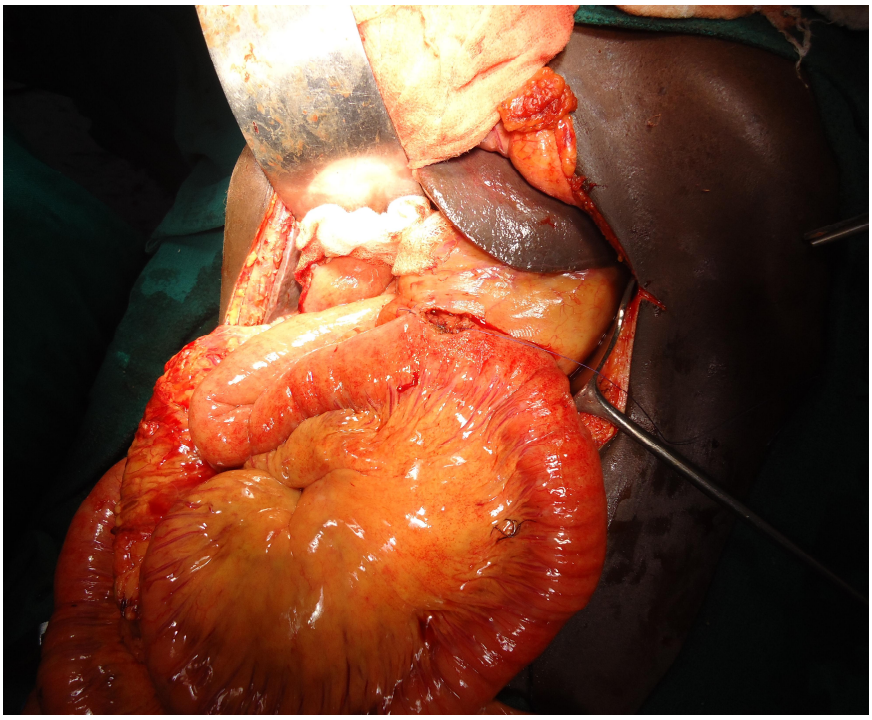
AFTER COMPLETION OF PANCREATICOGASTROSTOMY



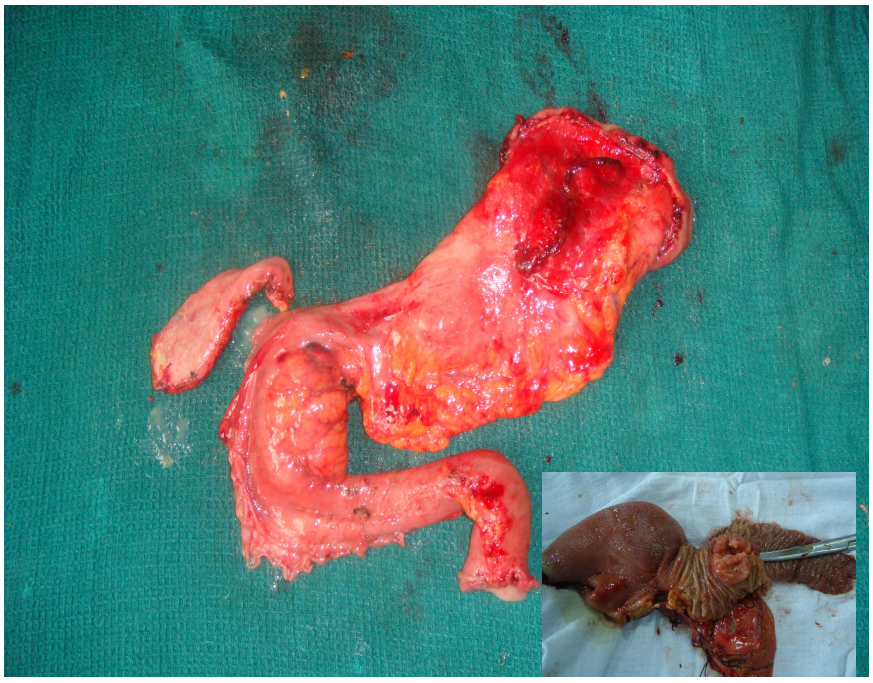
HEPATICOJEJUNOSTOMY



GASTROJEJUNOSTOMY



RESECTED SPECIMEN



RESULTS

Among the fifty patients included in the study 62% were male and 38% were female patients. The minimum age was 30 and maximum age was 72 with a mean age of 51.7 and a standard deviation of 10.9.

On clinical presentation 90% had jaundice, 86% had abdominal pain, 84% had weight loss, 56% had pruritus, 12% had fever, 14% had cholangitis and 28% had other symptoms such as nausea, vomiting, loss of appetite and constipation.

SYMPTOMATOLOGY

Symptoms	Frequency	Percent
JAUNDICE	45	90
ABDOMINAL PAIN	43	86
WEIGHT LOSS	42	84
PRURITUS	28	56
CHOLANGITIS	7	14
FEVER	6	12
OTHERS	14	28

On evaluating the patients for co-morbid illness 24% had Diabetes Mellitus, 10% had hypertension 2% had bronchial asthma and 22% had previous surgery.

CO-MORBID ILLNESS & PREVIOUS SURGERY

Co-morbid illness	Frequency	Percent
DIABETES MELLITUS	12	21
HYPERTENSION	5	10
BRONCHIAL ASTHMA	1	2
PREVIOUS SURGERY	11	22

Regarding the dietary habits 60% were non-vegetarians, 40% were vegetarians, 32% were smokers and 48% were ethanol users.

CLINICAL EXAMINATION

Findings	Frequency	Percent
ICTERUS	41	82
PALLOR	10	20
PALPABLE GALLBLADDER	39	78
PALPABLE LIVER	20	40

On examination, 82% were icteric and 20% were in pallor. Gallbladder was palpable in 78% of patients and liver was palpable in 40% of patients. Liver echoes were found to be normal in 92% of patients. Intrahepatic biliary radical dilatation was found in 98% and Common bileduct was dilated in 92% of the patients.

