Original Article

Iraqi Journal of Gastroenterology

Outcome of Pancreaticoduodenectomy (Whipple procedure) in Gastroenterology and Hepatology Teaching Hospital in Baghdad

***Moayad Kadhum Alnakeeb**
**** Safa M. Mahdi**
***** Hamid I. Jasim**

ABSTRACT

Back ground: Pancreaticoduodenectomyis a major and challenging operation, carrying a significant risk of morbidity and mortality. Today, surgical resection of localized tumor remains the only potentially curative option available for periampullary tumors patients.**Patients and methods:** A prospective and retrospective study for 18 patients underwent PD depending on the clinical features, radiological and laboratory results from 2008 to 2012 in Gastroenterology and Hepatology Teaching Hospital in medical city/Baghdad.**Results:**In this study 18 patients , 10(55.5%) were female and 8(44.4) were male ,the age ranged from 25 to 65 y. with mean age 43.5 y., most of them from Baghdad(33.3%) and the others referral from other provinces. With obstructive jaundice as a main presenting symptom (94%), we assess the cases depending on the abdominal CT scan (100%) and EUS in (88%) for resectability. We found that 7 patients (38.8%) with carcinoma of the head of the pancreas and 4 patients (22.2%) with ampullary tumor forming the majority of cases , PPPD were done for 11(61%) patients and CW for the other 7(39%). With mean operative time 5.3 hours, blood transfusion 3.5 units and post operative stay 8.1 days, 10(55.5%) patients develop complications as pancreatic fistula 3(16%) patients, wound infections 2(11%) patients and death to 2(11%) patients. In this study we get 1 and 2 years postoperative survival for pancreatitis (100% and 100%) and for ampullary tumor (100%
and 50%) respectively.**Conclusion:**Pancreaticoduodenectomy associated with morbidity and mortality, with careful patient selection, it can performed safelyThis study shows PD can be performed with an accepted morbidity and low mortality rate in a tertiary referral centre in Iraq, the perioperative results were comparable to those reported from the well established western centers, despite a lower case volume

Key Words: pancreaticoduodenectomy, periampullary pathology.

Introduction:

Pancreaticoduodenectomy is one of the most complex surgical procedures, it is the only potentially curative treatment for pancreatic cancer, which ranks ?fth in cancer related mortality worldwide [1,2]. after cancer of the lung, large intestine, breast and prostate [3]. It is second only to colorectal cancer as a cause of death from cancer of the digestive tract[4]

Anatomy:

The pancreas gland lies transversely in the retroperitoneal space. The broad right lateral portion is called the head, which is separated from the body by a constriction known as the neck. The tapering leftlateral portion is the tail, while the uncinate process emerges from the head at the angle between its lower and left lateral borders.The head of the pancreas lies within the duodenal curve , with the upper, lower and right lateral borders lying intimately to the duodenum and share same blood supply to a degree that cannot resects one of them without resecting the other safely.

The ascending portion of the duodenum lies in front of the left lateral border of the head. The anterior aspect is largely covered by the transverse colon, with the superior mesenteric artery crossing the uncinate process. The corresponding vein travels up behind the neck to form the portal vein. Posterior to the head of pancreas lies the inferior vena cava, the common bile duct, the renal veins, the aorta and right crus of the diaphragm[5]

Morbidity and mortality:

Pancreaticoduodenectomy is associated with substantial operative morbidity and mortality rates[1], which have improved dramatically within the past 15 years. While in the 1980s mortality rates after Whipple's procedure still exceeded 20%, today, mortality has been reduced to less than 5% in high volume centers. Some authors even report mortality rates as low as 0 to 3 %[6, 7] Complications related to the pancreatic remnant, such as pancreatic fistula which defined as drainage of amylase rich fluid of more than 50 ml per day and persisting after the 10th postoperative day[8], anastomotic dehiscence,

*M.B.Ch.B., F.I.C.M.S., C.A.B.S. Specialist surgeon gasteroenterology and Hepatology teaching hospital
** FRCS, Prof. In surgery ,Ministry of higher education
*** M.B.Ch.B.,F.I.C.M.S.Specialist surgeon on gastroenterology and hepatology teaching hospital

abscess formation, and bleeding are the main causes of morbidity and mortality following pancreatic head resection [6,9,10,].

