Early Outcomes of Pancreticoduodenectomy in the Elderly: is Age a Risk Factor for Complications, A Retrospective Study

Original Article

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ABSTRACT

Background: Pancreaticoduodenectomy (PD) is a complex surgery performed for pancreaticoduodenal pathology. Previous studies have found conflicting results regarding morbidity and mortality associated with performing PD operation for elderly patients.

Objectives: The primary endpoint of the study is to examine the safety of performing PD in older populations. Secondary endpoints include comparing the frequency of morbidity and mortality in the elderly group with that of the younger age group after PD operation.

Patients and Methods: A retrospective study comprising 267 patients who underwent PD in our institute for different indications, between January 2018 and January 2023. Demographics, American Society of Anesthesiologists scores, comorbidities, total hospital stays, postoperative complications, and 30-day mortality were analyzed. The patients were subdivided into two groups based on their age: those younger than 65 years (group I) and those aged 65 years and above (group II).

Results: The elderly group experienced a significantly longer total hospital stay, including longer postoperative ICU admission; a higher rate of readmission, with no significant difference was found between both groups as regards the total operative time, intraoperative blood loss, postoperative morbidity, and reoperation and 30-day mortality rates.

Conclusion: This research illustrates that PD is safe for individuals aged 65 and above, with similar rates of postoperative complications, reoperation, and mortality rates when compared to their younger counterparts. By carefully selecting patients and providing attentive perioperative care, satisfactory outcomes can still be achieved for elderly patients.

Key Words: Elderly, pancreaticoduodenectomy, whipple.

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INTRODUCTION

Although there have been recent advancements in chemotherapy regimens for advanced pancreatic cancers, the sole opportunity for cure remains with complete surgical resection (R0). The elderly population is rapidly growing in many developed countries as healthcare and socioeconomic conditions continue to progress, leading to the provision of intense therapy, including complex surgical operations, to patients in the final years of their lives [1,2].

Pancreaticoduodenectomy (PD) is a complex procedure performed mainly for pancreaticoduodenal pathology. Previous studies have found conflicting results concerning morbidity and mortality associated with performing PD for elderly patients [3,4]. Proponents of surgical resection in elderly patients argue that the immediate postoperative complication rates in the elderly population are comparable to those in younger patients with similar survival benefits[5,6]. Others have shown that elderly patients have a propensity for longer ICU admission following PD, as well as a higher likelihood of experiencing postoperative cardiac events. They also tend to face more challenges related to nutrition and functionality and necessitate more readmissions in comparison to younger patients [7].

A lack of calculation of the cut-off value of the age of patients who can tolerate PD [8]. Some research used the WHO's aging criteria to define the elderly [9]. However, the subjective definition of the age of the elderly as being over 70 years old is considered in a different study [10]. Currently, the age range for PD surgery patients is determined based on the increasing number of older people[11].

The present study aimed to compare early perioperative complications and mortality rates in patients under and over 65 years old that had undergone PD for different

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indications. The primary endpoint of the study is to examine the safety of conducting PD in older populations. Secondary endpoints include comparing the frequency of morbidity and 30-day mortality in the elderly group with that of the younger age group after PD operation.

PATIENTS AND METHODS

Patient's selection

In this retrospective analysis, all patients who underwent PD in our institution between January 2018 and January 2023 were included in this study. Owing to the retrospective nature of the study, patient approval to participate was waived by the IRB of our facility, which approved the study (Alexandria University Ethical Committee on Human Research; IRB Number: 00012098).

Patients were subdivided into two groups based on their age: less than 65 years (group I) and 65 years and older (group II). All the available data were retrieved for statistical analysis. Data of 267 patients who underwent PD were eligible for analysis. All parameters were then compared between the two groups. Patients whose operative, postoperative, and follow-up data cannot be accessed for analysis were excluded from analysis.

