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Retrospective Analysis of 101 Consecutive Cases of Pancreaticoduodenectomy in Single Center

Dr. S. Karthikeyan[1], Dr. A. Sastha[2]

[1]Senior Assistant Professor, Department of Surgical Gastro-enterology, Madurai Medical College, Madurai, India
[2]Assistant Professor , Madurai Medical College, Madurai, India

Abstract: ***Pancreatoduodenectomy has been associated with high rates of complications (40–60%) and mortality (up to 20%) With improvements in surgical techniques and perioperative care, mortality rates have decreased significantly, with operative mortality rates of less than 5% in high-volume centers. AIM: To analyze the preoperative and perioperative variables,the pattern of morbidity and results of perioperative care in reducing the morbidity, the factors predicting and predisposing to mortality and formulate standard for pancreaticoduodenectomy in terms of patient selection, operative procedures and perioperative care to achieve good outcome. PATIENTS AND METHODS: 101 consecutive patients (66 men, 34 women; mean age, years; range 24–78 Years) between January 2007April 2010.All data from patients were prospectively collected.the patients included in the list are resectable periampullary lesions, carcinoma head of pancreas, duodenal malignancy, and distal CBD growth, mass lesion in head of pancreas with suspected malignancy after routine clinical and radiological investigations. RESULTS:Periampullary carcinoma is the commonest indication for pancreatico duodenectomy in our center.Preoperative albumin value less than 3.0 WAS associated with complications.CA19-9 level <120 in majority of our patient and correlates with resectability.Preoperative biliary drainage had associated with infectious complications and increased morbidity. hence role of preop biliary drainage was not found useful in our smaller study.CBD size and type of anastomosis(continuous) forhepatico jejunostomy had no influence in outcome, Hence, continuous end to side HJ preferable as it takes lesser operative time after tedious pancreatic anastomosis.Undilated MPD (<3mm)and soft pancreas were associated with Increased morbidity,with increased pancreatic leak and hemorrhagic complications.Pancretico jejunostomy had increased leak rate compared to PG in our study, probably related to volume of work with this type of anastomosis. Hence PG is the commonest reconstruction preferable in our institution.Hemorrhagic complications all early complications were saved with early recognition and appropriate management, Stressing the need of vigilant post operative monitoring for this major procedure.DGE is the common post operative complication our study, though not related to mortality it increased the post op hospital stay and also cost of treatment for the patients.Most of the complications were managed conservatively. patient need surgical intervention had fair results.In our small series reported 30 day mortality is<2%, but morbidity remains 45-50%, though this is the area needs attention. CONCLUSION:Volume of the center and skill of surgical team, standard of preoperative care, in addition to the patient selection and optimization determines the outcome of pancreaticduodenectiomy. By adhering to above principles, it will be possible to do pancreaticoduodenectomy without mortality and limited morbidity with normal postoperative stay. Pancreas surgery has been the subject of much scrutiny worldwide, with accumulating evidence assuming that high volume centers provide better results.***

Keywords: Pancreatico duodenectomy, DGE – Delayed gastric emptying, Hepatico jejunostomy, Haemorrhage, pancreaticogastrostomy, Pancreatic leak

1. Background

In the past, pancreatoduodenectomy has been associated with high rates of complications (40–60%) and mortality (up to 20%) [1, 2]. With improvements in surgical techniques and perioperative care, mortality rates have decreased significantly, with operative mortality rates of less than 5% in high-volume centers. However, most large studies still report postoperative morbidity rates in the range of 30–65% [3, 4]. Common postoperative complications include delayed gastric emptying, pancreatic fistula, intra-abdominal abscess and hemorrhage.

Many researchers have indicated that preoperative instrumentation and drainage procedures of the biliary tract are associated with complications [5–13]. However, relatively little information is available in the literature regarding specific evaluation of pre- and intraoperative factors associated with postoperative complications.

2. Aim of the Study

- To analyze the preoperative and perioperative variables of the patients who underwent pancreatico duodenectomy in relation to morbidity and mortality.
- To analyze the pattern of morbidity and results of perioperative care in reducing the morbidity.
- To analyze the factors predicting and predisposing to mortality.
- To formulate standard for pancreaticoduodenectomy in terms of patient selection, operative procedures and perioperative care to achieve good outcome.

