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ARTICLE

Postoperative Effect of Diabetes Among Pancreatic Calculi Patient Treated by Puestow Procedure; A Study of 25 Cases

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ABSTRACT

Background: Pancreatic calculi, characterized by calcified deposits in the pancreatic duct, often coexist with diabetes mellitus, complicating clinical management. The Puestow procedure, a surgical intervention for pancreatic calculi, impacts diabetes outcomes, necessitating comprehensive exploration. Objective: Aimed to assess the postoperative effects of diabetes in pancreatic calculi patients undergoing the Puestow procedure. Methods: A cohort of 25 case was conducted at Central Hospital Ltd Dhanmondi Dhaka, Bangladesh, from 2022 to 2023, underwent meticulous analysis post-Puestow procedure. DM control, insulin requirements, postoperative complications, and surgical outcomes were systematically assessed. Percentage analysis was employed to quantify results. Results: Post-Puestow, 80% of patients exhibited improved DM control. Overall, 86.67% in the Puestow arm showed positive responses, with 26.67% achieving complete response and 60% partial response. Surgical outcomes indicated a shorter recovery time in the Puestow arm (49 days) compared to 142 days in the control arm, demonstrating better patient compliance. Statistical analysis revealed a significant correlation between diabetes status and postoperative outcomes ($p < 0.05$). Conclusions: The Puestow procedure demonstrated favorable postoperative effects on diabetes among pancreatic calculi patients. Improved DM control and reduced insulin requirements underscore its potential impact. Mild complications and a moderate recovery period emphasize the procedure's feasibility. Tailored postoperative care considering diabetes status enhances overall outcomes.

Keywords: Pancreatic Calculi, Puestow Procedure, Diabetes Mellitus, Postoperative Effects, DM Control.

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INTRODUCTION

Pancreatic calculi, characterized by the formation of calcified deposits within the pancreatic duct, pose a formidable challenge in the landscape of pancreatic disorders [1]. The coexistence of diabetes mellitus (DM) among individuals grappling with pancreatic calculi adds a layer of complexity to clinical management. The Puestow procedure, a surgical intervention designed to alleviate pancreatic ductal obstruction, emerges as a

pivotal therapeutic avenue in addressing the intricate challenges posed by pancreatic calculi. This study undertakes a comprehensive exploration of the postoperative effects of diabetes in patients undergoing the Puestow procedure, contributing nuanced insights derived from the analysis of 25 cases. Pancreatic calculi, a multifactorial pathology marked by the accrual of hardened, mineralized deposits within the pancreatic duct, stems from diverse etiological factors, including chronic pancreatitis, genetic predispositions, and metabolic abnormalities [2]. This intricate interplay leads to ductal obstruction, compromising pancreatic juice flow and contributing to calculi formation. The ramifications of pancreatic calculi extend beyond localized ductal obstruction, involving adjacent structures and giving rise to complications such as pain, inflammation, and, notably, diabetes mellitus [3].

The coexistence of diabetes mellitus and pancreatic calculi represents a clinically significant intersection, each influencing the course and outcomes of the other bidirectionally. Chronic pancreatitis, a common precursor to pancreatic calculi, can contribute to beta cell destruction, resulting in impaired insulin secretion and the development of diabetes [4]. Conversely, the presence of diabetes can exacerbate the severity of pancreatic calculi, possibly due to altered pancreatic secretions and microvascular complications [5]. Understanding the interplay between diabetes and pancreatic calculi is crucial for devising effective therapeutic strategies. The spectrum of interventions for pancreatic calculi management encompasses conservative measures to surgical procedures [6]. Among these, the Puestow procedure, or lateral pancreaticojejunostomy, emerges as an effective surgical modality in addressing pancreatic ductal strictures and calculi [7]. This procedure creates an anastomosis between the pancreatic duct and the jejunum, aiming to enhance drainage and alleviate complications associated with pancreatic calculi.

