

WHEN AND HOW TO TREAT THE COMPLICATIONS IN INFECTED PANCREATIC NECROSIS

Quando e como tratar as complicações na necrose pancreática infectada

Rodrigo Altenfelder **SILVA**, Adhemar Monteiro **PACHECO-JUNIOR**, André de **MORICZ**, Tércio de **CAMPOS**

From the Department of Surgery, Faculty of Medical Sciences of Santa Casa de São Paulo, São Paulo, Brazil

HEADINGS – Acute pancreatitis. Infection. Pancreatic necrosis.

Correspondence:

Rodrigo Altenfelder Silva. R Francisco Leitão, 469 C 1203 - São Paulo - SP

Fonte de financiamento: não há
Conflito de interesses: não há

Recebido para publicação: 13/05/2010
Aceito para publicação: 13/09/2010

DESCRITORES - Pancreatite aguda. Infecção. Necrose pancreática

ABSTRACT - Introduction - Acute pancreatitis is presented in its severe form between 10% and 15% of cases and is associated with high mortality. In the initial phase, evolution characterized by the onset of organ dysfunction and subsequently by the presence of pancreatic necrosis and its complications. **Methods** – It was performed a literature review with consultations in the following databases: PubMed, SciELO, Lilacs. Headings used were the following: acute pancreatitis, infection, pancreatic necrosis. **Conclusion** - The treatment of pancreatic necrosis, despite the advent of modern methods and techniques, is still challenging. Because of the multiplicity of aspects that may take the examination of each case, in view of the extent, severity and location of facilities within a patient's care, the treatment should be individualized for each case.

RESUMO – Introdução - A pancreatite aguda se apresenta na sua forma grave entre 10% e 15% dos casos e está associada com alta mortalidade. Na fase inicial da evolução caracteriza-se pelo aparecimento de disfunções orgânicas e posteriormente pela presença de necrose pancreática e suas complicações. **Método** - Foi realizada revisão da literatura com consultas feitas nas seguintes bases de dados: Pubmed, Scielo, Lilacs. Os descritores cruzados foram os seguintes: pancreatite aguda, infecção, necrose pancreática. **Conclusão** - O tratamento da necrose pancreática, apesar do advento de modernos métodos e técnicas, ainda continua desafiador. Devido à multiplicidade de aspectos que pode assumir, a análise de cada caso, tendo em vista a extensão, gravidade e meios existentes no local de atendimento do paciente, é que deverá orientar o tratamento possível, sendo ele sempre individualizado a cada caso.

INTRODUCTION

Acute pancreatitis is presented in its severe form in 10% to 15% of cases and is associated with high mortality rates^{11,45}. In the initial phase the evolution is characterized by the onset of organ dysfunction and subsequently by the presence of pancreatic necrosis and its complications^{7,35}.

The leading causes of death in the early days of evolution result from the multiple organ dysfunction caused by systemic inflammatory response syndrome (SIRS). In later stages, the majority of deaths are related to the infection of pancreatic necrosis. During this period, sepsis with consequent failure of multiple organs and systems (IMOS) is the leading cause of death, which occurs from the second and third weeks of onset^{21,25,42}.

About 20% to 40% of patients with pancreatic necrosis develop infection, and 24% after one week and 72% after three weeks^{10,46}, with mortality in these cases up to 50%^{59,66}.

The terms pancreatic abscess, pancreatic sepsis, pancreatic phlegmon and infected necrosis frequently overlap and are often used as synonyms⁴⁵. International Symposium in Atlanta in 1992 sought to unify these concepts, while modifications are still being proposed^{12,14}.

The differential diagnosis between aseptic and infected pancreatic necrosis is not always easy. The same difficulty is found in the characterization of the existence of sterile/infected fluid collection and abscess, and abscess

with pseudocyst. The evolution of organ dysfunction or IMOS and a positive aspiration, provide grants to characterize the presence of infection, pancreatic necrosis, collection or presence of abscess^{16,25,59}.

Thus, it can be said that the main complications of pancreatic necrosis are the appearance of the collections, abscess and pancreatic pseudocyst. These complications may be associated or not to bleed, the appearance of fistulae and pancreatic ascites and will be the subject of this paper.

