

Endoscopic treatment of extensive walled-off pancreatic necrosis with the use of single transluminal gateway transcystic multiple drainage (SGTMD)

Authors' Contribution:
 A – Study Design
 B – Data Collection
 C – Statistical Analysis
 D – Data Interpretation
 E – Manuscript Preparation
 F – Literature Search
 G – Funds Collection

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ABSTRACT:

The paper presents a description of the course of severe acute necrotizing pancreatitis as well as endoscopic treatment of an extensive infected walled-off pancreatic necrosis (WOPN), being the consequence of acute pancreatitis. The basic strategy of interventional treatment was to extend access to necrotic areas with use of single transluminal gateway transcystic multiple drainage (SGTMD). Endoscopic transmural access (transgastric) was applied. Endoscopic necrosectomy under fluoroscopic guidance was repeated nine times during active transluminal drainage. Endotherapy with use of SGTMD, as well as endoscopic necrosectomy became a successful and safe technique of treatment. Moreover, the paper proved the efficiency of endotherapy in the treatment of complete pancreatic duct disruption in the course of acute necrotizing pancreatitis.

KEYWORDS:

acute necrotizing pancreatitis, walled-off pancreatic necrosis, endoscopic drainage, endoscopic necrosectomy

INTRODUCTION

In the early stage of acute necrotizing pancreatitis, an acute necrotic collection (ANC) develops, which evolves to a late, walled-off pancreatic necrosis (WOPN) surrounded by a mature wall containing liquefied necrosis and fragments of necrotic tissue [1-3]. Infected walled-off pancreatic necrosis is diagnosed in about 15% of patients with severe acute pancreatitis [4].

The optimal strategy for the treatment of walled-off pancreatic necrosis is the combination of several minimally invasive methods that allow multiple access to the reservoir [4,5,6]. The extension of access to necrotic areas creates more favorable drainage conditions and increases the effectiveness of treatment [4,5,6]. The choice of access pathway for walled-off pancreatic necrosis should depend on the spread of necrosis, but also on the experience of the clinical center.

The work presents a description of endoscopic treatment of a patient with extensive walled-off pancreatic necrosis, without the need to use other treatment techniques. The basis for the management strategy was the extension of access to necrotic areas with the use of multiplied access through a SGDMD (single transluminal gateway transcystic multiple drainage).

CASE STUDY

The 40-year-old patient was admitted to the Department of Gastroenterology and Hepatology for abdominal pain with accompanying nausea. In the blood tests carried out on admission, elevated levels of pancreatic enzymes (amylase 1668 U/l; lipase 2300

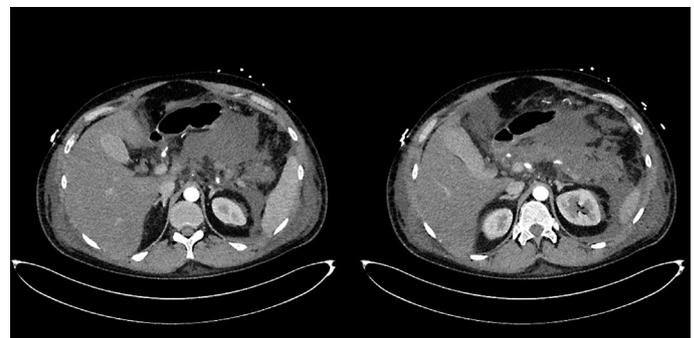


Fig. 1. Contrast-enhanced computed tomography (CECT) of the abdomen done in fifth day of hospitalization. The examination revealed features of pancreatic necrosis with an extensive fat tissues' infiltration and a fluid collection (acute necrotic collection) positioned nearby the greater curvature of stomach of size 110x80x50 mm.

