

## Surgical Approach to the Pancreatic Head Tumor in an Emergency Setting due to ERCP-Related Duodenal Perforation: A Case Report

ERCP İlişkili Duodenal Perforasyonda Pankreas Başı Tümörüne Cerrahi Yaklaşım: Bir Olgu Sunumu

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### ABSTRACT

**Introduction:** Duodenal perforation is a rare complication during endoscopic retrograde cholangiopancreatography (ERCP) which requires an emergency approach. Herein we report a case of emergency pancreatoduodenectomy (EPD) for a patient who developed ERCP-related duodenal perforation with an underlying pancreatic head tumor.

**Case presentation:** A 55-year-old man was referred to our gastroenterology unit because of a pancreatic head tumor with a complaint of jaundice. Due to the development of ERCP-related duodenal perforation, the patient that had incomplete tumor staging underwent an emergency operation. To facilitate the early assessment of arterial involvement thus assess prediction of tumor resectability and complex anatomical variations, the mesenteric approach was carried out. The patient's postoperative course was uneventful, and he was discharged from the hospital on day 7 after surgery. Histopathologically, a poorly-differentiated ductal adenocarcinoma was identified and R0 resection was achieved.

**Conclusions:** It should be kept in mind that tumor staging should be completed prior to the ERCP procedure. In an emergency setting, the "mesenteric approach" is more reliable in terms of exposing the SMA (superior mesenteric artery) and identifying vascular anatomy and tumor extension in patients with pancreatic head tumor whose staging has not been completed and anatomy has not been assessed yet.

**Keywords:** Case report, emergency pancreatoduodenectomy, pancreatic head tumor, duodenal perforation, mesenteric approach

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### ÖZET

**Giriş:** Duodenal perforasyon, endoskopik retrograd kolanjiyopankreatografi (ERCP) sırasında nadir olarak görülen ve acil yaklaşım gerektiren bir komplikasyondur. Burada, ERCP ile ilişkili duodenal perforasyon gelişen pankreas başı tümörlü bir hastada acil pankreatoduodenektomi (EPD) vakasını sunuyoruz.

**Olgu sunumu:** 55 yaşında erkek hasta pankreas başı tümörü nedeniyle oluşan sarılık şikayeti ile gastroenteroloji ünitemize sevk edildi. ERCP'ye bağlı duodenal perforasyon gelişmesi nedeniyle tümör evrelemesi eksik olan hasta acil operasyona alındı. Arteriyel tutulumun değerlendirmesini erken yapabilmek ve böylece tümör rezektabilitesini ve karmaşık anatomik varyasyonları erken değerlendirmek için mezenterik yaklaşım uygulandı. Postoperatif seyri sorunsuz geçen hasta ameliyat sonrası 7. gün hastaneden taburcu edildi. Histopatolojik olarak kötü diferansiye duktal adenokarsinom tespit edildi ve R0 rezeksiyon sağlandığı doğrulandı.

**Sonuç:** ERCP işlemi öncesinde tümör evrelemesinin tamamlanması gerektiği unutulmamalıdır. Evrelemesi tamamlanmamış ve anatomisi henüz değerlendirilmemiş pankreas başı tümörlü hastalarda acil cerrahi gerektiğinde, SMA'nın (superior mezenterik arter) ortaya çıkarılması ve vasküler anatominin ve tümör yayılımının belirlenmesi açısından "mezenterik yaklaşım" daha güvenilirdir.

**Anahtar Sözcükler:** Olgu sunumu, acil pankreatoduodenektomi, pankreas başı tümörü, duodenal perforasyon, mezenterik yaklaşım

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## INTRODUCTION

Pancreatic cancer is a common malignancy that has a poor prognosis (1). Pancreatoduodenectomy (PD) is the only cure for pancreatic head carcinoma and can be performed electively with low morbidity and mortality in experienced hands (1). However, PD may be required urgently for pancreatic head tumors with inadequate staging in cases where endoscopic retrograde cholangiopancreatography (ERCP)-related complications have occurred. ERCP is useful in the pancreatic head tumor for the diagnosis and biliary drainage; however, it potentially carries complications like pancreatitis, postprocedural hemorrhage, infections, and perforations (2). Among these complications, ERCP-related perforations are less frequent with a rate of 0,6% (2). Therefore, attempting ERCP in a pancreatic head tumor without obtaining adequate imaging studies can lead to a devastating outcome.