ULTRASONOGRAM FINDINGS

Parameters	Frequency	Percent
LIVER ECHOES	46	92
IHBR DILATATION	49	98
CBD DILATATION	46	92
MASS VISUALIZED	17	34

Ultrasonogram was able to diagnose the mass only in 34% of the patients. Vascular involvement was pre-operatively diagnosed in 1 patient and underwent resection. MRI scan was done in 24% of patients. Biopsy was attempted in 86% of patients and pre-operative biliary drainage was done in 18% of patients.

PREOPERATIVE BIOPSY AND BILIARY DRAINAGE

Procedure	Frequency	Percent
BIOPSY DONE	43	86
PREOP BILIARY DRAINAGE	9	18

Among the study population the distribution of disease were as follows: periampullary 82%, pancreatic 14%, distal CBD 2% and duodenal growth 2%.

Among the fifty patients, patients with one morbidity condition were 14%, with two conditions were 12%, with three conditions were 14% and 60% had no morbidity. Among the complications delayed gastric emptying occurred in 18%, haemorrhage in 8%, pancreatic leak in 36 %(grade A-10%, grade B-16%, and grade C-10%), intra-abdominal collection in 18%, wound infection in 24%, pneumonitis in 6%, urinary tract infection in 8% of patients. At the time of discharge about 82% had a normal blood count and 90% had a normal liver function tests.

DISTRIBUTION OF CLINICAL VARIABLES(BOTH PG & PJ GROUP)

	N	Minimum	Maximum	Mean	Std. Deviation
Age	50	30	72	51.74	10.885
Hb	50	4.7	14.2	9.800	2.0562
TC	50	880	18000	6361.40	3458.263
P	50	45	90	69.98	9.410
L	50	7	42	24.78	8.112
E	50	1	10	4.80	2.433
ESR	50	10	156	61.40	33.879
TB	50	0	29	15.77	7.221
DB	50	0	21	11.43	5.743
SAP	50	72	720	304.82	179.350
Albumin	50	2.2	5.4	3.256	.4978
PT	50	10	20	13.56	2.201
INR	50	.80	1.64	1.1222	.18792
CA19-9	50	12.0	235.9	49.324	40.7025
Dur_surgery	50	4	11	5.96	1.568

Blood_loss	50	80	4650	402.80	671.881
Transfusion	50	0	7	.78	1.529
RT_removal	50	0	16	7.61	3.328
Urinary	50	0	12	6.47	2.873
DT_removal	50	0	20	9.61	4.056
Serum_amylase	50	0	620	59.90	87.813
DT_amylase	50	0	8297	284.51	1181.301
Valid N (listwise)	50				

INTRAOPERATIVE VARIABLES (PG Vs PJ)					
	Technique	**N**	**Mean**	**Std. Deviation**	**P-value**
Dur_surgery	PG	24	6.15	1.931	0.426
	PJ	26	5.79	1.150	
Blood_loss	PG	24	550.00	915.091	0.138
	PJ	26	266.92	272.746	
Transfusion	PG	24	1.04	1.732	0.249
	PJ	26	.54	1.303	

POSTOPERATIVE EVENTS (PG Vs PJ)

T-Test	**Technique**	**N**	**Mean**	**Std. Deviation**	**P-value**
RT_removal	PG	24	7.50	3.388	0.777
	PJ	26	7.77	3.278	
Urinary	PG	24	6.25	2.592	0.557
	PJ	26	6.73	3.106	

DT_removal	PG	24	9.33	3.784	0.609
	PJ	26	9.92	4.279	
Serum_amylase	PG	24	68.58	120.673	0.469
	PJ	26	50.50	35.991	
DT_amylase	PG	24	418.54	1680.270	0.426
	PJ	26	151.69	220.243	
Post_stay	PG	24	12.58	4.624	0.710
	PJ	26	13.08	4.681	

When comparing between the two groups undergoing pancreaticogastrostomy and pancreaticojejunostomy the incidence of delayed gastric emptying in the PG group was 20.8% and the incidence in the PJ group was 15.4%, the incidence of haemorrhage was 8.3% in the PG group and 7.7% in the PJ group. When comparing the incidence of leak between the two groups it was about 41.7% in the PG and 30.8% in the PJ group. The incidence of intra abdominal collection in the PG group was 12.5% and in the PJ group it was 23.1%. Regarding the incidence of minor morbidities, the incidence of wound infection was 20.8% in the PG and 26.9% in the PJ group. There was no incidence of pneumonitis in the PG group compared to 11.5% in the PJ group. The incidence of urinary tract infection in the PG group was 8.3% and in the PJ group it was 7.7%. The mean duration of nasogastric tube removal

was 7.5 days in the PG group and 7.8 days in the PJ group and the mean days of urinary catheter removal was 6.3 days in the PG and 6.7 in the PJ group. The mean days of drainage tube removal was 9.3 days in the PG and 9.9 days in the PJ group. The mean postoperative hospital stay was 12.6 days in the PG group and 13.1 days in the PJ group.

The mortality in the patients who underwent pancreaticogastrostomy was 8.3% and the mortality in the pancreaticojejunostomy group was 7.7%.The overall mortality rate was 8%.

MORTALITY (PG Vs PJ)

			Mortality		
			Died	Alive	Total
Technique	PG	Count	2	22	24
		% within Technique	8.3%	91.7%	100.0%
	PJ	Count	2	24	26
		% within Technique	7.7%	92.3%	100.0%
Total		Count	4	46	50
		% within Technique	8.0%	92.0%	100.0%

P=1.000

DISCUSSION

Although the concept of cure after a curative pancreaticoduodenectomy has been challenged, surgical resection is the only therapy for all pancreatic head malignancies and periampullary growth that gives the patient a significantly increased survival. Though the mortality ranges between 3-5%, the morbidity following pancreaticoduodenectomy is still in the range of 40-60%. Morbidity and mortality arising out of such a major surgical intervention requires special attention for those with limited survival (10-30% are true 5 year survivors). Hence analyzing the peri-operative factors influencing the morbidity and mortality is important for a better outcome following this procedure. In our study we have evaluated the perioperative variables which influence the outcome between pancreaticogastrostomy and pancreaticojejunostomy following whipple's procedure.

Age & sex

As per various studies the peak incidence of pancreatic cancer is in the 60's and 70's and the mean age at diagnosis is 60-65 years[11]. There is a slightly higher incidence in men than in women (relative risk 1.35) and advancing age is perhaps the stronger risk factor. In our study the minimum age at diagnosis was 30 and the maximum age was at 72. The

mean age of presentation was 51.74 with a standard deviation of 10.9. Out of the 50 patients 31(62%) were male and 19(38%) were female patients. The difference was mainly due to inclusion of all periampullary tumours taken for our study.