Preoperative evaluation and preparation were of extreme importance to prepare the patient for surgery. Cases that are indicated for PD are usually discussed at our multidisciplinary weekly pancreatobiliary management conference. Specific cardiopulmonary workup was done as ordered by the cardiopulmonary consultants including: resting ECG, transthoracic echocardiography (for cardiac patients), and pulmonary function tests (for pulmonary patients). All patients were advised to undergo preoperative chest physiotherapy and incentive spirometry to minimize postoperative respiratory morbidity. A combined decision for the indication of PD was made by the team conference with the attending surgeon, taking into consideration the anesthesiologist's assessments, preoperative evaluation, and the patient's performance status.

Surgical management

Our surgical team performed PD. We adopted the classical Whipple operation, which involved resection of the distal third of the stomach with common hepatic duct transection just proximal to the cystic duct insertion. The posterior pancreatic resection margin is lateral to the superior mesenteric vessels and at the plane just anterior to the portal vein. Jejunum is transected at the first jejunal mesenteric branch. Lymph node clearance is confined to the hepatoduodenal ligament and retropancreatic areas, extending up to the superior mesenteric vessels.

The type of pancreatic-enteric anastomosis was based on the surgeon's preference. About 15 cm distal to pancreaticojejunostomy, end-to-side hepaticojejunostomy was usually constructed using interrupted 4/0-polydiaxanone sutures. Gastrojejunostomy was then usually performed in an end-to-side fashion. For pylorus preserving PD, the distal stomach and pylorus were preserved, and duodenojejunostomy was reconstructed, 70 cm from the hepaticojejunostomy, with an antecolic omega jejunal loop. Drains were placed near the hepaticojejunostomy and pancreaticojejunostomy. Octreotide was routinely used after the operation. Drains were removed after checking the amylase level on postoperative day 3 [12–15].

Operative details were recorded with special attention to intraoperative difficulties, operative time, and complications. Follow-up visits in the outpatient clinic were scheduled routinely after the patient's discharge.

Postoperative care is standardized for pancreaticoduodenectomy patients in our unit

Patients are kept nil-by-mouth, with a nasogastric tube inserted, for passive stomach drainage. A single dose of subcutaneous Sandostatin was routinely administered intraoperative with the start of pancreatic transection and continued for 5–7 days postoperatively (200 μg/8 h). The nasogastric tube was then removed on postoperative day 2 if the output remained less than 100 ml/day. Feeding was graduated as tolerated by the patient. In general, patients will be expected to tolerate a full diet by postoperative day 4. Drain amylase was assayed on the third postoperative day.

Postoperative follow-up with a cardiopulmonary specialist, a respiratory therapist for patients with chest conditions was extremely important for the elderly patients in our unit. Postoperative pain management with epidural analgesia allowed early return of bowel function, early mobilization, and reduced incidence of postoperative nausea.

Outcome measurements and definitions

Demographics, BMI, American Society of Anesthesiologists (ASA) scores, preoperative biliary drainage status, laboratory values including bilirubin levels, preoperative clinical presentations, associated comorbidities, amount of intraoperative bleeding, operative time, total hospital stay including both preoperative/postoperative hospital stays and ICU stay, postoperative complications and clinicopathological features of the tumors were analyzed.

The ECOG-PS was used to assess the patient's performance status [16]. The tumor staging was classified based on the American Joint Committee on Cancer guidelines [17]. All complications were documented clearly and graded according to the Dindo *et al.* [18] classification. We have adopted the International Study Group of Pancreatic Surgery (ISGPS) definitions for pancreatic resection-related complications: delayed gastric emptying (DGE), postoperative pancreatic fistula (POPF), postpancreatectomy hemorrhage (PPH), which

are universally accepted by pancreatic surgeons [19,20]. Operative mortality was defined as in-hospital death or death within 30 days of surgery.