Resectability:

Pancreaticoduodenectomy is indicated mainly for pancreatic head region tumors (pancreatic head, ampullary, duodenum and distal bile duct cancers)[11, 12].However, because pancreatic cancer usually presents late, only 10% to 20% of patients are candidates for Pancreaticoduodenectomy [13]. Findings contraindicating resection, Liver metastases (any size), Celiac lymph node involvementÊ, Peritoneal implant,ÊHepatic hilar lymph node involvement, Findings not contraindicating resection, Invasion at duodenum or distal stomach, Involved peripancreatic lymph nodes ,Involved lymph nodes along the portahepatis that can be swept down with the specimen[14].

Radiological (CT/MRI) signs of involvement of the superior mesenteric-portal venous confluence are no contraindication for resection.

Laparoscopic evaluations can only exclude peritoneal carcinomatosis or liver metastasis, and therefore only provide incomplete information about the local resectability [15]. During the operation, the peritoneal cavity and its contents have to be carefully examined. Lesions suspicious of metastasis should be assessed histologically. Assessment of local expansion including vascular tumor involvement requires careful mobilization from the surrounding structures. Involvement of superior mesenteric artery (SMA), celiac trunk, or hepatic arteries precludes resection with curative intent, whereas invasion of the portal vein does not.

Preoperative or intraoperative biopsies are not obligatory to confirm the diagnosis of malignancy. If preoperative findings, the clinical picture, and surgical findings are consistent, resection should proceed[16].

Indications:

Pancreaticoduodenectomy was indicated mainly for cancer patients;

1. Periampullary cancers account for about 5% of all gastrointestinal tract malignancies[17], which can be divided into four groups of tumor entities:
   (i)That originate from the pancreas (pancreatic cancer),
   (ii)The mucosa of the ampulla of Vater (ampullary carcinoma),
   (iii)The common distal bile duct (distal cholangiocarcinoma) or
   (iv)The mucosa of the duodenum (duodenal adenocarcinoma).

The most common periampullary malignancy is pancreatic cancer, accounting for 3% of all gastrointestinal tumors.

Carcinoma of the ampulla of Vater is the second most common periampullary malignancy. Distal cholangiocarcinoma is less frequent and duodenal adenocarcinoma of the periampullary region is only rarely seen[18].

2.Neuroendocrine tumors
3.Intraductal papillary mucinous neoplasm
4.Cystadenoma/cystadenocarcinomas
5.Ampullary/duodenal adenomas
6.Cancer metastatic to pancreas
7.Gastrointestinal stromal tumors

For benign conditions;

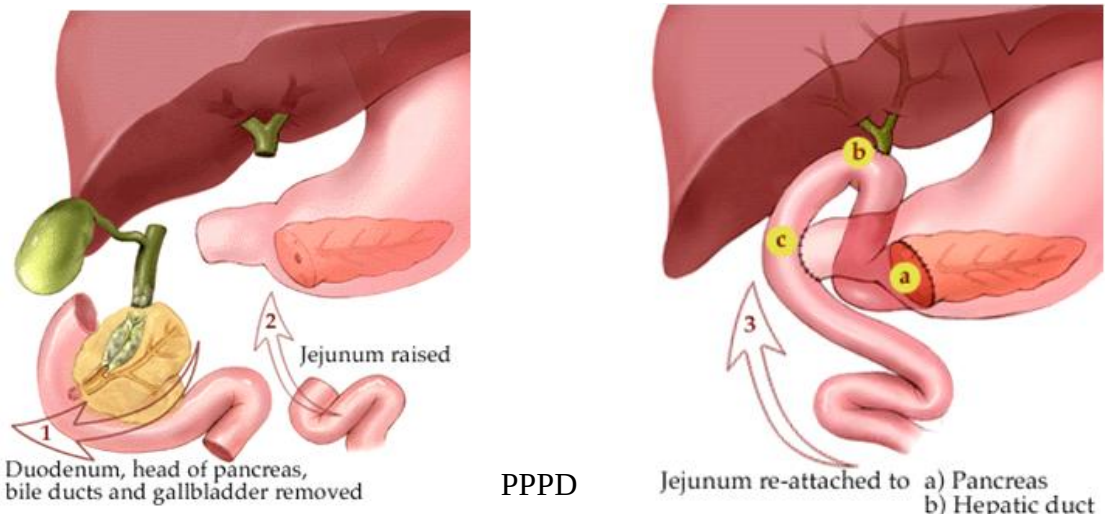
1.Chronic pancreatitis
2.trauma

Historically speaking:

