ORIGINAL ARTICLE

# Surgical Management of Chronic Pancreatitis: on the Way to a Specialised Service in Latvia

**Guntars Pupelis, Margarita Ptasnuka, Viktors Novikovs, Sabine Uguzova, Raivis Gailums, Oksana Jurcenko, Haralds Plaudis**

Riga East University Hospital and Hipokrata Str. Riga, LV 1038, Latvia

**ABSTRACT**

**Background** Pain irresponsive to conservative treatment, symptomatic pseudocysts, obstruction of the gastrointestinal tract and bile ducts, development of pseudoaneurisms and internal fistulas are complications of chronic pancreatitis that necessitate invasive treatment. The aim of the study was to review the 7-year experience in the treatment of this patient category. **Methods** Retrospective analysis of the treatment results of the patients with chronic pancreatitis who were treated in our institution between January 2010 and March 2016. **Results** Out of 450 patients, 26.7% were females and 73.3% males. Alcohol was an etiologic factor in the majority of cases, 44.0%. Association with gallstones was found in 6.4%, with trauma – in 1.1%, however 48% were of unconfirmed etiology. Most patients – 86.4% – suffered from pain. Gastroduodenal obstruction and biliary obstruction was found in 6.2% and 4.7%, internal pancreatic fistulae in 4.7%, pseudoaneurisms in 2% and septic complications in 2.2% of cases. Non-operative management was successful in 62%, while invasive treatment needed 38% of patients. In total, 130 patients were operated on. The Frey procedure was performed in most cases – 46.9%, followed by cystogastro/cystoduodenostomy in 23.8% and other types in 29.3%. The median intensive care unit stay was 3 days IQR 2-4, and hospital stay – 8 days IQR 5-13. The mortality rate in this cohort was 0.4%. **Conclusion** Surgical intervention is the most common treatment of chronic pancreatitis in our institution. The Frey and Beger procedures and internal drainage are associated with a low complication and mortality rate; however, minimally invasive treatment should be used more often in the future.

## INTRODUCTION

Chronic pancreatitis encounters a spectrum of clinical conditions associated with a chronic progressive inflammatory process in the pancreas with scarring that irreversibly damages the pancreas. It results in the loss of the exocrine and endocrine function and, ultimately, in a complete loss of its function [1, 2]. Unfortunately, the increase of the incidence of CP in different parts of the world is evident [1, 2, 3]. A major part of the patients with CP needs conservative treatment; however, certain types of complications mandate endoscopic or surgical treatment [4]. The development of symptomatic pseudocysts, obstruction of the upper gastrointestinal tract and bile ducts, development of pseudoaneurisms and internal fistulas are considered rare complications of CP [2, 3, 4]. It is accepted that a patient with a complicated course of CP should ideally receive treatment based on a multidisciplinary approach that involves different specialists like a gastroenterologist, radiologist, endocrinologist, endoscopy specialist, nutritionist and surgeon if indicated. However, differences in the level of the available specialization of endoscopy and radiology service and other specialists, local expertise and the size of the patient flow dictate the need to adjust the management of complicated CP to the available resources, keeping in mind the international experience and guidelines. Treatment of rare complications of CP is even more challenging. The aim of the study was to review the 7-year experience in the treatment of this category of patients in the setting of the General Surgery Department, putting an emphasis on the combined minimally invasive and surgical treatment.

Received July 25th, 2016 - Accepted August 19th, 2016
**Keywords** Fistula; Gastrointestinal Transit; Pancreatic Pseudocyst; Pancreatitis, Chronic; Surgical Procedures, Operative
**Abbreviations** CECT contrast enhanced computed tomography; CP chronic pancreatitis; IQR interquartile range; Me median; MRI magnetic resonance imaging
**Correspondence** Guntars Pupelis
Riga East Clinical University Hospital
General and Emergency Surgery
2 Hipokrata, Riga, LV1038
Lativa
**Phone** +37129404783
**Fax** +37167042763
**E-mail** aslimnicagp@gmail.com

## METHODS

Medical charts of patients with complicated forms of CP who underwent treatment in our surgical department from January 2010 to March 2016 were analyzed retrospectively. All patients were admitted with emergent signs associated with a complicated course of CP. The visual diagnostic was started with a transabdominal ultrasound screening, followed by contrast enhanced computed tomography (CECT) in the case of suspicious findings. According to the clinical presentation, upper endoscopy, magnetic resonance imaging (MRI) or subtraction angiography were the most frequent additional radiologic investigations. Intraoperative ultrasonography was performed in patients when indicated. Patient age, gender, etiology of pancreatitis,

clinical presentation, type of complications and the mode of interventions were the variables for the statistical analysis. The main outcomes were assessed, calculating the length of the intensive care and hospital stay, readmission rate and in-hospital mortality. The interval data was presented in the median (Me) with interquartile range (IQR) and was confirmed by the Kolmogorov-Smirnov test for the asymmetrical distribution of data. A comparison of the interval data was performed with the Mann-Whitney U test, the nominal data comparison performed using the Pearson's chi-squared test and Fisher's exact test.

