Management of pancreatic ascites complicating alcoholic chronic pancreatitis

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L. Schneider Bordat[1], M. El Amrani[1], S. Truant[1], J. Branche[2], P. Zerbib[1]

1. Department of digestive surgery and transplantation, university of Lille Nord de France, Claude-Huriez Hospital, CHU de Lille, 59037 Lille, France.

2. Gastroenterology department, university of Lille Nord de France, Claude-Huriez Hospital, CHU de Lille, 59037 Lille, France.

Auteur correspondant : Lucil Schneider Bordat

Service de chirurgie digestive et transplantation, Hôpital Claude-Huriez, CHU de Lille, Rue Michel Polonowski 59037 Lille, France.

lucil.schneider@chru-lille.fr

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Summary:

Introduction: Pancreatic ascites (PA) is an unusual and little studied complication of chronic alcoholic pancreatitis. Management is complex and is based mainly on empirical data. The aim of this retrospective work was to analyze the management of PA at our center.

Patients and methods:
A total of 24 patients with PA complicating chronic alcoholic pancreatitis were managed at the Lille University Hospital between 2004 and 2018. Treatment was initially medical and then, in case of failure, interventional (endoscopic, radiological and/or surgical). Data regarding epidemiology, therapeutic and follow-up data were collected retrospectively.

Results:
Twenty-four patients were analyzed; median follow-up was 18.5 months [6.75-34.25]. Exclusively medical treatment was effective in three of four patients, but, based on intention to treat, medical therapy alone was effective in only two out of 24 patients. Of 17 patients treated endoscopically, treatment was successful in 15 of them. Of the 15 who underwent surgery, external surgical drainage was effective in 13. Multimodal treatment, initiated after 6.5 days [4-13.5] of medical treatment, was effective in 12 out of 14 patients. In total, 21 patients were successfully treated (87%) with a morbidity rate of 79% and a mortality rate of 12.5% (n = 3).

Conclusion:
PA gives rise to significant morbidity and mortality. Conservative medical treatment has only a limited role. If medical treatment fails, endoscopic and then surgical treatment allow a favorable outcome in more than 80% of patients.

Key words: Pancreatic ascites, chronic alcoholic pancreatitis, pancreatic duct rupture, pseudocyst

ESSENTIAL POINTS

- PA is a rare complication of alcoholic chronic pancreatitis (CP) that results in significant morbidity and mortality.
- An initial morphological assessment is essential, particularly to determine the severity of the underlying pancreatitis and to obtain a precise topography of the lesion.
- Conservative medical treatment seems to be ineffective and, if it fails, should be followed by a second-line endoscopic sphincterotomy ± endoprosthesis insertion).
- Surgery is a last-line treatment but should be considered earlier if endoscopic treatment is not possible and in cases of associated necrotizing pancreatitis.
- Surgery is most often necessary for pancreatico-pleural effusion associated with PA.

INTRODUCTION

Pancreatic ascites (PA) usually develops secondary to chronic pancreatitis (CP) (1) although other causes have been reported (2–4). It is defined by exudative ascites with an amylase level at least six times higher than serum amylase or an amylase level greater than 1000 IU/L (2). Fibrosis, pancreatic parenchymal calcifications and the local inflammatory state of CP are believed to explain high intra-ductal pressure leading to extravasation of pancreatic secretions (5). Leakage can come directly from a rupture of Wirsung's duct or, more frequently, from a pancreatic pseudocyst (PPC). Thus, a PPC has been noted in 80% of PA cases (6). PA is a rare condition with an estimated prevalence of 3.5% of patients with CP and 6 to 14% of patients with PPC (2). PA can communicate with the retroperitoneum and/or the mediastinum via the esophageal or aortic hiatus (7,8) and pancreatico-pleural effusion has been seen in association with PA in 18 to 38% of cases (8,9).

Historically, treatment for PA was medical, with surgery as a last resort if it failed (1,9). Today, endoscopic intervention has come to play an important role in management (3,10), but the place and modalities of the different treatment methods are still poorly defined and there is no therapeutic consensus on their use in the management of PA.

In this study, we analyzed the management of patients who presented to our service with PA secondary to CP in order to try to define a coherent therapeutic attitude.

MATERIALS AND METHODS

We carried out a single-center, retrospective study from January 1, 2004 to October 30, 2018 that included all consecutive records of adult patients treated for PA complicating the evolution of alcoholic CP. Cases of PA associated with

pancreatitis due to trauma, gallstones,and iatrogenic injury were excluded from the study.

