

Managing Pancreatic Trauma: The Importance of Suspicion

Montiel Jiménez Fuertes, David Costa Navarro

ABSTRACT

Purpose: Traumatic injuries to the pancreas are rare and only represent 4% of all abdominal injuries after trauma. These injuries are associated with a significant increase in morbidity and mortality. Their early diagnosis is essential, since lack of treatment results in serious complications that endanger the patient's life. We present three cases of pancreatic trauma with delayed diagnosis, established only after serious complications, and a revision of the current diagnosis and management of pancreatic trauma.

Materials and methods

Case 1: A 49-year-old woman who, 2 months after a fall, presents with severe pancreatitis and diffuse peritonitis. Patient was diagnosed with complete transection of the Wirsung duct.

Case 2: A 29-year-old woman who consults about abdominal pain 6 months after a difficult birth. Patient was diagnosed with complete transection of the Wirsung duct and giant pancreatic pseudocyst with acute hemorrhage.

Case 3: A 30-year-old woman who consults about abdominal pain 2 months after falling from her bicycle. Patient was diagnosed with complete transection of the Wirsung duct and pancreatic pseudocyst with acute bleeding.

Results: Distal pancreatectomy with splenectomy was performed in the first and third cases, while in the second case, it was possible to preserve the spleen with satisfactory recovery in all three cases.

Conclusion: Complications after pancreatic trauma are frequent. Many contributing factors exist, including not only management but also diagnosis of the pancreatic injury. A high index of suspicion is the most important factor in reaching a diagnosis.

Keywords: Pancreas, Trauma, Pancreatic pseudocyst, Abdominal trauma.

How to cite this article: Fuertes MJ, Navarro DC. Managing Pancreatic Trauma: The Importance of Suspicion. Panam J Trauma Critical Care Emerg Surg 2012;1(2):131-136.

Source of support: Nil

Conflict of interest: None

RESUMEN

Propósito: Las lesiones traumáticas del páncreas son infrecuentes y representan tan solo el 4% de todas los traumas abdominales. Presentan una elevada tasa de morbi-mortalidad. El diagnóstico temprano resulta esencial puesto que no tratarlas a tiempo puede llevar a serias complicaciones que pueden amenazar la vida del paciente. Presentamos tres casos de trauma pancreático que tuvieron un retraso diagnóstico, el cual se estableció con la aparición de serias complicaciones, y una revisión y actualización de los métodos diagnósticos y del manejo.

Métodos

Caso 1: Mujer de 49 años que presentó una caída casual en domicilio dos meses antes y debutó como un cuadro de

pancreatitis aguda grave y peritonitis difusa. El diagnóstico fue de transección completa del conducto de Wirsung.

Caso 2: Mujer de 29 años que consultó por dolor abdominal de seis meses tras un parto dificultoso. El diagnóstico final fue de transección del conducto de Wirsung y pseudoquiste de páncreas gigante con hemorragia intraquística aguda.

Caso 3: Mujer de 30 años que consulta por dolor abdominal dos meses tras haber presentado traumatismo con la bicicleta. La paciente fue diagnosticada de transección completa del Wirsung con pseudoquiste y hemorragia aguda intraquística.

Resultados: Pancreatectomía distal y esplenectomía fue realizada en los casos 1 y 3. En el segundo caso fue posible preservar el bazo, con recuperación satisfactoria en todos ellos.

Conclusiones: Las complicaciones del traumatismo pancreático son frecuentes. Existen muchos factores que contribuyen, especialmente el diagnóstico precoz. Un alto índice de sospecha es lo más importante para alcanzar el diagnóstico.

Palabras clave: Traumatismo de páncreas, Pseudoquiste de páncreas, Traumatismo abdominal.

INTRODUCTION

Pancreatic injuries are rarely isolated, since they are frequently associated with other intra-abdominal injuries. In spite of their rarity, these injuries may result in a considerable increase in morbidity and mortality.¹ Clinical symptoms and diagnostic tests are not specific. Multiple treatment options exist, although the integrity of the main pancreatic duct is the most important determinant. Undiagnosed duct injuries are responsible for secondary infections, fistulas, fluid collections and, as a consequence, long hospital stays.^{2,3}

With the increase in conservative management of blunt trauma, it is very important to achieve precise diagnosis of pancreatic injuries. Even apparently banal blunt trauma is capable of producing severe pancreatic injuries and, in this case, diagnosis may be difficult, even more so if there is no suspicion of such injuries.^{4,5}

We report three cases of pancreatic trauma diagnosed months after it happened, following the development of complications and a revision of current treatment of pancreatic trauma.