## ETHICS

The assessment and use of all clinical data was approved and permitted by the ethics committee of the Riga Stradins University before the study. The study protocol conformed to the ethical guidelines of the "World Medical Association (WMA) Declaration of Helsinki – Ethical Principles for Medical Research Involving Human Subjects" adopted by the 18th WMA General Assembly, Helsinki, Finland, June 1964 and amended by the 59th WMA General Assembly, Seoul, South Korea, October 2008 [5].

## RESULTS

Out of 450 patients who were treated during the study period, 120 were females and 330 were males. The median age of the cohort was 47 years IQR (55-40). The age difference was not significant between female and male patients, a median of 48 years (IQR 61.8-39.3) *vs.* 47 years IQR (54-41) accordingly, p=0.41 **(Table 1)**. In half of the male patients the etiologic factor was alcohol, and in one third of the female patients it was the most common cause of complicated CP and hospitalization, however, the male dominance was significant, p<0.001. Association with gallstones was found in 12.5% of the hospitalized female patients *vs.* 4.2% in males, p=0.002. Association with trauma was present in 0.8%-1.2 %, p=0.735. Unfortunately, in 48% of patients definitive information about the etiologic factor could not be obtained, but it was likely alcohol in the majority of cases **(Table 2)**. The most common reason for hospitalization was pain (86.4% of patients). In 39.2% of patients hospitalization was associated with pseudocysts. Other complications like gastroduodenal obstruction and biliary obstruction were less common, comprising 10.9% in total. Development of internal pancreatic fistulae, pseudoaneurisms or septic complications was in the range between 4.7% and 2% **(Table 3)**. Non-operative management was successful in 62% of the hospitalized patients, however, 38% of them needed invasive, including surgical, treatment. Minimally invasive treatment was successful in 41 patients, comprising 9.1% of all. In total, 130 patients underwent surgical intervention. The Frey procedure was performed the most often (n=58), and only 3 patients underwent the Beger procedure, totalling at 46.9% of all surgical interventions. The second most frequent procedure was cystogastro/cystoduodenostomy **(Table 4)**. Surgical intervention was indicated in two patients with bleeding pseudoaneurysms of the splenic artery when radioembolisation was not possible due to a compression of the coeliac trunk by the arcuate ligament of the diaphragm, and in the other case due to haemodynamic instability. There were 2 deaths in the whole cohort, bringing the hospital mortality rate to 0.4% **(Table 5)**. One death was associated with a long-standing anamnesis of chronic alcohol-induced pancreatitis and severe comorbid conditions including epilepsy, stroke with hemiparesis, bilateral hypostatic pneumonia and toxic cardiomyopathy. A 38-year old patient was admitted after an epilepsy attack with pancreatic ascites, pleural exudate and pseudocyst in the tale of the pancreas. The 27-day long conservative therapy was not successful. Another 78-year old patient was admitted with a pseudocyst in the head of the pancreas. The pseudocyst had a fistulous communication with the duodenum and the common bile duct. The patient was septic with a dilated common bile duct and main pancreatic duct. The CECT scan showed the

**Table 1.** Patient characteristics.

| Age and gender distribution in cohort | | | |
|---|---|---|---|
| | No. of patients | Age (IQR) | p-value |
| Age in cohort (Me) | 450 (100%) | 47 (55-40) | |
| Female | 120 (26.7%) | 48 (61.75-39.25) | 0.411 |
| Male | 330 (73.3%) | 47 (54.00-41.00) | |

**Table 2.** Main etiologic factors.

| | Female, n=120 | Male, n=330 | p-value |
|---|---|---|---|
| Alcohol, no. of patients | 35 (29.2%) | 165 (50%) | <0.001 |
| Gallstones, no. of patients | 15 (12.5%) | 14 (4.2%) | 0.002 |
| Trauma, no. of patients | 1 (0.8%) | 4 (1.2%) | 0.735 |
| Other, no. of patients | 69 (57.5%) | 147 (44.5%) | 0.015 |