Patients were identified from the PMSI database (Programme de Médicalisation des Systèmes d'Information) using the following CCAM diagnostic codes: "R18 - Ascites" or "R18 01 - Pancreatic ascites" associated with one of the following codes: "K86.0 - Chronic alcoholic pancreatitis", "K86.1 - Other chronic pancreatitis", "K86.1+0 - Chronic hereditary pancreatitis", "K86.1+8 - Chronic pancreatitis, other and unspecified", "K85 .9 - Acute pancreatitis, unspecified ", "K85.2 - Acute pancreatitis of alcoholic origin ", " K85.0 - Acute idiopathic pancreatitis, " K86.2 - Pancreatic cyst ".

The diagnosis of PA was made in accordance with criteria from the literature (2) in patients with exudative ascites (protein level> 3g/dL) secondary to a benign pancreatic pathology and an ascites:serum amylase ratio > 6 or an ascitic amylase level greater than 1000 IU/L. If the ascitic amylase level was less than 1000 IU/L, the diagnosis of PA was nevertheless made if endoscopic retrograde cholangiopancreatography (ERCP) showed a pancreatic fistula and free intra-abdominal effusion on the CT scan.

For each patient, we analyzed general characteristics (age at diagnosis, co-morbidities, chronology of the various treatments introduced, malnutrition as defined by the French Endocrinology Society (11)), laboratory findings (serum and ascitic levels of lipase, albumin and, amylase, and ascitic protein levels); diagnostic examinations (paracentesis, thoracentesis, endoscopy, CT scan, magnetic resonance imaging (MRI)); the various treatments instituted (medical, radiological, endoscopic, surgical); the therapeutic strategy followed; the length of hospital stay (LOS); the most recent follow-up information; and the morbidity and mortality during follow-up.

The diagnosis of CP was made based on clinical and imaging data (CT, MRI and/or ultrasound) (12).

Sepsis was defined in accordance with the 3rd French Consensus Conference on Anesthesia and Resuscitation (13) as an infection associated with a SOFA score (Sequential Organ Failure Assessment) ≥ 2.

Medical treatment consisted of analgesics, oral intake limited to water (± parenteral or enteral nutrition), ± administration of somatostatin analogues, ± iterative paracentesis of ascites.
Endoscopic treatment consisted of ERCP and sphincterotomy was performed systematically if local conditions permitted. At the same procedure, a plastic stent was inserted whenever possible (diameter 5-7 Fr, length 4-12 cm) in order to bridge and cover the ductal rupture. Associated procedures could also include infundibulotomy, “pigtail” catheter drainage of necrosis extensions, pseudocyst-gastrostomy drainage, and/or the insertion of a naso-jejunal feeding tube.
Radiological treatment consisted of percutaneous drainage of PA under ultrasound or CT guidance.
Surgical treatment consisted of lavage-drainage of the abdominal cavity ± placement of a feeding jejunostomy. This could be associated with cholecystectomy and trans-cystic duct biliary drainage, as well as tube thoracostomy in the event of an associated pancreatico-pleural fistula.
Medical treatment continued after interventional management was started.
Complications were noted with each type of treatment. Complications were considered "serious" when they caused systemic side effects and organ failure that required admission to intensive care or when they required an invasive procedure to treat them (radiological, endoscopic or surgical). Given the heterogeneity of patient management (medical, endoscopic, surgical or combined), no classification of morbidity into “grades" (Dindo-Clavien, CTCAE, *etc*.) seemed suitable to describe the complications of this series. When a patient presented with a serious complication, other non-serious complications were not cited apart from thromboembolic complications.
The effectiveness of treatment was assessed by post-treatment imaging studies and defined as the disappearance of ascitic fluid in the abdominal cavity at three months after the diagnosis of PA.

STATISTICAL ANALYSIS

Qualitative parameters are described in terms of frequency. Numerical parameters are described as median with extremes, or mean with standard deviation according to the distribution, size and extremes of the different samples.

RESULTS

From 301 patients selected by the obove-mentioned diagnostic codes, 24 patients with a diagnosis of PA complicating the course of alcoholic CP were finally included. Past history was marked mainly by smoking (n = 21), at least one episode of acute pancreatitis (AP) (n = 10), cirrhosis (n = 4), and type II diabetes (n = 3). The principal patient characteristics are detailed in **Table 1**. The median follow-up was 18.5 months [1-63]. For 15 patients, the diagnosis of CP was made concomitantly with the diagnosis of PA. The main clinical signs in the diagnosis of PA are detailed in **Table 1**.

