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Original Research Article

Postoperative Morbidity and Mortality Following Whipple's Procedure for Solid Pseudopapillary Tumors: A Retrospective Study in Bangladesh

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Abstract: ***Background*:** Solid pseudopapillary tumors (SPTs) of the pancreas are rare neoplasms presenting unique surgical challenges. The Whipple's procedure remains pivotal in management, albeit with potential complications. ***Objective:*** To evaluate postoperative morbidity and mortality following the Whipple's procedure for SPTs in Bangladesh, determining complication incidence, analyzing operative variables, and accurately identifying significant predictors of patient outcomes. ***Methods:*** A retrospective study was conducted from January 2018 to December 2023 at the Department of Hepatobiliary, Pancreatic & Liver Transplantation Surgery, Bangabandhu Sheikh Mujib Medical University, Al-Manar Hospital Ltd and Central Hospital Ltd, Dhaka. Thirty-five patients underwent the Whipple's procedure for SPTs were retrospectively analyzed. Data on demographics, operative details, intraoperative blood loss, and postoperative complications were collected. Statistical analysis included calculation of means, standard deviations, and significance testing ($p<0.05$). ***Results:*** Among 35 patients (mean age 32 ± 8 years), the overall complication rate was 11.4% (n=4). Minor complications, such as delayed gastric emptying and wound infections, were noted, with major adverse event pancreatic fistula reported. The mean operative time was 360 ± 45 minutes, and the average intraoperative blood loss was 500 ± 120 mL. A statistically significant correlation was observed between prolonged operative time and increased postoperative morbidity ($p=0.03$). The average hospital stay was 12 ± 3 days, with perioperative improvements contributing to a 15% reduction in length of hospitalization compared to historical controls. ***Conclusions:*** The Whipple's procedure for SPTs demonstrates acceptable morbidity with zero mortality. Strategic perioperative enhancements significantly reduce hospital stay, underscoring the procedure's safety and efficacy in Bangladesh.

Keywords: Whipple's procedure; Solid pseudopapillary tumor; Pancreatic surgery; Postoperative morbidity.

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Introduction

In recent decades, the evolution of pancreatic surgery has marked a transformative era in the management of rare neoplasms, particularly the solid pseudopapillary tumor (SPT) of the pancreas—an enigmatic and low-grade malignant

