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Original Research

Post Operative Pancreatic Fistula Following Pancreatic duodenctomy- A Retrospective Study

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ABSTRACT

Background: Post-operative Pancreatic Fistula (POPF) is a potentially life-threatening complication after pancreatoduodenectomy. The aim of present study is to find out the incidence of POPF after pancreaticoduodenectomy, to find out the possible risk factors of POPF.

Methods: The present retrospective research was done at "Department of gastroenterology of a tertiary care centre" for a period of six years from January 2018 to December 2023 among 110 patients who had undergone pancreaticduodenctomy. Demographic, pathological & intraoperative data was recorded & results were analyzed using SPSS version 25.0.

Results: The average age of patients was 52.7±10.8 years. Out of 110 patients 65.5% were male & 34.5% were females. The mean BMI was 23.5±3.6 kg/m^2. Different type of diagnosis found were perampullary carcinoma (46.3%), CA head of pancreas (22.4%), NET (7.6%), distal cholangio carcinoma (8.2%) & others (15.5%). The mean blood loss was 362 ml. The mean value of salivary amylase at day 1 was 296.7 & at day 2 was 91.3. ICU stay was 4.8 days & mean post OP stay was 12.9 days. Mean PD size was 4.58 mm. Co-morbidity was present in 49.5% patients. 60.5% had soft pancreatic texture, SSI was present in 11%, sepsis was found in 19% patients, POPF was present in 35%. A soft pancreatic texture, a main pancreatic duct diameter <4mm, blood loss more than 350 ml, carcinoma head of pancreas & the serum amylase level were independent predictors of POPF (P<0.05). Sensitivity & specificity of serum amylase on POD 1 to predict CR POPF were 82.5%, 42.3% respectively. PPV, NPV, accuracy was 42%, 81.9%, 55.41% respectively.

Conclusion: A soft pancreatic texture, a main pancreatic duct diameter <4mm, blood loss more than 350 ml, carcinoma head of pancreas & the serum amylase level were risk factors for pancreatic fistula after pancreaticoduodenectomy.

Keywords: complications, pancreaticojejunal anastomosis, pancreatic duct, pancreaticduodenctomy, Post operative pancreatic fistula, surgery.

INTRODUCTION

The main treatment for malignant tumours involving the duodenal ampulla, pancreatic head, & distal bile duct is pancreaticoduodenectomy.[1,2] The protection of pancreaticoduodenectomy has significantly improved; nonetheless, the perioperative mortality rate remains between 0% & 5%.[3-5] Research indicates that the occurrence of pancreatic fistula following pancreaticoduodenectomy ranges from around 11.4% to 64.3%. Pancreatic fistula is the predominant complication following pancreaticoduodenectomy, resulting in extended hospitalisations & elevated medical costs.[6-9]

This difficulty, as delineated by the "International Study Group for Pancreatic Fistula (ISGPF)", is categorised into two principal groups: biochemical, clinically insignificant fistula (i.e., grade A) & clinically significant pancreatic fistula necessitating alterations in POM (i.e., grades B & C).[10] POPF may result in many secondary complications, including delayed stomach emptying, intra-abdominal infection, pseudoaneurysms, & abdominal haemorrhage.[11] Among all complications, postoperative haemorrhage of the pancreas (PPH) is the most lethal, occurring in 3% to 20% of patients, with an associated mortality rate of 20% to 50%. [12,13]

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Consensus on the appropriate therapeutic technique for clinically relevant pancreatic fistula is absent. [7-9] Direct relaparotomy was the method of treatment for many years. With this technique, the infection cause can be totally eradicated through surgical lavage, drainage, &, if necessary, a total pancreatectomy. Increased mortality rates are associated with this invasive surgery. Other studies, however, suggest that a full pancreatectomy can be performed with a fairly positive outcome (i.e., low mortality), & the researchers argue that the treatment should be performed as soon as possible in patients who need a relaparotomy.[14–16] Several studies have shown that the percentage of patients with pancreatic fistula who had relaparotomy varied widely, ranging from 15% to 50%.[17, 18] However, only a small percentage of these people may need relaparotomy.[19, 20]

In order to minimize perioperative adverse outcomes & optimize clinical management, the risk factors of POPF need to be understood. Hence the aim of present study is “to find out the incidence of POPF after pancreaticoduodenectomy, to find out the possible risk factors of POPF”.