MATERIALS AND METHODS

Case 1

A 49-year-old woman presented with abdominal pain and vomiting. Her history is remarkable because she had fallen down the stairs of her home. After the fall, she was examined by her general practitioner, who diagnosed three fractured ribs and sent her home with symptomatic treatment. The

patient was back 24 hours later with vomiting and abdominal pain. The general practitioner diagnosed gastroenteritis and sent her home. Five days later, the patient was presented to the hospital emergency room, where abdominal computed tomographic (CT) scan was performed (Fig. 1). It revealed diffuse augmentation of the pancreatic gland with a small focal area of necrosis in the neck (severe acute pancreatitis, grade E Balthazar), with intense peripancreatic inflammatory changes and the formation of small fluid collections in the right and left perirenal fascia. Test results showed a slight elevation in blood amylase level, leukocytosis and left shift. The patient was admitted to internal medicine and diagnosed with idiopathic acute pancreatitis. The patient evolved slowly during her hospital stay and was discharged at 39 days with hospital-at-home care. Four days later, she was readmitted with generalized abdominal pain and septic shock. Abdominal magnetic resonance imaging (MRI) (Fig. 2) revealed retrogastric and peripancreatic fluid collections, one of them with heterogeneous content. The pancreatic duct was enlarged at the level of the head and tail. During her hospital stay, the patient was assessed for the first time by the Department of Surgery which, because of her septic shock, indicated a laparotomy to remove the

fluid collections and place drainage. During the post-op and, because an injury to the Wirsung duct was suspected, a wirsungography was carried out with the intention of placing stent, if the injury was confirmed. The procedure confirmed ductal damage, but the small caliber of the duct prevented the installation of the stent. This is why, 4 months after the initial trauma, surgery was carried out: The patient presented with a high-output pancreatic fistula that drained through the surgical drains that were still present. Surgery revealed a transition area of pancreatic caliber (Fig. 3). Distal pancreatectomy without spleen preservation was performed due to the extensive inflammatory reaction. After this, the patient progressed satisfactorily and was released uneventfully 8 days after surgery.

Case 2

A 29-year-old woman presented with abdominal pain in the left upper quadrant. Her history was unremarkable, except for a vaginal birth 6 months earlier that appeared to have been difficult, requiring abdominal pressure by the gynecologist (Kristeller maneuver) that the patient linked to the start of the pain. For this reason, she had consulted with her general practitioner, who had prescribed analgesia.

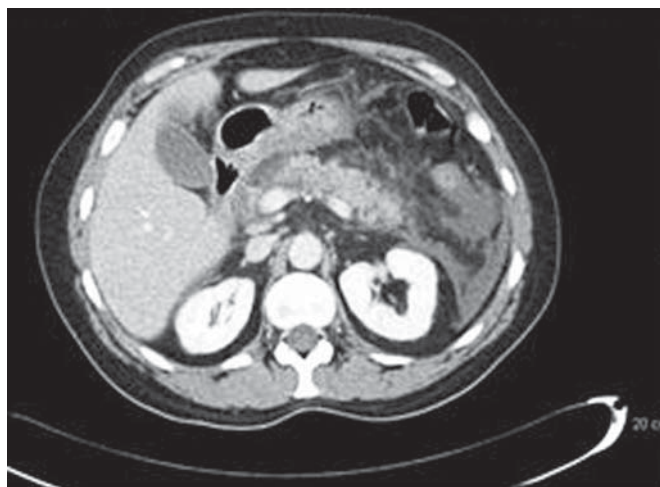


Fig. 1: CT: Necrotic focal area in the pancreatic neck with edema and peripancreatic fluid collections