Patients and methods

Pancreatoduodenectomy was performed for 101 consecutive patients (66 men, 34 women; mean age, years; range 24–78 Years) between January 2007April 2010.All data from patients were prospectively collected.

Variables classified into three categories.

3. Study Design

Preoperative variables were age, sex, symptoms and signs, nutritional status, comorbid illness and preoperative biliary drainage status. Blood investigations included were hemoglobin status, total white cell count, liver function test including conjugated bilirubin and albumin level. Preop CA 19-9 values also taken for all patients.

In addition to USG abdomen imaging studies used to assess the resectability and oesophagoduodenoscopy (including side view scopy) findings were included. Final preoperative diagnosis before planned resection taken for analysis.

Intraoperative variables recorded were duration of surgery, estimated blood loss, blood transfusion requirement anatomical factors including CBD(common bile duct)size, MPD(main pancreatic duct)size, consistency of pancreas, size of mass lesion, were included.

Type of anastomosis done for pancreatic stump recorded. Both pancreatico gastrostomy and pancretico jejunostomy were used for pancreatic stump reconstruction.

We routinely do hepatico jejunostomy for bile duct and gastrostojejunostomy for digestive tract reconstruction, by retro colic route.

Postoperative variables
Recorded were ventilator support requirement, complications, bile culture status, use of octreotide and antibiotics, no of postoperative days interventions required for complications and results.

Final outcome analyzed in terms of morbidity pattern and mortality.

Inclusion criteria
- Respectable periampullary lesions, carcinoma head of pancreas, duodenal malignancy, and distal CBD growth.
- Mass lesion in head of pancreas with suspected malignancy after routine clinical and radiological investigations.
- Preoperative tissue diagnosis usually not taken in view of its false negativity and associated with bleeding and seedling risk.

Exclusion criteria
- Patients' undergone palliative biliodigestive bypass surgery for non resectable lesions
- Patient undergone trial dissection and palliative procedure were excluded.

4. Results and observations

Among 101 patients taken for this analysis66were male 35 were female.

Age ranges from 24 to 78 years with mean age of 50.6years.

Regarding symptoms analysis jaundice is predominant symptom in 78 cases. 23 patients had abdominal pain with loss of appetite.

Two patients presented with cholangitis.21 patients already undergone preoperative biliary drainage (outside) during admission.

71 /101 (70%) patients had palpable gallbladder52/101 patients had palpable liver.81 patients were moderately built, 20 patients were well built.

Regarding co morbid illness 22 patients had diabetes,7 patients had hypertension,3patients had both these illnesses. one patient had polycystic kidney disease with normal renal function.68 patients had no comorbid illness.

Totally 22 patients in our study group underwent preoperative biliary drainage. 20 patients had ERCP and stenting with sphincterotomy. 02 patients had biliary drainage by PTBD. Indications for biliary drainage not exactly mentioned. Pruritis and cholangitis were presumed indication for them.

We have done ERCP and stenting for one patient had cholangitis not responding to antibiotics.

Table 1: Demographic profile of the study population

Demographics			
Characters	Number	Mean	Ratio
Age	24 – 78	56	
Sex			2: 1
Male	66		
Female	35		
Symptoms			
Jaundice	78		
Abdominal pain	23		
Signs			
Palpable Gallbladder	71		
Palpable liver	52		
Comorbid illness			
Diabetes	22		
Hypertension	07		
Both	03		
Polycystic kidney	01		
Preoperative biliary drainage	22		
ERCP and stenting	20		
PTBD	02		

20 out of 22cases were bile culture positive.
16 cases had infectious complication. (All had Wound infection. 2 patients had intra abdominal abscess also)

In addition, 4 cases had pancreatic leak.5 patients had DEG.2 patients had hemorrhagic complication. one patient had severe sepsis with MODS lead to death.

Biochemical analysis
Hemoglobin for 23 patients were between 9-10gms/dl. 38 patients had HB levels between 10-12gms/dl.40 patients had HB level >12gms/dl. We have not done any preop blood transfusion

Total WBC count useful for find out leukocytosis related to subclinal sepsis.minimum value was 6900cell/command maximumwas2300cells/cu.mm with average about 9684cells**.**

LFT
We have taken direct fraction of bilirubin and albumin level as both are important assessing the severity of obstruction, and nutritional status respectively.