MATERIAL & METHODS

The current retrospective research was done at “Department of gastroenterology of a tertiary care centre” for a period of six years from January 2018 to December 2023. Ethical permission was taken from institutional ethics committee before commencement of study. As it was a retrospective study & data was collected from hospital record no need of patients consent was needed.

On the basis of convenience sampling & availability of hospital record a total of 110 patients who had undergone pancreaticoduodenectomy were selected on the basis of inclusion & exclusion criteria.

Inclusion criteria

All patients (>18years) undergone elective Whipple’s PD at a tertiary care centre.

Exclusion criteria

• Patients with acute inflammatory conditions;
• Patients with cholangitis or bilirubin levels greater than 15 mg/dl;
• Patients not consenting to participate.

Study procedure: Data on demographics, pathology, & intraoperative procedures were documented. Age, gender, body mass index (BMI), & the findings of serum biochemical tests, such as serum bilirubin, urea, & amylase, were among the preoperative clinical data. Total amylase is the serum amylase that was measured during the study period. The pancreatic duct diameter at the line of pancreatic transsection anterior to the portal vein was determined by analysing preoperative computed CT images. Reconstruction technique, pancreatic remnant texture, & predicted blood loss were among the intraoperative data. Anaesthetic charts & perioperative blood transfusion data were used to create the blood loss data. The specimens were classified based on whether their pathology was linked to soft or normal pancreatic parenchyma (duodenal carcinoma, ampullary carcinoma, cholangio carcinoma, neuroendocrine tumours, & other lesions) or hard pancreatic parenchyma (pancreatic ductal adenocarcinoma (PDAC) & chronic pancreatitis).Among the outcome data were the duration of hospitalisation following surgery & the duration of stay in a critical care setting, which was defined as either an "intensive care unit (ICU)" or a "surgical high-dependency unit (SHDU)". The "International Study Group on Pancreatic Fistula (ISGPF)", "International Study Group of Pancreatic Surgery (ISGPS)", & the Clavien-Dindo classifications were used to record & rate all postoperative complications. Clavien-Dindo Grades III–V & ISGPS Grades B–C complications are regarded as clinically important. Deaths were noted at 30- & 90-day intervals.

In accordance with our institutional policy, serum amylase was tested on POD1 & POD3 in a systematic manner. Postoperative pancreatitis can be diagnosed without further laboratory or radiographic testing. Since there are currently no established protocols for treating POP, none will be adhered to during the trial period. Since there isn't a commonly agreed-upon definition, Connor defines POP as an increase in serum pancreatic amylase that is higher than the upper limit of normal on postoperative day (POD) 0 or 1. Serum pancreatic amylase levels at our institution have a typical upper limit of 100U/L. Three times the normal level is the threshold for increased amylase.

Statistical analysis

The data for the current study was gathered via a distinct study proforma. The data was inputted into MS-EXCEL for subsequent processing. Continuous variables will be represented as mean & standard deviation (SD), or median & interquartile range (IQR).The categorical variables will be represented as a frequency distribution. The Student's t-test, paired Student's t-test, median test, & chi-square test were utilised correctly. The Spearman correlation coefficient was employed to assess the strength of the link between the variables. Univariate logistic regression for risk factors associated with the development of POPF & a multiple logistic regression model were employed. Significant risk factors were incorporated into multivariate logistic regression analysis. The entry procedure for factors was sequential. P-value < 0.05, two-sided, was statistically significant. The study was

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conducted using the Statistical Package for the Social Sciences (SPSS version 25.0) & Med Calc software C.

The average age of patients was 52.7±10.8 years. Out of 110 patients 65.5% were male & 34.5% were females. The mean BMI was 23.5±3.6 kg/m^2 as shown in table 1.

RESULTS

Table: 1 Demographic data of patients

Variable		Mean±SD / N (%)
Age (in years)		52.7±10.8
Gender	Male	72 (65.5)
	Female	38 (34.5)
BMI		23.5±3.6

On the basis of diagnosis patients were distributed into having perampullary carcinoma (46.3%), CA head of pancreas (22.4%), NET (7.6%), distal cholangio carcinoma (8.2%) & others (15.5%) as shown in figure 1.

