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Clinical Characteristics and Outcomes of Pancreaticoduodenectomy (Whipple Procedure) in the Last Five Years at Prof. Dr. R. D. Kandou Hospital

Michael Tendean,[1] Ferdinand Tjandra,[1] Toar Mambu,[1] Marven Ayawaila,[1] Eric Sihaloho[2]

[1]Division of Digestive Surgery, Department of Surgery, Faculty of Medicine, Universitas Sam Ratulangi – Prof. Dr. R. D. Kandou, Manado, Indonesia
[2]Department of Surgery, Faculty of Medicine, Universitas Sam Ratulangi, Manado, Indonesia
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Abstract: Pancreatoduodenectomy (Whipple) is the standard procedure for resectable pancreatic and periampullary neoplasms. Although techniques and postoperative care continue to evolve, this procedure is still associated with high morbidity and significant complications, such as pancreatic fistula and delayed gastric emptying. It is most commonly performed on elderly patients with pancreatic adenocarcinoma and requires ongoing evaluation to improve outcomes. A five-year review is necessary to assess trends, complications, and postoperative outcomes as a basis for improving the quality of surgical management. This was a retrospective descriptive analysis of adult patients who underwent pancreatoduodenectomy at Prof. Dr. R. D. Kandou Hospital between 2020 and 2025. The inclusion criteria were patients with complete medical records, including demographic data, surgical indications, surgical outcomes, and postoperative complications. Cases with incomplete data, surgeries performed outside the study period, or patients who died before postoperative evaluation were excluded. Univariate analysis was performed using SPSS version 30 to describe clinical characteristics and patient outcomes. Of the 35 patients, the distribution of gender and diagnosis (icteric vs. non-icteric obstruction) was relatively balanced. Most underwent a single Whipple procedure (65.7%) using the duct-to-mucosa anastomosis technique (80%). Postoperative complications occurred in 57.1% of patients, and 30-day mortality was 34.3%. The mean age of patients was 55.6 years, the duration of surgery was 370 minutes, the blood loss was 568 cc, and the length of hospital stay was 9.8 days. In conclusion, the Whipple procedure demonstrates variable outcomes with high morbidity and a 30-day mortality rate of 34.3%. End-to-side anastomosis is the most commonly used technique. Age, case complexity, and operative variability influence patient recovery and prognosis.
Keywords: pancreatoduodenectomy; pancreatic neoplasm; Whipple procedure

INTRODUCTION

The Whipple procedure, also known as pancreaticoduodenectomy, is a complex surgical operation commonly performed to treat malignancies of the pancreas, periampullary region, and duodenum. The history of this procedure dates back to the early 20th century, when it was first introduced as a treatment for pancreatic cancer, an aggressive disease with a high mortality rate.

Dr. Allen Whipple introduced the procedure in the 1930s, accompanied by refinements in surgical techniques aimed at improving clinical outcomes and reducing mortality rates. In its early stages, the procedure had extremely high morbidity and mortality rates due to the complexity of the surgery and the critical anatomical structures involved. Over time, advancements in surgical technology, perioperative care, and postoperative management have significantly improved patient outcomes. However, the procedure remains challenging, with reported postoperative morbidity rates of 30–50% and mortality rates of approximately 2–5% in high-volume centers, though some reports indicate higher mortality rates in specific locations.[1,2]

Postoperative complications, such as delayed gastric emptying, pancreatic fistula, bile leakage, and infection, are still common and pose significant challenges. For example, delayed gastric emptying occurs in approximately 31% of cases, while pancreatic fistula affects approximately 22% of patients.[1] New surgical technique modifications, such as the addition of Braun jejunojejunostomy, are being evaluated to reduce the risk of complications and accelerate the recovery process.[3] Additionally, advancements in managing complications, such as the use of endoscopic techniques to address gastrojejunostomy leaks, have further improved the safety profile of this procedure.[4]