Bilirubin level varies from minimum of 1.2mgms/dl to maximum of 18mgms/dl with average about 9.3mg ms/dl. Patients with duodenalmalignancy and had preop stenting

had near normal bilirubin level. 23 patients had bilirubin >15mgm/dl.

Albumin pre-op albumin level in our study group varies from 2.6 to 4.2gms/dl. 22patients had albumin level below 3.0gms/dl.14 out of 22 patients had significant post op complications.

CA19-9
We have taken CA 19-9 levels for assessing advanced nature of disease and as follow up tumor marker**.** It ranges from 32 IU/dl to 484IU /dl with average about 126.8IU/dl.

17 patients in our study had >300 units.

Investigations

OGD
Endoscopy findings our study groups were
Periampullary growth-58
Prominent ampulla- 06
Duodenal growth-11
Normal study -26

Intra operative variables
Duration of surgery ranges from6hrs to 8hrs with average of 6.3 hrs. patient with preoperative stenting status and needed adjacent organ resection had prolonged duration**.**

Blood loss
Estimated blood loss varies from 300ml to 650ml with average about441ml

Transfusion varies from no transfusion to 4units of maximum transfusion. Mean transfusion volume 1.3units per surgery. 36(1/3) patients required no transfusion.

CBD (common bile duct) size
In our study Varies from 0.8cm to 2.5cm with average about 1.6cm.
One patient had bile leak alone.

MPD (Main Pancreatic Duct) Size and pancreas consistency
Main pancreatic diameter varies from 3mm to 8mm with mean diameter about 3.8 mm.
Duct size3mm or less were found in 69 patients.3-8mm found in 32 patients.
Pancreas were soft in consistency in 71 patients. Firm in consistency in 30 patients
15 patients with soft pancreas had pancreatic leak,5patients had hemorrhagic complications. similarly, 14patints with MPD≤3mmhad pancreatic leak.

Growth size
Growth size varies from 1.5cm to 4cmwith average size of 2.5cmin size.
Size of growth 3-4cm were found in 24 patients.

Type of pancreatic anastomosis
77 patients underwent pancreaticogastrostomy and 24 patients underwent pancreaticojejunostomy for pancreatic stump reconstruction. 05/77patients had leak (06%)

Among PJ patients, 2 patients underwent duct to mucosa anastamosis.3patients underwent isolated loop technique for pancreatico jejunostomy.05/24 patients had leak rate. (21%)

Bile culture results andculture and sensitivity
Intra operative bile culture taken for all patients.57 patients had positive culture.44 patients had no growth. E. coli was the most common organism isolated from bile in 34 cases. Klebsiella grown in 09 patients. NFGNB present in 03 case bile culture. Pseudomonas present in one case.

Table 2: number of positive cultures of pathogenic organisms

Organism	Positive cultures
E. coli	34
Klebsiella	09
NFGNB	03
Pseudomonas	04
E. coli with NFGNB	02
E. coli with proteus	02
Klebsiella with pseudomonas	02
Yeast	01

50 patients had single organism in bile. 7patients had more than one organism (poly microbial)

Post operative variables

Ventilatory support
Post operatively 19 patients required ventilatory support. As elective indication following surgery or for respiratory distress following severe complications.

08 patients required for oneday.06 patients required for 02days.0 patients required for more than 3 days.

Minor complications
31 patients had minor complications. 27 patients had wound infection. 4patients had pneumonitis.

Major complications
Complications related to pancreatic surgery were as follows

Table 3: Complications of pancreatic surgeries

Complications	Number
DGE	17
Pancreatic leak	12
Bile leak	01
Hemorrhagic complications	09
Early	07
Delayed	02
Intra abdominalabcess	04
Others	04

DGE
Most common complications present in our study patients. Presented alone in 17 patients, along with other complications in 3 patients. Mostly managed conservatively. Laparotomy required for patients had other complications.

Pancreatic leak
Established pancreatic leak present in13 patients.
Associated with other complications - 02 patients. Graded according to clinical impact into

Table 4: Grading of pancreatic leak

Pancreatic Leak		
Grade A	7 patients	Conservative management
Grade B	2 patients	USG guided aspiration
Grade C	3 patients	Laparotomy

Hemorrhagic complications

- Complications requiring urgent and appropriate intervention happened for 9 patients.
- Early hemorrhage happened for 7 patients. Delayed hemorrhage happened for 2 patients.