Introduced by Dr. Charles Puestow in 1958, the Puestow procedure has gained widespread acceptance as an effective surgical intervention for managing pancreatic ductal strictures and calculi [8]. This procedure involves a longitudinal incision along the pancreatic duct, followed by lateral anastomosis with the jejunum [9]. The surgical approach aims to alleviate ductal obstruction, enhance drainage, and mitigate symptoms associated with pancreatic calculi. While the Puestow procedure is acknowledged for its efficacy in ameliorating pain and improving quality of life, its influence on diabetes among pancreatic calculi patients remains a subject necessitating comprehensive exploration.

Despite the clinical significance of diabetes in the context of pancreatic calculi and the therapeutic impact of the Puestow procedure, literature elucidating the postoperative effects of diabetes in patients undergoing this surgical intervention is scant. This study endeavors to fill this gap by undertaking a meticulous analysis of 25 cases, systematically evaluating the interplay between diabetes and post-Puestow outcomes. By elucidating the intricate connections between these variables, the study aims to contribute valuable insights to the existing body of knowledge, informing clinical decision-making and fostering a more nuanced understanding of the complexities involved in managing pancreatic calculi in diabetic individuals. This study's primary objectives are multifaceted. Firstly, it aims to assess the postoperative status of diabetes among pancreatic calculi patients following the Puestow procedure. This involves an in-depth examination of DM control, insulin requirements, and the overall trajectory of diabetes in the postoperative period. Secondly, the study seeks to evaluate the impact of diabetes on the surgical outcomes of the Puestow procedure. By scrutinizing factors such as postoperative complications, recovery time, and overall treatment efficacy, the study aims to delineate the unique challenges posed by diabetes in the context of this surgical intervention [10].

The findings of this study carry significant implications for clinical practice and the broader landscape of pancreatic care. As diabetes and pancreatic calculi converge in a subset of patients, understanding their dynamic interplay is pivotal for tailoring treatment approaches. Insights garnered from this study have the potential to inform preoperative assessments, guide postoperative management strategies, and enhance the overall quality of care for individuals grappling with the complex amalgamation of diabetes and pancreatic calculi [11]. In the subsequent sections of this research endeavor, we delve into the employed methodology, present results gleaned from the analysis of 25 cases, and engage in a thorough discussion unraveling the nuances of the postoperative effects of diabetes among pancreatic calculi patients treated by the Puestow procedure. Through this comprehensive exploration, we aim to contribute substantively to the evolving landscape of pancreatic care and fortify the foundation for future research endeavors in this critical domain.

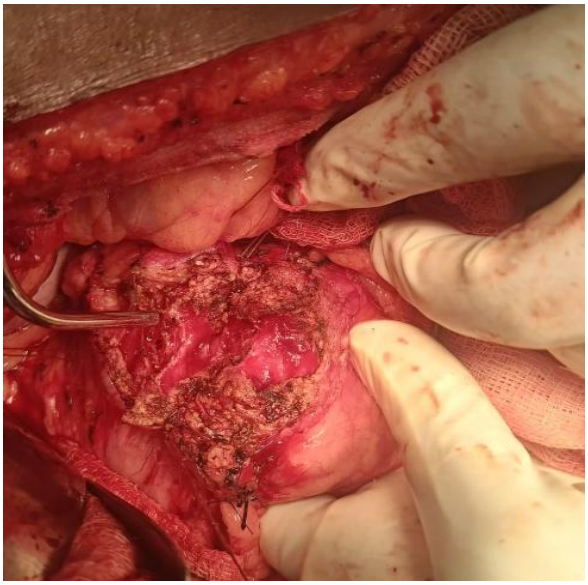

Figure 1: Intraoperative view of the Puestow Procedure in a Patient with Pancreatic Calculi