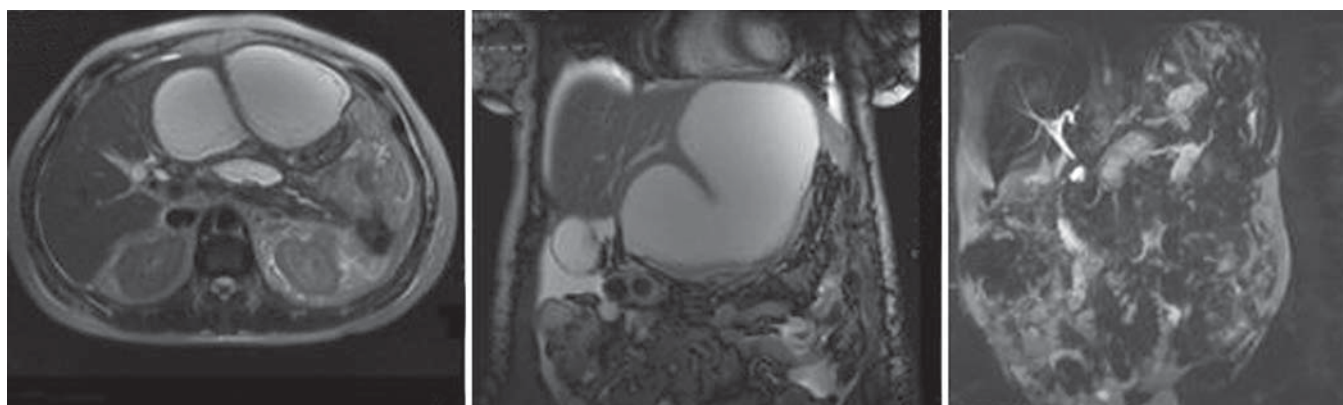


Fig. 2: MRI: Large retrogastric and peripancreatic fluid collection. Dilated pancreatic duct at the level of the body and tail



Fig. 3: Surgical view showing injury of the pancreatic body

She reported that she had come to the emergency room because the baseline pain had increased suddenly a few hours earlier. Physical exploration showed a mass in the left upper quadrant of the abdomen and generalized abdominal pain. An emergency abdominal ultrasound was performed, followed by abdominal CT (Fig. 4) that revealed a heterogeneous cystic lesion $15 \times 14 \times 11$ cm in size, located between the stomach, spleen and kidney. The pancreatic body and tail were not identifiable. The mass was described as a pancreatic pseudocyst containing blood in the context of acute intracystic hemorrhage.

Emergency surgery was performed because of the evidence of bleeding and the impossibility of emergency embolization. The pancreatic parenchyma and the Wirsung duct were found to be disrupted, so a distal pancreatectomy

with spleen preservation and cholecystectomy was performed. The postoperative course was uneventful and the patient was released from the hospital on the 6th postoperative day.

Case 3

A 30-year-old woman presented with abdominal pain in the left upper quadrant. Her history was remarkable in that she had fallen off her bicycle 2 months earlier. She had consulted her general practitioner after the fall because of continuous pain in her left upper quadrant of the abdomen that irradiated to the back. It was treated with analgesia and diagnosed as muscular pain. During 2 months, the patient presented loss of appetite and unquantified weight loss. She decided to present to the emergency room after she suffered a sudden worsening of the pain 48 hours earlier. Her test results on admittance were not specific except for moderate leukocytosis with left shift and severe anemia. Amylase levels were normal. Emergency abdominal ultrasound followed by CT (Figs 5A to C) was carried out because the patient was hemodynamically stable. They revealed a large pancreatic pseudocyst containing blood. Injury to the pancreatic duct was suspected and an emergency magnetic resonance cholangiopancreatography (MRCP) was performed (see Figs 5A to C), which confirmed duct disruption.