Table 5: Hemorrhagic complications and intervention done

Hemorrhagic complications		
Type of hemorrhage	Source of bleeding	Intervention done
Early hemorrhage		
Intra luminal	Pancreatic stump – 3	Laparotomy - 2
	Erosions	Endotherapy – 1 Conservative – 2
Extra luminal	Jejunal mesentery	Laparotomy
	Peri choledochal	Laparotomy
Intra and extraluminal	1	
Delayed Hemorrhage		
	Portal vein	Laparotomy
	Peri pancreatic vessel	angioembolization

Intraabdominal abscess

4patients had intra abdominal abscess. 3 patients had associated wound infection.Bile culture positive for 3 patients. All had poly microbial (ecoli, Klebsiella and NFGNB).average post op hospital stay were 25 days.

Two patients managed with USG guided aspiration. One patient improved with DT wash with saline and metronidazole.

One patient improved with higher antibiotics
No mortality reported with this group
After post-operative histo-pathological examination. One patient found to have CCP (Chronic Calcific Pancreatitis)

Other major complications

Four patients had major complications in the form of Sepsis, Cerebrovascular accident, Post op pulmonary complications

Interventions for complications

Most of patients with complications managed conservatively. Patients with ongoing haemorrhage, severe pancreatic fistula, multiple complications with imminent threat to life were taken for laparotomy and other interventional procedures.

Table 6: Interventions done and its complications

S. No.	Type of intervention	Nature of complications
1.	Laparotomy and lavage	Pancreatic leak
2.	Laparotomy and suture ligation + external drainage	Pancreatic leak with hemorrhage
3.	Laparotomy and suture ligation of bleeding stump	Hemorrhagic complication
4.	Laparotomy and hemostasis	Hemorrhage from jejuna mesentery
5.	Laparotomy and suture	Bleeding
6.	Laparotomy with wash	Pancreatic leak with delayed hemorrhage
7.	Laparotomy with wash and tracheostomy	Grade C pancreatic leak
8.	Laparotomy with wash	Pancreatic leak
9.	Laparotomy with suture ligation	Hemorrhage

USG guided aspiration was done for 4 patients in post operative period. Angio-embolization was attempted for one case of delayed hemorrhage with pancreatic leak. As source of bleeding from portal vein it could not be succeeded and patient was taken for laparotomy

Conservative management

All cases of DGE (19)and 8 cases of pancreatic leak and 3 cases of early hemorrhage were and one case of bile leak, managed with conservative management**.**

Mortality

Mortality within 30 days happened for 02/101 cases in this study contributing to 2% mortality. Variables of patients analyzed, both are male patients having normal pre-opHb, albumin level are within normal limits. preoperative bilirubin level <10gms %. One patient had periampullary carcinoma, one patient had carcinoma head of pancreas. Both patients had soft pancreas with undilated duct.

Both were having positive bile culture. Both patient required post opventilator supply. Pathology revealed t2n0m0 lesion.

One patient died of sepsis in early postoperative period. No demonstrable evidence of surgical complications. underwent preop biliary stenting.,

Another patient had pancreatic leak with collections and SIRS, laparotomy and wash given, extensive drainage given. As Patient kept with ventilator support tracheostomy done.

Patient fed with enteral feeding. Patient improved well. Leak reduced. Patient started oral fluids on 20th post op day. Suddenly developed aspiration pneumonitis and respiratory failure. Patient expired on24th post op day.

Postop hospital stay

Post op hospital stay varies from 10 days to 46 days in our study group. 34 patients had less than 15days post op stay. None of the patients had complications except one with early hemorrhage one case of pancreatic leak three patients had wound infection. Two of them underwent preoperative biliary drainage, with positive bile cultures.

46 patients had post op stay up to 30days.28of them major surgical complications. Majority of them due to Delayed gastric emptying (12cases.)

06 patients had hemorrhagic complications.06 patients had pancreatic leak. intraabdominal collection present for 2 patients. Other major complications, (MI and CVA)happened for two patients.

One mortality occurred due to grade C pancreatic leak with respiratory complications. rest of the patients had sere wound infection.

21 patients had post op stay more than 30 days.

8 patients had DGE. 2 patients had intra abdominal absess.2 patents had hemorrhagic complications.7 patients had pancreatic leak. 2of them had associated hemorrhage and abscess. one patient had other complication.