The historical evolution of the Whipple procedure illustrates progress in the fields of oncological surgery and gastrointestinal surgery in general. From a radical procedure with high risks, it has now become the standard of care for operable pancreatic and periampullary cancers. Research continues to minimize complications and improve long-term survival rates. Recent studies are also exploring the relationship between systemic inflammation, gut microbiome dysbiosis, and patient comorbidities, such as diabetes and cardiovascular disease, in influencing postoperative outcomes. This highlights the complexity of managing patients undergoing this procedure and underscores the need for a multidisciplinary approach.[2]

From an epidemiological perspective, the Whipple procedure is typically performed on patients diagnosed with pancreatic adenocarcinoma, the leading cause of cancer-related deaths worldwide. Patients undergoing this procedure are generally elderly, ranging in age from 60 to 80 years, consistent with the age distribution of pancreatic cancer incidence. A population-based study in the United States indicated that this procedure is also performed on patients in their 80s and even 90s, confirming its application across a wide age range despite the relatively high surgical risks associated with advanced age.[5]

The incidence and demographic characteristics of pancreatic cancer are closely related to the epidemiology of the Whipple procedure. Pancreatic adenocarcinoma is more common in men and is often diagnosed at an advanced stage due to non-specific symptoms, contributing to high morbidity and mortality rates. This procedure is typically performed at tertiary speciality centers with specialized expertise in pancreatic surgery, given its technical complexity and the need for intensive postoperative care. Studies report that the average duration of the procedure is approximately seven hours (436 minutes), reflecting the complexity of the procedure.[6]

The discussion of this study is critical because it provides a comprehensive overview of the implementation and outcomes of the Whipple procedure over a relatively long period. By data analysis from the past five years, the study was able to reveal trends in cases, success rates, complications, and long-term outcomes for patients who underwent the procedure. Additionally, this study contributes to evaluating the effectiveness of surgical techniques and identifying factors that influence patient prognosis after surgery. The information obtained can serve as a crucial foundation for the development of surgical techniques, postoperative management strategies, and the selection of suitable patients for the Whipple procedure. Thus, this study not only contributes

to the advancement of medical science but also has the potential to improve the quality of healthcare services for patients requiring this surgery.

METHODS

This study aimed to provide an in-depth description of the characteristics of adult patients who underwent the Whipple procedure or pancreaticoduodenectomy over the past five years, from 2020 to 2025, at Prof. Dr. R. D. Kandou Hospital.

The study samples consisted of patients with complete medical records including demographic data, surgical indications, surgical outcomes, and postoperative complications, who received care at the healthcare facility where the study was conducted. Patients with incomplete medical records, underwent surgery outside the study period, or died before or immediately after surgery, thus making postoperative evaluation impossible, were excluded from the samples. Patient refusal to participate was also a reason for exclusion, ensuring the ethics and validity of the research data. Data analysis was performed using a univariate approach with the assistance of SPSS software version 30 to describe the clinical characteristics and outcomes of medical interventions in patients during the study period.

RESULTS

Table 1 showed that data of patients who underwent the Whipple procedure had an almost equal distribution of gender, with 18 patients (51.4%) males and 17 patients (48.6%) females, indicating that the frequency of this procedure was relatively equal between the two genders. Most patients were diagnosed with non-icteric obstruction (18 patients, 51.4%), while those with icteric obstruction totaled 17 patients (48.6%), showing a similar balance between the two diagnoses. The majority of patients, 23 (65.7%), underwent the Whipple procedure without additional interventions, while 12 patients (34.3%) underwent the Whipple procedure in conjunction with other medical procedures, reflecting the need for further management in some patients. The end-to-side pancreaticojejunostomy anastomosis technique, using the duct-to-mucosa method, was the primary choice for 28 patients (80%), while seven patients (20%) underwent the dunking method, confirming that the end-to-side technique was more commonly used in this procedure. Most procedures were performed without considering the degree of complexity in 24 patients (68.6%), while 11 patients (31.4%) were treated with consideration for the complexity level, indicating specialized management in more complex cases.

Postoperative complications were experienced by 20 patients (57.1%), while 15 patients (42.9%) did not experience complications, indicating that more than half of the patients were at risk of complications, making postoperative monitoring crucial. The mortality rate within the first month after surgery reached 12 patients (34.3%), while 23 patients (65.7%) survived the critical period, underscoring the high risk during the early postoperative period.