Statistical analysis

IBM SPSS Statistics for Windows, version 25.0. Was used to perform different statistical analyses. The data were subjected to a Kolmogorov–Smirnov test to determine whether they followed a normal distribution. Means and SDs were used to summarize numerical variables, and counts and percentages were used to summarize categorical variables. The Student's t test was used to assess numerical data that followed a normal distribution. The Mann–Whitney test was used for numerical variables that did not follow a normal distribution. Categorical variables were compared with the $\chi 2$ test or Fisher's exact test. Logistic regression was performed to determine independent risk factors. *P value* of less than or equal to 0.05 were regarded as significant.

RESULTS

Demography, functional status, and comorbidities

The studied cohort included 267 patients who underwent PD in our surgical unit. Group I: included 177 patients who underwent PD with an age of less than 65 years old and group II: elderly patients with an age of 65 years old and older (*n*=90). The median age of group I was 50 (36–64) years, while group II was 66 (65–82) years (*P*=0.001).

Hypertension was the most common associated comorbidity in the entire cohort (36% in group I vs. 49% in group II). The elderly group had significantly more patients with chronic obstructive pulmonary disease, diabetes mellitus, and cardiac diseases; otherwise, both groups had comparable comorbid conditions. This was correlated with the significantly higher ASA class in group II (*P*=0.001), with more patients with ASA class III in group II (53%) than those in group I (32%). There was no significant difference between both groups as regards the sex, BMI, functional status, and comorbidities of the included patients' characteristics, are shown in Table (1).

Clinical presentation and preoperative biliary drainage procedures

The two groups had comparable presenting symptoms that led them to seek medical advice. The most common clinical presentation in both groups was obstructive jaundice. In group I, 39 (22%) patients underwent different preoperative biliary drainage procedures, while in group II, 28 (31%) patients had the same procedures, with no significant difference between the two groups (*P*=0.075).

Preoperative laboratory workup

The preoperative biochemical parameters were also compared between both groups. The elderly group had a significantly higher prevalence of preoperative hypoalbuminemia (*P*=0.013), with nearly half of the elderly patients exhibiting an albumin level of 2–2.5 g/dl, while there was no significant difference between the two groups as regards preoperative hematocrit level (*P*=0.4) and international normalized ratio levels (*P*=0.8).

Perioperative findings

Regarding perioperative variables (Table 2), no significant difference was found between both groups as regards the total operative time and intraoperative blood loss. The elderly group experienced a significantly longer total hospital stay, which was attributed to both the extended inpatient preoperative period required to prepare the patient for PD (1–2 days in group I with a mean of 1.5 days compared to 2–3 days in group II with a mean of 2.4 days) and the prolonged postoperative inpatient period (7–16 days in group I with a mean of 11 days vs. 9–22 days in group II with a mean of 16 days).

Our policy for the routine postoperative care of PD patients routinely included 24 h postoperative ICU admission. Twenty percent of the elderly group patients needed ICU admission for more than 24 h, with a significant difference between both groups regarding the need for extended postoperative ICU care.

Postoperative morbidity and mortality

All postoperative complications were documented, and the overall grading of postoperative morbidity was classified according to the Clavien Dindo scoring system. The majority of the morbidity was grades 1 and 2 while morbidity beyond grade 2 (grade 3; requiring surgical, endoscopic, or radiological intervention, grade 4: life-threatening complication requiring intensive care management, grade 5: resulting in death) occurred only in 5% of group I versus 10% in the elderly group with no significant difference between both groups (Table 3).

There was no significant difference between the two groups as regards specific postoperative PD-related complications; POPF (*P*=0.07), DGE (*P*=0.8), PPH (*P*=0.5), bile leakage (*P*=0.1), and enteric fistulas (*P*=0.18). On the contrary, postoperative cardiac events were significantly more common in the elderly group (*P*=0.001). Otherwise there was no significant difference between both groups as regards the general postoperative complications, such as wound infection, pulmonary embolism, and various respiratory complications. There was no significant difference as regards the 30-day mortality between both groups (1.7% in group I vs. 5% in group II, *P*=0.08).