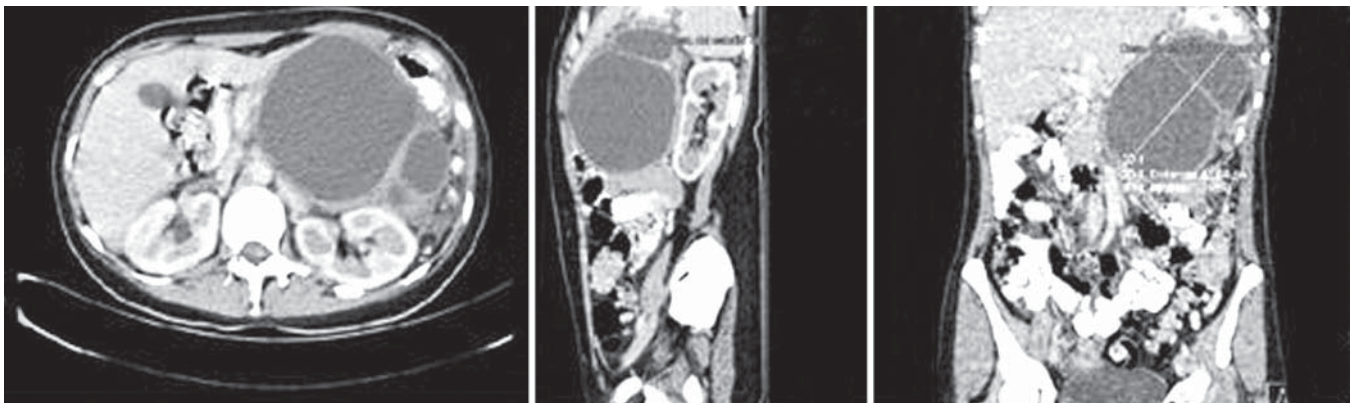


Fig. 4: Abdominal CT: Heterogeneous cystic injury measuring $15 \times 14 \times 11$ cm (pancreatic pseudocyst containing blood in the context of acute intracystic hemorrhage)



Figs 5A to C: (A and B) Abdominal CT showing pancreatic pseudocyst with hemorrhagic content, (C) MRCP: Disruption of Wirsung duct relative to fluid collection

Emergency surgery followed and distal pancreatectomy without spleen preservation was performed. The patient progressed satisfactorily and was released uneventfully from hospital at the 7th postoperative day.

DISCUSSION

Traumatic injuries of the pancreas are rare and only represent 4% of all abdominal.⁶⁻⁹ Because the pancreas is near multiple other structures, isolated injuries are rare. These injuries are associated with significant morbidity and mortality and, as a consequence, early diagnosis is essential for adequate management but, as can be seen in the cases, we have presented, it is important to suspect the diagnosis to be able to establish it. Although deaths directly related solely to pancreatic injuries are rare, they can occur in up to 3% of initial survivors.^{4,5} Nevertheless, morbidity associated with pancreatic injuries is much more frequent, of up to 48%.

DIAGNOSIS

The American Association for the Surgery of Trauma (AAST) published its Organ Injury Scale in 1990 to standardize the diagnosis and treatment of pancreatic injuries.

Early diagnosis can be difficult. Initial amylase levels are neither sensitive nor specific and may be normal in up to 35% of patients.¹⁰ However, if levels are abnormal, another test, such as abdominal contrast-enhanced CT, MRCP (they can be performed on hemodynamically stable patients) or endoscopic retrograde cholangiopancreatography (ERCP) for doubtful cases or for therapeutic stent implantation should be performed.

Exploratory Laparotomy

Laparotomy is usually required when there is important intraperitoneal bleeding or signs of peritonism. Median laparotomy for trauma is performed and hemorrhage control and limiting contamination become the priority. Some signs of pancreatic injury during laparotomy are the presence of liquid collections in the lesser sac, presence of bile, hematoma or necrosis on the pancreas or in the retroperitoneal space.¹¹ The integrity of the pancreatic duct should be determined. The simplest way of determining the integrity of the duct is to perform an intraoperative cholangiography through the cystic duct or an intraoperative pancreatography with cannulation of the ampulla, through the pancreatic tail and the duct or by performing intraoperative ERCP.¹² However, they all require time and, in most cases, they are not available in hospitals for emergency procedures. Besides, performing a duodenotomy can cause later leakage at that level and cannulation of the duct tail could prove impossible because of size. This is why, if the patient is unstable, the best

option is to install drainage and, when conditions allow it, to perform ERCP or other imaging tests.

TREATMENT

Nonoperative Treatment

Treatment requires knowing if the main pancreatic duct is injured. There are patients who, after blunt abdominal trauma, present with either a peripancreatic hematoma diagnosed via CT or post-traumatic pancreatitis. Non-operative treatment is indicated for these patients, although it is important in these cases to ensure that the pancreatic duct is not compromised through either MRI or ERCP. The latter allows the placing of a stent in case that there is evidence of injury. In situations like these, where conservative treatment is called for, a progressive elevation in amylase levels or changes in the patient's physical condition would call either for new imaging tests or for exploratory laparotomy.

Operative Treatment

Operative treatment is indicated for patients with penetrating or blunt abdominal trauma that show signs of peritoneal irritation, sustained low blood pressure or evidence of uncontrollable bleeding, have undergone positive focused assessment with sonography for trauma (FAST) performed by a surgeon, and show evidence of disruption of the pancreatic duct, if it was possible to perform an initial CT. Once bleeding and contamination are under control and the pancreatic injury has been confirmed, it will be necessary to know, if the main pancreatic duct has been disrupted and the site of injury, if a concurrent duodenal injury exists, besides the hemodynamic condition of the patient (Table 1).