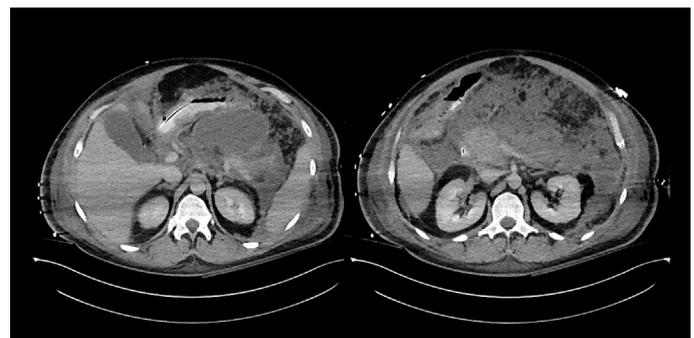


Fig. 2. Abdominal CECT performed in thirteenth day of hospitalization. It shows the features of progression of acute necrotizing pancreatitis with gradual liquefaction of pancreatic necrosis. The acute necrotic collection of size 130x80x95 mm, which is pushing the posterior wall of stomach, is visible. What is more, the flocculent mass for enteral nutrition is present in the lumen of the upper

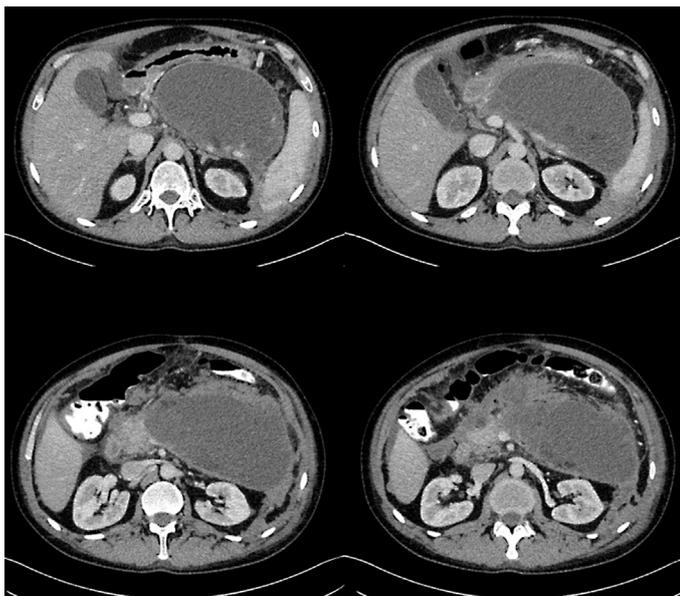


Fig. 3. CECT of the abdomen done in thirty-third day of hospitalization (before the beginning of endoscopic drainage). It shows further progression of acute necrotizing pancreatitis. The collection of infected walled-off pancreatic necrosis consisting of two cavities of size 176x100x117 mm and 107x55x85 mm



Fig. 4. It shows endoscopic transmural drainage. Two guidewires inserted to the cavity of necrosis through gastropancreatic fistula positioned on posterior wall of stomach created with use of endoscopic ultrasonography (EUS) are visible.

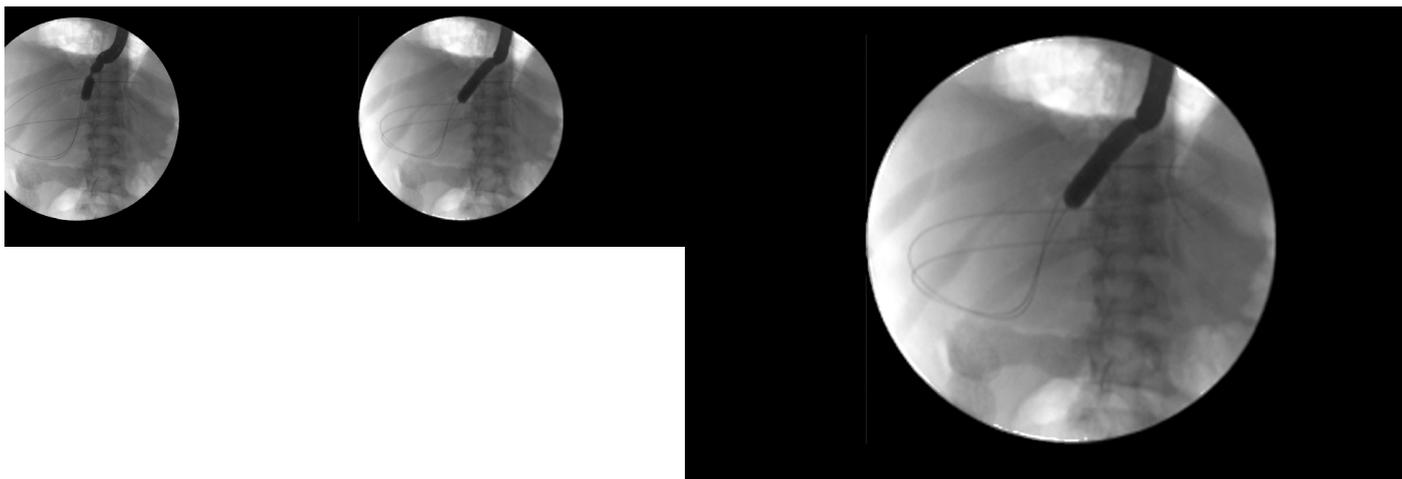


Fig. 5 a-b. Endoscopic transmural drainage. Gastropancreatic fistula was widened up to 20mm with use of high-pressure balloon.