Pathological analysis
Malignant lesion were present 95 respected specimens. 6 lesions were others. 4/6of them turned to ccp thought of ca head of pancreas. One specimen of periampullary carcinoma reported as neuro endocrine tumor. One patient resected for cystic neoplasm turned out serous cystadenoma. Most of them belong to t2nomo stage which correlates with high respectable rate. We had node positive lesions. All nodes were belonging to peripancreatic group.

Except in one case hepatoduodenal ligament was positive.
We had T3 lesions in 14 specimens. Two of them were node positive.

06/14 were duodenal malignancies. One patient had infiltrating ca Gb infiltrating into duodenum.

Incidentally all cases were margin negative on all aspects, three cases had lympho-vascular invasion positive.

Table 6: TNM Staging

T status	N status	M status	Number of patients
T2	N0	M0	66
T2	N1	M0	13
T2	NX	MO	02
T3	N0	MO	12
T3	N1	M0	02

Anatomical abnormalities
We have recognized aberrant Right hepatic artery two cases. One case by pre-op MDCT imaging and identified per operatively. One case preoperatively along Right side of CBD. One case of replaced Right hepatic artery from SMA we have seen in our study group. Inadvertent injury to this vessel and vascular repair done and flow reestablished and confirmed with intra op Doppler USG.

5. Discussion

Pancreaticodudenectomy is the accepted and only curative option for all resectable pancreatic head malignancies and periampullary malignancies.(14 -16)

Mortality and morbidity arising out of this major surgical intervention requires special attention for those having limited survival (5year survival 10-30%) after surgery. (17)

Hence analyzing factors contributing to morbidity and mortality is important to obtain good results following this procedure. moreover, importance of risk factors for perioperative morbidity after pancreas surgery is not well established in any literature. (18)

In our study we analyzed perioperative variables and complications and interventions for complications and their outcome.

Age and sex
As per studies Age of patients older than 65 years, hyperbilirubinemia, hypoalbuminemia and urgent operation, increased operative blood loss, and failure to stent the pancreaticojejunal anastomosis all have been reported to be associated with pancreatic fistula. (19 – 21)

In our study group, 11/22 (50%) patients above the age of sixty had major complications. But Bilirubin level >15 found in 21 cases in our study all were respectable lesions. But only 3of them had major complications. Two of them had hemorrhagic complications. It correlates with findings suggested by Balcahandar *et al* on defining the preoperative bilirubin level with hemorrhagic complications. (22)

Nutritional status and co morbid illness
Factors associated with increased postoperative complication rates have included obesity, cardiac disease, severe jaundice, and malnutrition. (23)

In our study Albumin level less than 3.0 had significant complications in our study group.

DM is the major comorbid illness inour study group.11/24 cases had complication but not directly related to diabetes

Thus, routine perioperative laboratory tests might help surgeons identify patients who are at increased risk for morbidity after pancreatoduodenectomy. Though statistically not significant it emphasizes need for preop optimization.

Preoperative biliary drainage
Associated with infectious complications in our study like in other studies.(24,25) 16 cases had infectious complication. (all had Wound infection. two patients had intraabdominal abscess also)with one mortality.

Though small in sample, observations suggesting that routine use of preoperative biliary drainage is still questionable as per met analysis and major RCTS. We are using selectively in the setting of cholangitis and severe malnutrition and severs comorbid illness requires time

CA19-9
Function of the tumor marker, CA19.9, as a predictive factor for resectability is consistent with other studies and is perhaps unsurprising given its noted proportional relationship with tumor size and burden.(26 – 28)

It ranges from 32 IU/dl to 484IU /dl wit average about 126.8IU/dl. Only 17 patients in our study had >300 units with respectable lesions

Imaging CECT useful for defining diagnosis and respectability in 2/3 cases and MRI for 1/3 cases.

Triple phase spiral MDCT CT often helpful to find out anatomical abnormalities in one case preoperatively.

As CECT has higher sensitivity and specificity in assessing (>90%) respectability and familiarity with interpretation we

used to prefer CECT spiral if possible MDCT for assessing the respectability. (29, 30)

Preoperative diagnosis

As per john Hopkins study, Pancreatic complications were experienced by considerably more men than women, and more patients with bile duct, ampullary and duodenal tumors than with pancreatic tumors.