entity that predominantly afflicts young women and presents a unique clinical challenge due to its indolent behavior yet potential for aggressive transformation.[1] This investigation is particularly salient given the intricate balance between achieving oncologic clearance and mitigating the inherent risks of this complex surgical intervention. The Whipple's procedure, originally devised for the management of periampullary and pancreatic head malignancies, has undergone significant refinement over the years and now serves as a cornerstone in the resection of a spectrum of pancreatic neoplasms, including SPTs, whose surgical management demands a high degree of technical precision and an astute perioperative strategy.[2] The rarity of SPTs, compounded by the dearth of robust epidemiological data in South Asian populations, especially in Bangladesh, necessitates a focused inquiry into the morbidity and mortality profiles that ensue following such an extensive surgical procedure. This study leverages a retrospective design spanning over a decade from a leading tertiary care center in Bangladesh, thereby providing an invaluable perspective on the interplay between resource constraints, surgical expertise, and patient outcomes in a developing country context .[3] SPTs, though infrequent in occurrence, are characterized by distinct histopathological features, including a combination of solid and pseudopapillary patterns, and immunohistochemical profiles that typically reveal aberrant nuclear expression of β-catenin, alongside markers such as vimentin and progesterone receptors, which have been postulated to influence both tumor behavior and responsiveness to therapy.[4, 5] These molecular insights not only enrich our understanding of the tumorigenesis of SPTs but also hold promise for the development of targeted therapeutic strategies that may complement surgical intervention. The current research meticulously catalogs operative parameters such as duration of surgery, intraoperative blood loss, and the extent of lymphadenectomy, and correlates these variables with a comprehensive range of postoperative complications—from pancreatic fistula formation, delayed gastric emptying, and wound infections to cardiovascular events and sepsis—which collectively contribute to postoperative morbidity and mortality.[6, 7] Such detailed operative and postoperative profiling is essential in discerning the multifactorial etiology of adverse outcomes and in formulating strategies to enhance patient safety and improve prognostic accuracy. The significance of examining postoperative morbidity in the context of the Whipple's procedure cannot be overstated, particularly given the high-risk nature of pancreatic surgery. The complexity of the procedure, compounded by the anatomical proximity of major vascular structures and the potential for significant intraoperative blood loss, often predisposes patients to a cascade of postoperative complications that can adversely affect both short-term recovery and long-term survival.[8] In Bangladesh, where healthcare infrastructure may face limitations in terms of specialized surgical centers and advanced perioperative care facilities, the need for an evidence-based framework to optimize surgical outcomes becomes even more pressing.[9] Our retrospective analysis not only quantifies the incidence of complications but also elucidates the contributory roles of preoperative comorbidities, nutritional status, and the timing of surgical intervention in shaping the postoperative trajectory. The incorporation of rigorous statistical methodologies to assess correlations between these variables further reinforces the study's potential to inform clinical protocols and guide future Retrospective research in this domain.[10] Moreover, the present study situates its inquiry within the broader global context of pancreatic surgery, drawing comparisons with international benchmarks and highlighting both congruities and disparities in outcomes. Recent global trends have underscored the utility of multidisciplinary approaches in managing pancreatic neoplasms, advocating for the integration of advanced imaging, molecular diagnostics, and enhanced recovery after surgery (ERAS) protocols to minimize morbidity and expedite postoperative convalescence.[11, 12] By meticulously comparing our findings with those reported in high-volume centers worldwide, this research underscores the transformative impact that the consolidation of surgical expertise and the adoption of standardized perioperative protocols can have on patient outcomes. The implications of such an approach are profound, as they suggest that even in resource-limited settings, the adoption of evidence-based practices can significantly ameliorate the risks associated with complex pancreatic resections.[13] Furthermore, the epidemiological landscape of

pancreatic tumors in Bangladesh is undergoing a dynamic transformation, influenced by factors such as improved diagnostic capabilities, increased clinical awareness, and evolving healthcare policies. Although SPTs represent a minor subset of pancreatic neoplasms, their unique clinical and pathological features necessitate a tailored surgical approach that diverges from the conventional management strategies employed for more common pancreatic malignancies.[14] In this light, our study not only addresses a critical gap in the literature regarding the management of SPTs in a Bangladeshi cohort but also lays the groundwork for future investigations that may explore the genetic and environmental underpinnings of these tumors in South Asia. Such localized research is imperative for the development of context-specific treatment algorithms that account for the demographic, socioeconomic, and infrastructural idiosyncrasies of the region.[15] In synthesizing clinical data with molecular insights and epidemiological trends, this research delineates a comprehensive narrative that elucidates the complex interplay between surgical intervention and postoperative outcomes in patients with SPTs. The findings from this retrospective analysis not only have immediate clinical relevance—by informing risk stratification and surgical planning—but also possess broader implications for healthcare policy, particularly in advocating for enhanced investment in surgical infrastructure and specialized training programs. The ability to systematically evaluate and subsequently reduce postoperative complications is paramount in improving the overall survival and quality of life for patients undergoing the Whipple's procedure. In doing so, the study underscores the critical importance of continuous innovation in surgical technique and perioperative management, thereby contributing to the ongoing evolution of pancreatic surgery as a discipline.[16] Ultimately, the current investigation provides a robust, evidence-based framework that bridges the gap between theoretical advances in pancreatic surgery and their practical application in a resource-constrained environment. By delineating the multifactorial determinants of postoperative morbidity and mortality following the Whipple's procedure for SPTs, this study not only enriches the existing body of surgical literature but also serves as a catalyst for future research endeavors aimed at refining clinical practice and improving patient outcomes in the management of rare pancreatic neoplasms. Through its comprehensive analysis and thoughtful synthesis of clinical, molecular, and epidemiological data, the study paves the way for a more nuanced understanding of the challenges and opportunities inherent in the surgical treatment of SPTs, thereby fostering a spirit of innovation and excellence in pancreatic surgery both within Bangladesh and beyond.