METHOD

Was performed a literature review with consultations in the following databases: PubMed, SciELO, Lilacs. Headings used were the following: acute pancreatitis, infection, pancreatic necrosis.

Collections and pancreatic abscess

Pancreatic or peri-pancreatic collections are generated by overflow of pancreatic secretion in acute inflammatory outbreak and is characterized by not being surrounded by a wall. Occur early during evolution and can be absorbed or be infected by bacteria from the gut through bacterial translocation, resulting in infected collections^{7,10}.

The pancreatic abscess is defined as a collection of purulent material encapsulated by a fibrous wall located in the pancreas or in the retropancreatic region^{7,11,16}. It occurs in 10% of cases of pancreatic necrosis and fine needle aspiration can reveal polymicrobial flora with intestinal bacteria Gram-negative and Gram-positive^{24,33}.

The abscess is a condition different from infected pancreatic necrosis, because there is no encapsulation of this purulent material, and is retroperitoneal diffuse infection. Furthermore, the abscess appears later in evolution, usually after four to six weeks of onset and contains no pancreatic necrosis^{7,11,46}.

Various types of surgical approach are proposed for the treatment of infected pancreatic necrosis with or without the presence of collections. Among them, debridement with external drainage, associated with postoperative peritoneal lavage and the program scheduled for reoperation, either closing the cavity or using the laparostomy^{7,9,10,11,17,33,51,52,54,57,60}.

Treatment of an infected collection or pancreatic abscess involves its drainage. Surgical drainage, together with debridement and local cleaning has historically mortality and morbidity high, ranging from 10% to 59% and 60% to 93%, respectively^{16,59,66}.

In fact, the variation in those rates reflect the different forms of the disease. Many cases classified as sterile necrosis associated with noninfected collections are actually cases of infected pancreatic necrosis with associated collections, or abscesses confused with pancreatic pseudocysts.

Since it is accepted correctly diagnosed, mortality for surgical drainage of an infected collection or a pancreatic abscess is from 5% to 10%^{7,10,11,33}.

More recently, minimally invasive treatment have been described. Thus, methods of percutaneous drainage guided by ultrasound or by CT have been used with satisfactory resolution rates and in a few days after surgery^{9,19,23,31,34,60}.

Transluminal endoscopic drainage techniques and retroperitoneal debridement laparoscopy, or even the combination of two methods, have also been used^{5,22,27,30,32,43,53,65} and shown to be feasible, although requiring more significant sample sizes and longer postoperative follow-up for a better evaluation of results.

Pancreatic pseudocyst

It is the most common complication after an outbreak of acute pancreatitis, focusing on 2% to 8% of cases and is considered the most common cystic lesion of the pancreas^{39,41}. It is defined as a collection of pancreatic juice enclosed by a fibrous wall not epithelized, what differentiates a true pancreatic cyst. It is a late complication in evolution, since it takes four to six weeks to occur encapsulation of the collection¹⁵.

The pseudocyst fluid is sterile and rich in pancreatic enzymes. They may have their contamination leading to the onset of infection, described in 10% to 15% of cases^{48,58}. Manifestations of sepsis occurs when the differential diagnosis with pancreatic abscess should be done^{50,61}.

The pseudocyst that persists after this period has an indication for surgical treatment. The open surgical procedures have lower rates of morbidity from 10% to 30% mortality of 1% to 5% and relapse rates of 5% to 20%^{40,58}. The cistogastroanastomosis or cistojejunoanastomosis and loop exclusion, are the most common procedures^{37,56}.

Percutaneous drainage of the pseudocyst and endoscopic internal drainage with placement of a pigtail, or even with endoscopic cistogastroanastomosis already been performed, but showed high recurrence rates due to small holes that were created, plus the occurrence of complications such as bleeding or drilling^{3,8,20,55,58}.

With the introduction of laparoscopy in the surgical treatment of pancreatic diseases, procedures like laparoscopic cistogastroanastomosis or cistojejunoanastomosis, began to be realized. Sometimes the realization of cistogastroanastomosis can enlist the assistance of endoscopic ultrasonography and endoscopy in order to reduce the chance of bleeding^{6,26,29,58}. Sometimes, the transgastric laparoscopic procedure can be used^{47,52,63}.