Isolated Injuries to the Pancreas without Duct Injury

They are the most common injuries and should be treated with hemostasis and drainage.¹²⁻¹⁵

Isolated Injuries to the Pancreas with Duct Injury

Injuries to the pancreatic neck, body or tail with major lacerations affecting the duct should be treated with distal pancreatectomy with or without splenectomy. If resection is delayed (in a damage control situation) or is performed with post-traumatic pancreatitis, fibrosis and inflammation may hamper spleen preservation, as in the cases we have presented.¹²

Injuries of the pancreatic head are more complicated. The easiest option, if the duodenum or the pancreatic head are not devitalized and, if the ampulla is intact, is external drainage.

Table 1: Outline of operational treatment options according to injury

Grades	Description of injury	Treatment
I	Minor contusion without duct injury Superficial laceration without duct injury	Observation External drainage
II	Major contusion without duct injury or tissue loss Major laceration without duct injury or tissue loss	External drainage External drainage
III	Distal transection or parenchymal injury with duct injury	Distal pancreatectomy (with or without splenectomy) Roux-en-Y distal pancreatojejunostomy
IV	Proximal transection or parenchymal injury involving ampulla	Simple external drainage in damage control situation Pancreatoduodenectomy (Whipple procedure) Anterior Roux-en-Y pancreatojejunostomy Endoscopic stenting
V	Massive disruption of pancreatic head	External drainage in damage control situation Pancreatoduodenectomy (Whipple procedure)

Endoscopically placed stents are another option. Their use is indicated in hemodynamically stable patients with isolated injuries to the proximal duct.¹³

Combined Pancreatoduodenal Injuries

If the duodenal injury is small, it may be repaired and drainage left in the area. But if the injury is large, it seems safer to, additionally, perform duodenal decompression to keep the suture line intact. The most used method is pyloric exclusion.¹⁴

Pancreatoduodenectomy should be reserved for extensive injuries that affect the duodenum and the pancreatic head. In this sense, it should be performed as a two-step process.

COMPLICATIONS

Between 20 and 40% of patients treated operatively for pancreatic trauma will suffer from complications. Multiple factors can contribute to the appearance of complications after pancreatic trauma, but the most important factor should not be forgotten: lack of diagnosis and appropriate management, as in the cases we have presented.

The most frequent complication is pancreatic fistula, occurring in up to 38% of cases.¹⁶⁻²⁰ Most fistulas resolve spontaneously with external drainage and nutritional support. However, fistulas secondary to disruptions of the main duct may be treated satisfactorily by endoscopic stenting and, if this is not possible, distal pancreatectomy is recommended for fistulas of the neck, body and tail and anastomosis with a Roux-en-Y loop in pancreatic head fistulas.

Intra-abdominal abscesses are a frequent complication appearing in up to 34% of patients. Other complications include pancreatitis (4.3-23.1%), pancreatic hemorrhage (2.8-8.5%) and sepsis (23%).

Pseudocysts appear months after the initial trauma. If the main duct is intact, percutaneous or endoscopic puncture is sufficient. If the duct is injured, the indicated treatment is

endoscopic stenting, internal surgical drainage or even distal pancreatectomy, as in the cases we have presented.⁷

CONCLUSION

Complications following pancreatic trauma are frequent. Many factors can contribute to their appearance, including not only management but also proper diagnosis of the pancreatic injury at an early moment so that the most adequate treatment may be chosen depending on the type of injury. And to be able to reach a diagnosis, the most important factor is suspicion.