For 21 patients, the diagnosis was confirmed by laboratory analysis of paracentesis fluid. The median amylase level in ascites was 7644 IU/L [269-153,560]. The diagnosis of PA was retained in three patients with an amylase level in ascites ≤ 1000 IU/L (852 IU/L,269 IU/L, and 735 IU/L) due to the presence of exudative ascites with protein levels well above 3 gm/L, free intra-abdominal fluid on imaging, and ERCP evidence of an active pancreatic duct fistula. The pancreatic lesion causing PA was identified in 23 patients by either abdominal CT (n = 9), MRI (n = 4), or ERCP (n = 10). For one patient, imaging could not identify the pancreatic lesion responsible for PA.

Four groups of patients were defined: exclusive medical care (Group A, n = 4), medical and endoscopic care (Group B, n = 4), medical and surgical management (Group C, n = 2), and multi-modal (medical, endoscopic, radiological and/or surgical) management (Group D, n = 14). The characteristics of the patients in each group are detailed in **Table 2**.

All 24 patients initially underwent medical management. Medical treatment was used exclusively in four patients with one death (52 days post-diagnosis), linked

to cirrhosis with edemato-ascitic decompensation (Patient n° 2). The other three patients had favorable outcomes. One of these patients had recurrent PA six months after the initial episode that was effectively treated with endoscopic stent placement (Patient # 1). Thus, based on intention-to-treat, exclusive medical treatment was effective in only two patients in the entire series.

On average, patients received 2.75 (± 1.2) types of treatment. After failure of medical treatment, second-line therapy was endoscopic (n = 11), surgical (n = 7), or radiological drainage (n = 2) where radiological drainage was performed in a context of diagnostic uncertainty (Patients n° 14 and 23). Second-line surgical treatment was motivated when endoscopic treatment was not technically feasible (Patients n° 9, 10, 17, 21, 22), for abdominal compartment syndrome (Patient n° 13), and due to diagnostic doubt regarding the possibility of malignant ascites (laparoscopic external drainage, Patient n° 15). The chronology of the different treatments is detailed in **Figure 1**. The median time between medical treatment and interventional management was 6.5 [5-7] days in group B, 7.5 [6 -9] days in group C, and 6.5 [1-38] days in group D.

The mean number of endoscopic procedures per patient was 1.4 ± 0.6. Sphincterotomy was systematically performed during ERCP while five patients also underwent infundibulotomy and 12 patients were treated with a plastic endoprosthetic stent (17 attempts with seven primary technical failures but two successes after a repeat endoscopic attempt). Among the five patients with technical failure of primary endoprosthesis insertion, two patients recovered after sphincterotomy alone (Patients n° 5 and n° 8) and three patients underwent secondary surgery with a favorable result (one patient was also treated by gastroscopic pseudocyst-gastrostomy). The median length of hospital stay was 28 days [16-99] for isolated sphincterotomy, while it was 40 days [16-74] for the 12 patients treated with stenting.

Among the 12 patients treated with pancreatic duct stent, treatment was effective in nine patients. Two patients received exclusive endoscopic treatment (group B, Patients n° 6 and n° 7) and seven patients received multimodal treatment (group

D). The Wirsung duct rupture was covered by the stent in eight cases and this data was not available for four patients. Three of the 12 patients failed endoscopic treatment: there were two deaths (Group D, Patients n° 18 and n° 22) and one patient with recurrent PA three months after endoscopic and surgical treatment, which was effectively treated by radiology-guided drainage (group D, Patient n° 21).

Of the 15 surgical patients, two underwent re-operation 8 and 60 days after the initial operation (one required a colostomy to treat a colonic perforation and the other underwent repeat abdominal lavage and drainage).

Six of the seven patients who presented with a flare of acute necrotizing pancreatitis complicating CP were treated surgically (including five after failure of endoscopic or radiological treatment) (Figure 2).

Three patients with PA also presented with pancreatico-pleural effusions. Two patients were successfully treated (Patients n° 19 and n° 23): the first by endoscopic endoprosthesis and surgical abdominal lavage-drainage associated with percutaneous thoracic drainage, the second by radiology-guided percutaneous abdominal drainage followed by surgical abdominal lavage-drainage and. percutaneous thoracic drainage. The third patient, who was treated with a ductal stent and thoracostomy for pleural empyema that persisted despite percutaneous chest drainage, died 78 days after diagnosis of PA from pulmonary embolism despite preventive anticoagulation (Patient n° 22).