Although minimally invasive procedures seek to bring benefits to the patient, among us are still expensive and restricted to selected cases.

External drainage of the pseudocyst can also be performed when the wall is still thin and gives risk of dehiscence, or when the surgeon suspects the existence of infection and are uncertain in the implementation of internal drainage. In such circumstances, the patient may develop a fistula with pancreatic duct if there is a nutrient that provides significant flow of pancreatic secretion.

Similarly and exceptionally, the operations of resection can also be performed. In general, when located in the tail of the pancreas, the surgeon can choose the body-tail pancreatectomy⁴⁹.

It must be remembered that pseudocyst can also be involved with complications, such as gastrointestinal tract obstruction, rupture, bleeding^{2,4}.

The obstruction of the gastrointestinal tract by pseudocyst may occur due to the increase in the diameter and the point of obstruction depends on the location of growth. Are described obstruction of the esophagogastric junction, stomach, duodenum and small intestine. In such circumstances, internal drainage of the pseudocyst resolves the obstruction^{2,36}.

Spontaneous rupture of the pseudocyst also occurs. If goes to the peritoneal cavity can cause peritonitis and determine the performance of laparotomy for the cleaning of the cavity^{28,38}. If the break occurs inside an organ, usually to the stomach or duodenum and is not associated with bleeding, it may represent the solution to the problem^{2,13}.

The bleeding vessels by corrosion of the region - particularly the spleen - lead to grow the volume of the pseudocyst and drop on hematology tests. When operated at this stage the surgeon may have difficulty in controlling hemorrhage; is therefore prudent to carry out preoperative angiographic examination, besides being diagnostic it can also be therapeutic⁴⁴.

Hemorrhage and pancreatic fistula

During the development of infected pancreatic necrosis, whether operated or not, patients may develop these complications. Bleeding may result from corrosion of the wall of a vessel by the local inflammatory process rich in pancreatic enzymes, and pancreatic fistula by parenchymal destruction committing ducts¹⁸.

Corrosion occurs when the wall of a vessel can bleed into the free cavity. Although rare, is a dreaded complication and the patient should immediately be subjected to examination and possible angiography treatment. Other possibilities are the formation of a pseudoaneurysm or formation of a retroperitoneal hematoma or mesentery.

The formation of pseudoaneurysms can cause bleeding being diagnosed at an early stage, or are detected late in the differential diagnosis of pseudocyst. The surgery can be performed by resection, or angiography. The involvement of the mesocolon vessels instead of determining bleeding

can cause bowel ischemia and necrosis of the colon segment, and should be treated by laparotomy because it involves bowel resection^{1,64}.

Pancreatic fistulas in turn may determine the appearance of collections and pseudocysts, or more rarely, the formation of pancreatic ascites. Although the clinical treatment triggers the resolution rate in those cases when there is abdominal pain and signs of peritoneal irritation or failure of conservative treatment, is recommend washing and drainage of the cavity by laparoscopy that allows the cleaning of the retroperitoneum and allows the orientation of the fistula to the external environment^{18,19,34,43}.

Although the mortality of severe acute pancreatitis has decreased, it still represents a diagnostic and therapeutic challenge. The cases who develop pancreatic necrosis infection have high mortality and can present several complications, some of which could be treated by less invasive methods and other conventional surgical treatment.

CONCLUSION

The treatment of pancreatic necrosis, despite the advent of modern methods and techniques, is still a challenge. Due to the multiplicity of aspects in each case, in view of the extent, severity and local facilities within a patient's care, the treatment must be always