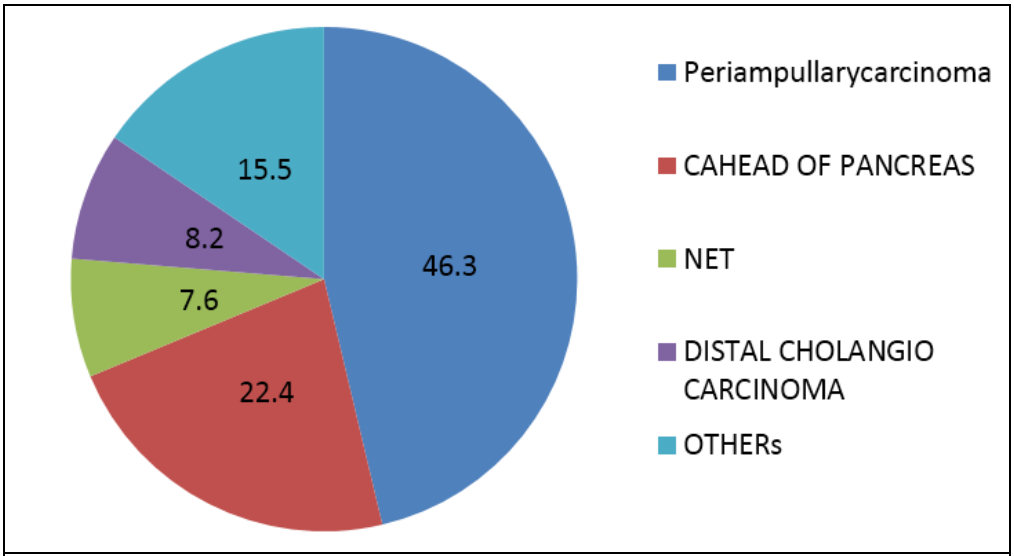

Figure 1: Distribution of patients on the basis of diagnosis

The mean creatinine value was 0.72, mean pre-op bilirubin was 2.87, blood loss was 362 ml. the mean value of salivary amylase at day 1 was 296.7 & at day 2 was 91.3. ICU stay was 4.8 days & mean post OP stay was 12.9 days. Mean PD size was 4.58 mm. Co-morbidity was present in 49.5% patients. 60.5% had soft pancreatic texture, SSI was present in 11%, sepsis was found in 19% patients , POPF was present in 35% patients as shown in table 2.

Table: 2 Patient characteristics

Variable		Mean±SD/ Percentage
Creatinine		0.72±0.08
Pre- opbilirubin		2.87±3.61
Blood loss		362±153.5
S.Amylase Day 1		296.7±340.2
S.Amylase Day 3		91.3±93.6
ICU Stay		4.8±2.48
POST OP Stay		12.9±4.87
PD size (mm)		4.58±2.60
Co-morbidity	Yes	49.5
	No	51.5
Pancreatic texture	Soft	60.5
	Firm	32.4
	Hard	7.1

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SSI	Yes	11
	No	89
Sepsis	Yes	19
	No	81
POPF type	No	27.5
	BL	37.5
	B	27.5
	C	7.5
CR POPF	B+C	35
	BL+NO	65
DGE	Yes	30
	No	70
PPH	Yes	12
	No	88
Clavendindo	0	32.5
	1	5.5
	2	40
	3A	10
	3B	2.5
	4A	4.2
	4B	2.5
	5	2.8

Age, sex, BMI, comorbidities, preoperative bilirubin levels , creatinine levels, blood loss during surgery, serum amylase on post-operative day 1 & day 3, pancreatic duct size, pancreatic texture, pre operative biliary drainage, surgery duration, diagnosis were analysed. A soft pancreatic texture, a main pancreatic duct diameter <4mm, blood loss more than 350 ml, carcinoma head of pancreas & the serum amylase level were independent predictors of POPF ($P<0.05$).

Table: 3 Analysis of risk factors of POPF

Variable		OR	P	95% confidence interval	
				Lower	Upper
Pancratictexture	SOFT				
	HARD & FIRM	3.45	0.002	1.45	7.80
Blood loss	>325				
	<325	3.78	0.001	1.77	7.98
Serum amylase Day 1	>300				
	<300	4.35	0.001	1.77	10.85
Serum Amylase Day 3	>300				
	<300	2.60	0.016	1.16	5.78
PDSIZE(mm)	<4.58				
	>4.58	3.21	0.002	1.45	7.06
Diagnosis	CA HEAD OF Pancreas				
	NON-CA HEAD OF Pancreas	0.22	0.005	0.05	0.62

Sensitivity & specificity of serum amylase on POD 1 to predict CR POPF were 82.5% , 42.3% respectively. PPV, NPV, accuracy was 42%, 81.9%, 55.41%respectively as shown in table 4.