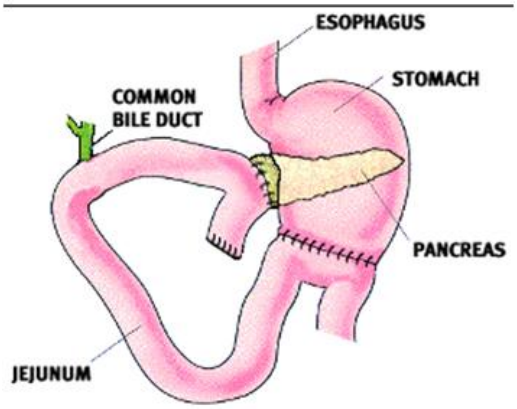
Biondi, in 1894, removed a tumor from the head of the pancreas with postoperative development of a biliary and pancreatic fistula that healed within 25 days [3].Halsted, in 1898, successfully performed the removal of an ampullary carcinoma. He excised a portion of the pancreas and the duodenum around the ampulla and re-implanted the pancreatic and common bile duct into the repaired suture line of the duodenal excision. The patient developed common duct stenosis 3 months after the operation, died 6 months later, and the autopsy showed recurrence of the cancer in the pancreas and the duodenum [19].Followed by Kausch, a German surgeon from Berlin ,in 1909,with successful regional resection of the head of the pancreas and reported in 1912 [20] .The operation was popularized by Whipple in 1935, who reported pancreatico- duodenectomies (PD), and perform it in a two-stage operation . The first stage consisted of a cholecystogastrostomy and gastrojejunostomy, while at the second stage a resection of the second and third parts of the duodenum along with a portion of the head of the pancreas was performed. The first and fourth parts of the duodenum were inverted and closed. The lower end of the common bile duct, the pancreatic duct, and the pancreatic stump were closed[21].Several modifications of the original procedure described by Whipple were made by other surgeons.

Classic (hemigastrectomy) PD versus pylorus preserving pancreaticoduodenectomy PPPD

PPPD may be considered in patients with small periampullary neoplasm and it should not be performed in patients with bulky neoplasm of the pancreatic head, neoplasm involving the ?rst or second portions of the duodenum, or lesions associated with grossly positive pyloric or peripyloric lymph nodes [22].



PPPD



CW

PATIENTS AND METHODS

This is a prospective and retrospective study of 18 patients with pancreatic head region pathology who underwent pancreaticoduodenectomy in the gastroenterology and Hepatology teaching hospital in Baghdad from May 2008 to January 2012.

Patients:

Patient age, gender and relevant history including comorbidities were documented. Inpatient procedure variables included the complications, length of stay in the hospital, and disposition after discharge. We also recorded data regarding the indication for surgery, the type of resection (pylorus preserving versus classical distal gastrectomy), whether the portal vein was resected, intraoperative blood loss, number of blood units transfused and operative time. Pathological data consisted of site of tumor origin, tumor di?erentiation and diameter, resection margins, and evidence of lymphatic invasion. Lastly the perioperative mortality (de?ned as death in hospital or within 30 days of discharge) and one to two years survival discussed in this study.

Methods:

After review of patients investigations and confirm resectability (US, high quality CT scan with contrasts, EUS) Informed consent was obtained . Prophylactic antibiotics consisted of 1 gm of Cefetrixon and 500 mg of metronidazole given intravenously for all patients. DVT prophylactic with 4000 i.u. of LMWH and lower limb compressive bandaging, We use a bilateral subcostal or midline incision, Exposure is optimal with a gallous retractor and self retaining retractor. We evaluate the peritoneal cavity for ascites ,seedlings and liver masses then a wide Kocher maneuver of duodenum done to assess the pathology, exclude vascular , paraortic and celiac nodal involvement and confirm resectability, when a decision to continue the procedure was taken, the gastroduodenal artery ligated and divided between ligatures, fundus first cholecystectomy done, CHD transected and the plane between it and portal vein dissected to the neck of pancreas .