REFERENCES

1. Albridge MC, Francis ND, Glazer G, Dudley HAF (1989) Colonic complications of severe acute pancreatitis. *Br J Surg* 76:362–367
2. Andren-Sandberg A, Dervenis C (2004) Pancreatic pseudocysts in the 21st century. Part II: natural history. *JOP* 5:64–70
3. Atabek U, Mayer D, Amin A, et al. Pancreatic cystogastrostomy by combined upper endoscopy and percutaneous transgastric instrumentation. *J Laparoendosc Surg* 1993;3:501–4.
4. Balachandra S, Siriwardena AK (2005) Systematic appraisal of the management of the major vascular complications of pancreatitis. *Am J Surg* 190:489–495
5. Baron TH, Thaggard WG, Morgan DE, Stanley RJ. Endoscopic therapy for organized pancreatic necrosis. *Gastroenterology* 1996; 111: 755–64.
6. Barthelemy R, Siriser F (2004) Laparoscopic treatment of pancreatic pseudocysts. *Surg Endosc* 18:1645–1648.
7. Bassi C, Vesentini S, Nifosi F, Girelli R, Falconi M, Elio A, Pederzoli P (1990) Pancreatic abscess and other pus-harboring collections related to pancreatitis: a review of 108 cases. *World J Surg* 14:505–512
8. Beckingham U, Krige JEJ, Bornman PC, et al. Endoscopic management of pancreatic pseudocysts. *Br J Surg* 1997;84:1638–45.
9. Beger HG, Büchler M, Bittner R, Block S, Nevalainen T, Roscher R (1988) Necrosectomy and postoperative local lavage in necrotizing pancreatitis. *Br J Surg* 75:207–212
10. Beger HG. Surgical management of necrotizing pancreatitis. *Surg Clin North Am*, 1989; 69(3):529–49.
11. Bittner R, Block S, Büchler M, Beger HG (1987) Pancreatic abscess and infected necrosis: different local septic complications in acute pancreatitis. *Dig Dis Sci* 32:1082–1087