Reoperation, readmission

In the elderly group, three patients required reoperation; one patient for intraluminal PPH from gastroenteric anastomosis, one patient for wound dehiscence requiring secondary sutures, and one patient for enteric fistula. In the younger group, four patients were reoperated; two patients for hepaticojejunostomy leakage, one patient for a stenosed gastrojejunostomy, and one patient for PPH from

the gastroduodenal artery stump. There was no significant difference between both age groups as regards reoperation rates (*P*=0.18).

In the elderly group, seven patients required readmission, with two patients returning due to chest infection, one patient due to a MI attack, one patient due to wound dehiscence, two patients due to abdominal collection, and one patient due to DGE. Meanwhile, in the younger group, five patients needed readmission, with one patient returning for POPF grade B, one patients for wound dehiscence, one patient for gastric outlet obstruction secondary to a stenosed gastrojujunostomy, one patient for abdominal collection, and one patient for DVT. Readmission rates were significantly higher in the elderly group (*P*=0.041).

Tumor characteristics (site, grading, and staging)

In the entire group, the most common location for cancer was in the periampullary area, with a comparable percentage in both groups. Approximately 36% of patients had surgery after a confirmed biopsy showed malignancy, while the rest underwent surgery based on radiological evidence of a mass. Malignancy was the most common indication for PD in both groups. Ductal adenocarcinoma was the most frequently diagnosed malignant tumor in both groups in our study, with no significant difference between both groups (*P*=0.21).

The postoperative grading of tumors showed no significant difference between the two groups (*P*=0.170). Both groups had a nearly similar predominance of well-differentiated tumors. Tumor staging was based on the American Joint Committee on Cancer guidelines with no significant difference between the two groups (*P*=0.4). Stage IIA was the most prevalent stage in both groups (43% in group I vs. 47% in the elderly group).

In our study, a multivariate analysis (Table 4) revealed that ASA class III, the presence of multiple associated comorbidities including at least a cardiac comorbidity and lengthy surgical procedures were significantly associated with the occurrence of two or more postoperative complications in the same patient (odds ratio=0.54, 2.13, 1.88, respectively). On the other hand, age, BMI, and preoperative laboratory values, such as bilirubin and albumin levels, showed no significant association with the development of multiple postoperative complications.

Table 1: General characteristics of patients undergoing pancreaticoduodenectomy (N=267) according to age.

Patients characteristic	Group I < 65 years (*N*=177)	Group II 65+ years (*N*=90)	*P value*
	n (%)	*n* (%)	
Age			
<50	88 (49.7)	0	
50–60	59 (33.3)	0	
60–70	30 (16.9)	32 (35.6)	
70–80	0	49 (54.4)	
>80	0	9 (10.0)	
Range	34–64	65–82	
Mean±SD	49.4±9.4	73.6±4.9	
Median	50.0	66.0	0.001
Sex			
Male	84 (47.5)	45 (50.0)	0.694
Female	93 (52.5)	45 (50.0)	
BMI			
Range	22.4–29.8	23–30.8	
Mean±SD	26.1±2.1	26.9±2.3	0.061
Comorbidity			
Cardiac disease	40 (22.6)	39 (43.3)	0.001
Hypertensive	64 (36.2)	44 (48.9)	0.045
DM	10 (5.6)	16 (17.8)	0.021
Bleeding disorder	8 (4.5)	8 (8.9)	0.155
COPD	12 (6.8)	17 (18.9)	0.002
Liver disease	4 (2.3)	5 (5.6)	0.265
Kidney disease	16 (9.0)	9 (10.0)	0.798
History of stroke	1 (0.6)	3 (3.3)	0.061
ASA class			
I	48 (27.1)	0	0.001
II	73 (41.2)	42 (46.7)	
III	56 (31.6)	48 (53.3)	

ASA, American Society of Anesthesiologists.

Table 2: Perioperative variables in the two studied groups.

