



## Outcomes of Pancreaticoduodenectomy Surgeries: A Single Center Experience With 71 Cases

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### Abstract

**Aim:** To retrospectively evaluate the results our pancreaticoduodenectomy surgeries in terms of morbidity and mortality rates as well as safety.

**Materials and methods:** Medical records of 71 patients, who underwent pancreaticoduodenectomy surgery between January 2007 and September 2012 at Department of General Surgery, Kocaeli University School of Medicine, were examined retrospectively. Age, sex, the type and localization of the lesion, surgical properties and postoperative complications were studied.

**Results:** A total of 71 patients (48 male, 23 female) with a mean age of 59.9 years who underwent pancreaticoduodenectomy were included in the study. Forty two patients (59%) had pancreatic head malignancies, 19 patients (27%) had ampulla malignancies, 4 patients (5.5%) had duodenum malignancies and 4 patients (5.5%) had common bile duct malignancies. Two of our cases (3%) underwent surgery for pancreatitis. Surgery related mortality rate was 2.8% (2 cases). The most frequently encountered complications were delay in gastric emptying (19%), pancreatic fistula (14%) and wound infection (10%). Postoperative morbidity rate was detected to be 28%.

**Conclusion:** Pancreatic and other periampullary tumors are serious clinical problems that cause morbidity. Traditionally, these patients have a dark prognosis but correct staging and appropriate patient selection allow better results. Surgical resection, the one reason for long-term survival, should be preferred whenever possible. In conclusion, we have found out that pancreaticoduodenectomy surgery is an effective and safe surgical method in the treatment of pancreas and common bile duct problems. This surgical procedure can be performed with low morbidity and mortality rates in experienced but low-density centers.

**Key Words:** Pancreaticoduodenectomy; Pancreas tumors; Periampullary region tumors; Mortality; Morbidity.

### Pankreatikoduodenektomi Operasyonu Sonuçları: 71 Olguluk Tek Merkez Deneyimi

#### Özet

**Amaç:** Kliniğimizde gerçekleştirilen pankreatikoduodenektomi operasyonu sonuçlarının morbidite ve mortalite hızları ve güvenilirlik açısından retrospektif olarak değerlendirilmesi.

**Gereç ve Yöntemler:** Ocak 2007-Eylül 2012 tarihleri arasında Kocaeli Üniversitesi Tıp Fakültesi Genel Cerrahi Anabilim Dalı'nda Whipple operasyonu yapılan 71 hastanın dosya kayıtları morbidite, mortalite ve güvenilirlik açısından geriye dönük olarak incelenmiştir. Yaş, cinsiyet, lezyon tipi ve lokalizasyonu, cerrahi özellikler ve postoperatif komplikasyonlar kaydedildi.

**Bulgular:** Ortalama yaşı 59.9 yıl olan ve pankreatikoduodenektomi uygulanan 71 hasta (48 erkek, 23 kadın) çalışmaya dahil edildi. Kırkiki olgu (%59) pankreas başı, 19 olgu (%27) ampulla, 4 olgu (%5,5) duodenum, 4 olgu (%5,5) koledok malignitesine sahip idi. İki olguya ise (%3) pankreatit nedeniyle cerrahi uygulandı. Cerrahiye bağlı mortalite oranı %2,8 (2 olgu) idi. En sık rastlanan postoperatif komplikasyonlar; mide boşalımında gecikme (%19), pankreas fistülü (%14) ve yara enfeksiyonu (%10) idi. Postoperatif morbidite oranı ise %28 olarak saptandı.

**Sonuç:** Pankreas ve diğer periampuller bölge tümörleri ciddi morbiditeye neden olan klinik problemlerdir. Geleneksel olarak bu hastalar karanlık bir prognoza sahip olmakla birlikte, doğru evreleme ve uygun hasta seçimi daha iyi sonuçlar elde edilmesini sağlar. Tek uzun süreli hayatta kalım sebebi olması nedeniyle, mümkün olan her durumda cerrahi rezeksiyon denenmelidir. Sonuç olarak, bu küçük olgu serisinde pankreatikoduodenektomi cerrahisi pankreas ve koledok patolojilerinin tedavisinde etkin ve güvenilir bir cerrahi yöntem olarak bulunmuştur. Cerrahi deneyimi olan düşük yoğunluklu merkezlerde de düşük mortalite ve morbidite oranları ile bu cerrahi işlem yapılabilmektedir.

