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Research Article

# Endoscopic Transluminal Drainage of Infected Pancreonecriosis: One Center's Initial Experience

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## Abstract

**Background:** The recent decades have been marked by intensive use of minimally invasive treatment of infected pancreonecrosis. The manuscript presents the experience of one center for the endoscopic transluminal drainage of infected pancreonecrosis.

**Materials and Methods:** From December 2018 to March 2020, 17 patients with infected pancreonecrosis were treated. Seven patients underwent ultrasound guided percutaneous drainage of pancreatogenic destruction (group I), 10 patients underwent endoscopic transluminal drainage in pancreatogenic destruction zones (group II). Statistically significant differences in gender, age, and BMI of patients of both groups were not noted.

**Results:** There was no statistically significant difference in the structure of infectious agents, the structure and frequency of postoperative complications, hospitalization period, and mortality of patients in the groups.

**Conclusion:** Our initial experience of using the method of transluminal endoscopic drainage of infected pancreatic necrosis does not provide a basis to talk about the significant benefits and drawbacks of this method. Further study of this technology is required.

***Keywords:*** *Minimally Invasive Treatment; Percutaneous Drainage; Endoscopic Transluminal Drainage; Infected Pancreonecriosis; Surgical Complications*

## Introduction

In the structure of acute surgical diseases of the abdominal cavity organs, acute pancreatitis (AP) occupies the third place, accounting for 4.5 to 10% [1-3] and there is currently no downward trend. Destructive forms of AP are the most severe and occur in 25 - 30% of the cases [1,3,4]. High mortality rates persist: it reaches 10% in the edematous form, varies from 10 to 30% in case of sterile pancreatic necrosis, and reaches 62-65% in case of infected pancreatic necrosis [3-5]. In 57 - 84% of the cases for men, the development of AP with an outcome in pancreatic necrosis of the pancreatic gland (PG) is associated with alcohol abuse [3,5,6]. In women, the most common etio-

logical factor is cholelithiasis (31 - 65%) [6-8]. The second most common cause in both men and women is traumatic pancreatitis, which ranges from 10 to 20% [6,8].

"Open" methods like surgical treatment are accompanied by a high postoperative mortality rate (27 - 32%) and a long postoperative period (on average from 18 to 49 days) [9-11], which is why they are being used less frequently now. An alternative to "open" surgical treatment is ultrasound-guided minimally invasive percutaneous drainage, which is accompanied by a lower mortality rate (8-15%) and a shorter postoperative period (average 13 to 19 days) [12-14]. Over the past 5 - 7 years, endoscopic transluminal drainage of the infected pancreatic necrosis has been actively introduced into clinical practice [15-20]. In the world medical literature, very few articles are featured that summarize the experience of various centers using this method of pancreatic necrosis treatment. This article is dedicated to the primary experience of applying endoscopic transluminal drainage of pancreatogenic destruction zones in our clinic.

## Materials and Methods

### Patients

From December 01 2018, to March 31, 2020, 17 patients with macro-focal pancreatic necrosis were treated. There were 8 men (47%) and 9 women (53%) among them. The patients' age ranged from 25 to 81 years, with the average age being 44 (39;55) years. The body mass index of patients varied between 21.7 and 34.4, and the average body mass index was 27.4 (23.3; 28.7). In the vast majority of cases, the most prevalent was alcoholic etiology of pancreatic necrosis (n = 13, 76.4%), idiopathic etiology was noted in 2 patients (11.8%), and pancreatic necrosis was caused by biliary duct calculi in 2 patients (11.8%).

Division by groups: Based on the treatment methods, the patients were divided into 2 groups.

Group I consisted of 7 patients who underwent focal percutaneous drainage of pancreatogenic destruction. There were 4 men (57.1%) and 3 women (42.9%) among them. The average age of the patients comprised 44 (33; 56) years (min = 29 years, max = 81 years). The average body mass index comprised 27.4 (22.6; 33.5). 5 patients (71.4%) were diagnosed with alcoholic etiology of pancreatic necrosis, bile duct stones acted as an etiological factor in 1 patient (14.3%), and idiopathic etiology was noted in 1 patient (14.3%).

Group II consisted of 10 patients who underwent endoscopic transluminal drainage in pancreatogenic destruction zones. There were 4 men (40%) and 6 women (60%) among them. The patients' age ranged from 25 to 70 years, the average age being 46 (39;55) years. The body mass index varied between 21.7 to 33, and the average BMI was 27 (23.3; 28.7). Alcoholic etiology of pancreatic necrosis was detected in 8 patients (80%), idiopathic etiology - in 1 patient (10%), and bile duct stones were the etiological factor in 1 patient (10%).