	Group I <65 years (*N*=177)	**Group II 65+ years (*N*=90)**	**t test *P value***
Operative duration (min)			
Range	240–450	247–417	0.055
Mean±SD	347.9±61.7	335.8±50.4	
Amount of blood loss (ml)			0.201
Range	250–2990	300–2950	
Mean±SD	1536.9±767.1	1622.2±823.2	
Duration of hospital stay			
Preoperative admission hospital stay			
Range	1–2	2–3	
Mean±SD	1.5±0.5	2.4±0.5	0.001
Postoperative hospital stay			
Range	7–16	9–22	0.001
Mean±SD	11.3±3.0	15.7±4.1	
ICU admission >24 h	n (%)	n (%)	
No	167 (94.4)	72 (80.0)	0.001
Yes	10 (5.6)	18 (20.0)	

All values are presented in n (%) unless indicated otherwise; Statistically significant when the *P value* is less than 0.05.

Table 3: Incidence of postoperative complications in the studied groups.

Postoperative complication	**Group I <65 years (*N*=177)**	**Group II 65+ years (*N*=90)**	***P value***
	***n* (%)**	***n* (%)**	
Clavien Dindo score ≥3			
No	167 (94.4)	81 (90.0)	0.191
Yes	10 (5.6)	9 (10.0)	
No complication	73 (41.2)	21 (23.3)	
1 complication	70 (39.5)	42 (46.7)	
2 complication	23 (13.0)	16 (17.8)	
3 or more complications	11 (6.2)	11 (12.2)	
POPF	22 (12.4)	19 (21.1)	0.072
Grade A	13 (7.3)	11 (12.2)	
Grade B	8 (4.5)	6 (6.7)	0.366
Grade C	1 (0.6)	2 (2.2)	
Bile leak	4 (2.3)	5 (5.6)	0.158
Enteric fistula	3 (1.7)	4 (4.4)	0.183
Intra-abdominal collection	24 (13.6)	15 (16.7)	0.496
DGE	30 (16.9)	16 (17.8)	0.685
Wound infection	10 (5.6)	5 (5.6)	0.974
Cardiac event	8 (4.5)	12 (13.3)	0.001
Pulmonary embolism	3 (1.7)	3 (3.3)	0.393
Chest infection	30 (16.9)	15 (16.7)	0.116
Perioperative mortality	3 (1.7)	5 (5.6)	0.080

DGE, delayed gastric emptying; POPF, postoperative pancreatic fistula; Statistically significant when the *P value* is less than 0.05.

Table 4: Multivariate logistic regression analysis for predictors of multiple complications (two or more).

Risk factors	Standardized B coefficients	Odds ratio	95.0% CI	*P value*
Age	0.211	1.03	0.68–2.22	0.321
BMI	0.506	1.21	0.43–2.02	0.11
More than one comorbidity (including cardiac disease)	0.241	2.13	0.13–0.98	0.021
ASA class III	0.12	2.54	2.1–3.11	0.0021
Increase operative duration	0.411	1.88	0.11–0.73	0.016
Albumin	0.714	1.02	0.56–2.02	0.069
Total bilrubin	0.108	1.07	0.76–1.52	0.231

ASA, American Society of Anesthesiologists.

DISCUSSION

With the development of the healthcare system and the luxury of access to advanced medical treatment, life expectancy has significantly increased, and the proportion of the elderly population in the world has increased in parallel. Unsurprisingly, with this demographic change, the number of conditions requiring surgical care in the older age group is correspondingly increasing. This has steadily changed the age limit for surgeons of elderly patients, with more complex operations being performed even for those over the age of 85 years [21].

The average age of diagnosis for pancreatic cancer is 72, with men typically being diagnosed at around 70 and women at around 74 [22].

The patient's age is one of the various preoperative factors that impact suitability for this procedure. Treating older individuals poses a challenge in accurately identifying those who can handle more aggressive treatment with fewer complications. However, the definition of "old/elderly patient" in terms of age varies among studies and lacks universal acceptance worldwide, leading to the use of various age cut-offs like 65, 70, 75, and 80 years in different studies addressing PD operation [10, 11, 21, 23–26].

