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Rate And Grade of Postoperative Pancreatic Fistula After Modified Blumgart Pancreaticojejunostomy in Pancreaticoduodenectomy

Awal MA[1*], Mazumder N[2], Talukder MT[3], Islam KM[4], Azam ANMN[5], Elahi MM[6], Bhuiyan NH[7]

[1]*Dr. Mohammad Abdul Awal, Senior Consultant, Department of Surgery, Dhaka Medical College Hospital, Dhaka, Bangladesh*

[2]*Dr. Nazma Mazumder, Medical Officer, Cumilla Medical College hospital, Cumilla, Bangladesh*

[3]*Dr. Md Tuhin Talukder, Junior Consultant, Department of Surgery, Dhaka Medical College Hospital, Dhaka, Bangladesh*

[4]*Dr. Kazi Mazharul Islam, Junior Consultant, Department of Surgery, Dhaka Medical College Hospital, Dhaka, Bangladesh*

[5]*Junior Consultant, Department of Surgery, Sheikh Hasina National Institute of Burn and Plastic Surgery, Dhaka, Bangladesh*

[6]*Dr. Mohammad Mahbub Elahi, Senior Consultant, Department of Surgery, Dhaka Medical College Hospital, Dhaka, Bangladesh*

[7]*Professor Nur Hossain Bhuiyan, Department of Surgery, Dhaka Medical College Hospital, Dhaka, Bangladesh*

Abstract

Introduction: *Pancreaticoduodenectomy (PD), commonly known as the Whipple procedure, is the standard surgical approach for treating pancreatic and periampullary cancers. Despite advancements in surgical techniques, postoperative pancreatic fistula (POPF) remains one of the most significant complications following PD, contributing to increased morbidity. This study aims to evaluate the development and severity of POPF in patients undergoing PD with the Modified Blumgart Pancreaticojejunostomy.*

Methods: *This Cross-sectional Observational study was carried out among the indoor patients of surgery units in Dhaka Medical College & Hospital, Dhaka, from January 2023 to December 2023. All patients who experienced Pancreatoduodenectomy in the Surgery department of Dhaka Medical College & Hospital during the study period were considered as the study population. A total of 30 patients were selected as study subjects by purposive sampling technique. Consent from patients and relevant authorities was taken. Univariate and multivariate analysis of the data was carried out using a statistical analysis software program. Descriptive analysis of continuous variables was carried out and showed as the means ± SD.*

Result: *This study involved 30 patients, with the majority (36.6%) aged between 40-50 years and male predominance (63.3%). Most patients (50%) were diagnosed preoperatively with periampullary carcinoma, followed by pancreatic carcinoma (40%). Postoperative pancreatic fistula occurred in 13.3% of patients, with the majority (75%) being Grade B fistulas, and 25% classified as Grade A. No Grade C fistulas were observed.*

Conclusion: *Placing sutures between the pancreatic tissue and the jejunum carries a risk of pancreatic juice leakage due to needle holes or injury to the pancreatic tissue, particularly in patients with a soft pancreas. Therefore, this study suggests that an anastomosis technique utilizing fewer sutures may be more advantageous. The original Blumgart anastomosis employed four to six trans pancreatic/jejunal seromuscular sutures, whereas our approach utilized only one to three. Additionally, the modified Blumgart technique ensured complete coverage of the pancreatic stump with jejunal serosa through the modified lateral suture that penetrates the seromuscular layer of the jejunum.*

Keywords: *Postoperative Pancreatic Fistula, Modified Blumgart Pancreaticojejunostomy, Pancreaticoduodenectomy*