Statistically significant differences in gender composition (p = 0.49), age (p = 0.96), and BMI (p = 0.74) (Table 1) were not noted.

| | Patients (n = 17) | | p |
|---|---|---|---|
| **Parameters** | **Group I (n = 7)** | **Group II (n = 10)** | |
| Men, n (%) | 4 (57,1) | 4 (40) | 0,49* |
| Women, n (%) | 3 (42,9) | 6 (60) | |
| Age, Me (25%;75%), years | 44 (33; 56) | 46 (39; 55) | 0,96** |
| BMI | 27,4 (22,6; 33,5) | 27(23,3; 28,7) | 0,74** |
| **Etiology of pancreatic necrosis** | | | |
| Alcoholic, n (%) | 5 (71,4) | 8 (80) | 0,68* |
| Bile duct stones, (n%) | 1 (14,3) | 1(10) | 0,79* |
| Idiopathic, n (%) | 1 (14,3) | 1 (10) | 0,79* |

***Table 1:*** *Characteristics of patient groups.*

**: Chi-square, **: Mann-Whitney.*

### Percutaneous drainage of pancreatic necrosis

Focal percutaneous drainage of pancreatic necrosis with a stylet catheter with locking "pigtail" was performed under continuous sonographic monitoring after determining the acoustic window and optimal trajectory. The liquid contents of the cavity were evacuated, then it was washed with antiseptic solutions. Daily sanitation of pancreatogenic destruction zone was performed. The effectiveness of treatment was assessed by the amount and nature of the discharge through drainage, and the intoxication syndrome dynamics. Ultrasound scanning was performed as a routine method of examination starting from 2 days after the operation. Computer tomography was performed with contrasting pancreatogenic destructive cavities in order to clarify the volume and configuration of the pathological focus, and to identify non-draining zones. Drainage was removed after a significant reduction in the size of the cavity and absence of separable material.

### Endoscopic transluminal drainage technique

A gastrocystostomy was performed under the control of endosonography and a self-expanding stent coated with nitinol was installed (Figure 1a) for drainage of pancreatic cysts. Under x-ray control, a cystonasal drainage (7 Fr) was installed through the stent lumen into the destruction cavity (Figure 1b).

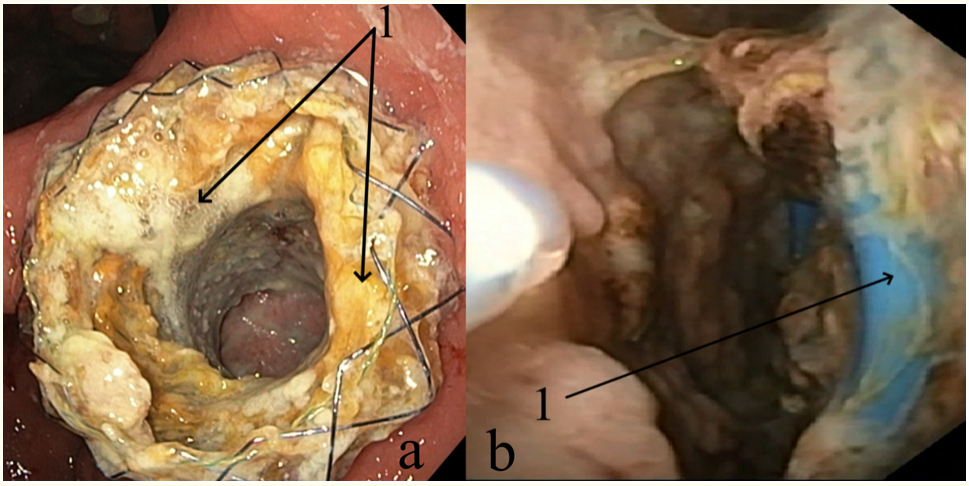


***Figure 1:*** *a. 1 - Installed self-expanding stent. b. 1- "pig tail" drainage installed in the area of pancreatogenic destruction.*

Programmed endoscopic sequestration was performed once every 2 days (Figure 2).