Table 1. Characteristics of research data based on gender, diagnosis, procedure, anastomosis, procedure complexity, complications, and 1-month mortality

Variables	Number	Percentages (%)
Gender		
Male	18	51.4
Female	17	48.6
Diagnosis		
Obstructive jaundice	17	48.6
Non-obstructive jaundice	18	51.4
Procedure		
Only the Whipple procedure	23	65.7
The Whipple procedure and other procedures	12	34.3

Variables	Number	Percentages (%)
Anastomosis		
Pancreaticojejunostomy end to side, duct to mucous	28	80
Dunking procedure	7	20
Complexity of procedures		
Yes	11	31.4
No	24	68.6
Complications		
Yes	20	57.1
No	15	42.9
Death in one month		
Yes	12	34.3
No	23	65.7

Tabel 2 showed that the age range of patients was quite broad, from 15 to 76 years, with an average of 55.6 years (SD 11.991). The duration of surgery varied between 255 and 500 minutes, with an average of nearly 370 minutes (SD 60.385). Blood loss during surgery ranged from 0 to 2,500 cc, with an average of 568 cc (SD 468.655), indicating significant variability among patients. The postoperative hospital stay ranged from 3 to 21 days, with an average of 9.79 days (SD 4.409), reflecting differences in the recovery process among patients who underwent the Whipple procedure.

Table 2. Characteristics of research data based on age, length of surgery, amount of blood loss, and length of hospital stay

Variables	Min	Max	*Mean*	Standard deviation
Age	15	76	55.6	11.991
Duration of surgery (minutes)	255	500	369.94	60.385
Total blood loss (cc)	0	2500	567.86	468.655
Length of hospital stay	3	21	9.79	4.409

DISCUSSION

Data of patients who underwent the Whipple procedure showed an almost equal distribution between males and females. Of the total patients, 18, or approximately 51.4%, were male, while 17, or 48.6%, were female. This indicates that the Whipple procedure is performed with nearly equal frequency in both genders. However, some demographic analyses from various studies have shown a higher prevalence among male patients. A multicenter cohort study involving 1,484 patients found that 56% were male and 44% were female. Other studies, including a report from a tertiary centre in India over 18 years, reported male dominance with a proportion of approximately 62%. Another cohort study recorded a figure of 61.7%.[7]

Although the number of male patients was higher, clinical outcomes between the two genders were generally similar. Extensive studies have not found significant differences in important aspects, such as length of hospital stay, 30- and 90-day mortality rates, readmission rates, recurrence rates, or five-year survival rates, between men and women.[7] However, some studies have shown a correlation between the male gender and longer surgery duration, higher blood transfusion requirements, and a greater risk of postoperative complications, such as surgical site infections and severe bleeding.[8]

Based on the data obtained, the majority of patients underwent the end-to-side pancreaticojejunostomy anastomosis technique using the duct-to-mucosa method, accounting for 80% or 28 patients. The remaining seven patients (20%) underwent the procedure using the dunking method. These findings indicate that the end-to-side pancreaticojejunostomy technique

is more commonly used in Whipple procedure compared to the dunking method. Various techniques for gastrointestinal continuity reconstruction involve several types of anastomoses, including pancreaticojejunostomy, hepaticojejunostomy (also known as biliojejunostomy), and gastrojejunostomy. Among these anastomoses, pancreaticojejunostomy is considered the most technically challenging and critical due to its association with postoperative complications such as pancreatic fistula.[9,10] The success of the Whipple procedure heavily depends on gastrointestinal reconstruction, which includes reconnecting the pancreas, bile ducts, and stomach to the small intestine. One of the most challenging steps is the pancreaticojejunostomy anastomosis, which involves the surgical connection between the pancreatic duct or pancreatic remnant and the jejunum.[11–13]

The data obtained showed that the majority of patients experienced complications after undergoing the Whipple procedure. A total of 20 patients (57.1%) reported complications, while the remaining 15 patients (42.9%) did not experience postoperative complications. This finding suggests that the risk of complications is high for more than half of the patients who undergo this procedure. Elderly adult patients have a higher risk of postoperative complications and mortality, while poor nutritional status is also associated with unfavorable outcomes, regardless of gender.[14,15] Despite advancements in surgical techniques and perioperative care, the Whipple procedure remains associated with significant morbidity and mortality. Common complications include delayed gastric emptying, pancreatic fistula, infection, and bleeding. In the referenced study, early postoperative outcomes were closely monitored, with morbidity and mortality analyzed at 30 days using multivariate methods.[1] The overall prognosis after the Whipple procedure depends heavily on factors such as tumour type, disease stage at diagnosis, and the presence of comorbidities. However, surgical intervention remains the only potentially curative treatment option for pancreatic head malignancies.