Four patients had concomitant cirrhosis (Patients n° 1, 2, 8, 22). Their CHILD-PUGH scores were respectively C10, B9, B7, B9. In addition to standard treatments for cirrhosis (low-sodium diet, diuretics, ß-blockers), two were treated by exclusively medical therapy, one by endoscopic treatment, and one by surgical and endoscopic treatment. Two of these patients died (Patients n° 2, n° 22): one from edemato-ascitic decompensation, the second from pulmonary embolism.

Nineteen of the 24 patients developed at least one complication: seven patients had non-serious complications treated medically and 12 patients had serious complications (Table 3). Two patients presented with a pseudo-aneurysm of the

gastro-duodenal artery due to pancreatic fistula: one patient in group C was effectively treated by radiologic arterial embolization (Patient n° 9) and the other in group D died 81 days after the diagnosis of PA from hemorrhagic shock and post-embolization duodenal necrosis (Patient n° 18). Nine of our patients developed thromboembolic complications during hospitalization requiring therapeutic anticoagulation (Table 1). These included pulmonary embolism (n = 3; Patients n° 6, 13, 15), portal thrombosis (n = 4; Patients n° 2, 12, 17 and 19), splenic vein thrombosis (n = 1; Patient n° 24) and splenic and portal vein thrombosis associated with pulmonary embolism (n = 1; Patient n° 1). Among the six patients with splenic and/or portal thrombosis, there were five successes and one death from edemato-ascitic decompensation (Patient # 2), although one patient developed recurrent PA three months after diagnosis that was effectively treated by endoscopic prosthesis (Patient #1).
In total, half of our 24 patients developed serious complications and 21 patients were successfully treated (including two recurrences of PA at three and six months who were effectively treated with radiological drainage and stent, respectively). Three patients died.

DISCUSSION

Almost 90% of the patients in our series were cured of their PA but this required an aggressive attitude, since, the patients required an average of almost three types of treatment. For 15 of the 24 patients in our series, CP was previously undiagnosed and PA was their initial presentation of pancreatic disease; this complicated early diagnosis. Concomitant cirrhosis may have confused the diagnosis of PA with that of edemato-ascitic decompensation. Even in patients with proven cirrhosis (17% of patients in our series), ascites should suggest the diagnosis of PA in patients with CP. In the series by Lipsett and Cameron, systematic liver biopsies from patients operated on for PA showed cirrhosis in 100% of cases (9). Two of our four cirrhotic patients ultimately died from thromboembolic complications. However, except in the context of cirrhosis,

splanchnic vein thrombotic complications do not seem to have caused PA or worsened the prognosis since five out of six patients with splenic and/or portal vein thrombosis progressed favorably.

CT and MRI identified the pancreatic lesion responsible for PA in 13 of our patients. For ten patients, only ERCP was able to identify the pancreatic ductal lesion causing PA. However, the combination of CT and MRI was able to precisely diagnose the lesion for all 16 patients in another French series (15). In our experience, ERCP remains important for etiological diagnosis. Even though ERCP is an invasive examination (16), it should complete the etiological workup when CT and MRI are indeterminate.

Some authors have questioned the value of medical treatment for PA due to the high rate of failure and death. In a retrospective series of 50 patients treated for PA, the rate of medical treatment failure was 50% (21/42) with 12% mortality (9). In a more recent prospective study, exclusive medical treatment was unsuccessful in 11 out of 14 patients (17). Another series from 2004 (n = 11), reported five medically treated patients with one death (18).

The severity of underlying CP has been shown to be a factor in failure of medical management (19). Of our patients with CP complicated by a flare of AP and pancreatic necrosis, all required surgical or multimodal management (Groups C and D).

In these situations with severe CP, medical treatment should probably not be prolonged. Other predictors of medical treatment failure in literature reports are hypoalbuminemia, hyponatremia, an elevated ascites/serum amylase ratio, and multiple sites of contrast extravasation during ERCP (20). In contrast, a dilated Wirsung's duct was a predictor of success (18). Opinion concerning the optimal duration of medical treatment varies markedly in the literature. Some authors have recommended a minimum of two to three weeks (1,4,5,8). The effectiveness of medical treatment was disappointing in our study since only two patients were effectively treated with exclusive medical treatment (2/24 or 8.3%).

These poor results of medical treatment may be linked to insufficient treatment duration. The median duration of medical treatment was 6.5 days and could have been longer, particularly for patients with criteria favoring a good response to medical treatment (dilated Wirsung's duct, mild CP, single ductal rupture site).