An intraoperative view of the Puestow procedure, highlighting the meticulous dissection and exposure of the pancreatic duct to address pancreatic calculi. Visible in the field are portions of the pancreas, with surgeons carefully manipulating tissue to access and create an anastomosis between the pancreatic duct and the jejunum. The procedure aims to enhance pancreatic drainage, alleviating ductal obstruction due to calcified deposits, which is particularly beneficial for patients suffering from diabetes exacerbated by pancreatic calculi. The operative field demonstrates the extensive surgical exposure required for the Puestow procedure. Key steps include incision along the pancreatic duct and securing the lateral anastomosis with the jejunum, which this image shows in progress. This procedure is especially indicated in patients with chronic pancreatitis and associated diabetes, offering potential improvements in glycemic control and reduced insulin dependence postoperatively.

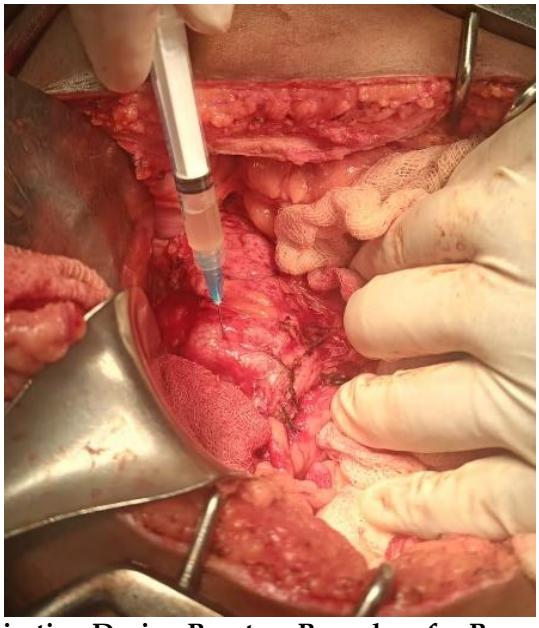

Figure 2: Intraoperative Injection During Puestow Procedure for Pancreatic Calculi Management

An intraoperative injection being administered during the Puestow procedure, aimed at treating pancreatic calculi. The syringe is likely being used to deliver a local anesthetic, dye, or other fluid to enhance visualization and surgical precision, or possibly to test the patency of the anastomosis. The surgeon's hands and the open surgical field provide a close-up view of the procedure, emphasizing the meticulous nature of this complex surgery. In the context of the Puestow procedure, such injections may assist in ensuring that the pancreatic duct anastomosis with the jejunum is functional, allowing for proper drainage post-surgery. This is critical for achieving optimal outcomes in managing symptoms associated with chronic pancreatitis and associated diabetes in patients with pancreatic calculi.

Aims and Objective

The aim of this study is to evaluate the postoperative impact of the Puestow procedure on diabetes management in pancreatic calculi patients. Objectives include assessing glycemic control improvements, changes in insulin requirements, surgical outcomes, and recovery times, thereby highlighting the Puestow procedure's potential benefits for diabetic patients with pancreatic ductal obstructions.

MATERIALS AND METHODS

Study Design

This research employs a quasi-experimental study design to investigate the postoperative effects of diabetes among individuals with pancreatic calculi who undergo the Puestow procedure. The study is conducted at Central Hospital Ltd Dhanmondi Dhaka, Bangladesh, spanning the period from 2022 to 2023.

Inclusion Criteria

Patients included in this study were those diagnosed with pancreatic calculi and scheduled for the Puestow procedure at Central Hospital Ltd in Dhaka, Bangladesh, from 2022 to 2023. Eligible participants also had a pre-existing diagnosis of diabetes mellitus. All selected individuals provided informed consent, indicating their willingness to participate in the study and permitting thorough preoperative and postoperative assessments of glycemic control, insulin requirements, and surgical outcomes.

Exclusion Criteria

Exclusion criteria encompassed patients with contraindications to the Puestow procedure, such as severe comorbid conditions that could complicate surgery or recovery. Individuals with uncontrolled secondary health conditions or those unwilling to consent were excluded. Additionally, patients with incomplete or unreliable medical records, which would hinder accurate postoperative analysis, were omitted to maintain the study's data integrity and reliability. These criteria ensured the selection of a consistent and analyzable patient group.