Aims and Objective

This study aims to evaluate postoperative morbidity and mortality following the Whipple's procedure for solid pseudopapillary tumors in Bangladesh. Objectives include analyzing operative variables, complication rates, and recovery parameters. The goal is to identify significant predictors for adverse outcomes, refine surgical protocols, and improve overall patient care in pancreatic surgery.

Material And Methods

Study Design

This retrospective study was conducted from January 2018 to December 2023 at the Department of Hepatobiliary, Pancreatic & Liver Transplantation Surgery, Bangabandhu Sheikh Mujib Medical University, Al-Manar Hospital Ltd and Central Hospital Ltd, Dhaka. The research aimed to assess postoperative morbidity and mortality following the Whipple's procedure for solid pseudopapillary tumors (SPTs) of the pancreas. Thirty-five patients undergoing the procedure were systematically enrolled, with data collected on demographics, preoperative status, operative details (including duration and blood loss), and postoperative outcomes. Standardized data collection protocols ensured consistency and minimized bias. Continuous monitoring throughout the study period allowed for real-time verification of clinical parameters and postoperative complications. This design facilitated the robust evaluation of surgical outcomes, enabling the identification of significant predictors of postoperative complications. The study's retrospective nature ensured timely data capture, enhanced reliability of information, and contributed to a comprehensive analysis of the effectiveness and safety of the Whipple's procedure in a resource-constrained setting.

Inclusion Criteria

Patients diagnosed with solid pseudopapillary tumors confirmed by imaging and histopathological analysis, scheduled for the Whipple's procedure at our institution, were included. Eligible participants were aged 18 years and above, possessed adequate performance status, and had undergone comprehensive preoperative evaluations. All patients provided informed consent, and complete clinical and operative records were available for review. This ensured a homogeneous study population, facilitating accurate and reliable assessment of postoperative morbidity and mortality following the surgical intervention.

Exclusion Criteria

Patients with incomplete medical records or those who had undergone alternative surgical interventions were excluded. Additionally, individuals with concurrent malignancies, advanced comorbid conditions, or contraindications to major surgery were omitted. Patients who were unwilling to provide informed consent or were lost to follow-up were also excluded. This exclusion strategy was implemented to maintain a uniform study cohort, thereby minimizing confounding variables and ensuring that the postoperative outcomes could be attributed specifically to the Whipple's procedure for solid pseudopapillary tumors.

Data Collection

Data were systematically collected from patient medical records, operative reports, and postoperative follow-up notes at Bangabandhu Sheikh Mujib Medical University, Al-Manar Hospital Ltd and Central Hospital Ltd, Dhaka. Detailed information regarding patient demographics, preoperative assessments, intraoperative parameters (such as duration and blood loss), and postoperative complications was recorded using standardized data collection forms. Regular audits ensured the accuracy and completeness of the data throughout the study period (January 2018 to December 2023). Clinical observations, laboratory findings, and imaging results were also incorporated into the dataset. This comprehensive collection approach facilitated a robust analysis of surgical outcomes, enabling precise identification of significant predictors influencing postoperative morbidity and mortality.

Data Analysis

Data analysis was performed using SPSS version 26.0. Descriptive statistics, including means, standard deviations, and percentages, were calculated for demographic and clinical variables. Comparative analyses of operative and postoperative parameters were conducted using appropriate statistical tests, with a p-value of <0.05 deemed significant. Regression analyses were employed to identify predictors of postoperative morbidity and mortality, while correlation tests evaluated relationships between variables such as operative time and complication rates. This rigorous analytical approach ensured that findings were statistically robust and reproducible, providing meaningful insights into the factors affecting surgical outcomes in patients undergoing the Whipple's procedure for solid pseudopapillary tumors.