Endoscopic treatment should probably be the preferred second-line treatment after medical treatment failure. This should include ERCP with placement of an endoprosthesis when possible. Ideally, the stent should be left in place for at least two months; the effectiveness on PA is better than with shorter drainage (4). Other identified predictors of success were partial rupture of Wirsung's duct, the ability to bridge the ductal rupture site with the stent, and localization of the ductal rupture in the pancreatic body (4,10). In our series, however, we did not obtain better results when these good prognosis criteria were met (data not provided).

In patients with CP, the difficulties in endoprosthesis placement are notorious (21,22). Two patients required a second attempt at endoscopic stent placement. When stent placement was unsuccessful, sphincterotomy alone allowed PA to resolve in two of these five patients. For these two patients, the median length of hospital stay was also shorter than that of patients treated with stents (28 days *vs.* 40 days). Although Kurumboor *et al.* recommended surgical management if cannulation of Wirsung's duct failed (3), ERCP sphincterotomy alone may prove effective in some cases.

Other endoscopic methods, such as trans-nasal pancreatic duct drainage, have been described with good results (100% efficacy) in small series (n=10 and n=3). This offers the advantage of being able to monitor the healing of Wirsung's duct by injected pancreatography through the indwelling drain (23,24). Endoscopic fibrin glue injection of the fistula tract allowed the leak to close and heal with resolution of PA in eight of 12 patients in a small series (25).

Currently, surgical treatment seems to be reserved for failures or when endoscopic management is contraindicated (duct stenosis, intrapancreatic stones, previous upper anatomy-modifying abdominal surgery or anatomical variations that prevent Wirsung catheterization). Thus, two patients in the present series underwent first-line surgery for collections that were inaccessible to endoscopic treatment; they had good long-term results without recurrence during follow-up. In addition, surgical treatment retains its place for CP complicated by an attack of acute necrotizing pancreatitis. Six of the seven patients in this situation underwent surgery after failure of endoscopic or radiological treatment (one death and five successes albeit with one recurrence treated by radiological drainage at one month).

In our series, pancreatic lavage-drainage was the only surgical intervention performed for PA; pancreatectomy was not performed. Analysis of the literature shows that internal drainage (pancreatic-jejunal anastomosis, pseudocyst-jejunostomy) and distal pancreatectomy were the most frequently reported interventions (2,26). However, compared to surgical lavage-drainage, these procedures seem technically more difficult and potentially more morbid in patients who are often undernourished. Internal drainage could nevertheless be considered when the ductal rupture has been identified during the operation. Likewise, left pancreatectomy can be considered when a distal pancreatic lesion is the cause of PA. In a recent series, the results in terms of recurrent PA favored left pancreatectomy over internal diversion although the difference was not statistically significant (26).

Although external surgical drainage have not been well studied in the literature, reported results have been disappointing. However, external drainage has the advantages of simplicity, speed, a less aggressive intervention, pancreatic parenchymal sparing and preservation of pancreatic endocrine and exocrine function. In our series, 12 of the 15 operated patients had a favorable result despite one recurrence of PA that was successfully treated. The re-operation

rate for complications was 6.6% (1/15 patients), significantly lower than the 47% reported in the literature for external surgical drainage (27). The complications presented by our patients were the same as those reported in the literature for internal drainage and partial pancreatectomy.
Pancreatic lavage-drainage therefore remains our preference for surgical treatment.

Fourteen of our patients underwent multimodal treatment (group D, which was successful in 12 patients while two patients died. At the end of the follow-up period, our results are consistent with the review by Gòmez-Cerezo *et al.* reporting on 139 patients who underwent a first-line treatment (either medical or interventional) that was effective in 59% of cases; 43 of these patients then underwent a second modality of treatment with a mortality rate of 10.8% but a success rate of 100% in the remainder (2).

In the 1976 series by Cameron *et al*., pancreatico-pleural fistulas complicated 0.4% cases of CP (28) and 18% of patients with PA (5/27 patients) (8). The incidence of this complication in our series is consistent with these figures since three of the patients with PA had an associated pleural effusion with high amylase level. The management of high-amylase pleural effusion was multimodal and always included surgery (endoscopy plus surgery (n = 2); radiologic drainage plus surgery (n = 1), with success for two patients and one death. The literature also reports frequent use of surgery and, in the review of Uchiyama *et al.,* 61% of patients underwent surgery (29). Other authors feel that management of PA should follow the traditional treatment sequence of initial medical therapy, then endoscopy, and finally surgical management in the event of failure (30).

CONCLUSION

PA is a rare complication of alcoholic CP that has significant morbidity and mortality. The initial morphological assessment should allow determination of the severity of the underlying pancreatitis and define the precise topography of the lesion to guide appropriate management. Medical treatment seems to have only a limited role. Second-line treatment is endoscopic in the majority of cases, but this must be supplemented by surgical intervention for pancreatic lavage-drainage in patients who have failed foregoing treatments.