Clinical presentation

The hallmark presentation for periampullary and pancreatic cancer is jaundice, resulting from obstruction of the intrapancreatic portion of the common bile duct[1] . Although some patients exhibit a vague abdominal pain, locally advanced pancreatic cancer with tumour invasion of celiac plexus typically causes a constant dull pain accompanied by back pain.non-specific symptoms such as nausea, anorexia, weight loss and fatigue are common in many patients. Weight loss of 10% or more is well known to affect outcome adversely with an overall increased susceptibility to postoperative complications. In our study 90% of patients presented with jaundice and 86% presented with abdominal pain. 84% presented with weight loss, 56% presented with pruritus, 12% with fever and 14% with cholangitis. Other symptoms like nausea, vomiting, loss of appetite and fatigue were present in 28% of patients. Patients with cholangitis and poor performance status were subjected to endoscopic biliary drainage. All the 7 patients with cholangitis were managed initially by endoscopic biliary drainage. One

of the patient who presented with cholangitis with performance status ECOG 3 as we were are not possible to drain either endoscopically or percutaneously we offered an operative biliodigestive bypass and resected subsequently.

Nutritional status and co-morbid illness

Lillemoe et al observed that 15-20% patients with pancreatic cancer had new-onset diabetes mellitus[11] . As many patients are elderly[33] there is also a higher incidence of co-morbid illness. Cardio-pulmanory testing assess the ability to deliver oxygen during stress and the need for postoperative ventilator support. Weight loss and dehydration are frequent features in such patients and hence need to be aggressively addressed. In our study diabetes mellitus was the major co-morbid illness with an incidence of 24%, hypertension 10%, bronchial asthma 2% and 22% had previous surgery particularly in the female population. Out of the 4 patients with mortality 2 of the patients had hypertension and all the 4 patients had diabetes mellitus. So routine preoperative blood tests and careful history taking might help surgeons to identify high risk patients and subject them for optimization before such major surgical procedure. All patients with previous surgery were females and 9 out of the 11 patients had undergone puerperal sterilisation. Previous

surgery did not have any impact in the duration of surgery when compared with patients who had no previous operation.

Personal habits

Though dietery habits have no direct influence, they have indirect influence in the form of nutrirional status and hence the performance status. 60% of patients were non-vegetarians and 40% were vegetarians. This dietery habit had no influence on the outcome. The study had 32% smokers and 48% alcoholic. Patients who were found to be nutritionally depleted were encouraged to take adequate enteral formulas and albumin infusion was administered preoperatively.Patients with significant morbidity related to pulmonary mechanism were all smokers. Hence abstinence of smoking for atleast 2 weeks before surgery, incentive spirometry, lung function tests, nebulisation with bronchodilators and mucolytics, aggressive postoperative chest physiotherapy and ventilator support is given to all smokers. Among the patients with mortality only one was a smoker. So although smoking has an influence of postoperative chest infections and wound complications as such it has no influence on the mortality.

Physical examination

Jaundice was the most common clinical presentation with 82% and 20% were anaemic. Gall bladder was palpable in 78% of the patients and liver was palpable in 40%.

Imaging, endoscopy and biopsy

All patients underwent initial ultrasonogram of the abdomen and pelvis. Liver was found to have normal echoes in 92% of patients with intrahepatic biliary radical dilatation in 98% of study group. Common bile duct dilatation was diagnosed in 92% of patients, wheras mass in the head of pancreas or periampullary region was diagnosed only in 34% of patients. Therefore the accuracy of ultrasonogram in detecting IHBR dilatation is more than that of CBD dilatation which in turn is more than the presence of mass. Hence ultrasonogram is an easily available, cost effective, less time consuming and adequate initial imaging study to differentiate between proximal and distal biliary obstruction but the disadvantage is the observer variation which is operator dependent.

There are lot of evidence in literature that helical CT is the most efficacious initial imaging study[16] and is the most sensitive initial tool to diagnose and stage pancreatic cancer[17].Initially we did CECT for evaluating but now we use 64 slice MDCT with vascular reconstruction

for all patients to assess the resectablity with accuracy[18]. Those patients deemed to be unresectable by distant metastasis, peritoneal metastasis and vascular invasion were not included in the study except for one patient with solid and cystic components of head of pancreas with portal vein involvement for which we have done a pancreaticoduodenectomy and vascular resection with grafting.

We have done upper GI endoscopy for all patients and attempted for a biopsy if feasible with a side viewing scopy. If clinical, biochemical and imaging modalities suggest distal obstruction and operable growth we proceed with surgery even if the biopsy turns out to be negative or inconclusive after explaining to the patient and the relatives of the possibility of a benign postoperative biopsy report. Out of the 50 patients 43 patients were biopsied and all the preoperative biopsies correlated with postoperative biopsy reports.

Preoperative biliary drainage

There are 6 prospective randomized studies(Hattfield et al 1982,Mc person et al 1984, Smith et al 1985, Smith etal, Lai et al, Wig et al) which analysed the outcome after a preoperative biliary drainage. Only 2 studies suggested that preoperative biliary drainage is beneficial (Smith et al & Wig et al). A meta-analysis by Sewnath has showed that routine preoperative biliary drainage carries no benefit[38]. Instead there is

a high complication rate with prolonged hospital stay. Saleh and his associates have showed that there is no evidence of either a beneficial or an adverse effect of preoperative biliary stenting. We have done preoperative biliary drainage for 9 patients(18%). Majority of the indications were for cholangitis and the rest for poor performance status with biliribin more than 20. One patient underwent open surgical biliodigestive bypass for poor nutritional status with vomiting with ECOG3 and later proceeded with resection.

Provisional diagnosis

The distribution of diseases in our study as follows: Periampullary40 (80%), head of pancreas 6(12%), duodenal 2 (4%) and distal bileduct 2(4%).