U/l) and increased parameters of inflammation (CRP 338 mg/l, leukocytosis 16 G/l) were found. Acute pancreatitis with alcohol etiology was diagnosed. Conservative treatment was applied. Due to the symptoms of gastrointestinal insufficiency, in the third day of hospitalization, enteral nutrition was introduced through a naso-intestinal tube, the end of which was left under the control of fluoroscopy in the proximal part of the jejunum. During the fifth day of hospitalization, the general condition deteriorated with symptoms of multiorgan failure. In the performed multiphase abdominal computed tomography of the abdominal cavity, features of acute pancreatitis with the area of necrosis of the parenchyma, pancreatic tail and pancreatic tissues were found (Figure 1). Empiric broad-spectrum antibiotic therapy (Piperacillin with Tazobactam 4g + 0.5g - 3x daily) was included, which was continued for 21 days. Due to respiratory failure in the course of severe form of acute pancreatitis, the patient was intubated and ventilator therapy was used in analgesation. After 8 days, respiratory therapy was completed. Conservative treatment was continued with a good effect. In subsequent imaging studies performed during hospitalization, gradual liquefaction and wall-off of pancreatic



Fig. 6. Transgastric endoscopic drainage. The transmural stent 'double pigtail' 7Fr and nasal drain 7Fr, both inserted through the stomy into the area of pancreatic necrosis, are visible in the fluoroscopic image.



Fig. 7 a-c. It shows endoscopic retrograde pancreatography. The contrast applied through the major duodenal papilla filled the main pancreatic duct in the head of pancreas. The contrast leaked into the necrotic cavity through the complete disruption of main pancreatic duct in the area of pancreatic isthmus.

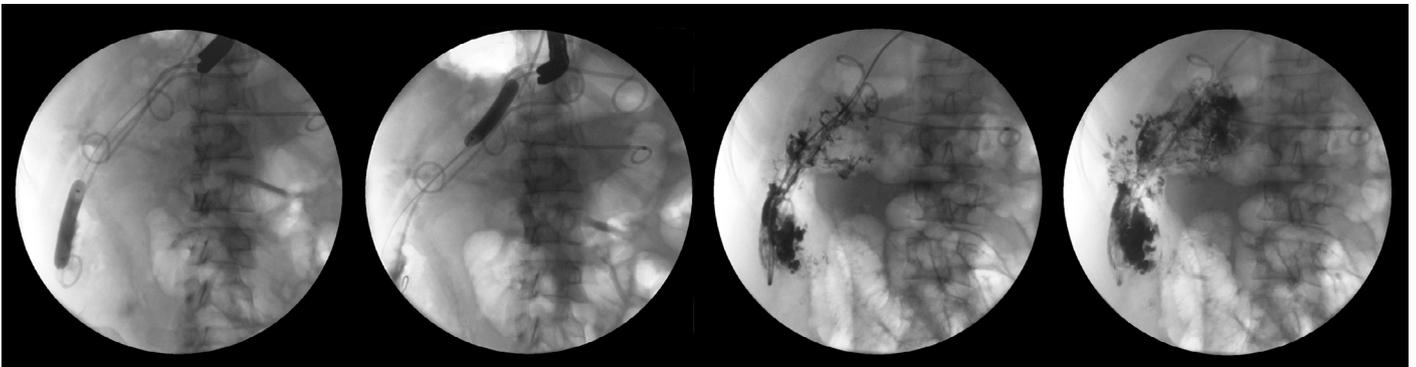


Fig. 8 a-d Single transluminal gateway transcystic multiple drainage (SGTMD). The guidewire was inserted into further cavities of collection under the fluoroscopic imaging. The connection of necrotic areas was widened with use of high-pressure balloon of 15mm diameter under fluoroscopy (a-b). The contrast applied via nasal drain after the procedure filled the infected collection of necrosis with big amount of necrotic tissues visible during fluoroscopy (c-d).