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Table 1 – Caracteristics of 24 patients

Parameters	n
Age mean ± S.D.	51 ± 9.8
Sex Ratio M/F	22/2
Nutritional status *n*	
BMI: *median in kg/M^2 [Range]*	20 [15.2-30.6]
Weight loss: *median in Kg. [Range]*	10 [3-18]
Nutritional state, n	18
• Severe	16
Serum albumin, *median in Gm/L [Range]*	26 [19-30]
Initial clinical presentation, *n*	
Nonspecific abdominal pain	18
Alteration in general condition	14
Concomitant AP	13
• Acute necrosing pancreatitis	7
Diarrhea	4
Associated pathologies during hospitalization, *n*	
Pancreatic pleural effusion	3
Thromboembolic event	10
• Pulmonary embolus	4
• Portal vein thrombosis	5
• Splenic vein thrombosis	2
Sepsis	19
Treatment modalities, *n*	
• Medical	24
• Endoscopic	17
• Radiologic (Percutaneous drainage)	2
• Surgical	15

Success, *n*	21
• Recurrent PA, successfully treated	2
Mortality, *n*	3

PPC: Pancreatic pseudocyst; AP: Acute pancreatitis; BMI: Body mass index; PA: Pancreatic ascites

Table 2: Characteristics of the groups

	Group A	Group B	Group C	Group D
Number of patients	4	4	2	14
Median delay between medical treatment and interventional treatment, *days [range]*	-	6.5 [5-7]	7.5 [6-9]*	6.5 [1-38]
Length of hospital stay, *median in days [range]*	21 [10-32]	18.5 [16-27]	27.5 [21-34]*	47 [27-99]
Etiology, *n*				
- Pancreatic duct rupture	3	3	1	7
- Pseudocyst rupture	1	0	1	7
- Undetermined	0	1	0	0
Treatments				
• **Medical**, *n*	4	4	2	14
- Enteral nutrition	3	2	1	13
- Parenteral nutrition	1	0	2	8
- Somatostatin analog	2	3	1	8
- Iterative paracentesis	1	2	2	4
• **Radiologic** (Percutaneous drainage) *n*	-	-	-	2
	-	4	-	13
• **Endoscopic**, *n*	-	4	-	13
- Sphincterotomy	-	2	-	10
- Ductal stent endoprosthesis	-	0	-	1
- Transnasal cystic drain	-	0	-	4
- Drainage of necrotic foci	-	0	-	4
- Cyst-gastrostomy	-	1	-	2

- Naso-jejunal drain				
	-	-	2	13
• **Surgical**, n	-	-	2	12
- Lavage and external drainage	-	-	1	9
- Feeding jejunostomy	-	-	0	2
- Prophylactic cholecystectomy	-	-	0	1
- Thoracostomy				
• **Complications**, *n*				
• Non-serious	3	2	-	2
- Serious	1	-	1	10
Success, *n*	3	4	2	12
• Recurrent PA successfully treated	1**	0	0	1***
Mortality, *n*	1	0	0	2

Group A: Exclusive medical treatment; Group B: Medical and endoscopic treatment; Group C: Medical and surgical treatment; Group D: Multi-modal treatment

***** Results mean with range (sample size too small to calculate median time); ** recurrent PA six months from original diagnosis of PA, treated successfully with endoscopic stent placement (Patient n°1); ******* recurrent PA three months from original diagnosis of PA, treated successfully by radiology-guided percutaneous drainage (Patient n°21).

Table 3 – Complications

Severity	Complications
Non-serious (n = 7 patients)	Intra-cystic hemorrhage (n = 1, Patient n°4) PPC (n = 1, Patient n°6) Infected ascites (n = 4, Patients n°1, 7, 12, 16) Retroperitoneal air (n = 1, Patient n°7) Pulmonary embolus (n = 2, Patient n°6, 13) Portal vein thrombosis (n = 1, Patient n°12) Pulmonary embolus & splenic and portal vein thrombosis (n = 1 ; Patient n°1)
Serious (n = 12 patients)	FA gastroduodenal artery (n = 2, Patient n°9, 18) Duodenal perforation (n= 1, Patient n°18) FA splenic artery (n = 2, Patient n°17, 24) Infected ascites (n = 1, Patient n° 20) Nosocomial pneumonia with ARDS (n = 2, Patient n°19, 20) Inter-mesenteric abscess (n = 1, Patient n°17) Pulmonary embolus (n = 1, Patient n° 22) Edemato-ascitic decompensation (n = 1, Patient n°2) Hemorrhagic shock post-sphincterotomy (n = 2, Patient n°15, 11) Necrosing AP post endoscopy (n =1, Patient n°21) Post-operative intestinal perforation (n = 1, Patient n°23)
Non-serious TEC in patients who presented with other serious complications (n = 5)	Pulmonary embolus (n = 1; Patients n°15) Portal vein thrombosis (n = 3; Patients n°2, 17 and 19), Splenic vein thrombosis (n = 1; Patient n°24)