In this study 7 patients classical Whipple (CW) were performed In which we ligate and divide the terminal branches of the left gastric artery along the lesser curvature of the stomach, Transect the antrum of the stomach, Divide the omentum at the site of transection ofthe greater curvature transection. Other 11 patients a PPPD done with transection of the duodenum 2 cm beyond the pylorus. We mobilize the right colon and hepatic ?exure to expose the entire duodenum then incise the retroperitoneal peritoneum along the inferior border of the pancreas to expose the junction of the middle colic vein and the SMV.Divide the middle colic vein prior to its junction with the SMV to allow greater exposure of the infrapancreatic SMV; this minimizes the risk of traction injury to the SMV. We carefully dissect the SMV to create a tunnel between it and neck of pancreas. Take down the loose attachments of the ligament of Treitz with care to avoid the inferior mesenteric vein injury. Transect the jejunum about 10cm distal to the ligament of Treitz, Continue this dissection to involve the fourth and third portions of the duodenum. Re?ect the devascularized duodenum and jejunum beneath the mesenteric vessels.Transect the pancreas with electrocautery or scalpel down to the anterior surface of the PV. Care must be taken when dissect the most important and difficult part of the operation when complete mobilization of the SMPV con?uence and separation of the uncinate process and pancreatic head from the right lateral border of the SMA.

In two patients the PV was invaded by the tumor and dealt by controlled U shaped vascular clamp and lateral resection of the involved PV with the tumor and the defect sutured with proline.The inferior pancreaticoduodenal artery(branch of SMA) was ligated.The specimen (Gall bladder, CBD, pancreatic head, duodenum and proximal jejunum) send for histopathology. The pancreaticojejunostomy was performed using a duct to mucosa anastomosis or, alternatively, an invaginated anastomosis, followed by an end to side choledochojejunostomy and end to side duodenojejunostomy or gastrojejunostomy. One to two drain were left in the area of the pancreaticojejunostomy and the hepaticojejunostomy. The drain was removed according to postoperative events. Abdominal wall closed in layers. All patients were managed in ICU with a standard postoperative care and monitoring.

Results:

Between May 2008 and January 2012, 18 patients with pancreatic head region pathology underwent a pancreaticoduodenectomies in our hospital.

Age and gender:

There were ten female patient (55.5%) and eight male patients (44.4%). The mean age were 43.5 years (ranged from 25 to 65 years),two patients were in their 20s, four in the 30s and 50s, seven in the 40s and one at 65 years old (Table 1).

Table 1. Age and Gender distribution

Age (years)	Male	Female	Total
20 - 29	1 (5.5 %)	1 (5.5 %)	2 (11 %)
30 - 39	3 (16.6 %)	1 (5.5 %)	4 (22.1%)
40 - 49	1 (5.5 %)	6 (33.3 %)	7 (38.8 %)
50 -59	2 (11.1 %)	2 (11.1 %)	4 (22.2 %)
60 - 69	1 (5.5 %)	0 (0 %)	1 (5.5%)
Total	**8(44.4 %)**	**10 (55.5 %)**	

Distribution of patients residency:

One third of patients were from Baghdad and the other two thirds from other provinces (Table 2).

Table 2. Distribution of residency

provinces	Number of patients	Percentage
Baghdad	6	33.3 %
Hilla	2	11.1 %
Diyala	2	11.1 %
Theqar	2	11.1 %
Messan	1	5.5%
Karbalah	1	5.5%
Alanbar	1	5.5%
Wasset	1	5.5%
Dewanea	1	5.5%
Mossel	1	5.5%
Total	18	100%

Symptoms:

The main symptom were jaundice in 94%, other include weight loss in 22%, and abdominal pain in 11% (Table 3).

Table 3. Symptoms of the patients

Symptoms	Number of patients	Percentage
Jaundice	17	94.4 %
Weight loss	4	22.2 %
Abdominal pain	2	11.1%
Bleeding (gastrointestinal)	2	11.1 %

Diagnostic modalities

The majority of patients were evaluated with a computed tomography (CT) scan and endoscopic ultrasound EUS, magnetic resonance imaging/magnetic resonance cholangiopancreatography (MRI/MRCP) and endoscopic retrograde cholangiopan creatography (ERCP) were used with less frequently (Table 4).

Table 4. Diagnostic modalities

Diagnostic modality	Number of patient
CT – Scan	18 (100 %)
EUS	16 (88.8 %)
MRI / MRCP	7 (38.8 %)
ERCP + stent	5 (27.7 %)

Indication of the procedure:
A total of 15 patients had a periampullary adenocarcinoma (pancreatic 7, ampullary 4, distal cholangiocarcinoma 2, duodenal 2), two patients had chronic pancreatitis and one patients had pancreatic pseudopapillary tumor (Table 5).