Biochemical parameters

The mean haemoglobin concentration was 9.8 with lowest at 4.7 and highest at 14.2 and the need for preoperative transfusion is decided when haemoglobin is less than 8g%.The mean total count was 6361.4 and the highest was 18000 which is a clue to diagnose cholangitis earlier and hence decide upon urgent endoscopic biliary decompression. The mean bilirubin value is 15.8mg% as literature evidence suggests malignancy with a level above 10mg%. The mean serum alkaline

phosphatase value was 304.8. Serum albumin was from 2.2 – 5.4 and the average value is 3.25g%.

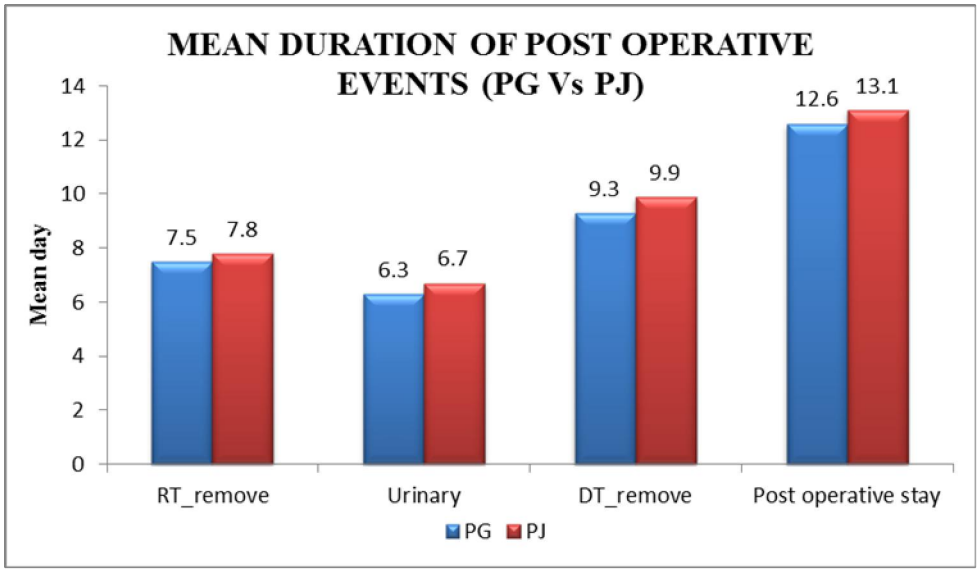
Intraoperative factors

The mean duration of surgery was 5.9 hours with shortest duration of 4 hours and longest duration of 11 hours. This patient had a portalvein resection with artificial venous graft. The mean blood loss was 402.8 ml and on an average blood requirement was 0.78 bottles per patient. There was slightly more blood loss in the pancreaticogastrostomy group than pancreaticojejunostomy group.

Type of anastomosis

Among the 50 patients 24underwent pancreaticogastrostomy and 26 underwent pancreaticojejunostomy. On analyzing the preoperative variables among both the sub-groups they were almost comparable with each other. Though there were minor difference they were not statistically significant. There are 4 randomized controlled trials, 1 favouring pancreaticogastrotomy in terms of lesser leak rate (Fernandez cruz L et al,2008). 3 RCT's (Bassi et al, Yeo et al & Duffas et al) have showed PG and PJ to be similar in terms of leak rate. 1 meta-analysis by Mc Kay et al has favoured PG and other meta-analysis by Wente et al has shown no difference between both subgroups in terms of leak as well as major morbidity. Though there is a prolonged operative time

(mean 6.15 hours) in the PG group when compared with the PJ group (5.79 hours) it is not significant statistically (P value=0.426). As our centre is a teaching institution where surgery is done by Professors, Assistant Professors and Post Graduates there is a wide variation in the duration of surgery and hence the morbidity. The amount of estimated blood loss in PG group was 550 ml and in the PJ group was 267 ml which is not statistically significant (P value=0.138) though there is an apparent difference. Comparing between both the subgroups there was no significant difference in terms of removal of nasogastric tube, drainage tube and postoperative stay. Even the biochemical investigation reports at the time of discharge showed no significant statistical difference between the two subgroups.



The incidence of haemorrhage was 8.3% (2) in the PG and 7.7% (2) in the PJ group. The difference is not statistically significant as the P

value is 1.000. Two patients were managed by endoscopically and two patients were managed conservatively. The incidence of pancreatic leak were higher in the PG group when compared to the PJ group. But the trend in the incidence of leak indicates that there were more leaks in the initial half of study than in the later half which helps in concluding a possibility of a learning curve in the process of pancreatic remnant anastomosis. The incidence of intra-abdominal collection was 12.5% in the PG group compared to 23.1% in the PJ group. Though the incidence is less in the PG group, it is not statistically significant (P value=0.467). The incidence of wound infection in the PG group was 20.8% (5) and in the PJ group it was 26.9%(7). No patient developed pneumonitis in the PG group but 3 patients had in the PJ group which is again not significant statistically. 8.3% developed urinary tract infection in the PG and 7.7% in the PJ group.

DELAYED GASTRIC EMPTYING (PG Vs PJ)

Technique * DGE			**DGE**		**Total**
			Yes	**No**	
Technique	PG	Count	5	19	24
		% within Technique	20.8%	79.2%	100.0%
	PJ	Count	4	22	26
		% within Technique	15.4%	84.6%	100.0%
Total		Count	9	41	50
		% within Technique	18.0%	82.0%	100.0%

P=0.721 not significant

HAEMORRHAGIC COMPLICATION (PG Vs PJ)

			Haemorrhage		Total
			Yes	No	
Technique	PG	Count	2	22	24
		% within Technique	8.3%	91.7%	100.0%
	PJ	Count	2	24	26
		% within Technique	7.7%	92.3%	100.0%
Total		Count	4	46	50
		% within Technique	8.0%	92.0%	100.0%