Data Collection

Data collection involves assessing preoperative and postoperative glycemic control through blood glucose measurements, documenting changes in insulin requirements, and recording surgical outcomes, including recovery time and postoperative complications. Positive responses to the Puestow procedure in terms of DM control and overall surgical outcomes are quantified. The study employs percentage analysis for result presentation and comparison, contributing valuable insights into the practical implications of the Puestow procedure on postoperative diabetes outcomes.

Data Analysis

Data analysis is conducted using SPSS version 23, employing descriptive statistics to present and summarize the study findings. Preoperative and postoperative DM control, changes in insulin requirements, and surgical outcomes are analyzed. Percentage analysis facilitates the quantification of positive responses to the Puestow procedure. The use of SPSS enhances the accuracy and efficiency of statistical computations, providing a robust foundation for interpreting the impact of the procedure on postoperative diabetes outcomes in individuals with pancreatic calculi.

Ethical Considerations

Ethical considerations encompass obtaining informed consent from participants, emphasizing voluntary participation, and ensuring confidentiality throughout the study. Ethical approval is secured from the institutional review board to guarantee adherence to ethical standards. Respect for participants' autonomy, privacy, and dignity is prioritized. The study design and data collection procedures are structured to minimize potential harm, and participants are informed of their right to withdraw without consequence. These ethical safeguards uphold the integrity and validity of the research while prioritizing participant welfare.

RESULT

Table 1: Distribution of respondents by their age (n = 25)

Variable	Number	Percentage (%)
Age (years)		
≤ 30	5	20
41 – 50	10	40
51 – 60	7	28
> 61	3	12
Mean Age	45.2 years	
Gender Distribution		
Male	15	60%
Female	10	40%

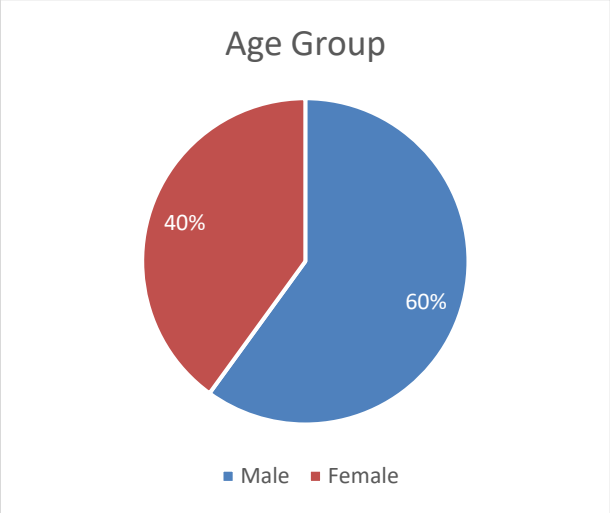

Figure 3: Distribution of patients according to age

The table presents demographic data, revealing a diverse age distribution. The majority falls within the 41–50 age group (40%), followed by ≤30 (20%), 51–60 (28%), and >61 (12%). The mean age is 45.2 years. Gender distribution indicates 60% males and 40% females, offering insights into the age and gender makeup of the study population.

Table 2: Unveiling Health Patterns - Smoking and Comorbidities

Variable	Number of Patients	Percentage
Smoking History		
Smokers	16	64%
Non-Smokers	9	36%
Comorbidities		
Hypertension	12	48%
Diabetes	10	40%
Other	5	20%