The decision to perform a PD for elderly patients is a challenging one because of the frequent comorbidities that usually exist in this age group and the anticipated postoperative adverse outcomes. The elderly patient presents unique challenges due to several factors: their lower physiological reserves, impaired nutritional status, existing age-related health conditions, as well as cognitive impairment. These patients often take multiple medications that may need to be continued after surgery. Several essential principles must be adhered to when dealing with this critical population, including conducting a comprehensive preoperative evaluation, providing appropriate postsurgical care, effectively managing pain, ensuring adequate perioperative nutrition, preventing delirium, and promoting early movement and rehabilitation. These measures are critical for improving surgical outcomes in older patients and reducing mortality rates and healthcare costs [27].

Anticipation of the surgical outcomes after PD in the older patients is important to assist in making a surgical decision, as PD is still the only proven curative treatment for periampullary tumors regardless of the age. The operation may therefore be justified in the elderly because of the apparent unimportance of chronological age [28–31].

Our study aimed to confirm the validity of performing PD operations for elderly patients compared with their younger counterparts.

The ECOG performance status of patients, including the preoperative ASA score, is a crucial prognostic indicator for surgeries for pancreatic cancer and is considered when determining treatment strategies [32].

Elderly patients have more comorbid diseases that may pose a risk for postoperative complications. Hypertension and cardiac comorbidities are risk factors for POPF and postoperative bleeding [33–35]. In our study, older patients had significantly higher ASA scores, hypertension, diabetes, COPD, and cardiac diseases were significantly more common in the elderly group, as expected, with no significant difference between the two groups regarding other associated comorbidities.

A meta-analysis on 6293 PD patients conducted by de la Fuente *et al.* [24], found that older patients also had a higher incidence of postoperative complications after PD. This study identified age, reduced functional status, higher ASA scores, history of dyspnea, and the need for intraoperative transfusion as factors linked to poorer postoperative outcomes. Our study involved analyzing multiple factors using multivariate analysis, and we found that ASA class III, the presence of multiple associated comorbidities including at least a cardiac disease, and lengthy surgical procedures were all significantly linked to the occurrence of two or more postoperative complications in the same patient. However, we observed that age did not show a significant association with the development of multiple postoperative

complications. This emphasizes that the patient's physical condition is more crucial than age itself as a risk factor for the development of complications and the actual challenge in managing older patients is accurately identifying those who can tolerate more aggressive treatment regimens, as PD, with less morbidity [28].

This finding supports our practice of requiring cardiac and respiratory assessment before surgery as a mandatory requirement, particularly for elderly patients. A comprehensive evaluation of the heart and lung function is crucial for decision-making by both surgeons and patients. It also plays a vital role in guiding the postoperative management and recovery of patients, including fluid control and early detection of complications.

In our study, the frequency of benign disease found in resection specimens was consistent with previously reported rates, which ranged from 7 to 30% in the literature[36–38]. In our institute, patients who were diagnosed with benign disease often underwent repeated endoscopic procedures and interventions like ERCP with endoscopic biliary stenting. But for those who continued to experience symptoms despite these treatments, our policy involves attempting conservative and endoscopic treatments to alleviate issues in the pancreatic head and distal CBD region, particularly when preoperative biopsy/cytology results were inconclusive. In cases where malignancy cannot be ruled out, surgery remains a viable option after a prolonged period of conservative treatment. This approach is especially crucial for elderly patients because it is important to thoroughly assess the risks and benefits of surgery in this patient population.

There was no significant difference as regards the operative time in our study. This result is comparable to the study adopted by Kow *et al.* [36], who showed comparable operative time between both groups. On the contrary, Futagawa *et al.* [21], in their study, showed that the operative time was significantly shorter in the elderly group and attributed their result to the surgeon's willingness to shorten the operative time for the older patients, considering that they are at greater risk. Moreover, patients with longer operative time in our study were significantly more likely to experience multiple complications.