The effectiveness of endoscopic treatment was evaluated based on the state of the pathological focus in endoscopic imaging, the number and nature of the drainage discharge, and the dynamics of intoxication syndrome. Just as in group I patients, ultrasound was used as a routine diagnostic method, and computed tomography with cavity contrast and endoscopic imaging were used as clarifying methods. In the case when the cavity was contrasted with the intra-flow system of the pancreas, pancreatoduodenal stenting was performed with a 7Fr diameter plastic stent. Cystonasal drainage was removed after a significant reduction in the size of the cavity and an absence of sequesters and purulent contents during endoscopic imaging.

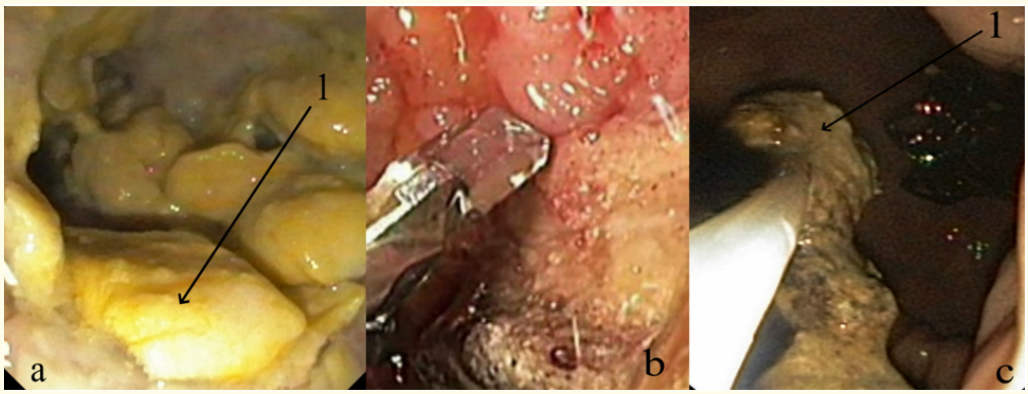


***Figure 2:*** *a. Cavity of necrotic destruction. 1- sequestration. b. Sequestrectomy (in sight of farcept). c. Sequestrectomy. 1 - sequester.*

### Drug therapy

Third-generation cephalosporins (Ceftriaxone, 1g iv bid) or nitroimidazoles (Metronidazole 500 mg thrice a day) were used as an antibacterial therapy over a period of 7 days.

Proton inhibitors (Omeprazole 20 mg bid) were used as anti-secretory therapy for 7 days.

In addition, infusion (saline solution 1000 - 1500 ml iv per day) and symptomatic therapy were conducted.

The severity of surgical complications was assessed in accordance with the Clavien-Dindo classification. Free gas in the abdominal cavity was detected in all patients without exception after transluminal drainage; however, we did not consider this as a complication in the postoperative period and, accordingly, did not undertake to correct it.

Statistical processing was carried out using the statistical software package Statistica for Windows v. 10.0, StatSoft Inc. (USA). The normality of the distribution was checked using the Shapiro-Wilk test. When comparing the groups according to their qualitative characteristics, Pearson's Chi Square test was used. When comparing the quantitative characteristics of the two groups, the Mann-Whitney U test was used. The differences were considered statistically significant at $p < 0.05$.

## Results and Discussion

The results of bacteriological culture of the contents of the pancreatogenic destruction zones in patients of both groups are presented in table 2.

| Microorganism culture | Group I | Group II | p* |
|---|---|---|---|
| *Klebsiella pneumoniae*, n (%) | 4 (57) | 4 (40) | 0.49 |
| *Staphylococcus aureus*, n (%) | 0 | 2 (20) | 0.21 |
| *Pseudomonas aeruginosa*, n (%) | 2 (29) | 2 (20) | 0.68 |
| *Escherichia coli*, n (%) | 1 (14) | 1 (10) | 0.79 |
| Staphylococcus coagulase negative, n (%) | 0 | 1 (10) | 0.39 |

***Table 2:*** *The results of a microbiological study of the contents of pancreatogenic destruction zones.*

**: Chi-square.*

*There was no statistically significant difference in the structure of infectious agents in the contents of the pathological focus.*

In group I, an uncomplicated postoperative period was observed in 5 patients (71.4%). In 2 patients (28.6%), the early postoperative period was complicated by the presence and progressive increase of fluid in the abdominal cavity (IIIA category of severity), which required drainage of the retro-hepatic space. All patients showed clinical effectiveness of the treatment. No fatalities were reported in group I. The hospitalization period ranged from 38 to 74 days and averaged 56 (52; 71) days.