Emergency pancreatoduodenectomy (EPD) is performed in exceptional situations, such as complex pancreatic injury, hemorrhage from ulceration and tumors that cannot be controlled conservatively, gross duodenal perforations, or severe infections (3). Furthermore, EPD may be required for periampullary tumors in such cases where ERCP-related complications have occurred (3). Since EPD was reported to have comparatively higher surgical mortality compared to elective PDs when looked through all indications, it's rarely performed in an emergency setting for pancreatic head tumors. Herein, we present the case of a pancreatic head mass, from a patient who had an ERCP-related duodenal perforation and consequently our approach on how to cope with it.

## CASE REPORT

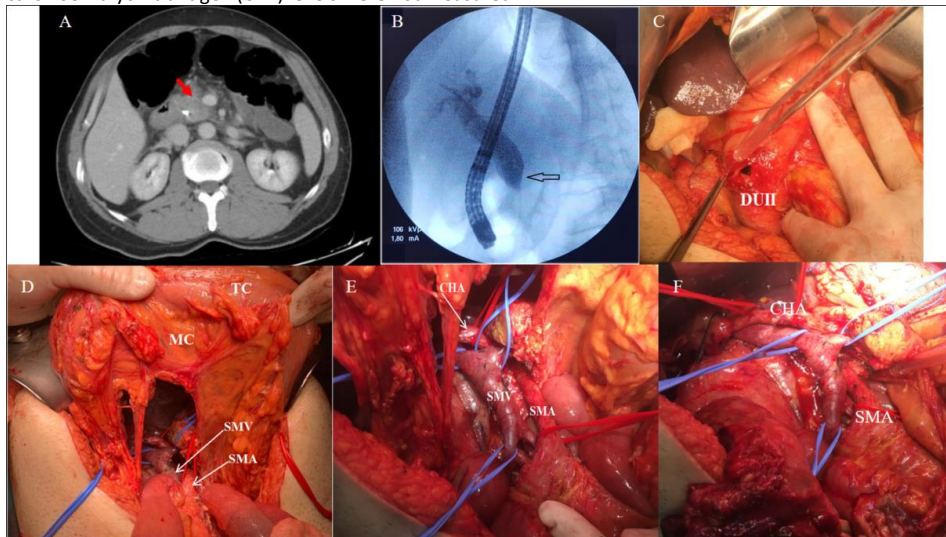
A 55-year-old male patient who had a history of acute pancreatitis attacks 5 times in the last 10 months presented to a local hospital. At the local hospital, two biliary stents were inserted for decompression and unenhanced computed tomography (CT) that taken afterward had shown a heterogeneous appearance at the pancreatic head region (shown in Fig. 1A), and. Due to nonfunctional stents, the patient was referred to the gastroenterology unit of our hospital with the complaint of jaundice.

On admission to our hospital, the laboratory results showed normal levels of lipase (52 IU/L) and amylase (44 IU/L). Also, white blood cell count was within a normal range (5650/ $\mu$ L) but C-reactive protein was increased (134 mg/dL). Liver function test results included as follows: total bilirubin 11,86 mg/dl, direct bilirubin 7,53 mg/dl, alkaline phosphatase 319 IU/L, aspartate transaminase 110 IU/L, alanine transaminase 165 IU/L, and gamma-glutamyl transferase 411 IU/L. Coagulation tests showed an increased level of INR (1,28) and a decreased level of aPTT (23,8 sc). The patient's serum carbohydrate antigen 19-9 (CA19-9) and carcinoembryonic antigen (CEA) levels were not measured.