The total hospital stay was significantly longer in the elderly group compared to the younger group in our study. This is attributed to the longer preoperative inpatient hospital stay needed to adjust the patients for surgery (preoperative optimization), which was more common in the elderly group and to the postoperative hospital stay. This result is comparable to other studies in the literature, also revealing significantly longer hospital stays in the elderly group [24, 39].

The effect of age on postoperative morbidity is extremely important to be assessed. Some studies showed that radical resection for pancreatic carcinoma is associated with higher complication rates [24,40], while other studies showed comparable complication rates between elderly and younger patient groups [29, 41–43]. In our study, there was no significant difference between the two age groups in terms of postoperative complications. Moreover, the multivariate logistical analysis showed that age is not a predictor for the occurrence of multiple complications in both groups.

A wide discrepancy is observed when searching the literature on the incidence of postoperative mortality after PD. The elderly patients undergoing radical resection for pancreatic and periampullary carcinoma have been found to experience an unacceptably high mortality rate of 18–25% in several studies[40,44]. The mortality of the elderly group in our study was nearly 5%, with no significant difference in comparison to the younger age group. This is comparable to the study adopted by Zhang *et al.* [41] where the overall mortality in their study was 2.7%, including a 4.3% mortality in the elderly subgroup and comparable to the study adopted by Sohn *et al.* [45] where PD led to a perioperative mortality rate of 4.3% in the older group, while the younger group experienced a rate of 1.6%. However, the disparity between these rates did not show statistical significance. This discrepancy in the results among the literature may reflect improvements in patient selection, surgical technique, and perioperative care in the latest. A recent population-based study based on data from Texas hospitals supports this concept, showing that mortality after PD decreased in every consecutive year of the study and concluded that the year of the operation was an independent predictive factor of postoperative mortality[46].

Our study results led us to believe that it is justifiable to perform PD in elderly patients for several reasons: the mortality rate is acceptable and comparable to patients with younger age group, the operative difficulty including the operative time and intraoperative blood loss were similar, the rate of redo surgery is comparable, and the majority of the elderly group experienced grade A morbidity, with no clinically significant difference in the overall morbidity compared to PD in the younger group.

According to our research, elderly patients undergoing PD are anticipated to experience a prolonged recovery period, leading to an extended postoperative hospital stay, including longer time in the ICU and increased likelihood of readmission soon after surgery. Therefore, we recommend implementing structured rehabilitation programs for elderly individuals undergoing complex procedures such as PD and enlisting the support of geriatric and rehabilitation medicine specialists in postoperative rehabilitation efforts to ensure comprehensive care, as many elderly patients may experience physical decline following major surgeries. Counseling is crucial to help patients and their families adjust their expectations regarding postoperative recovery.

It is also important to offer guidance on the longer hospital stay, which is accordingly translated to higher healthcare expenses after the procedure.

The main limitation of this study is the retrospective nature and the subsequent selection bias. Selection bias may have been applied when recommending surgery to elderly patients which may have affected the results. Even though the ECOG-PS is commonly utilized in oncology, it is a single-dimensional functional assessment primarily conducted by physicians, making it subjective and susceptible to bias. As a result, it may not adequately consider morbidity, frailty, or cognition. However, alternative scales for improved patient selection could not be utilized due to the retrospective nature of the study [16]. Additionally, due to the difficulty of the long-term follow-up, we could not collect the long-term outcomes after the PD operation. Therefore, further prospective multicenter studies will be needed to understand the influence of age on the short-term and long-term consequences after PD.

CONCLUSION

The global trend of an aging population is unavoidable, particularly in developed nations. When considering patients for PD, age should not be the sole factor. It is crucial to evaluate the physical and functional status of older patients before proceeding with the surgery. This research illustrates that PD is safe for individuals aged 65 and above, with similar rates of postoperative complications and mortality compared to their younger counterparts. By carefully selecting patients and providing attentive perioperative care, satisfactory outcomes can still be achieved for elderly patients.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

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