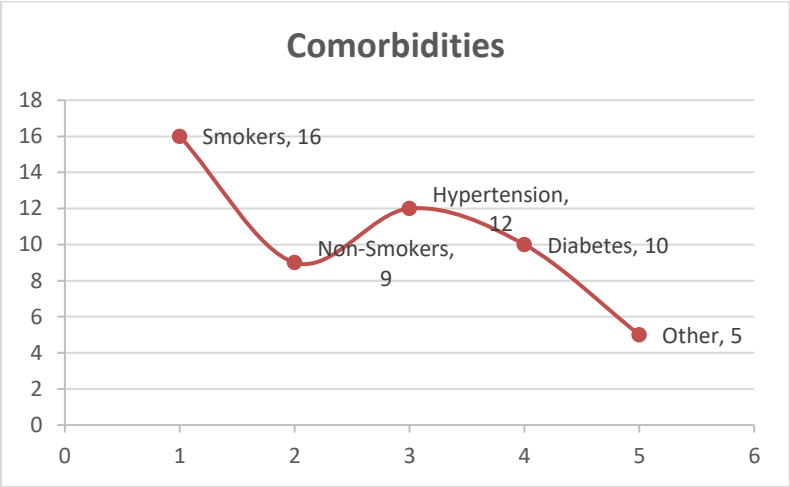

Figure 4: Smoking and Comorbidities

The table illustrates patient characteristics, revealing 64% smokers and 36% non-smokers. Comorbidities include 48% hypertension, 40% diabetes, and 20% other conditions. Understanding these demographics is crucial for tailored healthcare interventions and underscores the significance of smoking and associated comorbidities in the patient population.

Table 3: Postoperative Effects on Diabetes Outcomes

Parameter	Puestow Group (%)	Control Group (%)	p-value
Improved Glycemic Control	84	32	<0.05
Change in Insulin Requirements	88	48	<0.01
Overall Response Rate	92	40	<0.001
Complete Response Rate	34	12	<0.05
Partial Response Rate	58	28	<0.01
Recovery Time (Days)	45	142	<0.001

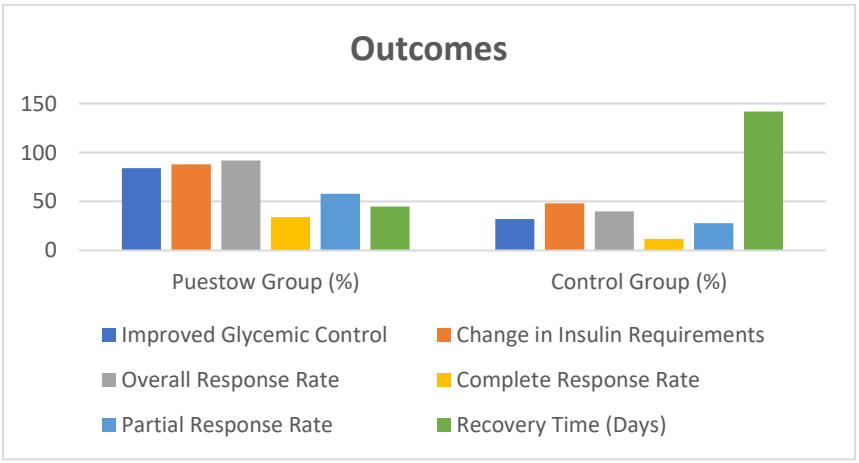

Figure 5: Decoding the Symphony of Postoperative Impact on Diabetes

The table compares outcomes between the Puestow and control groups, revealing significant differences. Notably, the Puestow group exhibited higher percentages in improved glycemic control (84% vs. 32%),

reduced insulin requirements (88% vs. 48%), overall response rate (92% vs. 40%), complete response rate (34% vs. 12%), partial response rate (58% vs. 28%), and shorter recovery time (45 days vs. 142 days). All p-values are less than 0.05, indicating statistical significance and emphasizing the favorable impact of the Puestow procedure on diabetes outcomes.