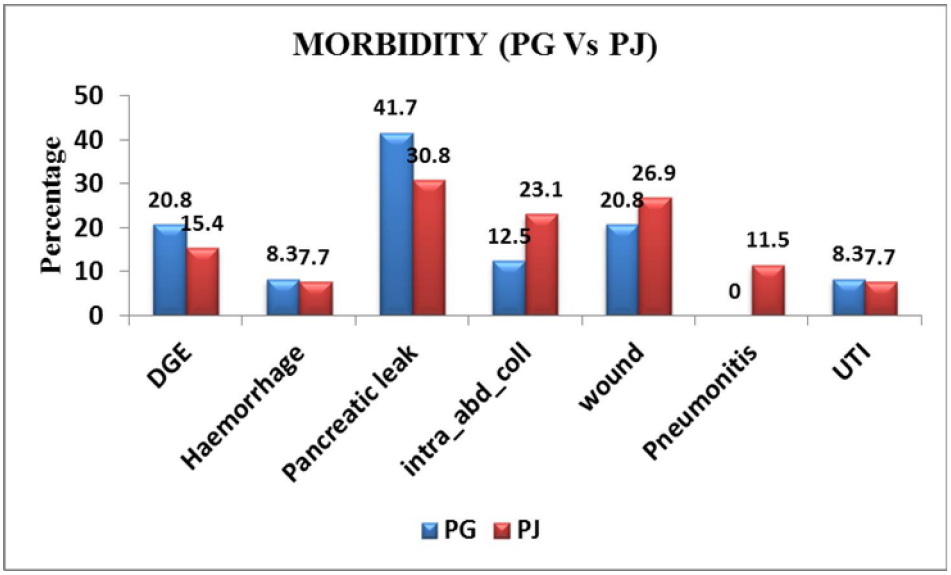
P=1.000

PANCREATIC LEAK(PG Vs PJ)

			PANCREATIC LEAK				Total
			A	B	C	No leak	
Technique	PG	Count	4	3	3	14	24
		% within Technique	16.7%	12.5%	12.5%	58.3%	100.0%
	PJ	Count	1	5	2	18	26
		% within Technique	3.8%	19.2%	7.7%	69.2%	100.0%
Total		Count	5	8	5	32	50
		% within Technique	10.0%	16.0%	10.0%	64.0%	100.0%

P=0.403

Morbidity



Among the 50 patients 7 patients developed delayed gastric emptying, 6 patients developed DGE and pancreatic leak and 7 patients developed other complications along with DGE and pancreatic leak accounting for a morbidity of 40%. The incidence of delayed gastric emptying in the PG group was 20.8%(5) when compared to PJ group which was 15.4%(4). The maximum days we have retained the nasogastric tube was for 16 days. We have managed the patients with prokinetics and maintaining them on enteral feeding through feeding jejunostomy. Though there is an apparent difference among both the groups there is no statistical difference (P value=0.721). Pancreatic leak occurred in 18 patients with grade A leak in 5(10%), grade B leak in 8(16%) and grade C leak in 5(10%) patients. All patients with pancreatic leak were managed by non-operative means. Grade A leaks

were managed conservatively and grade B leaks required supportive care in the postoperative ward with drainage tube retained for a prolonged period and grade C leaks were managed aggressively in the ICU with one or more image guided percutaneous drainage tubes and nutritional support. We have not reoperated for a suspected leak. Similarly there is no statistically significant difference in the outcome between pancreaticogastrostomy and pancreaticojejunostomy in terms of other major morbidities.

INRA-ABDOMINAL COLLECTION (PG Vs PJ)

			Intra_abd_coll		
			Yes	No	Total
Technique	PG	Count	3	21	24
		% within Technique	12.5%	87.5%	100.0%
	PJ	Count	6	20	26
		% within Technique	23.1%	76.9%	100.0%
Total		Count	9	41	50
		% within Technique	18.0%	82.0%	100.0%

P=0.467

WOUND INFECTION (PG Vs PJ)

			Wound infection		
			Yes	No	Total
Technique	PG	Count	5	19	24
		% within Technique	20.8%	79.2%	100.0%
	PJ	Count	7	19	26
		% within Technique	26.9%	73.1%	100.0%
Total		Count	12	38	50
		% within Technique	24.0%	76.0%	100.0%

P=0.745

PNEUMONITIS (PG Vs PJ)

			Pneumonitis		
			Yes	No	Total
Technique	PG	Count	0	24	24
		% within Technique	.0%	100.0%	100.0%
	PJ	Count	3	23	26
		% within Technique	11.5%	88.5%	100.0%
Total		Count	3	47	50
		% within Technique	6.0%	94.0%	100.0%

P=0.236

URINARY TRACT INFECTION (PG Vs PJ)

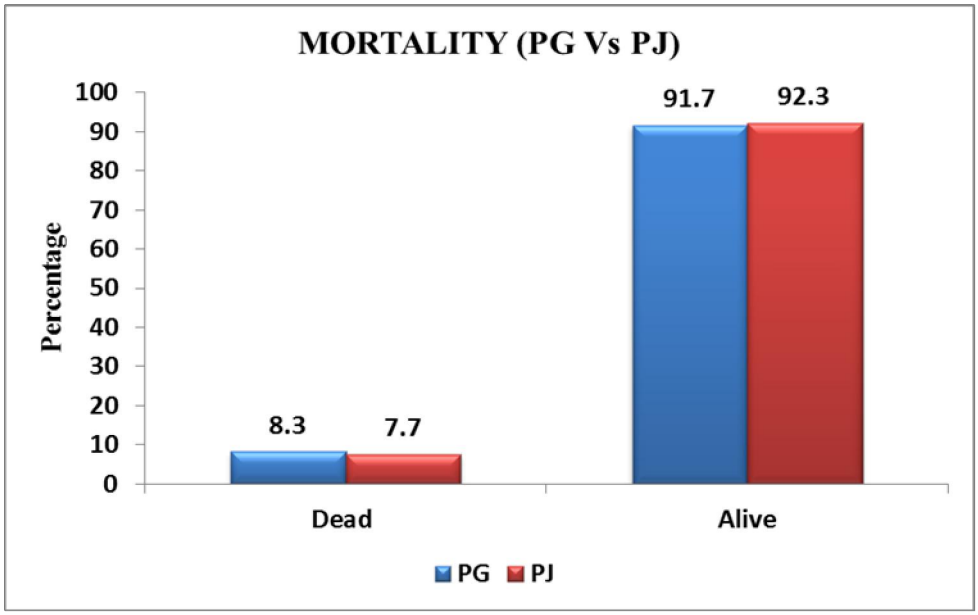
			UTI		Total
			Yes	No	
Technique	PG	Count	2	22	24
		% within Technique	8.3%	91.7%	100.0%
	PJ	Count	2	24	26
		% within Technique	7.7%	92.3%	100.0%
Total		Count	4	46	50
		% within Technique	8.0%	92.0%	100.0%

