

## Current approach to traumatic hepato-pancreatico-duodenal injury: Report of a case and review of the literature

Travmatik hepato-pankreatiko-duodenal yaralanmalara güncel yaklaşım: Olgu sunumu ve literatüre bakış

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### Summary

Traumatic pancreaticoduodenal injuries still have a high mortality rate and the treatment remains challenging for surgeons. Damage control has become an important part of trauma care nowadays. This approach is useable only in selected groups of trauma patients.

An 18-year-old male was referred to our department because of motorcycle accident. Abdominal computed tomography (CT) demonstrated bilateral pleural effusion, a laceration in the right kidney, retroperitoneal hematoma, free air nearby the duodenum, complete transection of the pancreatic head and second portion of duodenum, and multiple lacerations in the right liver lobe. On laparotomy, the right lobe of the liver was divided with multiple lacerations. There was complete transection of the pancreatic head and second portion of the duodenum. We performed a right hepatectomy and whipple procedure. The patient was discharged from the hospital on the 31th postoperative day and has been stable and healthy during the one-year follow-up period.

Traumatic pancreatic injuries are generally associated with other abdominal injuries. Several surgical treatment options can be considered for pancreaticoduodenal injuries. Damage control surgery is the modern approach in severe trauma patients. However, in selected patients, definitive surgery can be the optimal choice because of a one step approach, but patient selection must be performed carefully.

**Key Words:** Damage control surgery, trauma, injury, pancreaticoduodenal, liver.

### Özet

*Travmatik pankreatikoduodenal yaralanmalar hala yüksek mortaliteyle seyretmekte ve tedavisi cerrahlar için zorluk teşkil etmektedir. Günümüzde hasar kontrol cerrahisi travma bakımının önemli bir parçasını oluşturmaktadır. Bu yaklaşım sadece iyi seçilmiş hasta grubunda kullanılmalıdır. 18 yaşında erkek hasta motosiklet kazası nedeniyle kliniğimize yönlendirildi. Batın tomografisi'nde bilateral plevral efüzyon, sağ böbrekte laserasyon ve retroperitoneal hematoma, duodenuma komşu serbest hava, pankreas başı ve duodenum 2. parçasının tam olarak bölünmüş olduğu ve karaciğer sağ lobda çok sayıda yırtık olduğu saptandı. Laparotomide, batın içi safra ve kanla karışık 2000 mL sıvı, karaciğer sağ lobu laserasyonlarla parçalanmış, pankreas başı ve duodenum 2. parçasının tam olarak bölünmüş olduğu görüldü. Sağ hepatektomi ve Whipple operasyonu uygulandı. Hasta operasyon sonrası 31. gün taburcu edildi. 1 yıllık kontrolünde halen sağlıklı ve stabil olarak izlendi. Travmatik pankreas yaralanmaları genelde diğer batın içi yaralanmalarla birliktelik göstermektedir. Pankreatikoduodenal yaralanmalarda çok çeşitli cerrahi tedavi seçenekleri bulunmaktadır. Günümüzde ciddi travmalı hastaya yaklaşımda hasar kontrol cerrahisi güncel yaklaşım olarak öne plana çıkmaktadır. Bununla beraber seçilmiş hasta grubunda definitif cerrahi tek adımlı bir operasyon olduğundan alternatif bir cerrahi seçenek olabilir. Fakat hasta seçimi çok dikkatli yapılmalıdır.*