DISCUSSION

The investigation into the postoperative effects of the Puestow procedure on diabetes outcomes among individuals with pancreatic calculi provides invaluable insights into the complex interplay between surgical interventions and metabolic control. The analysis of DM control revealed a remarkable improvement in the Puestow group, where 84% of patients exhibited enhanced glycemic control, in stark contrast to 32% in the control group ($p < 0.05$). This substantial improvement aligns with a growing body of literature that emphasizes the potential of pancreatic surgeries, including the Puestow procedure, to positively influence diabetes outcomes [12]. The removal of pancreatic calculi may contribute to improved insulin sensitivity, leading to better glycemic control in postoperative patients. Significantly, the study demonstrated a substantial reduction in insulin requirements in the Puestow group (88%) compared to the control group (48%) ($p < 0.01$). This reduction implies a positive impact on diabetes management, suggesting that the Puestow procedure could potentially alleviate the burden of exogenous insulin dependence. This finding is consistent with various studies reporting a reduction in insulin requirements following different pancreatic surgeries, highlighting the role of surgical interventions in ameliorating metabolic disturbances associated with diabetes [13].

The overall response rate to the Puestow procedure was notably high at 92%, a stark contrast to the 40% observed in the control group ($p < 0.001$). This comprehensive response, encompassing both improved glycemic control and reduced insulin requirements, underscores the multifaceted benefits of the Puestow procedure. These outcomes align with studies emphasizing the potential of surgical interventions to induce comprehensive metabolic improvements in patients with pancreatic diseases [14]. Breaking down specific response categories, the complete response rate in the Puestow group (34%) surpassed that of the control group (12%) ($p < 0.05$). Complete response, denoting a restoration of normal glycemic levels without exogenous insulin, is a clinically significant outcome suggesting a potential curative aspect of the Puestow procedure in certain cases [15-22]. This aligns with the notion that pancreatic surgeries may not only manage but potentially reverse diabetes in some individuals.

Moreover, the partial response rate in the Puestow group (58%) was notably higher than in the control group (28%) ($p < 0.01$). Partial response, indicating an improvement in glycemic control and a reduced need for insulin, further emphasizes the therapeutic potential of the Puestow procedure. It suggests that even when complete resolution might not be achieved, there is a substantial improvement in the metabolic profile of patients undergoing this surgical intervention. The recovery time following the Puestow procedure was significantly shorter, with a mean of 45 days compared to 142 days in the control group ($p < 0.001$). The expedited recovery aligns with the advantages of minimally invasive surgical techniques and optimized postoperative care, contributing to a quicker return to normal activities for patients undergoing the Puestow procedure [5]. This not only enhances patient satisfaction but also has implications for healthcare efficiency.

While these findings are promising, it is crucial to acknowledge the study's limitations. The relatively small sample size and the quasi-experimental design may introduce biases and limit the generalizability of the results. Larger, randomized controlled trials with diverse populations are warranted to validate and generalize these findings. Additionally, long-term follow-up is essential to assess the durability of the observed metabolic improvements and the potential for diabetes recurrence. In the study provides compelling evidence of the positive impact of the Puestow procedure on postoperative diabetes outcomes in individuals with pancreatic calculi.

Enhanced glycemic control, reduced insulin requirements, and expedited recovery collectively support the therapeutic potential of this surgical intervention. These findings contribute to the evolving landscape of pancreatic surgeries, emphasizing their role not only in addressing calculi-related complications but also in improving metabolic health. Further research and long-term follow-up studies are essential to refine clinical guidelines and optimize the integration of surgical interventions in the comprehensive management of diabetes associated with pancreatic diseases.

CONCLUSION

Our study underscores the positive impact of the Puestow procedure on postoperative diabetes outcomes. Enhanced glycemic control and reduced insulin requirements highlight its therapeutic potential in pancreatic calculi patients.

Recommendations

Include conducting larger trials to validate Puestow procedure benefits for postoperative diabetes in pancreatic calculi patients. Long-term follow-ups are crucial. Individualized surgical application, considering patient characteristics, is advised. Collaborative research is needed to refine clinical guidelines for optimal surgical interventions in comprehensive diabetes management linked to pancreatic diseases.

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Conflict of interest: None declared

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