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I. Introduction

Pancreaticoduodenectomy (PD) is an usual surgical procedure for pancreatic & periampullary malignancy [1-3]. Allen Oldfather Whipple standardized this procedure in 1940 [4]. After that, multiple techniques have been described to make it safe [5,6]. In classical PD, the pancreatic head with distal stomach, duodenum, proximal jejunum, gall bladder, and distal common bile duct is resected. After those three anastomoses are performed namely Pancreaticojejunostomy, hepaticojejunostomy, and gastrojejunostomy. Pancreaticojejunostomy (PJ) is the most vulnerable, with potential for leakage, and is considered as Achilles' heel [7]. To safeguard PJ, several technical modifications were carried out [8]. These include the use of internal/external pancreatic stent, performing Pancreaticogastrostomy (PG), and reinforcement of anastomosis [4]. More than 80 different techniques of PJ have been described in the literature [5]. Despite all efforts operative complications are high after PD even in specialized centers. Post-PD complications are post-operative pancreatic fistula (POPF), intra-abdominal hemorrhage, intra-abdominal abscess, bile leakage, wound dehiscence, surgical site infection, and many more [7,8]. The most grievous is POPF, incidence is about 10-30% [7-10]. Most of the other complications are consequences of POPF [11]. Mortality after PD is 2-4%, which almost depends on the evolution of POPF [12]. To prevent these morbidities and mortality it is necessary to adopt a safer technique [12]. Pancreatic anastomosis is influenced by many factors like gland texture, duct diameter, nutritional status, per operative bleeding, meticulous surgery, type of suture, administration of octreotide & surgeon experience [4-6]. As the anastomotic technique has gross effects on POPF, different techniques of PJ have evolved, [6] like Dunking and duct-to-mucosa procedure, etc. Studies showed that the outcomes of these are good and no significant differences in terms of POPF [8]. Most of these techniques create a shearing force on pancreatic remnants from the sutures that are placed tangentially to the capsule, which is the most significant factor for POPF [9]. To avoid this problem Blumgart and colleagues developed a new method of PJ with transpancreatic mattress suture in 2000 [5-8]. Later, the original Blumgart technique was modified by decreasing the number of transfixing sutures and by bringing some changes to knotting. This is known as the Modified Blumgart technique (MBT). In this technique, multiple monofilament mattress sutures were placed through and through the pancreatic parenchyma. As a result, there was no shearing effects [11]. Literature shows that if previously mentioned factors can be addressed properly, POPF is significantly low (<10%) in MBT of PJ [2-4]. The present study aimed to assess the rate & grade of postoperative pancreatic fistula after Modified Blumgart Pancreaticojejunostomy in pancreaticoduodenectomy.

II. Methods

This Cross-sectional Observational study was carried out among the indoor patients of surgery units in Dhaka Medical College & Hospital, Dhaka, from January 2023 to December 2023. All patients who experienced Pancreatoduodenectomy in the Surgery department of Dhaka Medical College & Hospital during the study period were considered as the study population. A total of 30 patients were selected as study subjects by purposive sampling technique. Consent from patients and relevant authorities was taken. Acquisition of information regarding particulars of the patient, history, clinical examination findings, preoperative investigations, operation notes, and histopathological findings of resected specimens were collected by a preformed data collection sheet. Univariate and multivariate analysis of the data was carried out using a statistical analysis software program. A descriptive analysis of continuous variables was carried out and showed as the means ± SD.

Inclusion criteria:

- Patients received Modified Blumgart Anastomosis after pancreatoduodenectomy for various reasons.
- Age between 40 to 75 years.

Exclusion criteria:

- Patients required liver resection with PD.
- Patients required pancreaticogastrostomy or duct to mucosa anastomosis.
- Patient with concomitant other malignancy.
- The patient having a history of previous upper GIT resection surgeries.

III. Results

Table 1: Distribution of patients according to age (years) (N=30)

Age group (in years)	n	%
40 – 50	11	36.6
51 – 60	8	26.6
61 – 70	10	33.3
71 – 75	1	3.3
Mean age ±SD (in years)	20.00±10.00	
Age range (in years)	40 - 75	

It was observed that most of the patients were between 40 – 50 years (36.6%) and next most were 61 – 70 years (33.3%) of age [Table 1].

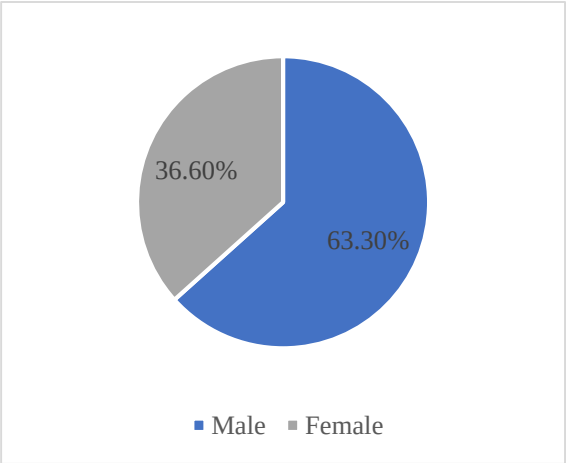

Figure 1: Distribution of patients according to sex (N=30)

Figure 1 shows that out of 30 patients, 63.3% were male, and rest 36.6% were female. The male-to-female ratio was 3:2.