Table 5. Indication of the procedure

Indication	Number of patients
periampullary adenocarcinoma(pancreatic)	7 (38.9%)
periampullary adenocarcinoma(ampullary)	4(22.3%)
periampullary adenocarcinoma(cholangiocarcinoma)	2(11.1%)
periampullary adenocarcinoma(duodenal)	2(11.1%)
chronic pancreatitis	2(11.1%)
pseudopapillary tumor of pancreas	1 (5.5%)
Total	**18(=100%)**

Treatment:
An eleven patients underwent a pylorus preserving Pancreaticoduodenectomy, and 7 underwent a classical pancreaticoduodenectomy (Table 6).

Table 6. Operative procedure

Procedure	Number of patients
Pylorus preserving pancreaticoduodenectomy	11(61.11%)
classical pancreaticoduodenectomy	7(38.8%)

In those 10 patients in whom the information was available, the texture of the gland was ?rm in 70% and ?rm to ?brotic in 30% of patients. Portal or superior mesenteric vein was involved in three patients, one of them mandate graft reconstruction (Table 7).

Clinical Course
The operative time was ranged from 4 to 9 hours (mean time 5.3 hours). Blood loss and units of transfusion ranged from 1 unit to 9 units(mean 3.5 units). Postoperative length of hospital stay ranged from 1 to 17 days (mean 8.1 days) see (Table 7).

Table 7.Operative and perioperative data of patients who underwent pancreaticoduodenectomy

Characteristics	Range	Mean	Number of patients
operative time	4 – 9 hours	5.3 hours	
Blood loss and units of transfusion	1 – 9 units	3.5 units	
Postoperative length of stay	1 -17 days	8.1 days	
texture of the gland (data from 10 patients)			7 firm (70%)
			3 fibrotic (30%)
PV or SMV involvement			3 (16.6%)

A 55.5% of the patients developed postoperative complications(Table 8) , in which a pancreatic ?stula in 3(16.6%) of patients , a delayed gastric emptying (mandate a nasogastric tube 7 or more days after surgery) in 1(5.5%), an Intestinal fistula in 1(5.5%), a wound infection developed in 2(11.1%)

of patients and one patient required reoperation for bleeding.There were 2 postoperative deaths, for a hospital and/or 30 days mortality(11.1%), Causes of death were massive bleeding from portal vein in one patient and pulmonary embolism in the third post operative day in the second patient (Table 9).

Table 8. postoperative complications

complications	Number of patients
Mortality	2 (11.1%)
Morbidity	
Pancreatic ?stula	3 (16.6 %)
wound infection	2 (11.1%)
Delayed gastric emptying	1 (5.5 %)
Intestinal fistula	1 (5.5 %)
Reoperation	
Bleeding	1 (5.5 %)
Total	**10 (55.5%)**

Table 9. Two postoperative death

Age(Y) gender	Comorbidity	Operation type	Diagnosis	Complication	Post operative course	Died
39 M	None	Classical whipple	Ampullary cancer	Pulmonary embolism	Circulatory and pulmonary failure	POD 3
40 F	None	Classical whipple	Chronic pancreatitis	Bleeding	DIC (Disseminated intra vascular coagulation)	POD o

Among the 16 patients with tumor, the mean diameter was 3.3 cm(from 2 6 cm), 6 (37.5%) patients had positive lymph nodes, 15 patients the adenocarcinoma was moderately differentiated and one patient had pseudopapillary tumor of pancreas. There were 7 adenocarcinoma of the pancreas, one patient with cholangiocarcinoma had a positive resection margin .The one, two year survival was

Among the other 3 periampullary tumors, for ampullary cancer 2-year survival was 66.6%, and for duodenal cancer 2-year survival was 50% and 2-year survival for distal common bile duct tumors cannot obtained because of recent operation . Among those patients with negative lymph nodes, 2-year survival was 50%, compared with 16% with positive lymph nodes (Table. 10).

Table 10. Post operative survival rates

Patient group	number	survival rates %	
		1 Y	2 Y
Pancreatic Periampullary tumor	8	62.5	37.5
Ampullary Periampullary adenocarcinoma	3	100	66.6
Duodenal Periampullary adenocarcinoma	2	100	50
Distal bile duct Periampullary adenocarcinoma	2	100	-
Pancreatitis	1	100	100
Total	**16**	**92.4**	**63.5**
Negative lymph nodes	10	-	50
Positive lymph nodes	6	-	16
positive resection margin	1(5.5%)	-	-

Finally we had compared the Histopathological and EUS staging of a sixteen patients with tumor (Table. 11).