Similarly, most common indication is periampullary carcinoma (60%) more than 50% of them had complications(35/60), likewise 5/14(36%) cases with distal bile duct malignancy and03/11(27%) 0f duodenal malignancy patients had complications. (31 – 34)

Since the operative procedure can be performed with low hospital mortality, indications have greatly expanded. In the present series, two patients had pancreaticoduodenectomies performed for cystic tumor of pancreas and direct tumor extension from a primary in another site.

Intra operative variables

Blood loss& Transfusion

Estimated blood loss varies from 300ml to 650ml with average about 441ml. 1.3 units per surgery. 36(1/3) patients required no transfusion. Mean operating time (6.03hrs) also correlates with major studies (35-37)

CBD and tumor size

In our study CBD size Varies from 0.8cm to 2.5cm with average about 1.6cm 1/101 cases had isolated bile leak in our study. Managed conservatively. Also, technique of continuous bile duct anastomosis gave excellent results and gives advantage of reducing operative time.

Though tumor size <2cm had better survival average tumor size in our study was 2.5cm.(36 – 40)

Consistency and pancreatic ductsize

Soft texture of the pancreatic tissue significantly impacted the incidence of a pancreatic fistula after PD. It is believed that patients with a nondilated pancreatic duct and a soft, friable pancreas are especially susceptible to this complication.

Both of these findings were consistent with prior studies. (41,42)

In our study 15 patients with soft pancreas had pancreatic leakand abscess,5patients had hemorrhagic complications. Similarly, 14patients with MPD≤3mmhad pancreatic leak.

In our analysis complications especially, pancreatic leak associated soft pancreas and undilated duct are statistically significant.

Type of anastomosis

Majority (77/101) our patients underwent pancreatico gastrostomy. Withleak rate of 06%, 24 cases under went pancreaticojejunostomy leak were present in 21% PJ group.

In our study one mortality happened with PJ patients. Interventions were not successful. Complications following pancretico jejunostomy were multiple and life threatening in two patients

PGvs PJ

Pancreatico gastrostomy has shown reduced rate of pancreatic fistulas per many prospective studies,(43-46). Our result is correlating with these retrospective studies revealing that PG has less leak rate and complications following leak were improving with conservative management. But RCT conducted by bassi and yeo etal shows no difference in incidence of fistula between two groups

Other complications

Infectious complications were present in 50%of patients with pancreatico duodenectomy.(47-49). In our study 31 patients had wound infection, 4patients had intabadominal abscess, 4patients had pneumonitis contributing to about39%

In 57 patients, 91% of (20/22) of preoperative biliary drainage patients had bactibilia and wound infections present in 15/22 (68%) of them defining its adverse influence on postoperative outcome.(50 - 54)

Pancreatic leak &abscess

In some studies, the overall rate of fistula and abscess/sepsis was 11%. (55)

Postoperative fistula, leak, or abscess was identified in 158 of the 908 patients (17%).

MSKC study: The pancreatic fistula, leak, abscess reported in the current study (17%) is comparable with those published by other investigators.(56-58)

DGE

There is evidence from the literature that DGEis responsible for almost 50% of the morbidity followingPD.(59), now reduced up to 20% nowadays. Similarly delayed gastric emptying is the commonest complication we were encountered in our study patients, with average hospital stay for these patients were 27.06 days.

Hemorrhagic complications

Incidence ranges from 5-16%leading cause for re laparotomy following pancretico duodenectomy. (60-62). In our study also 9patients (09%) had hemorrhagic complications. more than 50%of them need laparotomy. Studies mentioning Soft pancreas, Pancretico jejunostomy, Pancreatic leak, Intraabdominal abscess(63) were associated with delayed hemorrhage.

In our study also, they were associated with hemorrhagic complications. Early hemorrhage improved with interventions including laparotomy. Outcome following delayed hemorrhage were depends upon associated complications.

Another study by Rajratinam et al from our institution stressed the role of interventional radiology for delayed haemorrhage.

Role of octreotide

It has been proposed that the perioperative administration of octreotide may reduce the incidence of postoperative pancreatic fistula by pharmacologically inhibiting exocrine pancreatic secretion.