Data indicate that 12 patients, or approximately 34.3%, died within one month postoperatively. In contrast, the majority of patients, 23 individuals (65.7%), successfully survived the critical period without mortality. This highlights the significant risk associated with the Whipple procedure during the early postoperative period and warrants careful consideration in patient evaluation and management. Life expectancy analysis revealed that younger age was associated with improved life expectancy following pancreatoduodenectomy. Multivariate studies confirm that younger age, absence of perineural infiltration, lower grade of postoperative fistula, and absence of postoperative bleeding are independent prognostic factors for better survival.[16] These conditions may be related to younger patients' ability to tolerate surgical physiological stress and recover from complications more effectively.

Patient data showed a wide age range, from 15 to 76 years, with an average of 55.6 years and a standard deviation of 11.991. Various findings have confirmed that age is a crucial factor in risk stratification and prognosis for patients undergoing the Whipple procedure. Older patients have a higher risk of complications and mortality, while younger patients typically have better clinical outcomes. This highlights the importance of thorough preoperative assessment, optimization of comorbidities, and personalised perioperative management, particularly for older patients, to enhance surgical outcomes and overall survival.[16–18]

The age group most commonly undergoing the Whipple procedure is middle-aged to elderly adults, reflecting the epidemiology of the underlying disease, particularly pancreatic cancer and malignant tumours around the ampulla of Vater. A retrospective observational study at the Pakistan Kidney and Liver Institute reported an average age of 59.5 years for patients undergoing this procedure, with a similar age distribution between Whipple and distal pancreatectomy patients.[19] These findings are consistent with other studies, which report an average age ranging from the late 50s to early 60s. For example, a five-year review at Taleghani General Hospital revealed an average age of 57 years, with a range of 18 to 82 years, indicating that while this procedure is commonly performed on older individuals, it can be performed across a wide age range, depending on the patient's clinical condition.[20] Similarly, a 12-year review recorded an

average age of 61.7 years for the Whipple patient group, with the majority of cases being cancer.[21]

The amount of blood loss during surgery varies considerably, ranging from zero to 2,500 cc, with an average of approximately 568 cc and a standard deviation of 468.655 cc, indicating significant variation between patients. Factors influencing bleeding include the patient's vascular anatomy, the extent of tumour involvement, surgical experience, and the use of minimally invasive techniques. Intraoperative bleeding is an important variable that can affect short-term surgical outcomes and long-term patient recovery. Excessive bleeding may require blood transfusion, which carries its risks, such as transfusion reactions, immunomodulation, and increased risk of postoperative infection. Advances in surgical techniques, particularly laparoscopic approaches and the use of minimally invasive ports show potential for reducing blood loss. A case report of a laparoscopic Whipple procedure using only three trocars reported bleeding of approximately 600 cc, with an uneventful postoperative course, and the patient was discharged on the ninth day.[22]

CONCLUSION

Patients undergoing the Whipple procedure showed an almost equal distribution of males and females, as well as a relatively balanced proportion of non-icteric and obstructive icteric diagnoses. Most patients underwent this procedure without additional measures, with the end-to-side pancreaticojejunostomy anastomosis technique being the most commonly used method. Although the majority of procedures were performed without considering high complexity, more than half of the patients experienced postoperative complications, and the one-month mortality rate reached approximately 34%. Patient ages ranged from 15 to 76 years, with an average of 55.6 years. Surgical duration and blood loss also showed significant variation among patients. The average postoperative hospital stay was nearly 10 days, reflecting differences in the recovery process for each patient.

Conflict of Interest

The authors affirm no conflict of interest in this study.

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