Table : 4 Sensitivity, specificity, PPV, NPV & accuracy of serum amylase on POD 1 to predict CR POPF

	95% confidence interval	
Sensitivity	82.5%	69.6–92.4
specificity	42.3%	32.5–53.2
PPV	42%	32.8-52.5

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NPV	81.9%	69.0–92.3
ACCURACY	55.41%	

DISCUSSION

Pancreatico-jejunal anastomotic leakage, leaking from pancreatic resection, leakage from damage to the pancreatic capsule, & leakage through the puncture channel are among the causes of pancreatic fistula. A common & serious side effect of pancreaticoduodenectomy is pancreatic fistula, which is the main reason for complications & death following this procedure. There is still no solution for the problem of pancreatic fistula after pancreaticoduodenectomy [21]. Gender, age, preoperative jaundice, intraoperative blood loss, duration of surgery, pancreatic texture, body mass index, diameter of the primary pancreatic duct, & pancreaticojejunal anastomosis are now the criteria that researchers link to pancreatic fistula [22–26]. Bundled pancreaticogastrostomy is a safe & effective anastomosis technique to prevent pancreatic juice leakage from pancreaticojejunal anastomosis, according to Peng et al. [27]. The clinical risk score for pancreatic fistula (CRS-PF) may be able to predict the incidence of pancreatic fistula after pancreaticoduodenectomy, according to Shubert et al. [28]. Male gender is a risk factor for pancreatic fistula after pancreaticoduodenectomy, according to Kawai's [29] retrospective analysis of perioperative data from 1239 patients treated at 11 medical facilities between 2005 & 2009. El Nakeeb et al. [30] examined 471 cases of pancreaticoduodenectomy & identified that a BMI more than 25 was a risk factor for postoperative pancreatic fistula (POPF). Gaujoux et al [22] examined 100 consecutive cases of pancreaticoduodenectomy & similarly identified that a BMI exceeding 25 was a risk factor for pancreatic fistula following the procedure. In this study regression analysis identified soft pancreatic texture, a main pancreatic duct diameter <4mm, blood loss more than 350 ml, carcinoma head of pancreas & the serum amylase level as risk factors for pancreatic fistula following pancreatoduodenectomy.

In our study the incidence of post operative pancreatic fistula was 35%. PPH & DGE was present in 12% & 30% respectively. Overall mortality rate was 2.5%. This was comparable to study done by Shinde RS et al.[31] Large series & review of these series have given their morbidity & mortality data that is comparable to our baseline characteristics.

POPF might be a clinical sign of pancreatic stump ischaemia sustained during surgery, which eventually leads to anastomotic leaking. Ischaemia poses a serious threat to normal pancreatic tissue, & even brief hypoperfusion can cause pancreatic necrosis. In order to avoid hypovolemia & hypoperfusion, proper intraoperative fluid treatment is necessary. The ERAS protocol states that improved surgical outcomes after abdominal procedures are associated with stringent intraoperative fluid management.[32] A restricted fluid balance was associated with a markedly increased risk of postoperative abdominal pain (POAP) & postoperative pancreatic discomfort in individuals with a soft pancreatic residual. Customised intraoperative fluid management in these patients may lower the incidence of postoperative pancreatic fistula &, consequently, the risk of postoperative sequelae. [33]

The most referenced model for predicting postoperative pancreatic fistula (POPF) is the validated Fistula Risk Score (FRS) developed by Callery et al.[34] The FRS forecasts POPF based on pancreatic texture, pancreatic duct diameter, intraoperative blood loss, & final pathology.Numerous revisions of risk scoring methods were implemented. Serum amylase on postoperative day 1 may potentially be incorporated into scoring systems for enhanced prediction of postoperative pancreatic fistula (POPF).

CONCLUSION

In conclusion, a soft pancreatic texture, a main pancreatic duct diameter <4mm, blood loss more than 350 ml, carcinoma head of pancreas & the serum amylase level were risk factors for pancreatic fistula after pancreaticoduodenectomy.

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