**Anahtar Kelimeler:** Pankreatikoduodenektomi; Pankreas tümörleri; Periampuller bölge tümörleri; Mortalite; Morbidite.

## INTRODUCTION

Pancreaticoduodenectomy (PD) surgery is first defined by Whipple in 1935, and it is still the standard surgical treatment option for pancreatic adenocarcinoma. Also known as the Whipple procedure, this surgical technique brought about better results over time with applied modifications. The mortality rate, which was around 20% when the method was applied in its first years, is now

reported to be below 5% in large series of operations (1-3). Despite a significant reduction in the rate of mortality, the incidence of postoperative complications is still high. Today, the preoperative mortality rate in a standard Whipple operation is under 5% whereas the morbidity ratio is around 30% (4).

Among the most common complications of PD surgery one can count the delay in gastric emptying, pancreatic anastomotic leak, fistula, intra-abdominal abscesses,

bleeding, wound infection, diabetes and pancreatic exocrine insufficiency associated metabolic disorders. Several studies in the literature report decreases in mortality rates following the increase of PD cases in clinics and surgeon's experience (5,6). The aim of this study is to evaluate the results of PD operations performed in our clinic and to compare our surgical outcomes with other series in the literature in terms of mortality, morbidity and reliability.

## MATERIAL AND METHODS

To this end, we have retrospectively examined the files of our patients who underwent the Whipple operation in our clinic with various indications between January 2007 and September 2012. We have also compiled the records of patients's ages, sex, type and localisation of lesion, surgical procedures and related intraoperative and postoperative complications.

For all patients, we performed the standard Whipple operation procedures such as the removal of pancreatic head, neck, and region of the duodenum, 1/3 of the stomach distal, of the distal common bile duct and gallbladder along with the regional lymph nodes. To stabilise gastrointestinal and pancreatobiliary system continuity after the resection, starting from proximal jejunum, we have applied pancreaticojejunostomy (PJ) (end-to-end, two-layer binking method), hepaticojejunostomy (end-to-side, single layer), and gastrojejunostomy (side-by-side, two layers), respectively. During these operations, pancreatic anastomosis stents were placed.

Continuous data, mean  $\pm$  standard deviation, and categorical variables are indicated with the number of cases (percentages). For the statistical analysis of the data, we have used SPSS 15.0 for Windows software package (SPSS, Chicago, IL, USA).

## RESULTS

Whipple procedure was performed for a total of 71 patients included in the study. 48 of the cases (67%) were males and 23 (33%) were females. The mean age of the patients was  $59.9 \pm 14.8$  (35-84) years. When analyzed according to indication for surgery, 69 patients have undergone surgery for malignancy and 2 cases for pancreatitis. In terms of lesion localisation in patients with malignancies, we have seen that 42 patients (59%) had pancreatic head malignancy, while 19 patients (27%) had ampullary malignancy, four patients (5.5%) duodenum and the other four (5.5%) had bile duct malignancies. The average duration of hospitalisation after surgery was 13 (7-35) days.

The postoperative mortality rate was 2.8% (2 patients). One of these patients was lost due to myocardial infarction, and the other because of a cerebrovascular incident. The postoperative morbidity rate was 28%. We observed pancreatic fistula in eight patients, lung infection in two patients, wound infection in four patients, and post-operative hemorrhage in one patient,

and gastric atony in five of our patients. Of these patients, those with pancreatic fistula, gastric atony and lung infection were treated with conservative methods. Hemostasis was achieved by re-operation in one of the patients with postoperative hemorrhage. Pancreatic fistula and wound infection were the two most important factors affecting the duration of hospitalization, respectively.

The pathological examination of specimens taken from 38 pancreatic head malignancy patients showed that three of these patients had adenocarcinoma, three neuroendocrin tumour, and one of the patients had carcinosarcoma. In 18 of these patients, lymph node involvement was detected as well. The mean tumor diameter, varying between 0.7cm and 9cm, was 4.5 cm. The histopathological diagnosis for all 19 patients with ampulla vateri tumour was adenocarcinoma. In 12 of these patients, we identified metastatic lymph nodes. Ranging from 1 to 4.5 cm, the average tumour diameter was 2,5cm. In four of the patients with duodenum tumour, we identified adenocarcinoma. Lymph node was positive in only one of these patients. The mean tumor diameter was 6cm (between 4cm and 8cm). We also detected adenocarcinoma in four of the common bile duct tumour patients. In three of these patients, lymph node was positive and the mean tumor diameter was reported as 2cm (between 1cm and 4cm). According to the TNM classification, almost 80% of the pancreatic head cancer cases were in stage II and III. Of these patients, 3% were stage IV patients. 82% of all periampullary tumours were also observed to be in stage II and stage III.