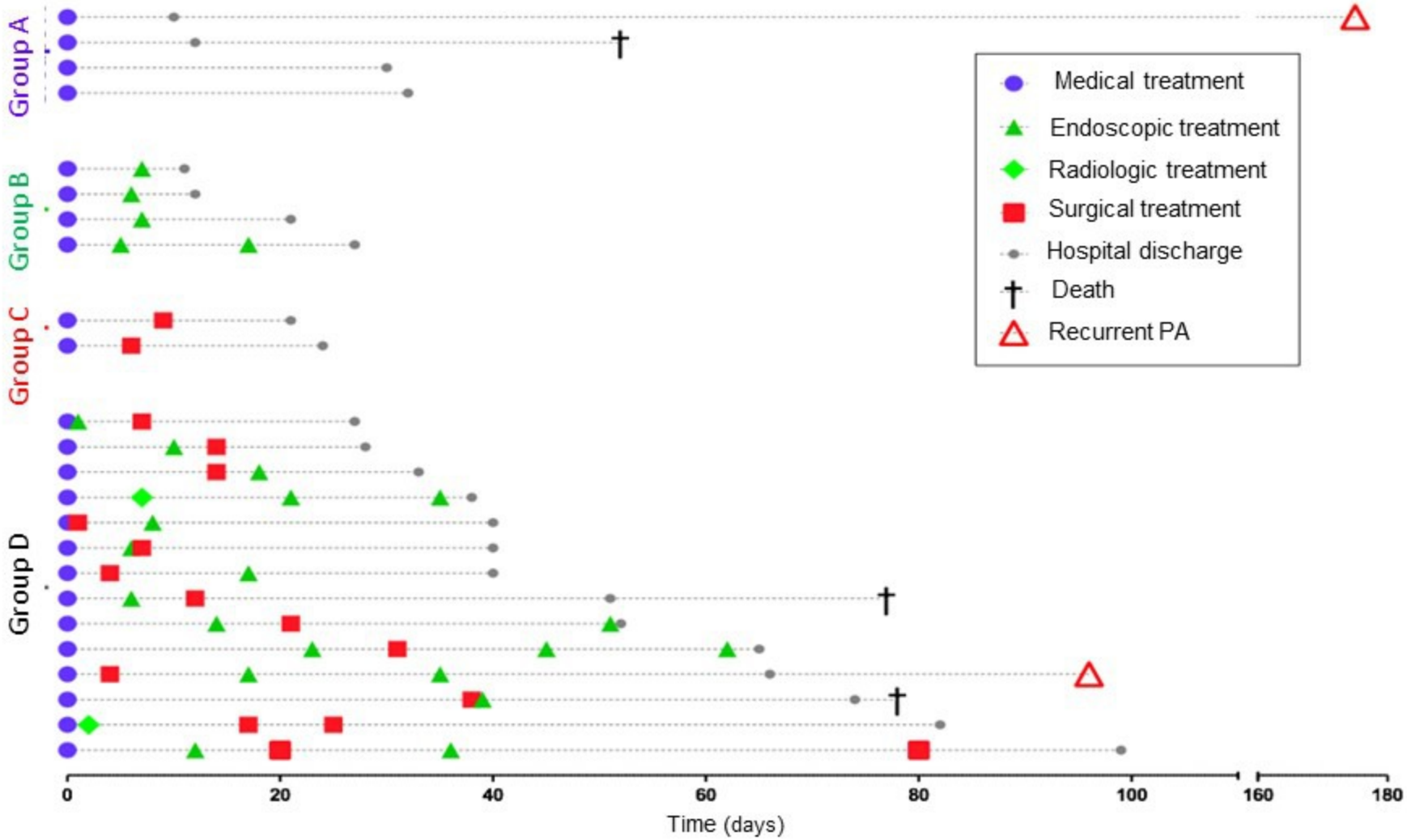
TEC: Thrombo-embolic complications; PPC: Pancreatic pseudocyst; FA: False aneurysm; ARDS: Acute respiratory distress syndrome;