ERCP was performed by the Gastroenterology Unit and revealed a dilated proximal common bile duct 22 mm in diameter at the widest point with a 30 mm filling defect in the distal common bile duct (shown in Fig. 1B). However, the ERCP procedure was interrupted due to the perforation which located at the anterior wall of the second part of the duodenum. The physical examination was given at the time of consultation to our clinic and revealed tachycardia, tachypnea, abdominal distension, and abdominal tenderness. Because of the hemodynamic instability, emergency laparotomy had to be performed without wasting any time.

At surgical exploration, liver metastasis and peritoneal seeding were not confirmed. After performing Kocher's maneuver and division of the gastrocolic ligament, the perforated area 2-3 cm in diameter at the wall of the second part of the duodenum was identified (shown in Fig. 1C). The common hepatic artery (CHA), gastroduodenal artery, and proper hepatic artery were dissected carefully and slung with vessel loops. Regional lymph nodes around these vascular structures were removed. The right gastric artery and gastroduodenal artery were sacrificed. Following cholecystectomy, the common hepatic duct was exposed and skeletonized. Behind the common bile duct, the portal vein was exposed and skeletonized. Following this, the base of the transverse mesocolon was incised with blunt and sharp dissections until exposing the SMA and superior mesenteric vein (SMV). The dissection along the SMA was maintained proximally to the root by performing connective tissue clearance for assessment of resectability. The middle colic artery was ligated and divided at its root for the purpose of mesopancreas dissection. After the confirmation of the resectability, PD was performed and reconstruction was achieved by the modified Child method (shown in Fig. 1D-F). The omentum was wrapped around the gastroduodenal artery stump by passing behind the pancreaticojejunostomy. Two silicon drains were placed in the abdominal cavity. The operation time was 450 min and red blood cell transfusion was not required. The patient was transferred to the intensive care unit where he was extubated on postoperative day 1. Oral feeds which he tolerated well were started on postoperative day 3. The amylase level from the right and left abdominal drains on postoperative days were as follows: Day 3: 3 IU/L and 1 IU/L and day 5: 6 IU/L and 7 IU/L. Therefore, drains were subsequently removed. The patient was discharged uneventfully from the hospital on postoperative day 7.

Macroscopically, the pancreatic head mass was 4 cm. Histopathological examination revealed a poorly-differentiated ductal adenocarcinoma with infiltration of the periampullary region and common bile duct. Also perineural and angiolymphatic invasion was detected. Resection with a clean margin (R0 resection) was achieved. From the harvested 47 lymph nodes, 26 metastatic lymph nodes were identified. 2 of them were paraaortic metastatic lymph nodes and 7 of them presented extracapsular invasion. The patient is currently receiving chemotherapy.



**Fig. 1.** A Unenhanced CT shows a heterogeneous appearance at the pancreatic head region (red arrow). B ERCP cholangiography revealed an obstruction of the distal common bile duct (arrow). C The perforated area at the wall of the second part of the duodenum was identified. DUII (second part of the duodenum). D Early exposing the SMV (superior mesenteric vein) and SMA (superior mesenteric artery) from the inframesocolic root. TC transverse colon, MC mesocolon. E, F Connective tissue clearance around the SMV, SMA, and the CHA (common hepatic artery).

**DISCUSSION**

Although ERCP is a widely used procedure for the management of biliary and pancreatic diseases, its complication risk is the highest among endoscopic procedures (2). Of these complications, ERCP-related perforations are relatively uncommon but have the highest mortality rate (2). It is difficult to diagnose duodenal perforation during ERCP, however, several studies show that 73% of duodenal perforations can be diagnosed during ERCP by the endoscopic view or using fluoroscopy (4). Management of the ERCP-related duodenal perforation varies from the conservative treatment to the surgery depending on the status of the patient, and the size and location of the perforation (5). Crocchi et al. discussed appropriate management by using the Stapfer classification system which is currently the most widely used classification system of ERCP-related duodenal perforation (5). According to Stapfer classification, our case is classified as type 1 which is defined as the duodenal perforation caused by the endoscope (often lateral duodenal wall). Crocchi et al. found that early surgical treatment (<24 h from ERCP) gives the best results in Stapfer type 1 perforations (5). In addition to early detection, preventing delays in surgical operation is of considerable significance to decrease morbidity and mortality (3).