P=1.000

Mortality

The mortality rate in our study was 8% (8.3% in PG group and 7.7% in PJ group) which is again statistically not significant (P value=1.000) between the two groups. The mortality rate in the literature is in the range of 3-5%. In our study the reason for mortality were due to cardirespiratory impairment due to myocardial infarction and other two cases were due to haemorrhage and metabolic encephalopathy. One of the patient had an urgent endoscopy and we could not find any bleeding points except for clots. Patient was on ventilator with haemodynamic support and could not be shifted for angioembolisation. We reopened

and explored but could not find the source and patient succumbed with multiorgan failure. The other patient was haemodynamically unstable on day 4 and before we could intervene patient succumbed due to metabolic encephalopathy. Both the patients had adequately controllable co-morbid illnesses. Though our study showed a 41.7% leak in the PG group and 30.8% in the PJ group all the patients were managed successfully and no patients with leak had mortality.



CONCLUSION

There is no statistically significant difference in outcome between pancreaticogastrostomy and pancreaticojejunostomy after a standard pancreaticoduodenectomy.

A better patient selection, preoperative optimisation, meticulous intraoperative techniques and early recognition and aggressive management of complications with utmost perioperative care helps to improve the morbidity and hence prevent mortality after whipple's procedure.

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OUTCOME ANALYSIS OF PANCREATIC REMNANT ANASTAMOSIS AFTER PANCREATICODUODENECTOMY – OVER 3 YEARS

NAME : AGE/SEX: IP NO:

DOA: DOS: DOD:

DIAGNOSIS :

COMPLAINTS :
- ABDOMINAL PAIN :
- JAUNDICE :
- FEVER :
- PRURITUS :
- WEIGHT LOSS :
- CHOLANGITIS : YES/NO
- OTHERS :

H/O PAST ILLNESS : DM/HT/IHD/BA/PREVIOUS SURGERY

PERSONAL HISTORY : NON-VEG/VEG/SMOKER/ALCOHOLIC

PHYSICAL FINDINGS : ICTERUS/PALLOR

P/A - GB PALPABLE/LIVER PALPABLE/FREE FLUID

P/R EXMN -

<u>PRE-OPERATIVE INVESTIGATIONS</u>:
BIOCHEMICAL INVESTIGATIONS:

CBC: Hb% TC DC ESR

LFT: TB DB SAP ALBUMIN PT INR

CA 19-9:

USG: LIVER ECHOTEXTURE
IHBR
CBD
MASS HEAD OF PANCREAS/PERIAMPULLARY

OGD:

SVS:

CECT: SIZE
VASCULAR INVOLVEMENT

MRI:

PRE-OPERATIVE BILIARY DRAINAGE: YES/NO

BIOPSY:

PROVISIONAL DIAGNOSIS: AMPULLARY
PANCREAS
DISTAL CBD
DUODENAL CARCINOMA

DURATION OF SURGERY
ESTIMATED BLOOD LOSS
TRANSFUSION

TECHNIQUE:PANCREATIC STUMP PG/PJ
BILEDUCT CONTINUOUS/INTERRUPTED
GJ-ANTECOLIC/RETROCOLIC

POST-OPERATIVE COURSE:
RT REMOVED ON
URINARY CATHETER REMOVED ON:
DT REMOVED ON:
POST-OPERATIVE BIOCHEMICAL INVESTIGATIONS:
SERUM AMYLASE
DT AMYLASE
CBC
LFT
POST-OPERATIVE STAY