Table 11. EUS versus Histopathological staging

Stage	Patient number	T1	T2	T3	T4	N+	N-
EUS	12	4	6	2	0	1	11
Histopathology	16	2	5	7	2	6	10

10 of our patients completed their post operative oncological treatment depending on histological result of the resected specimen,

the oncologist give Folinic acid with 5-Flurouracile as a single dose weekly for 24 weeks, two patients with T1,N0,M0 and negative resection margin were not treated (Table. 12).

Table 12.Postoperative oncological treatment

Not needed	Need treatment (FA+5 FU)	
	Not completed	completed
5	3(23%)	10(77%)

Discussion:

The age of the patients recorded at the time of the operation in this study ranged from 25 to 65 years with mean age 43 years and male to female ratio was 44:55 when compared with Max Schmidt et al study [23], patients age ranged from 15 to 93 years, mean age 58 years and male to female ratio was 58:42. Regarding age, the number of patients in this study was small and when increased the spectrum of age also will increased. In this study female slightly higher than male this may related to low alcoholic consumption in our society when compared to western countries. The main presenting symptoms were jaundice in 94% of patients which is equal to Max Schmidt et al study 86%.All patients were evaluated and assessed with abdominal US and CT scan, usually with IV and Oral contrast to confirm the diagnosis and assess resectability, followed by EUS in 88% , MRI/MRCP in 38% and ERCP in 27% of patients. And when compared with a big study from Johns Hopkins Medical Institutions by John L. Cameron with One Thousand Consecutive Pancreaticoduodenectomies [24], they use CT scan in 98%, regarding EUS no data available in their study, MRI/MRCP in 5%, ERCP in 21% of patients and PTC in 13%. The results of both studies were similar in using CT scan and ERCP. The high number of patients with MRI/MRCP in our study was referral cases with this less informative diagnostic modality, the PTC used in Johns Hopkins Hospital not used in this study because of unavailability of it in our country. Lastly most patients in this study evaluated preoperatively with EUS for diagnosis and staging to asses resectability. Mean while not used in Cameron study, this can be attributed to EUS which is a new modality of investigation and not mentioned in Cameron study which started from 1969 to 2003.

In our study An11(61%) patients underwent a PPPD, and 7 (39%) underwent a CW this results was equal to a study from united state in Mo?t-Long Hospital (ML) with a results 64% and 36% respectively [25] .Delicate lymphadenectomy during PD is important for radical oncological enforcement. In several trials, extended lymphadenectomy showed no significant benefits and is still under discussion. Despite the encouraging advances in surgical treatment, actuarial 5-year survival rates after pancreatic resection are only at about 20% [26], in our study extended lymphadenectomy not practiced. Total operative time and length of stay in the ICU and in the hospital were signi?cantly shorter in our study than the San Francisco County General Hospital (SFGH) and at the Mo?t-Long Hospital (ML) [25] .This mostly related to style of our theater when patient anesthetized and operated on in the same room with no significant delay if compared with westerns hospital, the longer operative time in their studies also may related to routine using of intraoperative US and frozen section which was not used in our study. Mean postoperative hospital stay were 8 days (1-17 days) in this study which is lower than reported outside the USA with an averages 1428 days[27]. The involvement of the resection margin, known as R1 resection, is an important factor in prognosis following pancreatic resection [28].In this study one (5.5%) CBD tumor patients had a R1 resection. A positive surgical margin is generally accepted as a poor prognostic factor , as in this study but a surprising thing that in a study of 360 patients by Raut et al found no statistical significance in its effect on survival[29]They attributed this fact to the variable reporting patterns of histology and the lack of differentiating between micro and macroscopically involved margins in other studies.

However, evidence from the European Study Group for Pancreatic Cancer (ESPAC-1) trial indicates that R1 tumours represent a biologically more aggressive cancer.

In addition to a poorer response to surgery, the magnitude of benefit from chemotherapy is decreased in patients with R1 margins [30].PD continues to be a challenging and substantially morbid procedure. In our study 10 patients 55.5% undergoing PD had a complications, which was the mid of the spectrum of other studies, Mo?t-Long Hospital (ML) 58%, San Francisco County General Hospital (SFGH) 60% and Johns Hopkins Medical Institutions 40%. Nonetheless, these complications, for the most part, were minor and not life threatening. Moreover, the pancreatic ?stulas and anastomotic leaks that are often associated with longer hospitalizations and increased morbidity in this study occurred at statistically lower rates 16 %(3 patients) than the internationally reported average of 14.3%26.7% [31].The low operative mortality rate in this study(11.1%), together with the data from western studies regarding the impact of hospital volume on perioperative outcomes, seem to support the concentration of complex surgical procedures such as PD in tertiary referral center in Iraq.