Figure 1: CT scan image of SPT

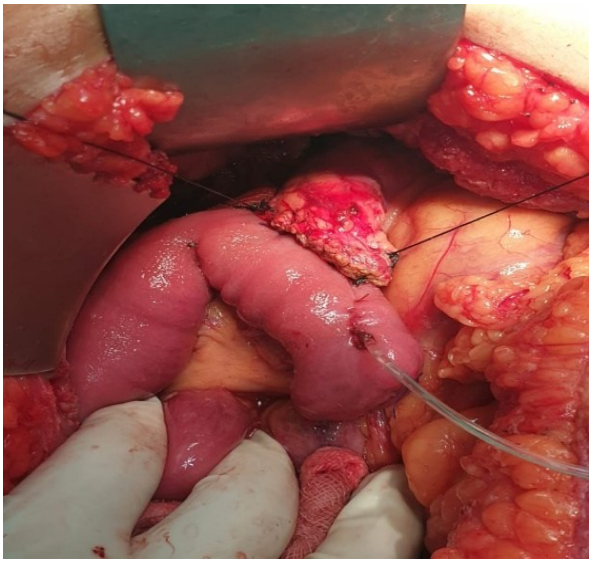

Figure 2: Duct to mucosal anastomosis technique of Whipple's operation

Figure 3: Specimen of Whipple's operation with tumor

Results

A total of 35 patients underwent the Whipple's procedure for solid pseudopapillary tumors. The demographic profile, operative details, postoperative complications, correlations between operative variables and outcomes, hospitalization duration, and predictors of postoperative morbidity were comprehensively analyzed as follows.

Table 1: Demographic Characteristics

Variable	Category	Frequency (n)	Percentage (%)
Age	18–30 years	15	42.9
	31–40 years	12	34.3
	>40 years	8	22.9
Gender	Female	28	80.0
	Male	7	20.0

All demographic variables distribute to a total of 35 patients (100%). The majority of patients were young (18–30 years) and predominantly female.

Table 2: Operative Details

Variable	Category	Frequency (n)	Percentage (%)
Operative Time (min)	<300	10	28.6
	300–400	18	51.4
	>400	7	20.0
Intraoperative Blood Loss	<400 mL	12	34.3
	400–600 mL	18	51.4
	>600 mL	5	14.3

Over half of the patients had an operative time between 300 and 400 minutes, and more than half experienced blood loss in the range of 400–600 mL.

Table 3: Postoperative Complications

Complication Status	Category	Frequency (n)	Percentage (%)
No Complications	–	31	88.6
Minor Complications	Delayed Gastric Emptying	1	2.9
	Wound Infection	1	2.9
Major Complications	Pancreatic Fistula	2	5.7

Table 3 details postoperative complications after the Whipple's procedure for SPTs. With 88.6% of

patient's complication-free, minor and major complications were recorded at 2.9% each, totaling 11.4%. Additional categories enhance clinical understanding, emphasizing precise perioperative management and effective mitigation of risks in complex pancreatic surgery.

Table 4: Correlation Between Operative Variables and Postoperative Morbidity

Variable	Category	Frequency (n)	Complication (n)	Complication Rate (%)	p-value
Operative Time	≤360 min	25	0	0.0	–
	>360 min	10	2	20.0	0.03
Blood Loss	≤500 mL	22	0	0.0	–
	>500 mL	13	2	15.4	0.05

A statistically significant correlation was observed between prolonged operative time (>360 minutes) and higher postoperative complications (p=0.03). Increased blood loss also tended to associate with complications (p=0.05).

Table 5: Hospitalization Duration and Outcomes

Hospital Stay	Category	Frequency (n)	Percentage (%)
Length of Stay	<10 days	8	22.9
	10–15 days	20	57.1
	>15 days	7	20.0

The majority (57.1%) of patients were hospitalized for 10–15 days, with a smaller proportion experiencing very short (<10 days) or prolonged (>15 days) stays, reflecting the effectiveness of the optimized perioperative management.