MORBIDITY
MAJOR DGE
HAEMORRHAGE
PANCREATIC LEAK/FISTULA
INTRA ABDOMINAL COLLECTION

MINOR WOUND INFECTION
PNEUMONITIS
UTI

MORTALITY

Name	Age	sex	Abd_pain	Jaundice	Fever	Pruritus	Wt_loss	Cholangiti	Others	DM	HT	BA	Pre_surge	N.V	Veg	Smoker	Alc	Icterus	Pallor	GB	Liver	Hb	TC	P	L	E	ESR	TB	DB	SAP	Alb	PT	INR	CA19-9	Liver_Echo	IHBR	CBD
Rajakannu	45	1	1	1	2	1	1	2	1	2	2	2	2	1	2	2	1	1	2	1	2	7.5	4600	70	15	5	68	3	2	243	2.9	11	0.91	13.8	1	1	1
rajendran	42	1	1	1	2	1	1	2	1	2	2	2	2	1	2	1	1	1	2	1	2	9	4800	80	12	6	26	16	8	436	3.6	14	1.16	120	1	1	1
singaram	62	1	1	1	2	2	2	2	2	1	2	2	2	1	2	1	1	1	2	1	2	10	5600	63	20	4	45	12	10	384	3.6	12	1	58	1	1	1
Subramani	58	1	1	1	1	1	1	1	2	2	2	2	2	1	2	2	1	1	2	1	1	8.6	14000	60	38	2	126	20.6	12.8	684	2.9	18	1.5	104	2	1	1
Deivasigam	68	1	1	2	2	2	1	2	2	1	1	2	2	1	2	1	1	2	2	2	2	10.2	6800	67	28	4	29	1.8	0.9	112	3.9	12	1	26	1	2	2
Vijaya	45	2	1	1	2	2	1	2	2	2	2	2	1	1	2	2	2	1	1	1	1	8.8	7600	64	30	6	54	14.6	7.4	256	3.6	13	1.08	82	1	1	1
Salomi	35	2	1	1	2	2	1	2	2	2	2	2	1	1	2	2	2	1	2	1	2	7.9	4300	73	24	3	77	16.2	6.9	186	3	12	1	18	1	1	1
Malar	30	2	1	1	1	1	1	1	1	2	2	2	2	1	2	2	2	1	2	1	1	8	18000	64	23	9	120	24.9	20.8	540	2.2	18	1.5	112	1	1	1
Parvathi	72	2	1	1	2	1	1	2	2	1	2	2	1	2	1	2	2	1	2	2	2	7	3400	70	28	2	33	12	8	120	3	12	1	20	1	1	2
Kalesha she	47	1	1	1	2	2	2	2	2	2	2	2	2	2	1	2	2	2	1	2	2	12	4500	58	36	5	40	3	1.2	80	3.2	14	1.16	26	1	1	2
Yanathi	60	1	1	1	2	2	2	2	2	2	2	2	2	2	1	2	2	1	2	1	1	9.4	5400	60	34	6	46	16	12	420	3.8	12	1	21	1	1	1
Renganayal	50	2	1	1	2	2	2	2	2	2	2	2	2	2	1	1	1	2	1	2	2	13.8	3600	64	30	1	50	18	14	680	3.6	13	1.08	38	2	1	1
Kumar	66	1	1	1	2	2	2	2	2	2	2	2	2	2	1	2	2	2	1	2	2	10.2	4800	66	34	4	80	14	12	720	2.8	14	1.16	22	1	1	1
Karunanidh	54	1	1	1	2	2	1	2	2	2	2	2	2	1	2	2	2	1	2	1	1	13.2	6700	78	22	1	76	16	12	204	3.5	15	1.3	12	1	1	1
Chokkaling	72	1	1	1	1	1	1	2	1	1	2	2	1	2	1	1	1	2	1	1	12	12200	86	12	2	146	21	14.6	490	3	16	1.33	94	1	1	1
Chinnapilla	60	1	2	1	2	1	1	2	1	1	1	2	2	1	2	1	2	1	2	1	2	11	8700	67	31	4	56	16	12	324	3	14	1.16	22	1	1	1
Kesavan	40	1	1	1	2	2	1	2	2	2	2	2	2	2	1	2	1	1	2	1	2	9	880	58	32	8	50	19	16	200	3	12	1	30	1	1	1
Maragatha	60	2	1	1	2	1	1	2	2	2	2	2	1	2	1	2	2	1	1	1	2	7	4400	86	16	2	80	19	14	120	3.4	13	1.08	32	1	1	1
Krishnan	40	1	2	1	2	1	1	2	2	2	2	2	2	1	2	1	1	1	2	1	2	9	4300	76	22	4	45	19	14	256	2.8	14.6	1.2	33	1	1	1
Elumalai	69	1	1	1	1	1	1	1	2	1	2	2	2	1	2	1	1	1	1	1	1	7	3450	62	24	8	125	23.5	19	446	2.9	16	1.33	32	1	1	1
Maragatha	51	2	1	2	2	2	1	2	1	2	2	2	1	1	2	2	2	2	2	2	2	9.6	5800	72	22	4	45	0.33	0.11	452	4.1	10.09	0.8	32	1	1	1
Sathyanara	57	1	1	1	2	2	1	2	2	2	2	2	2	2	1	2	1	1	2	1	2	9	880	58	32	8	50	19	16	200	3	12	1	30	1	1	1
Babu	67	1	2	1	2	1	2	2	2	1	2	2	2	2	1	1	1	1	2	1	1	9.2	9400	82	12	3	45	20.6	17.2	316	3.6	15.7	1.3	62	1	1	1
Narasimma	60	1	2	1	2	1	1	2	2	2	2	2	2	2	1	1	1	1	2	1	1	9.8	3900	45	33	2	40	7.5	4.5	458	2.7	14.1	1.16	235.9	1	1	1
Rajammal	70	2	1	2	2	2	1	2	1	2	2	2	2	2	1	2	2	2	1	2	2	9.2	4800	48	42	6	72	0.7	0.3	72	3.2	13.1	1.11	20	1	1	1
Dhanaback	45	2	1	1	2	1	1	2	2	2	2	2	1	1	2	2	2	1	2	1	2	12	6700	78	21	2	66	17	13	196	3.4	12	1	22	1	1	1
Samikannu	55	1	1	1	2	2	2	2	1	2	2	2	2	1	2	2	2	1	2	1	2	8.6	9200	76	21	3	60	2.9	1.7	256	2.8	14.6	1.2	30	1	1	1
Gunalan	65	1	2	1	2	1	1	2	2	1	2	2	2	1	2	2	2	1	2	1	2	9.6	5600	80	18	2	98	18	12	322	3	12	1	80	1	1	1
Premkuma	50	2	1	1	2	1	1	2	1	2	2	2	2	1	2	2	2	1	2	1	2	10.5	6500	73	23	9	67	15.5	11.8	105	3.6	15	1.25	67.74	1	1	1
Nawab joh	68	1	2	1	2	1	1	2	2	1	1	2	2	1	2	1	1	1	2	1	2	10.2	7600	67	32	5	20	22	16.4	670	3	18	1.5	98	1	1	1
Ravi	48	1	1	1	2	1	1	2	2	2	2	2	2	1	2	1	1	1	2	1	2	13	4600	76	30	4	60	16	14.4	340	3.4	12	1	32	1	1	1
Thilagam	40	2	1	2	2	2	1	2	1	2	2	2	1	1	2	2	2	2	2	2	2	9.6	5800	72	22	4	45	0.33	0.11	452	4.1	10.09	0.8	32	1	1	1
Shankaran	40	1	1	1	2	2	1	2	2	2	2	2	2	2	1	2	1	1	2	1	2	9	880	58	32	8	50	19	16	200	3	12	1	30	1	1	1
Pujiammal	40	2	1	1	2	1	2	1	2	2	2	2	1	2	1	2	2	1	2	2	1	4.7	8300	75	19	3	24	21.9	13.8	293	3.2	11	1.02	26	2	1	1
Aravalli	40	2	1	1	2	1	1	2	1	2	2	2	2	1	2	2	2	1	2	1	2	10.5	6500	73	23	9	67	15.5	11.8	105	3.6	15	1.25	67.74	1	1	1
Vasantha	47	2	1	1	2	2	1	2	2	2	2	2	2	2	1	2	2	1	2	1	2	12	4500	76	22	4	34	17.8	12.4	120	3.2	12	1	20	1	1	1
sulochana	60	2	1	1	2	1	1	2	2	1	1	2	1	2	1	2	2	1	1	1	1	6.6	5600	70	22	8	55	19.8	11	420	2.9	15	1.25	26	1	1	1
Fathima be	46	2	1	1	2	1	1	2	2	1	2	2	1	2	1	2	2	1	1	1	1	8	2300	68	33	6	102	18	10	336	2.6	19.6	1.64	112	1	1	1
Dhanaback	36	2	1	1	2	1	1	2	2	1	2	2	2	1	2	2	2	1	2	1	2	11	6800	72	23	7	23	22	11	234	3	15	1.25	34	1	1	1
Sekar	47	1	1	1	2	2	1	2	2	2	2	2	2	2	1	2	1	1	2	1	1	12.8	7300	68	21	7	106	18	16	212	3	12	1	20	1	1	1
Viswanatha	45	1	1	1	2	2	1	2	2	2	2	2	2	2	1	2	1	1	2	1	2	9	880	58	32	8	50	19	16	200	3	12	1	30	1	1	1
Natarajan	40	1	1	1	2	1	1	2	2	2	2	2	2	1	2	2	1	2	1	2	1	10.2	4500	66	24	6	12	20	17.9	302	3.4	12	1	100.4	1	1	1
Gopal	58	1	1	1	2	1	1	2	2	2	2	2	2	1	2	1	1	1	2	1	2	13	4600	76	30	4	60	16	14.4	340	3.4	12	1	32	1	1	1
Subramani	58	1	1	1	2	2	1	2	2	2	2	2	2	2	1	1	1	1	2	1	1	12	4500	80	17	3	50	15.6	11.5	102	3	15	1.25	24	1	1	1
Sagadevan	45	1	2	1	2	1	1	2	1	2	2	2	2	1	2	2	2	1	2	1	1	9.4	10600	76	34	7	156	26.8	20.9	159	5.4	13	0.9	90	1	1	1
Krishnan	40	1	1	2	2	2	1	2	2	2	2	2	2	2	1	1	1	2	2	2	1	9.9	11600	73	17	10	40	1.2	0.6	96	3.3	15.9	1.22	50.4	2	1	1
Balasubran	51	1	1	1	1	1	1	1	1	2	2	1	2	1	2	2	2	1	2	1	2	12	10200	62	38	4	112	29	18	441	3.9	11.2	0.89	30.2	1	1	1
selvam	46	1	1	1	2	1	1	2	2	2	2	2	2	1	2	2	1	1	2	1	1	8.3	12200	90	7	3	10	23	16	122	3.3	12	1	64	1	1	2
Saradha	50	2	1	1	1	1	1	1	1	2	2	2	2	1	2	2	2	1	2	1	1	14.2	10600	78	18	4	15	22	18	680	3.1	11.6	0.92	20	1	1	1
suseela	47	2	1	1	2	2	1	2	1	2	2	2	1	1	2	1	1	1	2	1	1	6.5	7400	81	8	1	64	18.5	11	139	2.9	17.4	1.45	32	1	1	1