PD is an ideal surgery for the mass lesions of the duodenum, distal bile duct, and pancreatic head in elective conditions. However, EPD is performed in exceptional situations, such as complex pancreatic injury, hemorrhage from ulceration and tumors that cannot be controlled conservatively, gross duodenal perforations, or severe infections (3). Furthermore, EPD may be required for periampullary tumors in such cases where ERCP-related duodenal perforation has occurred (3). Although the conservative approach is a successful treatment to fix the emergent situation in the majority of the iatrogenic perforation cases, the decision of EPD as a definitive treatment for tumors can be taken by experienced surgeons based on the patient's clinical conditions. When the underlying tumor is not overcome at first intervention, local peritonitis, inflammatory changes and undesirable complications such as fistula formation, focal pancreatitis, biliary peritonitis can attribute to delay second definite surgical intervention. Thus, a temporary salvage procedure can not be recommended in this specific situation (3). Therefore, a definitive surgery that is performed at the first exploration is a life-saving decision, particularly for patients who have co-existent malignancy (3). However, EPD is a troublesome surgical procedure in case of incomplete tumor staging. Hence, the tumor staging should be completed before ERCP by performing dynamic CT and MRI, thus be prepared for emergent definitive surgery.

Similar to our case, the definitive EPD has been reported in very few cases of ERCP-related perforation with periampullary tumor (3). Making a decision of EPD for the cure of the tumor is challenging due to preoperative incomplete tumor staging and it is not accurately interpreted whether the tumor is resectable or not. However, EPD prevented the second surgical operation that could have been difficult due to the altered anatomy and dense adhesions and also prevented the progression of the tumor that could have occurred until the second operation. Furthermore, Standop et al. found that in such cases with ERCP-related perforation and underlying malignancy, lengthened hospital stay after EPD is related to nonsurgical complications (3). The morbidity and mortality rates of EPD were not found to be increased disproportionately compared to elective PD, despite the fact that EPD was generally reported to have a higher mortality rate (3). Consistent with the literature, our case was discharged uneventfully on postoperative day 7.

The margin toward the SMA was found to be the most involved margin with the tumor and SMA infiltration is commonly considered as a sign of unresectability (1). Thus, first of all, infiltration of the SMA and SMV should be assessed intraoperatively for pancreatic head tumors. As in our case, the "mesenteric approach" can be performed by early exposing the SMV and SMA from the inframesocolic root and additional dissections continued cranially for pancreatic cancer (6). This technique facilitates the early assessment of arterial involvement and thus assesses the prediction of tumor resectability and complex anatomical variations. Therefore, the infracolic approach should be considered as a standard procedure when the assessment of the tumor involvement and anatomical variations can not be determined preoperatively such as emergency setting.

**CONCLUSION**

Early surgical treatment is a lifesaver in patients with ERCP-related perforations. If a perforation occurs in a patient with a co-existent periampullary tumor, EPD should be considered for the definitive cure of the tumor. In such cases, EPD prevents second surgery that can be challenging due to inflammatory changes, dense adhesions, and complications. Also, this approach prevents the progression of the tumor that could have occurred until the second operation and allows early initiation of adjuvant chemotherapy. It should be emphasized that performing imaging studies before ERCP provides early assessment of the tumor invasion and complex anatomical variations thus facilitates the decision-making process on whether to perform the emergency definitive surgery for the tumor. However, in cases where urgent surgery is required and tumor staging could not be completed, the mesenteric approach should be considered for early exposing the SMA and identifying vascular anatomy and tumor extension.

**Conflict of interest**

No conflict of interest was declared by the authors.

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