Low, medium and high volume centers for pancreaticoduodenectomy were defined as 1 to 5

cases per year, 6 to 20 cases per year and more than 20 cases per year, respectively, and the corresponding hospital mortality rates were 19%, 12%, and 2.2%, respectively(Our institution was classified as a low volume centre (5 case /y.) according to such definition, but our hospital mortality rate was comparable to those of medium volume western centers [32].The low hospital mortality rate observed in our study is likely to be related to proper patients selection and the management of all patients by a specialized team of surgeons, even though the case volume was not high compared with western standards. A recent study in the UK has demonstrated significantly lower postoperative mortality rate after resection of pancreatic and periampullary tumors in specialist pancreatic units compared with general surgical units (average mortality rate 4.9% versus 9.8%) [33].It is not only the operative technique but also the perioperative management that determine patients' outcomes. In a recent study, hospital rather than individual surgeon's case volume was identified as the most important determinant of hospital mortality rate after resection of pancreatic cancerAlthough experience in our centre with portal vein resection is limited, the authors believe that pancreatic carcinoma with isolated portal vein involvement should not be considered a contraindication to surgery [34].Also the results of this study indicate that the location of the tumor can influence the survival pattern, where patients with ampullary tumor have a better prognosis, this reflects their earlier presentation. With 100% to 66.6% which is higher regarding 1 year and similar regarding 2 year survival when compared to Max Schmidt et al study with 84% to 60% respectively [32] 81% of patients in our study received chemotherapy, when compared with Johnson study, most patients did not have adjuvant treatment 67% and 33% received chemotherapy most of them with combined radiotherapy which is not used in our patients. And this may related to diagnosis and treatment at an early stage in Johnson study [35].

Conclusion:

Pancreaticoduodenectomy continues to be associated with considerable morbidity and mortality. With careful patient selection, PD can be performed safely.This study shows that pancreaticoduodenectomy can be performed with an accepted morbidity and low mortality rate in a tertiary referral centre in Iraq. When performed by a well trained surgeons, the perioperative results were comparable to those reported from the well established western centers, despite a lower case volume due to a lower prevalence of pancreatic cancer and chronic pancreatitis in the our population. However, operative morbidity can be improved by reduction in the intraoperative blood loss when meticulous surgical techniques practiced and good post operative care.

References:

1. C.M.Schmidt, E.S.Powell et al .Pancreaticoduodenectomy: a 20-year experience in 516 patients. Archives of Surgery2004;139:718727.
2. C. J. Yeo, J. L. Cameron et al. Pancreaticoduodenectomy for cancer of the head of the pancreas: 201 patients. Annals of Surgery1995; 221: 721733.
3. J. P. Neoptolemos, R. C. G. Russell .Low mortality following resection for pancreatic and periampullary tumors in 1026 patients: UK survey of specialist pancreatic units. British Journal of Surgery1997;84:13701376.
4. C. Fernandez-Del Castillo, D. W. Rattner. Standards for pancreatic resection in the 1990s. Archives of Surgeryp;130: 295300.
5. Gudjonsson B. Cancer of the pancreas 50 years of surgery.
Cancer 1987; 60:2284-303.
6. Beger HG, Gansauge et al . Pancreatic head resection, the risk for local and systemic complications in 1315 patients, a monoinstitutional experience. Am J Surg 2007;194:S16S19.
7. Berberat PO, Friess Het al . Prevention and treatment of complications in pancreatic cancer surgery. Dig Surg 1999;16:327336.
8. McKay A, Mackenzie Set al . Meta analysis of pancreaticojejunostomy versus pancreaticogastrostomy reconstruction after pancreaticoduodenectomy. Br J Surg 2006;93:929936.
9. Jemal A, Murray T et al. Cancer statistics. CA Cancer J Clin;2003: 53:5-26.
10. Jemal A, Siegel R et al. Cancer statistics. CA Cancer J Clin;2007: 57:43-66.
11. S.F.Sener, A.Fremgen et al. Pancreatic cancer: a report of treatment and survival trends for 100,313 patients diagnosed from 19851995, using the National Cancer Database. Journal of the American College of Surgeons1999;189: 1-7.