Table 2: Distribution of patients according to preoperative diagnosis (n=30)

Diagnosis	n	%
Carcinoma of Pancreas	12	40.0
Periampullary Carcinoma	15	50.0
Distal Cholangiocarcinoma	2	6.6
Carcinoma of Duodenum	1	3.3

It was observed that 50% of patients had a preoperative diagnosis of periampullary carcinoma while carcinoma of the pancreas stood next with 40% and distal cholangiocarcinoma was 6.6% [Table 2].

Table 3: Distribution of patients according to progress of postoperative pancreatic fistula (N=30)

Comment	n	%
Yes	04	13.3
No	26	86.8

Table 3 shows that 13.3% (n=04) of patients developed post-operative pancreatic filtrate [Table 3].

Table 4: Distribution of patients according to grade of postoperative pancreatic fistula (n=04)

Grade	n	%
A	01	25.0
B	03	75.0
C	00	0.0

Table 4 shows that 75% (n=03) of post-operative pancreatic filtrate were Grade B, 25% (n=01) were Grade A and none were found to be Grade C [Table 4].

IV. Discussion

POPF is a critical factor contributing to postoperative morbidity and mortality. It is often linked to abscess formation, which can lead to abdominal sepsis or life-threatening erosional bleeding. Clinically significant POPF can result in extended hospital stays and longer durations in intermediate care units, subsequently impacting overall treatment costs [12]. Identified risk factors include soft pancreatic parenchyma, pancreatic lesions without pancreatitis, small pancreatic duct diameter (<3 mm), and significant blood loss (>500 mL) [13-15]. Additionally, a high body mass index (BMI) is a risk factor, likely due to pancreatic steatosis commonly observed in obese individuals [13, 16-18]. Advanced age is also associated with pancreatic steatosis [17]; however, while older age was previously considered a determinant for POPF [19], this has not been corroborated by recent studies [20,21]. Male gender has also been cited by several authors as a determinant [13, 21-22]. Numerous anastomosis techniques have been proposed for pancreatojejunostomy following pancreatic head resection. Chromik [23] notes that each surgical center tends to develop its own specific technique, complicating comparisons between methods. Various strategies have been explored to mitigate the rate of POPF, indicating that no single technique is ideal. Studies on the modified Blumgart technique recommend its advantages over conventional pancreatojejunostomy, with the potential to lower the incidence of clinically related POPF and related postoperative complications. In the initial publication regarding the Blumgart anastomosis, 187 patients who undertook pancreatic head resection were analyzed. The authors reported a mortality rate of 1.6% and a very low POPF rate (grades B and C) of 6.9% [3]. Kleespies et al. conducted a comparative study. Their findings indicated a significantly reduced rate of POPF (4%), shorter operation times, decreased postoperative hemorrhage, shorter stays in intermediate care units, and fewer surgical and general complications following the modified Blumgart anastomosis [24]. Similar outcomes were reported in another study, which demonstrated a lower incidence of POPF and overall complications associated with the Blumgart anastomosis [25]. A recent study highlighted the Blumgart anastomosis's potential to lower both adverse complications and the rate of "grade C" POPF when compared to duct-to-mucosa anastomosis, as well as reducing complications and 90-day mortality compared to the invagination pancreatojejunostomy technique [26]. An upcoming large multicentred randomized controlled trial (RCT) comparing the conventional Cattell-Warren anastomosis with the Blumgart anastomosis is expected to provide further insights [27]. Current data analysis suggests that the modified Blumgart anastomosis may effectively decrease the rate of POPF, particularly for cases involving soft pancreatic parenchyma, while also being straightforward to implement and resulting in shorter operation times.

Limitations of The Study

The study was conducted in a single hospital with an insignificant sample size. So, the results may not represent the whole community.

V. Conclusion

Placing sutures between the pancreatic tissue and the jejunum carries a risk of pancreatic juice leakage due to needle holes or injury to the pancreatic tissue, particularly in patients with a soft pancreas. Therefore, this study suggests that an anastomosis technique utilizing fewer sutures may be more advantageous. The Blumgart anastomosis employed four to six trans pancreatic/jejunal seromuscular sutures, whereas our approach utilized only one to three. Additionally, the modified Blumgart technique ensured complete support of the pancreatic stump with jejunal serosa through the modified lateral suture that penetrates the seromuscular layer of the jejunum. These modifications resulted in more favorable outcomes.

VI. Recommendation

A multicentered, double-blinded comparative study conducted in divisional and tertiary hospitals across Bangladesh is recommended to provide a more comprehensive understanding of the outcomes. Such a study should involve a larger sample size with extended follow-up periods to ensure the reliability of the findings.

Additionally, adopting a multidisciplinary research approach would enhance the accuracy and authenticity of the study, contributing to a more precise evaluation of the technique and its long-term impact.

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