Fig. 9 a-c. Single transluminal gateway transcystic multiple drainage (SGTMD). The canals between the necrotic areas are being widened with use of 15 mm high-pressure balloon and under fluoroscopic imaging (a-b). The nasal drain and transmural stent were inserted into necrotic area through the widened canal later on (c).

necrosis and peripancreatic tissues without evidence of infection was found (Figure 2). Despite the improvement of the clinical condition, abdominal pain and symptoms of obstruction of the upper gastrointestinal tract were maintained due to the presence of a walled-off pancreatic necrosis reservoir and its impression on the gastrointestinal wall.

In the abdominal cavity CT performed on day 33 (Figure 3), a two-

-chamber pancreatic necrosis reservoir was found (176x100x117 mm and 107x55x85mm), exerting an impression on the back of the stomach. Based on the clinical picture and the results of imaging examinations, the patient was qualified for endoscopic treatment. On the 36th day of hospitalization under the control of endoscopic ultrasound (EUS), a gastropancreatic fistula was performed on the back of the stomach with a cystostome, observing the outflow of dense necrotic content (Figure 4). A 20-mm diameter fistula was

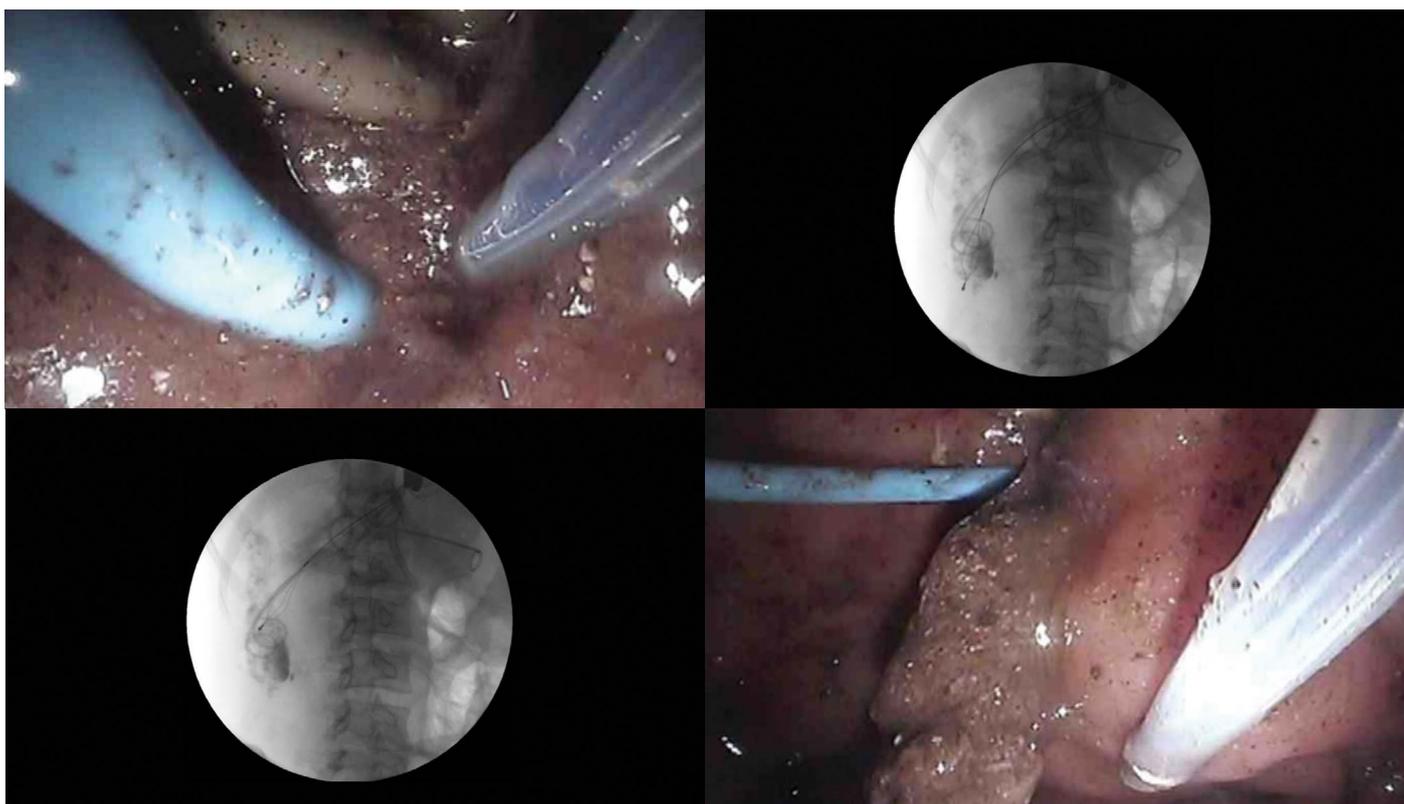


Fig. 10 a-d Endoscopic necrosectomy under fluoroscopic guidance. Dormia basket was inserted into the necrotic cavity through gastropancreatic fistula and under fluoroscopic imaging (a-c). Next the fragments of necrotic tissues were collected with use of the Dormia basket (d).

widened with a high-pressure balloon (Figure 5a-b). Next, a 7 Fr „double pigtail” prosthesis and a 7 Fr nasal drain were inserted through the wall to rinse the reservoir (200 ml saline every four hours) (Figure 6). Based on the result of inoculation of the contents of the necrotic reservoir (*Klebsiella pneumoniae* ESBL +, *Prevotella buccae*, *Prevotella melaninogenica*, *Peptostreptococcus*), targeted antibiotic therapy with Imipenem with Cilastatin (500 + 500mg) were used three times a day intravenously, furthermore Metronidazole 500mg was applied intravenously three times a day, which was continued for 28 days. Every 7 days during abdominal drainage, an abdominal ultrasound scan was performed to assess the effectiveness of the treatment. During the second endoscopic procedure performed after seven days of active transmural drainage, endoscopic retrograde pancreatography was performed, in the course of which total damage of the pancreatic duct in the pancreatic body was found (Figure 7a), through which the applied contrast was infiltrated into the cavity of the necrosis reservoir (Figure 7b-c). The pancreatic endoprosthesis 7Fr was introduced through the major duodenal papilla, the distal end of which was left in the lumen of the walled-off pancreatic necrosis reservoir.