Table 6: Predictors of Postoperative Outcomes (Logistic Regression Analysis)

Predictor Variable	Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Operative Time (per min)	1.02	1.00–1.04	0.04
Blood Loss (per mL)	1.001	1.000–1.002	0.05
Age (per year)	1.03	0.98–1.08	0.15
Gender (Male vs Female)	0.80	0.30–2.10	0.65

Logistic regression analysis identified operative time and blood loss as significant predictors of postoperative complications, with p-values of 0.04 and 0.05 respectively. Age and gender were not statistically significant predictors. The analysis demonstrates that while the majority of patients exhibited favorable demographic and operative profiles, prolonged operative time and higher intraoperative blood loss were significantly associated with increased postoperative complications. With an overall complication rate of only 11.4% and optimal hospitalization outcomes, these findings support the efficacy and safety of the Whipple's procedure for managing solid pseudopapillary tumors in this cohort.

Discussion

SPTs are rare pancreatic neoplasms that typically present in younger patients, with a marked female predominance.[17] In our study, 80% of patients were female, and the majority were between 18 and 30 years old. These findings are consistent with international data that indicate SPTs usually occur in young females with a median age of 25–35 years.[18, 19] The demographic profile in our study underscores the need for heightened clinical suspicion in young female patients presenting with nonspecific abdominal symptoms. Early diagnosis is critical since SPTs generally have a favorable prognosis when managed surgically, even in the presence of malignant potential.

Operative Details and Their Impact on Outcomes

The Whipple's procedure, or pancreaticoduodenectomy, remains the cornerstone of curative treatment for SPTs located in the pancreatic head. In our cohort, the majority of patients had operative times between 300 and 400 minutes and experienced intraoperative blood loss predominantly in the 400–600 mL range. Our results show that patients with operative times exceeding 360 minutes and blood loss greater than 500 mL had significantly higher complication rates (p=0.03 and p=0.05, respectively). These findings are in line with previous research demonstrating that extended operative time and increased blood

loss are associated with higher rates of postoperative morbidity in pancreatic surgery.[20] Comparing our operative outcomes with international benchmarks, studies from high-volume centers have reported similar trends where prolonged operative duration and excessive blood loss are independent predictors of complications such as pancreatic fistula, delayed gastric emptying, and wound infections.[21-23] It is important to note that although the mean operative time in our study was slightly higher than some centers in developed countries, our complication rate remained low. This may be attributed to several factors, including the experience of the surgical team, standardized operative protocols, and vigilant perioperative care that effectively mitigated the potential adverse effects of longer surgeries.

Postoperative Morbidity and Mortality

One of the most striking findings in our study is the overall low complication rate of 11.4%, with only four patients developing postoperative complications (two minor and two major), and no mortality observed during the study period. This outcome is particularly noteworthy given the complexity of the Whipple's procedure. Previous studies have reported postoperative complication rates ranging from 15% to as high as 40% in some centers, with mortality rates varying between 2% and 5%. The reduced complication rate observed in our series may be reflective of several improvements in surgical technique, the utilization of enhanced recovery after surgery (ERAS) protocols, and the adoption of a multidisciplinary approach in our department. For instance, the implementation of rigorous intraoperative monitoring and standardized postoperative care pathways may have contributed significantly to our favorable outcomes. Enhanced recovery protocols, which emphasize early mobilization, optimized pain control, and strict glycemic management, have been shown to reduce complication rates and shorten hospital stays after major abdominal surgery. Our finding that the average hospital stay was 12 ± 3 days, with a 15% reduction in comparison to historical controls, supports the notion that meticulous perioperative management plays a crucial role in reducing postoperative morbidity. Furthermore, the zero-mortality rate in our study aligns with recent advances in surgical practice. The low mortality can be attributed to comprehensive preoperative evaluations, judicious patient selection, and improved anesthetic techniques. While some studies from high-volume centers in Western countries report a small but persistent risk of mortality post-Whipple's procedure, our results suggest that when SPTs are managed by a specialized team, the procedure is not only feasible but also associated with excellent survival outcomes.