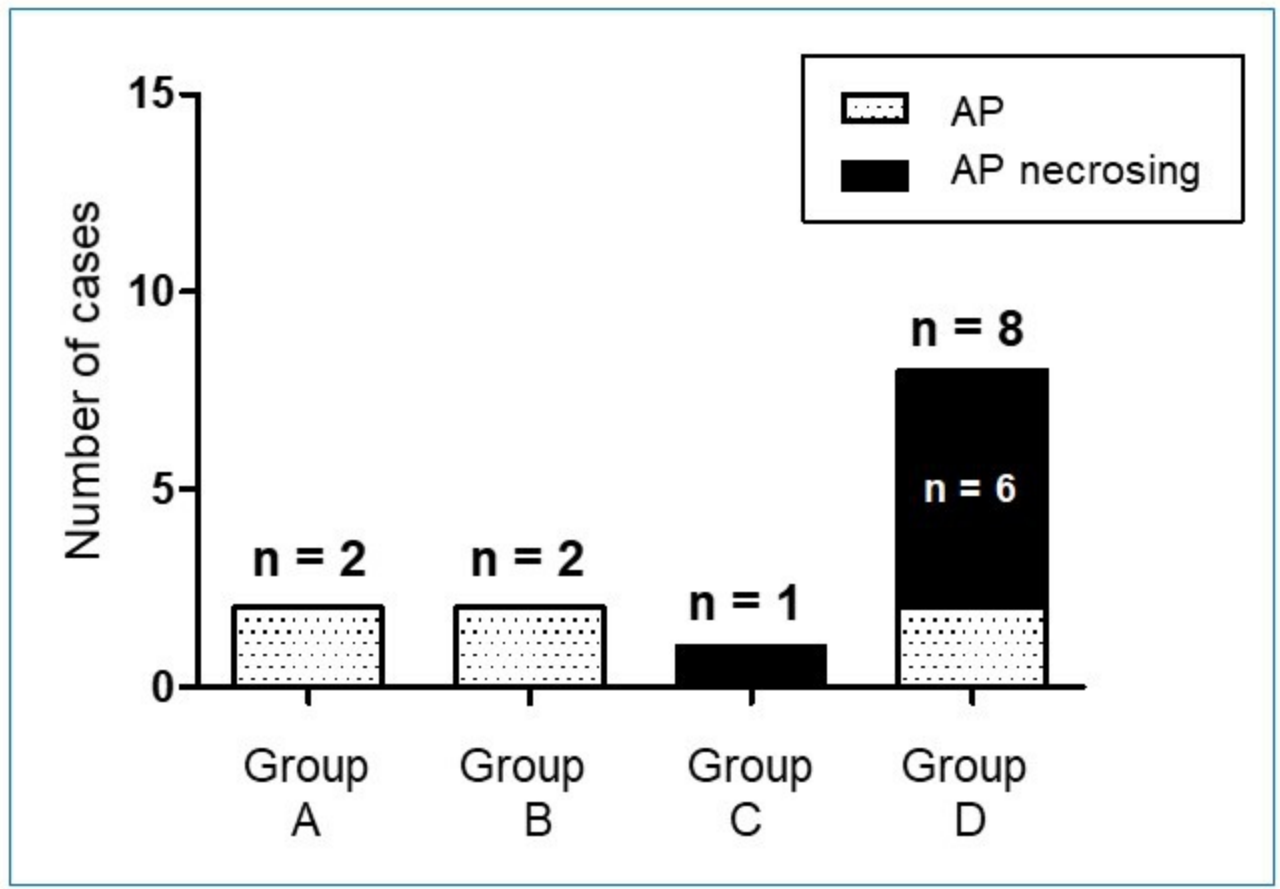
Figure 1: Chronology of treatments initiated for each patient

Group A: Exclusive medical treatment; Group B: Medical and endoscopic treatment; Group C: Medical and surgical treatment; Group D: Multi-modal treatment

Figure 2: Concomitant acute pancreatitis in each group of patients

AP: Acute pancreatitis; Group A: Exclusive medical treatment; Group B: Medical and endoscopic treatment; Group C: Medical and surgical treatment; Group D: Multi-modal treatment


Group A
Group B
Group C
Group D
Medical treatment
Endoscopic treatment
Radiologic treatment
Surgical treatment
Hospital discharge
Death
Recurrent PA
0
20
40
60
80
100
160
180
Time (days)


AP
AP necrosing
Number of cases
15
10
5
0
n = 2
n = 2
n = 1
n = 8
n = 6
Group A
Group B
Group C
Group D