In group II, 2 patients with primary contrast of the pancreatogenic destruction cavity were associated with the intra-flow system of the pancreas, which required pancreatoduodenal stenting as part of a complex surgical treatment. Uncomplicated course in the postoperative period was observed in 7 patients (70%). 3 complications were noted in 3 patients (30%) - bleeding from the necrotic destruction zone. Two patients underwent selective angiography and endovascular embolization a. gastroduodenalis (IIIb category of severity) (Figure 3), one - endoscopic hemostasis. All patients showed clinical effectiveness of the treatment.

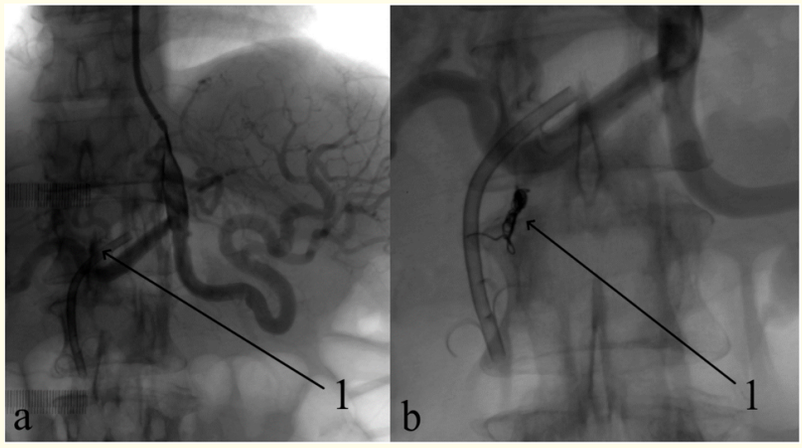


***Figure 3:*** *Angiography. a. 1-Area of extravasation of contrast material from arteria gastroduodenalis. b.1 - embolization coils in arteria gastroduodenalis.*

Hospital mortality rate in patients of group II was 20% (n = 2). One patient's cause of death was multiple organ failure, which developed 16 days after surgical treatment. The second patient's the cause of death on day 32 of the postoperative period was caused by a severe respiratory failure, which developed amidst a nosocomial infection of pneumonia. The hospitalization period varied from 35 to 145 days and averaged 61 (52.5; 79.5) days.

| Parameters | Group I | Group II | p |
|---|---|---|---|
| Uncomplicated course | 5 | 7 | 0,95* |
| Complications | 2 | 3 | |
| I | 0 | 0 | |
| II | 0 | 0 | |
| IIIa | 2 | 1 | 0,33* |
| IIIb | 0 | 2 | 0,21* |
| IVa | 0 | 0 | |
| IVb | 0 | 0 | |
| Period of hospitalization | 56 (52; 71) | 61 (52,5; 79,5) | 0,54** |
| Fatal outcomes | 0 | 2 | 0,21* |

***Table 3:*** *The structure and frequency of postoperative complications, hospital mortality rate and hospitalization period in both groups. *: Chi-square, **: Mann-Whitney.*

*There was no statistically significant difference in the structure and frequency of postoperative complications, hospitalization period, and mortality of patients in the groups.*

## Conclusion

The first experience of using the method of transluminal endoscopic drainage of sources with infected pancreatic necrosis does not provide a basis to talk about the significant benefits and drawbacks of this method. The results obtained are not statistically different from those in the group with percutaneous drainage of sources with pancreatogenic destruction under ultrasonic navigation. Further study of this technology is required, and if the efficiency and safety indicators are comparable to those in groups with "open" methods of surgical treatment and percutaneous drainage under ultrasonic guidance, then its wide clinical use could be recommended.

## Authors Contributions

- Yuriy Teterin - Study concept and design, acquisition of data, analysis and interpretation of data, critical revision of the manuscript for important intellectual content.
- Peter Yartsev - Drafting of the manuscript, study concept and design, study supervision, critical revision of the manuscript for important intellectual content.
- Ilya Dmitriev - Drafting of the manuscript, analysis and interpretation of data, study supervision, critical revision of the manuscript for important intellectual content.
- Mikhail Rogal - Acquisition of data, analysis and interpretation of data.
- Yuriy Kulikov - Acquisition of data, analysis and interpretation of data.
- Sergey Novikov - Acquisition of data, analysis and interpretation of data.
- Tigran Enrike Rokhas Tadevosyan - Acquisition of data, analysis and interpretation of data.

All authors are in agreement with the content of the manuscript.

## Disclosure

There are no potential financial and non-financial conflicts of interest to declare.

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