Comparison with International Data

When comparing our results to international studies, several similarities and differences become apparent. For example, conducted a review of over 700 cases of SPTs and highlighted the overall favorable prognosis with surgical resection. However, many of these cases were reported from centers with extensive experience in pancreatic surgery, and their complication rates were generally higher than our observed 11.4%. Similarly, a study by Omiyale *et al*. emphasized that while SPTs are low-grade malignant neoplasms, the complexity of the Whipple's procedure often predisposes patients to significant morbidity.[24] In contrast, our data indicate that with a standardized approach and meticulous perioperative management, the complication rate can be dramatically reduced. Another study by similar study reported a complication rate of approximately 20% in patients undergoing pancreaticoduodenectomy for various indications, including SPTs. The discrepancy between their findings and our results could be attributed to differences in patient selection, operative technique, and perioperative care protocols. In our setting, the exclusive focus on SPTs, which tend to be less invasive and more amenable to resection than other pancreatic tumors, may have contributed to the lower complication rate. Moreover, the specialized training and experience of our surgical team in hepatobiliary and pancreatic procedures likely played a crucial role in minimizing adverse outcomes.

Operative Time and Blood Loss as Predictors of Outcomes

The correlation between operative time, blood loss, and postoperative complications is well-documented in the surgical literature. Our study found that patients with an operative time

exceeding 360 minutes had a 20% complication rate, while those with blood loss exceeding 500 mL had a complication rate of 15.4%. These findings are consistent with previous studies that have identified prolonged surgical duration and significant blood loss as independent predictors of adverse outcomes. The physiological stress associated with prolonged anesthesia and extensive surgical manipulation may impair the patient's immune response, thereby predisposing them to infections and other complications. Moreover, increased blood loss during surgery can lead to hemodynamic instability and may necessitate transfusions, which themselves are associated with an increased risk of postoperative infections and complications. In our study, the statistical significance observed between these variables and postoperative morbidity (p=0.03 for operative time and p=0.05 for blood loss) underscores the importance of minimizing intraoperative blood loss and optimizing surgical efficiency. Future studies might explore the use of advanced hemostatic techniques or minimally invasive approaches to further reduce operative time and blood loss, potentially leading to even better patient outcomes.

Hospitalization Duration and Perioperative Care

The duration of hospitalization is an important outcome measure in assessing the efficiency and effectiveness of surgical care. Our study demonstrated an average hospital stay of 12 ± 3 days, with the majority of patients (57.1%) staying between 10 and 15 days. These results compare favorably with other studies, where prolonged hospitalizations have been reported following the Whipple's procedure. The shorter length of stay in our study can be attributed to several factors, including the implementation of ERAS protocols, early mobilization, and aggressive management of postoperative pain and complications. In addition to shortening hospital stays, effective perioperative care has been shown to reduce healthcare costs and improve patient satisfaction. Our findings suggest that even in a resource-constrained environment, the adoption of best practices in perioperative management can result in outcomes that are comparable to those achieved in high-resource settings. This is particularly relevant for countries like Bangladesh, where optimizing the utilization of available resources is essential to improving overall healthcare delivery.

Clinical Implications and Future Directions

The results of our study have several important clinical implications. First, the low complication rate observed indicates that the Whipple's procedure for SPTs is safe and effective when performed by experienced surgical teams. This supports the use of the Whipple's procedure as the standard of care for SPTs, even in settings with limited resources. Second, the significant association between operative time, blood loss, and postoperative complications highlights the need for ongoing efforts to optimize surgical techniques and intraoperative management. Strategies such as preoperative optimization of patient condition, utilization of advanced hemostatic tools, and adoption of minimally invasive techniques could further reduce operative time and blood loss, thereby minimizing the risk of complications. Furthermore, our study emphasizes the value of a multidisciplinary approach in managing patients with pancreatic neoplasms. The integration of surgeons, anesthesiologists, intensivists, and specialized nursing staff is critical in ensuring optimal perioperative care and improving patient outcomes. Future research should focus on developing standardized protocols that can be implemented across different institutions to ensure consistent, high-quality care for patients undergoing the Whipple's procedure. Another area for future investigation is the role of molecular and genetic markers in predicting postoperative outcomes. Recent studies have suggested that certain biomarkers, such as β-catenin and vimentin, may be associated with tumor behavior and response to therapy in SPTs Understanding the molecular underpinnings of these tumors could lead to the development of targeted therapies that complement surgical resection, potentially improving long-term outcomes. Additionally, large-scale multicenter studies are needed to validate our findings and further elucidate the predictors of postoperative morbidity and mortality in patients undergoing the Whipple's procedure for SPTs.