**Table 3.** Type of complications of CP.

| | No. of patients |
|---|---|
| Pain syndrome | 389 (86.4%) |
| Pseudocysts | 176 (39.2%) |
| GI segment compression | 28 (6.2%) |
| Compression of bile ducts | 21 (4.7%) |
| Internal fistula | 21 (4.7%) |
| Sepsis | 10 (2.2%) |
| Pseudoaneurisms | 9 (2.0%) |

**Table 4.** Modality of treatment of complications of CP.

| | No. of patients |
|---|---|
| Non-operative management | 279 (62%) |
| Invasive in total | 171 (38%) |
| **Minimally invasive treatment** | |
| External drainage under USS control | 31 (6.9%) |
| Percutaneous trans hepatic stenting | 4 (0.9%) |
| Angioembolization | 6 (1.3%) |
| Total | 41(24% from all invasive) |
| **Surgical treatment** | |
| Mode of surgical intervention | Number of surgical interventions |
| Frey; Beger | 58; 3 (46.9%) |
| Cysto-gastro/duodeno/jejuno-stomy | 31(23.8%) |
| Distal pancreatectomy with splenectomy | 6 (4.6%) |
| External drainage | 13 (10.0%) |
| Other type of drainage | 18 (13.8%) |
| Pancreatoduodenectomy | 1 (0.8%) |
| Totaly | 130 (100%) |

**Table 5**. Main outcomes.

| | No. of patients | |
|---|---|---|
| One episode of hospitalization from | 159 (35.3 %) | |
| More than one episode of hospitalization | 141 (31.3%) | |
| Lost data | 150 (33.4%) | |
| Lethal outcome | 2 (0.4%) | |
| Totally | 450 | |
| **Readmission rate** | | |
| After conservative therapy, n=279 | 124 (44.9%) | p<0.005 |
| After surgical intervention, n=130 | 15 (11.5%) | |

presence of air in both ducts. The endoscopy specialist recommended performing an open intervention due to the inability to provide stenting in the oedematous and a deformed duodenum. Even though the patient's preoperative comorbid condition corresponded to grade III-IV according to the American Society of Anaesthesiology classification, open intervention was defined as the only option. The diverticulization of the duodenum with gastro-entero, hepatico-jejuno and entero-entero anastomosis was performed; however, due to hypoproteinaemia, dehiscency of the gastro-entero anastomosis developed on the 9th postoperative day with a formation of high output gastric fistula. The patient died 45 days after the operation. The evaluation of the overall treatment results revealed that 35.3% of all patients were successfully treated and needed one hospitalization during the observed period of 7 years. However, repeated hospitalization was necessary for 44.9% of patients who received only non-operative management *vs.* 11.5% of patients after surgical interventions, p< 0.005, Table 5.

## DISCUSSION

### Epidemiology

CP has a negative impact on life expectancy. According to a large multinational study, 45% of patients diagnosed with CP survive 20 years [6]. Overall, the annual incidence of CP per 100,000 inhabitants is 6 to 7 cases in Europe, 7 to 8 cases in the United States, and 5 to 14.4 cases in Asia [2, 7]. The incidence of newly diagnosed patients with CP in Latvia could approach more than 200 patients per year. Taking into account those already suffering from a clinical course of CP, the numbers of patients who need treatment could be much higher. This assumption is based on the fact that during the 7-year period 450 patients with different forms of complicated CP were emergently admitted directly to the surgical department of our institution. This demonstrates an insufficient recognition of CP at the level of primary medical care and a need for more developed endoscopy and gastroenterology services. This may explain the rather high percentage of patients who were admitted to the surgical department and were finally treated without surgery. It is not surprising that alcohol was the main etiologic factor associated with the development of a complicated course of CP, complying with the data from literature [2, 7, 8]. The male predominance in this category of patients is significant. The second most often recognized reason of development of CP is associated with gallstone disease as a consequence of repeated acute episodes of pancreatitis. In this category, the prevalence of female patients is significant, indicating a necessity for a wider screening and treatment of gallstones at the level of primary care. Unfortunately, the study revealed insufficient anamnestic data regarding alcohol as the etiologic factor and other types of CP associated with genetic predisposition, especially in female patients. Because of that, the real number of patients with alcohol-induced CP or a genetic predisposition to CP could be even higher, indicating a need for the development of genetic and prophylactic screening. Another important task for further development is the establishment of a proper nationwide electronic data base allowing a provision of strong statistical assessment of morbidity associated with pancreatitis and other HPB diseases.