The average annual survival rate in our seventy-one-patients series was 58% in pancreatic head tumour patients; the rate was recorded to be 72% in duodenum and periampullary region tumour patients.

## DISCUSSON

Pancreaticoduodenectomy is still valid and effective in the treatment of malignant and benign pathologies in periampullary regions. Appropriate patient selection, proper surgical technique, postoperative care and adequate interventional radiology support are all important factors that reduce mortality and morbidity. This retrospective study has shown that PD surgery mortality rate for various etiologies is 3% while the morbidity rate is 28%.

The mortality rate was reported to be 1.7% in a case series of 650 patients who underwent pancreaticoduodenectomy (1). The decrease in operative mortality is bound to the improvements in surgical techniques and preoperative care. However, many small-scale hospital are still known to have a high mortality rates. After examining all the procedures in a large scale research that studied the mortality rate differences in fourteen different procedures, it has been reported that the greatest mortality difference for pancreatic resection was 16.3% (year <1 case) in a hospital with very small numbers of patients, and %3,8

(year>16 cases) in a hospital with many cases (4). Although there are some studies to better understand the cause of these differences, the current data suggest that pancreaticoduodenectomy surgery success rate is higher in centers with more of such cases. However, it has also been argued that, with careful patient selection, major pancreatic resections can also be applied safely with low morbidity and mortality rates in hospitals with less number of these patients (7).

Similarly, it has been shown that qualification is independent from quantity in determining the outcomes of pancreatotomy and that mortality rates and clinical outcomes in centres that perform oncologic surgery might be close to or even better than centres with higher numbers of operations (8).

The post-pancreaticoduodenectomy mortality rate in centers specialised pancreatic surgery is around 2-3%. Although our clinic is a less crowded medical centre, the mortality rate was determined as 2.8%, and this ratio is consistent with centers having high numbers of cases. Despite low mortality rates, postoperative complication rates are still high in PD. In a pancreaticoduodenectomy series of 650 patients, the mortality rate was 1.4%, while the complication rate was reported to be 41% (1). The most common three complications in this series were delay in gastric emptying (19%), pancreatic fistula (14%), and wound infection (10%), respectively. In our series, the postoperative morbidity rate was 28%. The postoperative complications we came across in our series were pancreatic fistula (12%), lung infection (2.5%), wound infection (5.5%), postoperative bleeding (1%), and gastric atony (7%). Among these complications, delay in gastric emptying is not life threatening and usually resolves spontaneously. However, it prolongs hospitalisation period and increases costs. Patients should be applied parenteral nutrition support and nasogastric decompression until the complication is resolved. Pancreatic fistula after PD is not very common. Although the definition of the pancreatic fistula rates vary in publications depending on how fistula is defined, it is usually described as the leaking of pancreatic juice rich in amylase over 50 ml on the 7th postoperative day. In most cases, pancreatic leak comes to an ends with conservative treatment. In our series, too, pancreatic fistula were treated with conservative treatments without the need for re-operation.

To control potential pancreas leaks, in most centres, during surgery, a drain is implemented around pancreatic anastomosis as we did in our cases. In some centres, however, the drain is not placed during the surgery; instead, should a post-operative symptomatic pancreatic leak take place, they prefer drainage through interventional radiological techniques. If the patient is relatively asymptomatic and if, in spite of the normal diet, a fistula output below 200 ml/day is observed, the patient can be discharged with the drain. In most cases, the fistula closes in a few days. If the patient is symptomatic and his/her daily drainage is high (>200

mL/day), a parenteral nutrition practice should be considered for the patient.

In 56-79% of pancreatic cancer, 36-47% of duodenal cancer, 30-50% of ampulla cancer, and 56-69% of biliary tract cancer, lymph node metastasis is observed (9-12). The invasion of the pancreas due to non-pancreatic tumours significantly increases lymph node metastasis rate including paraaortic section (13). In our series, consistent with the reports in literature, we have detected lymph node metastasis in around 48% of pancreatic head cancer and 44% of all periampullary tumours.

Consequently, pancreatic and other periampullary tumors are serious clinical problems that cause morbidity. Traditionally, these patients have a poor prognosis but with the correct staging and patient selection, better results can be obtained. Surgical resection, the sole reason for long-term survival, should be preferred whenever possible. Surgical resection should be carried out by surgeons experienced in the treatment of such diseases in centres with lowest morbidity and mortality rates. As a result, it can be stated that current data recommends that PD should be applied in centres with high number of cases. But it should also be kept in mind that it is also possible to have PD operations with low mortality and morbidity rates in centres like ours having small number of patients and less experience.

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