A controlled clinical trial by Buchler *et al* appeared to support this proposal but Meta-analysis of six RCTS did not show any significant benefit on pancreatic fistula.(52,63)

In our study also, octreotide usage not significantly associated with reducing the complications.

Outcome

Morbidity

In our study 48 patients had complications taking morbidity up to 47.5%%.

This extent of complications was present in various series.it was 29-43% in yeo et al study.32% in trede study series.

Post op hospital stay

Postoperative hospital stays ranged from10 to 46 days. The median length of stay was 17 days. Post op complications particularly DGE prolonged the hospital stay. (53)

Mortality

In our study 30 days mortality was 2% comparable. overall operative and hospital mortality rate was 3.1%in trede series 2 patients had.

Major series from Cameroon etal revealed no mortality. Yeo *et al* in comparative study mortality were 4% in radical and 2% in standard group- 3.1%with Trede *et al.*

Outcome of interventions

1) 31(30%) patient managed conservatively with hydration, nutrional and antibiotics care with good outcome.
2) 9 (10%) patients need laparotomy .one patient had mortality. Comparable to 17% cases in trede study required relaparotomy. With 6 mortalities.
3) Two patients survived for >45 days following relpapartomy.
4) Two patients underwent USG guided aspiration for intraabdominal collections one patient underwent angioembolization, signifies the role of intervention radiology in perioperative care and improve the survival of patients.

Pathologic analysis

Majority of lesions were t2nomo status. Margin negative for all lesions. though we routinely doing standard lymph node dissection. One patient had neuroendocrine tumor.4 patients had CCP, contributing to up to 5% of lesions could be benign in resected specimens

Liver resection and colon resection done fortwo separate cases in our study group without additional morbidity and mortality as favored by Nikfarjam and colleagues (64).

Summary of our study

- Periampullary carcinoma is the commonest indication for pancreatico duodenectomy in our center.
- Gallbladder palpable in about 70% cases of obstructive jaundicedue to distal origin.
- Preoperative albumin value less than 3.0 associated with complications.
- CA19-9 level <120 in majority of our patient and correlates with resectability.
- Pre-operative bilirubin level >15 not associated with significant complications
- Preoperative biliary drainage had associated withy infectious complications and increased morbidity. hence role of preop biliary drainage was not fond useful in our smaller study.
- Duration of surgery and blood loss are comparable with other international studies.
- CBD size and type of anastomosis(continuous) forhepatico jejunostomy had no influence in outcome, Hence, continuous end to side HJ preferable as it takes lesser operative time after tedious pancreatic anastomosis.
- Undilated MPD (≤3mm)and soft pancreas were associated with Increased morbidity,with increased pancreatic leak and hemorrhagic complications
- Role of octreotide didn't have significant impact on prevention of complications in our small controlled group
- Pancretico jejunostomy had increased leak rate compare to PG in our study, probably relate to volume of work with this type of anastomosis. Hence PG is the commonest reconstruction preferable in our institution.
- Hemorrhagic complications all early complications were saved with early recognition and appropriate management, Stressing the need of vigilant post operative monitoring for this major procedure.
- Delayed hemorrhage as associated with other complications like leak and collections had outcome were(50%mortality) poor in our study. Hence prevention of leak and sepsis only reduces mortality from this treaded complication.
- DGE is the common post operative complication our study, though not related to mortality it increased the post op hospital stay and also cost of treatment for the patients.
- Most of the complications were managed conservatively. patient need surgical intervention had fair results.
- Patient with more than one complications (leak, hemorrhage and intraabdominal sepsis and DGE)had increased life risk not responding to interventions,compare to single complication
- Intraoperative bile culture helpful for predicting the infectious complication and helpful to use appropriate antibiotics.
- Most complications were treated with conservative management, but hemorrhagic complications and severe leak needed laparotomy.
- Last 35 cases in our study group were went away home without mortality.
- In our small series reported 30 day mortality is<2%, but morbidity remains 45-50%, though this is the area needs attention.

6. Conclusion

Volume of the center and skill of surgical team, standard of preoperative care, in addition to the patient selection and optimization determines the outcome of pancreaticduodenectiomy. By adhering to above principles, it will be possible to do pancreaticoduodenectomy without mortality and limited morbidity with normal postoperative stay. Pancreas surgery has been the subject of much scrutiny worldwide, with accumulating evidence assuming that high volume centers provide better results.

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