# Outcomes of pancreaticoduodenectomy in elderly patients

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**BACKGROUND: Although the mortality and morbidity of pancreaticoduodenectomy (PD) have improved significantly over the past years, the concerns for elderly patients undergoing PD are still present. Furthermore, the frequency of PD is increasing because of the increasing proportion of elderly patients and the increasing incidence of periampullary tumors. This study aimed to analyze the outcomes of PD in elderly patients.**

**METHODS: We studied all patients who had undergone PD in our center between January 1995 and February 2015. The patients were divided into three groups based on age: group I (patients aged <60 years), group II (those aged 60 to 69 years) and group III (those aged ≥70 years). The primary outcome was the rate of total postoperative complications. Secondary endpoint included total operative time, hospital mortality, length of postoperative hospital stay, delayed gastric emptying, re-exploration, and survival rate.**

**RESULTS: A total of 828 patients who had undergone PD for resection of periampullary tumor were included in this study. There were 579 (69.9%) patients in group I, 201 (24.3%) in group II, and 48 (5.8%) in group III. The overall incidence of complications was higher in elderly patients (25.9% in group I, 36.8% in group II, and 37.5% in group III; *P*=0.006). There were more patients complicated with delayed gastric emptying in group II compared with the other two groups. There was no significant difference in the incidence of postoperative pancreatic fistula, biliary leakage, pancreatitis, pulmonary complications and hospital mortality.**

**CONCLUSIONS: PD can be performed safely in selected elderly patients. Advanced age alone should not be a contraindication for PD. The outcome of elderly patients who have undergone PD is similar to that of younger patients, and the increased rate of complications is due to the presence of associated comorbidities.**

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**KEY WORDS: pancreaticoduodenectomy; elderly; pancreatic fistula; delayed gastric emptying**

## Introduction

Following the increase of life expectancy, the patients in general surgical department are getting older, about 60% of them are 65 years or older.[1] It is clear that the old age is one of the risk factors for the development of hepatobiliary and pancreatic tumors; the annual incidence of pancreatic tumors is 50 folds higher in the elderly than that in the young population,[2, 3] which leads to a dramatic increase in the number of elderly patients undergoing pancreaticoduodenectomy (PD).[3, 4]

PD remains the main line of treatment of periampullary tumors. Although PD is a major and complex operation which involves extensive resection and different reconstruction procedures, the mortality rate has dropped to less than 5% in many published series whereas the rate of postoperative complications remains high from 40% to 50%.[5-7] Recently, many studies[1-4] expanded the selection criteria for PD to elderly patients. The significant improvement in the outcome of PD has encouraged surgeons to approach periampullary tumors as aggressively in elderly as in younger patients. The PD selection in elderly patients depends on their health status such as cardiopulmonary function and surgeon's skills.

Studies on the outcomes of PD for elderly patients are almost all from single high volume centers in the

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United State.[1-4, 7] It is difficult to decide whether PD is indicated for an older patient because of the existed comorbidity which resulted in postoperative complications and mortality. The benefit of PD for elderly patients is still debatable. Some studies reported the risk of morbidity and mortality of surgery in the elderly.[4, 8-10] However, others found that it almost carries no or minor risk compared to control patients.[1-3] The present study was to analyze the outcomes of PD in elderly patients in our center.

## Methods

### Patients

We analyzed all of the patients who underwent PD between January 1995 and February 2015 in Gastrointestinal Surgical Center, Mansoura University, Egypt. The indications for PD were periampullary tumors either benign or malignant, including ampullary tumors, pancreatic head cancers, lower end common bile duct tumors and duodenal tumors. We divided the patients into three groups based on age: group I (younger group, patients aged <60), group II (aged 60 to 69 years) and group III (aged ≥70 years). The institutional review board of the Mansoura Faculty of Medicine approved this study.

Patient data were collected from a prospectively maintained database since 2000 and from the archieve files between 1995 and 1999. The collected data included preoperative data, operative details, and postoperative complications and mortality. Only patients whose general conditions fulfilled the American Society of Anesthesiologists Physical Status Score Class I or II were considered as candidates of PD. Preoperative assessments such as cardiac and pulmonary functions were carried out. Preoperative details and postoperative data in our center have been described in our previous publications.[5, 11-13]

### Assessments

The primary parameter was the rate of total postoperative complications. We adopted the grading system of postoperative complications proposed by Clavien and Dindo classifications.[14] The secondary parameters included total operative time, hospital mortality, length of postoperative stay, time to resume oral intake, postoperative pancreatic fistula (POPF), delayed gastric emptying, biliary leakage, bleeding pancreaticogastrostomy, bleeding gastrojejunostomy, internal hemorrhage, pulmonary complications, re-exploration, and survival rate.

POPF was defined by the International Study Group of Pancreatic Fistula (ISGPF) as any fluid volume of drained on or after postoperative day 3 with serum amylase level being 3 times greater than the normal amylase level. POPF was graded into A, B, and C according to the clinical course.[15] Delayed gastric emptying was defined as output from a nasogastric tube of greater than 500 mL per day that persisted beyond postoperative day 10, the failure to maintain oral intake by postoperative day 14, or reinsertion of a nasogastric tube.[15] Biliary leak was defined as the presence of bile in the drainage fluid that persisted to postoperative day 4.[15]

### Statistical analysis

The data were analyzed using SPSS software, version 20 (Chicago, IL). Descriptive data were expressed as mean±SD and compared by using the one-way ANOVA or expressed as median (range) and compared using the Kruskal-Wallis test depending on whether they were normally distributed or not. Categorical variables were expressed as percentages and compared using the Chi-square test. The overall survival times were calculated using the Kaplan-Meier method and compared using the log-rank test. Multivariate analysis was performed using the Cox regression model to identify the predictors of postoperative morbidities. A $P$ value <0.05 was considered statistically significant.

## Results

### Demographic data

In the 828 patients with periampullary tumors treated with PD, 579 (69.9%) were divided into group I, 201 (24.3%) group II and 48 (5.8%) group III, respectively. In the past 20 years, the number of elderly patients who underwent PD increased annually. About 4.5% (15/336) of the patients underwent the operation between 1995 and 2004; this number was markedly increased between 2005 and 2015 (6.7%, 33/492). The median age of the patients was 56 years. The median age was 50 years in group I, 63 years in group II, and 71.5 years in group III. The three groups had similar gender distribution. Demographic and preoperative data of the patients are shown in Table 1.

Our center received 3782 patients with malignant obstructive jaundice over 20 years (Fig.). Among them, 2510 (66.4%) were pancreatic head cancer. Only 1404 out of 2510 (55.9%) patients with pancreatic head cancer were explored and 461/1404 (32.8%) were resectable. The overall resectable rate of pancreatic head cancer was 18.4% (461/2510). This rate in patients below 60 years was 29.5% (327/1110), between 60-69 years was 14.1% (110/779), and over 70 years was 3.9% (24/621).

The incidences of diabetes, hypertension, coronary