Mass	OGD	size	VAS	MRI	Pre_Biliary	Biopsy	Ampullary	Pancreas	Distal CBD	Duo_carcin	Dur_surge	Blood_loss	Trans	Tech	RT	Urinary	DT	Serum_am	DT_amylas	CBC	LFT	stay	DGE	Hae	leak	Intra_abd	Wound	Pneumoni	UTI	Mortality
2	1		2	2	2	1	2	2	2	2	10	800	2	1	7	6	8	84	68	1	1	15	2	2	4	2	1	2	2	2
1	1	2.6	2	2	2	2	2	1	2	2	5	200	0	2	8	10	12	96	54	1	1	16	2	2	4	2	2	2	2	2
2	1	1	2	2	2	1	1	2	2	2	5	250	0	2	12	8	14	120	100	1	1	14	1	2	4	1	1	1	2	2
2	1	1.5	2	1	1	1	1	2	2	2	4.5	100	0	2	9	7	10	120	86	1	1	12	2	2	4	2	1	2	2	2
2	1	2.6	2	2	2	2	2	1	2	2	5	80	0	2	11	8	14	102	450	1	1	18	1	2	2	1	1	2	2	2
2	1	1.1	2	2	2	1	1	2	2	2	5	120	0	2	7	5	10	102	50	1	1	12	2	2	4	2	2	2	2	2
2	1	1.5	2	1	2	1	1	2	2	2	4	80	0	2	7	4	9	86	42	1	1	11	2	2	4	2	2	2	2	2
2	1	1	2	1	1	1	2	2	2	1	6	200	0	2	9	4	8	24	36	1	1	14	2	2	4	2	2	2	2	2
2	1	3	22	2	2	1	1	2	2	2	6	100	0	2	8	7	9	40	80	1	1	10	2	2	4	2	2	2	2	2
2	1	1	2	2	2	1	2	1	2	2	4	100	0	2	8	4	9	30	66	1	1	12	2	2	4	2	2	2	2	2
2	1	2	2	2	2	1	1	2	2	2	6	120	0	2	6	8	9	40	36	1	1	12	2	2	4	2	2	2	2	2
1	1	3	2	2	2	1	2	2	1	2	6	100	0	2	7	6	8	32	74	1	1	14	2	2	4	2	2	2	2	2
2	1	2.2	2	2	2	2	2	2	2	1	6	200	0	2	8	5	9	26	58	1	1	13	2	2	4	2	2	2	2	2
1	1	3.2	2	2	2	2	1	2	2	2	6	200	0	2	9	5	10	20	27	1	1	12	2	2	4	2	2	2	2	2
2	1	2.2	2	1	2	1	1	2	2	2	8	1050	3	2	0	0	0	0	0	0	0	0	2	1	3	1	2	2	2	1
2	1	2	2	2	2	2	2	1	2	2	7	220	0	2	9	12	10	23	46	1	1	18	2	2	4	2	1	1	1	2
2	1	2	2	2	2	1	1	2	2	2	6	100	0	2	6	8	9	34	64	1	1	14	2	2	4	2	2	2	2	2
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2	1	2	2	1	1	1	1	2	2	2	6	560	0	2	8	7	10	34	58	1	1	12	2	2	4	2	1	2	2	2
1	1	2	2	2	2	1	1	2	2	2	4	150	0	1	11	9	14	45	160	1	1	16	1	2	1	2	2	2	2	2
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2	1	2	2	2	2	1	1	2	2	2	4	200	0	1	10	9	15	86	46	1	1	16	1	2	1	2	2	2	2	2
1	1	2.6	2	2	2	2	2	1	2	2	6	200	2	1	8	7	6	6	10	2	1	13	2	2	4	2	1	2	2	2
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1	1	3.4	2	2	2	1	2	1	2	2	7	500	0	1																