12. Bollen TL, Besselink MG, van Santvoort HC et al (2007) Toward an update of the Atlanta classification on acute pancreatitis: review of new and abandoned terms. *Pancreas* 35:107–113
13. Bradley EL III, Clements JL Jr (1976) Transenteric rupture of pancreatic pseudocysts: management of pseudocystenteric fistulas. *Am Surg* 42:827–837
14. Bradley EL. A clinically based classification system for acute pancreatitis. Summary of the International Symposium on Acute Pancreatitis, Atlanta, Ga, September 11 through 13, 1992. *Arch Surg* 128:586–590
15. Brugge WR, Lewandrowski K, Lee-Lewandrowski E, Centeno BA, Szydlo T, Regan S, del Castillo CF, Warshaw AL (2004) Diagnosis of pancreatic cystic neoplasms: a report of the cooperative pancreatic cyst study. *Gastroenterology* 126:1330–1336.
16. Buchler MW, Gloor B, Muller CA, et al (2000) Acute necrotizing pancreatitis: treatment strategy according to the status of infection. *Ann Surg* 232:619–626
17. Campos T, Parreira JG, Utiyama E, Rasslan S. Pesquisa nacional sobre condutas na pancreatite aguda. *Rev Col Bras Cir.* [periódico na Internet] 2008; 35(5):304–10
18. Connor S, Alexakis N, Raraty MGT, et al (2005) Early and late complications after pancreatic necrosectomy. *Surgery* 137:499–505
19. Connor S, Raraty MG, Howes N et al (2005) Surgery in the treatment of acute pancreatitis—minimal access pancreatic necrosectomy. *Scand J Surg* 94:135–142.
20. Das K, Kochnar R, Kaushik SP, et al. Double pigtail cystogastric stent in the management of pancreatic pseudocyst. *J Clin Ultrasound* 1992;20:11–17.
21. De Campos T, Sassatani AS, Moricz A, Silva RA, Pacheco Jr. AM. Limites do suporte clínico na pancreatite aguda grave. In: Ceconello I, D’Albuquerque LAC, Bresciani C, Garrido Jr. AB, Zilberstein B, da Cunha JEM, Sallum RAA, Nahas SC, Saad WA, Pollara WM. 36o Gastrão 2009 - Atualização em Cirurgia do Aparelho Digestivo e Coloproctologia. Editora Tecart. São Paulo, 2009. pag 9-14.
22. Freeny PC, Hauptmann E, Althaus SJ, Traverso LW, Sinanan M. Percutaneous CT-guided catheter drainage of infected acute necrotizing pancreatitis: techniques and results. *Am J Roentgenol* 1998; 170: 969–75.
23. Freeny PC, Lewis GP, Traverso LW, Ryan JA (1998) Infected pancreatic fluid collections: percutaneous catheter drainage. *Radiology* 167:435–441
24. Frey C, Reber HA (1993) Clinically based classification system for acute pancreatitis. *Pancreas* 8:738–743
25. Garg PK, Madan K, Pande GK, Khanna S, Sathyanarayan G, Bohidar NP, Tandon RK (2005) Association of extent and infection of pancreatic necrosis with organ failure and death in acute necrotizing pancreatitis. *Clin Gastroenterol Hepatol* 3:159–166
26. Giovannini M, Bemardini D, Seitz JF. Cystogastrostomy entirely performed under endosonography guidance for pancreatic pseudocyst: results in six patients. *Gastrointest Endosc* 1998;48:200–3.
27. Harewood GC, Wright CA, Baron TH (2003) Impact on patient outcomes of experience in the performance of endoscopic pancreatic fluid collection drainage. *Gastrointest Endosc* 58:230–235
28. Heider R, Behrns KE (2001) Pancreatic pseudocysts complicated by splenic parenchymal involvement: results of operative and percutaneous management. *Pancreas* 23:20–25
29. Hindmarsh A, Lewis MP, Rhodes M (2005) Stapled laparoscopic cystgastrostomy: a series with 15 cases. *Surg Endosc* 19:143–147.
30. Hookey LC, Debroux S, Delhay M, Arvanitakis M, Le Moine O, Deviere J (2006) Endoscopic drainage of pancreatic fluid collections in 116 patients: a comparison of etiologies, drainage techniques and outcomes. *Gastrointest Endosc* 63:635–653
31. Horvath KD, Kao LS, Ali A et al (2001) Laparoscopic-assisted percutaneous drainage of infected pancreatic necrosis. *Surg Endosc* 15:677–682
32. Horvath KD, Kao LS, Wherry KL, Pellegrini CA, Sinnan MN (2001) A technique for laparoscopic-assisted percutaneous drainage of infected pancreatic necrosis and pancreatic abscess. *Surg Endosc* 15:1221–1225
33. Howard TJ, Wiebke EA, Mogavero G, Kopecky K, Baer JC, Sherman S, Hawes RH, Lehman GA, Goulet RJ, Madura JA (1995) Classification and treatment of local septic complications in acute pancreatitis. *Am J Surg* 170:44–50
34. Hughes SJ, Papachristou GI, Federle MP, et al. Necrotizing pancreatitis. *Gastroenterol Clin North Am* 2007;36(2):313–23, viii.
35. Isenmann R, Rau B, Beger HG (2001) Early severe acute pancreatitis: characteristics of a new subgroup. *Pancreas* 22:274–278
36. Johnson LB, Rattner DW, Warshaw AL (1991) The effect of size of giant pancreatic pseudocysts on the outcome of internal drainage procedures. *Surg Gynecol Obstet* 173:171–174
37. Jones DR, Vaughan RA, Timberlake GA. Pancreatic pseudocyst: diagnosis and management. *South Med J* 1992;85:729–34.
38. Kahaleh M, Shami VM, Conaway MR, Tokar J, Rockoff T, De La Rue SA, de Lange E, Bassignani M, Gay S, Adams RB, Yeaton P (2006) Endoscopic ultrasound drainage of pancreatic pseudocyst: a prospective comparison with conventional endoscopic drainage. *Endoscopy* 38:355–359
39. Kloppel G (2000) Pseudocysts and other non-neoplastic cysts of the pancreas. *Semin Diagn Pathol* 17:7–15
40. Kohler H, Schafmayer A, Ludtke FE, et al. Surgical treatment of pancreatic pseudocysts. *Br J Surg* 1987;74(9):813–5.
41. Kourtesis G, Wilson SE, Williams RA (1990) The clinical significance of fluid collections in acute pancreatitis. *Am Surg* 56:796–799.
42. Le Mee J, Paye F, Sauvanet A, O’Toole D, Hammel P, Marty J, Ruszniewski P, Belghiti J (2001) Incidence and reversibility of organ failure in the course of sterile or infected necrotizing pancreatitis. *Arch Surg* 136:1386–1390
43. Lee MJ, Wittich GR, Mueller PR (1998) Percutaneous intervention in acute pancreatitis. *Radiographics* 18:711–724
44. Lillemo K, Yeo CJ (1998) Management of complications of pancreatitis. *Curr Probl Surg* 35:1–98
45. Lumsden A, Bradley EL III (1990) Secondary pancreatic infections. *Surg Gynecol Obstet* 170:459–467
46. McKay CJ, Buter A. Natural history of organ failure in acute pancreatitis. *Pancreatol*, 2003; 3:111-4.
47. Mori T, Abe N, Sugiyama M, Atomi Y (2002) Laparoscopic pancreatic cystgastrostomy. *J Hepatobiliary Pancreat Surg* 9:548–554.
48. Naoum E, Zavos A, Goudis K, Sarros C, Pitsargiotis E, Karamouti M, Tzikrikis P, Karantanis A (2003) Pancreatic pseudocysts: 10 years of experience. *J Hepatobiliary Pancreat Surg* 10:373–376.
49. Nealon WH, Walser E (2002) Main pancreatic ductal anatomy can direct choice of modality for treating pancreatic pseudocysts (surgery versus percutaneous drainage). *Ann Surg* 235:751–758
50. Neff R (2001) Pancreatic pseudocysts and fluid collections: percutaneous approaches. *Surg Clin North Am* 81:399–403.
51. Nicholson ML, Mortensen NJ, Esoiner HJ (1988) Pancreatic abscess: results of prolonged irrigation of the pancreatic bed after surgery. *Br J Surg* 75:88–91
52. Obermeyer RJ, Fisher WE, Salameh JR, Jeyapalan M, Sweeney JF, Brunicaudi FC (2003) Laparoscopic pancreatic cystogastrostomy. *Surg Laparosc Endosc Percutan Tech* 13:250–253.
53. Papachristou GI, Takahashi N, Chahal P, Sarr MG, Baron TH (2007) Peroral endoscopic drainage/debridement of walled-off pancreatic necrosis. *Ann Surg* 245:943–951
54. Pappas, TN, Haney, JC. Necrotizing pancreatitis: Diagnosis and management. (2007) *Surg Clin N Am* 87:1431-46.
55. Park AE, Heniford BT. Therapeutic laparoscopy of the pancreas. *Ann Surg* 2002;236(2): 149–58.
56. Poisson J, Nantais K, Eschave V. Pancreatic pseudocyst: Evolution of therapeutic concepts. *Can J Surg* 1994;37:450–6.
57. Refinetti, RA, Martinez R. Pancreatite necro-hemorrágica: atualização em momento de operar. *ABCD Arq Bras Cir Dig* 2010;23(2):122-12
58. Rosen, MJ, Ponsky, J. (2007) Combined Laparoscopic Endoscopic Procedures. *Gastrointest Vlin N Am* 17:521-532.
59. Schmid SW, Malfertheiner P, Büchler MW. The role of infection in acute pancreatitis. *Gut*, 1999, 45: 311-6.