**Anahtar Sözcükler:** Hasar kontrol cerrahisi, travma, yaralanma, pankreatikoduodenal, karaciğer.

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## Introduction

Traumatic pancreaticoduodenal injury still has a high mortality rate and the treatment remains challenging for surgeons. Both pancreatic and duodenal injuries consist of 5% of all abdominal injuries and mortality rates still remain high. The sensitivity of computed tomography (CT) in detecting pancreaticoduodenal injuries is 75.7% (1). Serum amylase and lipase levels are not reliable in predicting the severity of pancreatic trauma. Simple and fast damage control surgery ensures better outcomes (1). Damage control has become an important part of trauma care nowadays. In major abdominal injuries, development of lethal triad (coagulopathy, acidosis and hypothermia) affects and worsens both preoperative and postoperative outcomes (2). If this triad can not be defined and corrected definitely, each part of this triad accelerates the death circle (2,4). Hypothermia is defined as the condition in which the core temperature drops below 35 °C. Hypothermia occurred approximately in 21% of all severely injured patients and in 46% of all patients who underwent surgery for laparotomy (2). Hypothermia is associated with peripheral vasoconstriction, end-organ hypoperfusion and metabolic acidosis caused by anaerobic respiration. It also causes coagulopathy. In recent studies, hypoperfusion has been reported as the most important cause of coagulopathy in patients with severe trauma (2). Hypoperfusion leads the activation of protein C and hyperfibrinolysis. As a result of hypoperfusion and anaerobic respiration, acidosis occurs (2,3). This approach is useable only in selected groups of trauma patients. Patients with major vascular injury and visceral injuries including 2 or more organs, could possibly benefit from a damage control approach. Patients with insufficient reserves and who can not tolerate definitive surgery, may also be benefited from this approach (2). Injury severity score (ISS) and estimated time for definitive surgery are useful parameters in selecting patients for damage control (6). ISS is an anatomical scoring system that provides an overall score for patients with multiple injuries. Each injury is assigned an Abbreviated Injury Scale (AIS) score and is allocated to one of six body regions (Head, face, chest, abdomen, extremities, external). Injuries are ranked on a scale of 1 to 6, with 1 being minor, 5 severe, and 6 a nonsurvivable injury. Only the highest AIS score in each body region is used. The three most severely injured body regions scores are squared and added together to produce the ISS score (2,5). Damage control strategies were also described for vascular, thoracic, orthopedic and neurosurgical injuries. At Pre-hospital and in the emergency department, damage control must be performed to prevent severe hemorrhage until the patient's transport to the operating room. At the pre-hospital phase, fast-moving transport is the most

important step. In the operating room, both anesthesia and surgery have a potential role for damage control. Definitive airway, oxygenation, preventing hypothermia, correcting coagulopathy and perfusion supply are the main steps in damage control. Surgical bleeding must be controlled with rapid packing, arterial ligation or resection of bleeding organ. Contamination control is the next step. Abdominal closure is commonly achieved with a bogota bag or only cutaneous clamping (2,7-9). After the damage control surgery; the resuscitation should promptly begin at the intensive care unit. All effort should be given to maintaining normothermia, correcting coagulopathy and acidosis (2). Damage control has become an important part of trauma care in the last decades, and rarely definitive surgery was performed due to the patient's stability and vital signs in selected cases. In pursuant of this, we performed definitive surgery in our patient and we aimed to share our experience.

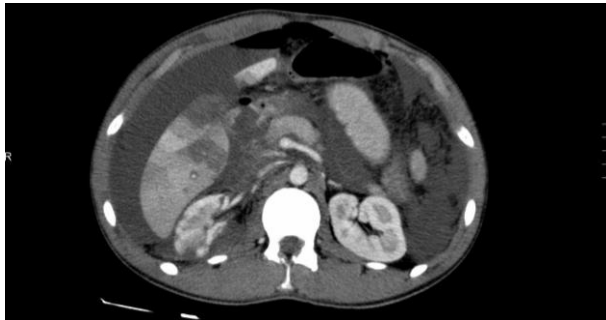
## Case Report

A 18-year-old male patient was admitted to a regional hospital for severe abdominal pain because of a motorcycle accident. On admission, his vital signs were stable but he complained of severe abdominal pain. Abdominal computed tomography (CT) demonstrated diffuse fluid collection in the abdominal cavity. He was referred to our department because of worsening pain after 24 hours. On admission, his vital signs were stable but only his heart rate was 120 per minute and he complained of severe abdominal pain. Rebound tenderness in physical examination and abrasion in inspection was observed. Laboratory results revealed a hemoglobin level of 16.9 g/dl, white blood cell count of 12.000 and platelet count of 175.000. The aspartate aminotransferase (ALT) and alanine aminotransferase (AST) levels were increased to 782 IU/L and 974 IU/L respectively. The serum amylase and lipase values were 2166 IU/L and 1970 IU/L respectively. Abdominal computed tomography (CT) demonstrated free intraperitoneal air nearby duodenum, complete transection of the pancreatic head and second portion of duodenum (Figure 2 and 3), with multiple lacerations in the right liver lobe lies on the main portal vein (Figure-1), diffuse fluid collection in the abdominal cavity and bilateral minimally hemopneumothorax. In operating room, his blood pressure was 125/80 mmHg and heart rate was 120 per minute. In blood gas analysis, there was no acidosis. His body temperature was 37°C. We did not consider lethal triad. The patient's vital signs were within normal limits for definitive surgery and during operation he also remained stable. On exploratory laparotomy, there was 2000 mL fluid in abdominal cavity which contained blood and bile. The right lobe of the liver was divided with multiple lacerations lies to main portal vein. There was complete transection of the