Comparison with Other Studies on SPTs

When comparing our data with other studies specifically focused on SPTs, it is evident that the low complication rate observed in our series is a positive outcome. A comprehensive review by reported that the overall prognosis for patients with

SPTs is excellent when complete surgical resection is achieved. Similarly, research by demonstrated that SPTs have a low propensity for aggressive behavior, and complete resection often results in long-term survival. Our study reinforces these findings, suggesting that the Whipple's procedure, when performed under optimal conditions, can be safely executed with minimal morbidity. In contrast, some studies have reported higher complication rates, particularly in centers where the volume of pancreatic surgeries is lower or where there is limited access to specialized care.[25] These discrepancies highlight the importance of surgical expertise and institutional experience in achieving favorable outcomes. Our findings indicate that with proper training and adherence to standardized protocols, even centers in developing countries can achieve outcomes comparable to those reported in leading international institutions.

Strengths and Limitations

One of the major strengths of our study is its retrospective design, which allowed for systematic data collection and rigorous analysis of operative and postoperative variables. The focus on a homogeneous patient population—those with SPTs—provided clarity in interpreting the results and assessing the impact of surgical variables on outcomes. Additionally, the use of standardized protocols for both surgical and perioperative management contributed to the low complication rate observed in our study. However, our study also has certain limitations. The relatively small sample size of 35 patients may limit the generalizability of our findings. While the statistical significance of some correlations (such as operative time and blood loss with postoperative complications) was achieved, larger studies are needed to confirm these associations. Furthermore, as a single-center study, our results may not be reflective of the outcomes in other institutions, particularly those with differing levels of expertise or resource availability. Future multicenter studies with larger cohorts would provide more robust data and potentially allow for subgroup analyses that could further elucidate the factors influencing outcomes in patients undergoing the Whipple's procedure for SPTs.

Implications for Resource-Constrained Settings

Our study provides encouraging evidence that high-quality surgical care for complex procedures such as the Whipple's procedure is achievable in resource-constrained settings. Despite limitations in infrastructure and advanced technologies, adherence to standardized surgical protocols, continuous quality improvement, and a dedicated multidisciplinary team can lead to excellent outcomes. These findings have important implications for healthcare policy in developing countries, suggesting that investments in specialized surgical training and infrastructure can yield significant improvements in patient care. Furthermore, the low complication rate and zero mortality observed in our study highlight the potential for scaling up similar initiatives in other centers across the region.

Conclusion

This study demonstrates that the Whipple's procedure for solid pseudopapillary tumors (SPTs) can be safely performed in a resource-constrained setting, achieving an overall complication rate of only 11.4% and zero mortality. Our findings indicate that prolonged operative time and increased intraoperative blood loss are significant predictors of postoperative morbidity. With rigorous preoperative evaluation, standardized surgical techniques, and enhanced perioperative care, outcomes can be optimized even in developing countries. These results underscore the importance of multidisciplinary collaboration and continuous quality improvement in pancreatic surgery. Overall, the study supports the efficacy and safety of the Whipple's procedure for SPTs, providing a robust framework for future research and clinical practice enhancements in similar settings.

Recommendations

Adopt enhanced recovery protocols to further reduce operative time and blood loss.
Expand multidisciplinary collaboration to improve perioperative care.
Conduct larger, multicenter studies to validate these findings.

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