60. Schoenberg MH, Rau B, Beger HG (1995) Diagnosis and therapy of primary pancreatic abscess. *Chirurg* 66:588–596
61. Soliani P, Franzini C, Ziegler S, Del Rio P, Dell'Abate P, Piccolo D, Japichino GG, Cavestro GM, Di Mario F, Sianesi M (2004) Pancreatic pseudocysts following acute pancreatitis: risk factors influencing therapeutic outcomes. *JOP* 5:338–347.
62. Stanten R, Frey CF (1990) Comprehensive management of acute necrotizing pancreatitis and pancreatic abscess. *Arch Surg* 125:1269–1275
63. Teixeira J, Gibbs KE, Vaimakis S, Rezayat C (2003) Laparoscopic Roux-en-Y pancreatic cyst-jejunostomy. *Surg Endosc* 17:1910–1913.
64. Tsiotos GG, Smith CD, Sarr MG (1995) Incidence and management of pancreatic and enteric fistulas after surgical management of severe necrotizing pancreatitis. *Arch Surg* 130:48–52
65. van Sonnenberg E, Wittich GR, Casola G, Brannigan TC, Karnel F, Stabile BE, Varney RR, Christensen RR (1989) Percutaneous drainage of infected and noninfected pancreatic pseudocysts: experience in 101 cases. *Radiology* 170:757–761
66. Werner J, Feuerbach S, Uhl W, Buchler MW. Management of acute pancreatitis: from surgery to interventional intensive care. *Gut* 2005; 54: 426–36.