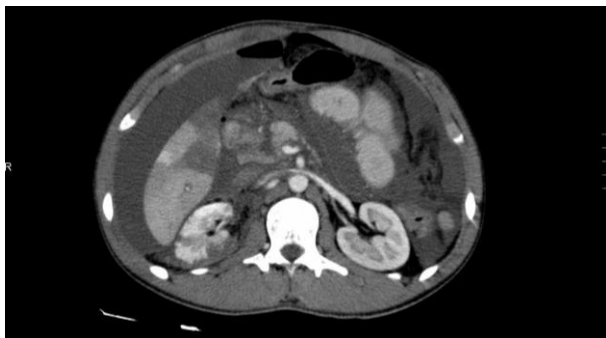
pancreatic head and second portion of duodenum. The gall bladder was separated from the liver and the bile duct and gastroduodenal artery were torn but not bleeding. We performed a right hepatectomy and whipple procedure. During recovery no surgical problem was observed, however, just a low flow rate bile fistulae occurred with 100 mL per day on the 3th postoperative day. It stopped spontaneously about postoperative 30th day. The patient was discharged from hospital on the 31th postoperative day and has been stable and healthy during a one-year follow-up period.



**Figure-1.** Demonstrates multiple lacerations in the right liver lobe.



**Figure-2.** Demonstrates complete transection of the second portion of duodenum.



**Figure-3.** Demonstrates complete transection of the pancreatic head.

## Discussion

Traumatic pancreatic injuries are generally associated with other abdominal injuries. The choice of surgical procedure depends on the location and degree of the injury. Several surgical treatment options can be

considered for pancreaticoduodenal injuries. The choice of aggressive or definitive surgery also depends on the patient's stability. If the patient is unstable or has a lethal triad, damage control surgery must be performed (1). In these patients, it is a clearly life-saving procedure. With the growing experience in damage control surgery, outcomes could be better and complications could decrease. In the literature, there are a few reported studies of searching damage control surgery. In 1908, Pringle used the damage control concept in liver hemorrhage with inflow occlusion and perihepatic packing. In 1982, Kashuk et al. described hypothermia, coagulopathy and acidosis in major abdominal injuries. Jurkovich et al. investigated severely injured patients undergoing laparotomy and reported 100% mortality in patients with a body temperature below 32°C. Rotondo et al. showed 2 or more visceral injuries and major vascular injury (2). Asensio et al. showed 98% life-threatening coagulopathy in patients with injury severity scores >25, systolic blood pressure <70 mmhg, ph <7,1 and temperature < 34°C. Cannon et al. first noted permissive hypotension (2). Shapiro et al. reported that coagulopathy is the most important parameter for deciding damage control surgery. Moore et al. described that the severity of coagulopathy, massive blood transfusion and persistent cellular shock was the most common causes of death in trauma patients (4,5). Hess et al. reported and first described Acute Coagulopathy of Trauma-shock (AcoTS) which consists of acidemia, hypothermia and dilution. Matsumoto et al. suggested that one of these parameters, including systolic blood pressure < 90mmhg, base excess < -7,5 mmol/L and if body temperature <35°C, damage control surgery should be performed (4). Damage control surgery increases the survival rate up to 50-70%. This approach is a physiological but not anatomical procedure. It is a minimal and short-timed surgery but saves the patient's life (7). According to Moore and Saphiro et al., the indications of damage control surgery are; coagulopathy, major venous injury, suboptimal resuscitation for a time consuming procedure, extra-abdominal life-threatening injury, the need to reassessment of intraabdominal process and the inability to reapproximate the abdominal fascia because of visceral edema. Excluding these indications and if the patient's vital signs are within normal limits, the definitive 'one step' surgery could be performed (4,5).

Nowadays damage control principles are also applied in non-trauma care including abdominal compartment syndrome and intra-abdominal sepsis. In conclusion, nowadays damage control surgery is the modern approach in severe trauma patients. However, in selected patients, definitive surgery can be an optimal choice because of a one step approach but patient selection must be performed carefully.

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