REFERENCES

- Patton Jr JH, Lyden SP, Croce MA, Pritchard FE, Minard G, Kudsk KA, et al. Pancreatic trauma: A simplified management guideline. *J Trauma* 1997;43(2):234-39 [discussion 239-41].
- Ballard RB, Badellino MM, Eynon CA, Spott MA, Staz CF, Buckman RF Jr. Blunt duodenal rupture: A 6-year statewide experience. *J Trauma* 1997;43(2):229-32.
- Lopez PP, Benjamin R, Cockburn M, Amortegui JD, Schulman CI, Soffer D, et al. Recent trends in the management of combined pancreatoduodenal injuries. *Am Surg* 2005;71(10):847-52.
- Teh SH, Sheppard BC, Mullins RJ, Schreiber MA, Mayberry JC. Diagnosis and management of blunt pancreatic ductal injury in the era of high-resolution computed axial tomography. *Am J Surg* 2007;193(5):641-43 [discussion 643].
- Vasquez JC, Coimbra R, Hoyt DB, Fortlage D. Management of penetrating pancreatic trauma: An 11-year experience of a level-1 trauma center. *Injury* 2001;32(10):753-59.
- Wind P, Turet E, Cunningham C, Frileux P, Cugnenc PH, Parc R. Contribution of endoscopic retrograde pancreatography in management of complications following distal pancreatic trauma. *Am Surg* 1999;65(8):777-83.
- Lin BC, Chen RJ, Fang JF, Hsu YP, Kao YC, Kao JL. Management of blunt major pancreatic injury. *J Trauma* 2004;56(4):774-78.
- Wolf A, Bernhardt J, Patrzyk M, Heidecke CD. The value of endoscopic diagnosis and the treatment of pancreas injuries following blunt abdominal trauma. *Surg Endosc* 2005;19:665-69.
- Tyburski JG, Dente CJ, Wilson RF, Shanti C, Steffes CP, Carlin A. Infectious complications following duodenal and/or pancreatic trauma. *Am Surg* 2001;67(3):227-31.

10. Velmahos GC, Tabbara M, Gross R, Willette P, Hirsch E, Burke P, et al. Blunt pancreatoduodenal injury: A multicenter study of the Research Consortium of New England Centers for Trauma (ReCONNECT). *Arch Surg* 2009 May;144(5):413-19; discussion 419-20.
11. Oláh A, Issekutz A, Haulik L, Makay R. Pancreatic transection from blunt abdominal trauma: Early versus delayed diagnosis and surgical management. *Dig Surg* 2003;20(5):408-14.
12. Degiannis E, Glapa M, Loukogeorgakis SP, Smith MD. Management of pancreatic trauma. *Injury* 2008 Jan;39(1):21-29.
13. Lin BC, Fang JF, Wong YC, Liu NJ. Blunt pancreatic trauma and pseudocyst: Management of major pancreatic duct injury. *Injury* 2007 May;38(5):588-93.
14. Degiannis E, Krawczykowski D, Velmahos GC, Levy RD, Souter I, Saadia R. Pyloric exclusion in severe penetrating injuries of the duodenum. *World J Surg* 1993 Nov-Dec;17(6):751-54.
15. Krige JE, Beningfield SJ, Nicol AJ, Navsaria P. The management of complex pancreatic injuries. *S Afr J Surg* 2005 Aug;43(3):92-102. Review.
16. Amirata E, Livingston DH, Elcavage J. Octreotide acetate decreases pancreatic complications after pancreatic trauma. *Am J Surg* 1994 Oct;168(4):345-47.
17. Lewis G, Knottenbelt JD, Krige JE. Conservative surgery for trauma to the pancreatic head: Is it safe? *Injury* 1991;22(5):372-74.
18. Degiannis E, Levy RD, Potokar T, Lennox H, Rowse A, Saadia R. Distal pancreatectomy for gunshot injuries of the distal pancreas. *Br J Surg* 1995;82(9):1240-42.
19. Farrell RJ, Krige JE, Bornman PC, Knottenbelt JD, Terblanche J. Operative strategies in pancreatic trauma. *Br J Surg* 1996;83(7):934-37.
20. Gustavo Recinos, Joseph J DuBose, Pedro GR Teixeira, Kenji Inaba, Demetrios Demetriades. Local complications following pancreatic trauma. *Injury* 2009;40(5):516-20.

ABOUT THE AUTHORS

Montiel Jiménez Fuertes

Department of General and Digestive Tract Surgery, Marina Baixa Medical Center, Alcalde Jaume Botella Mayor Avenue, 7 Villajoyosa Alicante, Spain

David Costa Navarro

Department of General and Digestive Tract Surgery, Marina Baixa Medical Center, Alcalde Jaume Botella Mayor Avenue, 7 Villajoyosa Alicante, Spain

Correspondence Address: Pintor Xavier Soler Avenue, 7D 6ª. 03015, Alicante Spain, Phone: 0034 609 633 372, e-mail: davidcir@hotmail.com