### Complications

Generally, the patient cohort of the current study reflects the same incidence of the main complications associated with the course of CP as reported by the other authors [7, 8, 9]. There is a common opinion that pain is the most frequent complaint and disabling factor in patients with CP and the current study is in perfect compliance with that [4, 7, 9].

### Pseudocysts

The recently revised Atlanta classification has specified that a pseudocyst, being a consequence of the duct obstruction or even disruption, is attributive to the clinical course of CP [10]. Clinical criteria, such as prior episodes of acute pancreatitis, data regarding the course of CP or signs of calcified cystic wall less than 1 cm thick, make the diagnosis of a pancreatic pseudocyst more likely. On the contrary, weight loss, a palpable abdominal mass, the lack of pre-existing pancreatic disease, and multilocular cysts with non-calcified walls thicker than 1 cm, all indicate the likelihood of a malignant cystic tumour. Important criteria for malignancy are a markedly elevated carcinoembryonic antigen value in the cyst fluid (over 192 ng/mL) and an increased viscosity of the cyst content [11]. The main symptomatic complications causing the need for therapeutic intervention are pain associated with obstructive masses, compression of the adjacent gastrointestinal organs including biliary obstruction, infection of pancreatic pseudocysts, haemorrhage into the pancreatic pseudocysts due to vascular complications and ruptures causing pancreatopleural fistula and/or pancreatic ascites [9, 12, 13]. The incidence of pseudocysts in the current study is high in comparison with the reports from literature, reaching 39% [7, 9, 12]. This might be explained by fact that numerous patients were admitted to the surgical department without proper indications and underwent only non-operative management. Symptomatic pancreatic pseudocysts larger than 4 cm that develop outside the pancreas can be considered as a relative indication. In our patients the main indications for interventional strategy were pain, compression of the neighbouring gastrointestinal structures and/or infection. The reported incidence of gastroduodenal or biliary

obstruction 5.4% - 8.9% % is similar to the results of this study. The internationally accepted strategy favours the endoscopic approach in the treatment of symptomatic pseudocysts [14, 15, 16]. In our series, endoscopic treatment was mainly applied for the relief of the biliary compression and sepsis control, demonstrating evidence that the endoscopic approach should be applied more routinely. Surgical intervention was mostly performed in multifactorial cases for a decompression of the ductal hypertension, relief of the gastrointestinal and biliary compression and bleeding, generally complying with the international practice in the cases when endoscopy fails.

**Pseudoaneurysms**

The overall development of pseudoaneurisms with bleeding was observed less often than reported in literature (4% to 10%) [7, 17, 18, 19], and, fortunately, in the current study it was possible to escape mortality in this category of patients, which is reported as high as 15% to 75% in emergent cases [19, 20, 21, 22, 23]. The management of this category of patients is a matter of debate, however the accepted strategy recommends starting with the endoscopic treatment or using angioembolization in the case of pseudoaneurisms and postponing surgical treatment in the cases not suitable for an endoscopic treatment or of a failed endoscopic treatment [14, 18, 19, 20, 23, 24, 25, 26]. Generally, we follow the recommended steps with an initial dynamic abdominal CECT and angiography to localize the bleeder, followed by embolization to control the bleeding and to achieve early stabilization of the patient's condition. Surgical intervention is reserved for patients who are unable to undergo or who fail arterial embolization for pseudoaneurysm bleeding, or when endoscopic management of the pseudocyst is unsuccessful [18, 19, 20, 23, 26].

**Internal Fistulas**

Pancreatopleural fistulas and pancreatic ascites are named by Cameron *et al.* internal pancreatic fistulas" [27, 28]. The usual mechanism is a distribution of the pancreatic juice due to a rupture of the pancreatic duct or pseudocyst through the peripancreatic fascial planes, either anteriorly or posteriorly into retroperitoneum. The incidence of pancreaticopleural fistula is reported to be at 0.4% to 4.5%, predominantly in patients with alcohol-induced CP [27, 29, 30]. In these series we did not observe pancreaticopericardial or other rare types of fistulas recently reported [31, 32]. The data of the current study demonstrates a relatively high incidence of internal fistulas in comparison with the reports from literature [27, 29, 30]. This observation once more indicates an increase of patients with unrecognized, long-standing, complicated course of CP and a necessity for proper screening at the level of primary care and a multidisciplinary approach for the in-hospital treatment. According to the guidelines, conservative and endoscopic management of complicated forms of CP is recommended initially, however, in the cases with frequent relapses surgical management is the definitive mode of treatment [30, 33, 34]. The first line of treatment should be a chest drain, octreotide therapy, and ERCP with an attempt at pancreatic stent insertion. Endoscopic pancreatic stenting is an effective therapeutic option associated with minimal morbidity and mortality, and combined with somatostatin analogues it can shorten the duration of hospital stay [14, 30, 33, 34].