12.William E. Fisher et al. Pancreas. F. Charles Brunicardi, MD,FACS. Schwartzs principle of surgery ,ninth edition. McGraw-Hill Companies;2010:1226.
13. Friess H, Kleef J et al. The role of diagnostic laparoscopy in pancreatic and periampullary malignancies. J Am Coll Surg 1998;186:675682.
14.Hirano S, Kondo S Hara T et al. Distal pancreatectomy with en bloc celiac axis resection for locally advanced pancreatic body cancer: long term results. Ann Surg 2007; 246: 4651.
15.Talamini MA, Moesinger RC et al. Adenocarcinoma of the ampulla of Vater. A 28-year experience. Ann Surg 1997;225:590-9; discussion 599-600
16.Yeo CJ, Cameron JL et al. Pancreaticoduodenectomy with or without distal gastrectomy and extended retroperitoneal lymphadenectomy for periampullary adenocarcinoma. Ann Surg 2002;236:355.
17. W. Halsted. Contributions to the surgery of the bile passages especially of the common bile duct. Boston Med Surg
1899;141: 645-654.
18. Kausch W. Das carcinoma der papilla duodeni und seine radikale entfeinung. Beitr Z Clin Chir 1912;78:439486.
19.Whipple A, Parsons WB. Treatment of carcinoma of the ampulla of Vater. Ann Surg 1935;102:763779.
20.Pierre-Alain Clavien . Atlas of Upper Gastrointestinal and Hepato-Pancreato-Biliary Surgery; Tina W.F. Yen et al, Resection for Neoplasms of the Pancreas;2007:763.
21.C.M.Schmidt, E.S.Powell et al. Pancreaticoduodenectomy: a 20-year experience in 516 patients.Archives of Surgery2004.;139:718727.
22.Micheal T. Schell et al. Pancreaticoduodenectomy: Volume is not Associated with Outcome within an Academic Health Care System. HPB Surgery2008;Article ID 825940, 6 .
23.Zerbi A, Balzano G. Comparison between pylorus-preserving and Whipple pancreatoduodenectomy. Br J Surg 1995;82:975.
24.Wente MN, Bassi C et al. Delayed gastric emptying (DGE) after pancreatic surgery: a suggested de?nition by the International Study Group of Pancreatic Surgery (ISGPS). Surgery 2007; 142: 761768.
25.Benassai G, Mastrorilli M et al. Factors influencing survival after resection for ductal adenocarcinoma of the head of the pancreas. J Surg Oncol 2000;73: 212-8.
26. Raut CP, Tseng JF et al. Impact of resection status on pattern of failure and survival after pancreaticoduodenectomy for pancreatic adenocarcinoma. Ann Surg. 2007; 246: 52-60.
27.Neoptolemos JP, Stocken DD et al. Influence of resection margins on survival for patients with pancreatic cancer treated by adjuvant chemoradiation and/or chemotherapy in the ESPAC-1 randomized controlled trial.Ann Surg. 2001; 234:758-68.
28.K.M.Reid-Lombardo et al. Pancreatic anastomotic leakage after pancreaticoduodenectomy in 1,507 patients: a report from the Pancreatic Anastomotic Leak Study Group," Journal of Gastrointestinal Surgery2007; 11:14511459.
29.Gordon TA, Burleyson GP. The effects of regionalization on cost and outcome for one general high-risk surgical procedure. Ann Surg 1995;221:43-9.
30.Glasgow RE, Mulvihill SJ. Hospital volume influences outcome in patients undergoing pancreatic resection for cancer. West J Med 1996;165:294-300.
31.Gouma DJ, van Geenen RC et al. Rates of complications and death after pancreaticoduodenectomy: risk factors and the impact of hospital volume. Ann Surg 2000;232:786-95.
32.Neoptolemos JP, Russell RC. Low mortality following resection for pancreatic and periampullary tumors in 1026 patients .Br J Surg 1997;84:1370-6.
33.Sosa JA, Bowman HM et al. Importance of hospital volume in the overall management of pancreatic cancer. Ann Surg 1998;228:429-38.
34. Poon RT, Fan ST. Opinions and commentary on treating pancreatic cancer. Surg Clin North Am 2001;81:625-36.
35.Mr C D Johnson. Guidelines for the management of patients with pancreaticcancer periampullary and ampullary carcinomas. Gut 2005;54:1136.