However, the success of the endoscopic and minimally invasive treatment depends on the local expertise and the development of the service.

**SURGICAL TREATMENT**

Despite the generally good results of the endoscopic treatment of CP-associated complications in a part of patients, the reported results of the long-term effects after endoscopic treatment are controversial [14, 35, 36]. This is more evident in the patient group where the cause of the complication is intraductal hypertension due to a complete ductal obstruction anywhere along the main pancreatic duct or both a stricture and leakage within the pancreatic tail [30, 37, 38, 39]. The surgical intervention is aimed at reaching two goals; the removal of the space occupied lesions and the provision of the decompression of the pancreatic duct system; however, the type of surgical intervention has been a matter of debate. The evolution of the surgical interventions started from variations of the latero-lateral drainage [40, 41] to duodenum-preserving resection of the head of the pancreas known as the Beger, Frey, minimal Frey, Bernes, Hamburg, Izbicky procedures [35, 39]. The difference lies in the complete division of the neck of the pancreas in the Beger procedure [42, 43] and a more substantial, extended drainage of the main pancreatic duct system without division of the neck in the Frey procedure [39, 43]. Considering the net drainage effect and the technical applicability, especially in the cases with recent exacerbation, our preference is in favour of Frey`s procedure. It is understandable due to evidence that most patients in the current study that were operated on suffered from pain due to pseudocysts and an obstructed main pancreatic duct system associated with evident ductal hypertension, and all patients with pancreatopleural fistula and pancreatic ascites underwent the Frey procedure with good long-term effects. The reported long-term outcomes are mostly in favour of surgical intervention especially considering the effect of pain control [34, 44, 45, 46, 47], although most guidelines recommend starting with the conservative and endoscopic approach [14, 35, 36, 46]. The analysis of rehospitalisation rate in the current study clearly demonstrates more favourable outcomes with the surgical approach, which is in compliance with other reports [12, 36, 37, 45]. However, the differences in the recommended strategy largely depend on the level of the assessment of the patients with CP who need interventional therapy at the level of primary care, the availability of a dedicated endoscopic and radiologic service and specialised surgical teams. Undoubtedly, family doctors, gastroenterologists and other specialists are integrated in this process. Finally, patients suffering from CP and its associated complications (e.g.,

pain, duodenal or pancreatic duct obstruction, cholestatic jaundice, appearance of inflammatory mass, and vascular complications) should be assessed for a problem-tailored surgery in an interdisciplinary centre with an expertise in pancreatic surgery. Unfortunately, many patients are sent for surgery too late, when even surgery cannot be an effective treatment anymore. Nowadays, surgical treatment of CP is associated with low morbidity and mortality, preservation of further deterioration of exocrine or endocrine pancreatic function, sustainable pain reduction, and improvement in the quality of life. The timing of surgical therapy is crucial for the outcome for patients with painful CP, and the indication of surgery should be considered early, once the symptoms are unambiguous. In any case, surgery should be tailored to the needs of the patients and should be as problem-oriented and organ-sparing as possible [36, 45, 46]. The weak points of our study are the retrospective design and the lack of precise anamnestic data for a more definitive assessment of the etiology of CP. Another shortcoming is the small number of patients initially treated with the endoscopic approach. However, a sufficient number of patients and data of a 7-year follow-up make it possible to have an overlook of the main complications and treatment results associated with CP. In the recent years our hospital has had to serve as a tertiary reference centre without appropriate funding and formal appointment, and the major flow of the complicated CP patients was directed to our department. We have found unsatisfactory screening and recognition of CP at the prehospital level and important evidence for the development of our endoscopy service. The results of our surgical strategy are within the internationally reported range. The data from the current study serves as the grounds for discussions with the Latvian medical authorities to set up crucial directions and allocate resources for the development of a multidisciplinary service, first of all, introducing a nationwide electronic medical database. This would be the first step on our way to a specialized HPB service.

## CONCLUSION

Surgical treatment of complicated forms of CP is reliable when endoscopy or other minimally invasive methods fail or are not available. A proper selection of patients at the primary and secondary health care level and specialised multidisciplinary service in tertiary-level institutions are the goals of future development in our country.

## Conflict of Interest

The authors declare that there is no conflict of interests regarding the publication of this paper.

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