During subsequent endoscopic procedures performed in the patient, multiplied access was obtained through one transversal fistula to extensive necrotic areas (Figure 8a-d). Under the control of the fluoroscopic image, a guidewire was introduced to further chambers of the reservoir. The canals between the necrotic areas were widened with an 8-15-mm high pressure balloon under the control of fluoroscopy (Figure 9a-b). Then, after dilation, the next nasal drain 7 Fr or „double pigtail” 7 Fr was introduced through the canals, the other ends of which were left in the light of necrosis (Figure 9c).

Due to the persistence of a large number of tissue elements in the

lumen of the reservoir, after 18 days of active transmural drainage, a decision was made to perform endoscopic necrosis under fluoroscopy image control (Figure 10 a-c). With the Dormia basket, under the control of the fluoroscopic image, through the fistula in the stomach wall, numerous fragments of necrotic tissues were removed from the necrosis of the necrosis reservoir (Figure 10 d). The procedure of endoscopic necrosis was performed nine times every third day.

After 50 days of active transmural drainage (during the 86th day of hospitalization), observing the disappearance of clinical symptoms and gradual regression of limited pancreatic necrosis reservoirs in subsequent abdominal CT scans, it was decided to remove nasal drains, leaving the transmural prostheses to maintain stoma patency and prevent reservoir relapse. The patient was sent home in good general condition. During the next hospitalization, six months after the end of active drainage, in the control CT scan of the abdominal cavity with contrast (Figure 11), complete regression of the reservoir was found. During endoscopic surgery, wall prostheses were removed. In the pancreatic area, there was no pancreatic prosthesis introduced intrapapillarily (spontaneous dislocation). A higher contrast applied through the major duodenal papilla was filled only by the pancreatic duct in the head of the pancreas; despite the dilution of the contrast with saline, there was no leakage of the contrast to the distal part of the main pancreatic duct in the body and tail of the pancreas, or beyond the pancreatic duct (the total damage to the pancreatic duct which was found earlier was closed); no new endoprosthesis has been introduced.

During the 15-month observation from the end of endoscopic treatment, the patient is in a good general condition, without any ailments. In control imaging studies, there was no recurrence of pancreatic reservoirs.

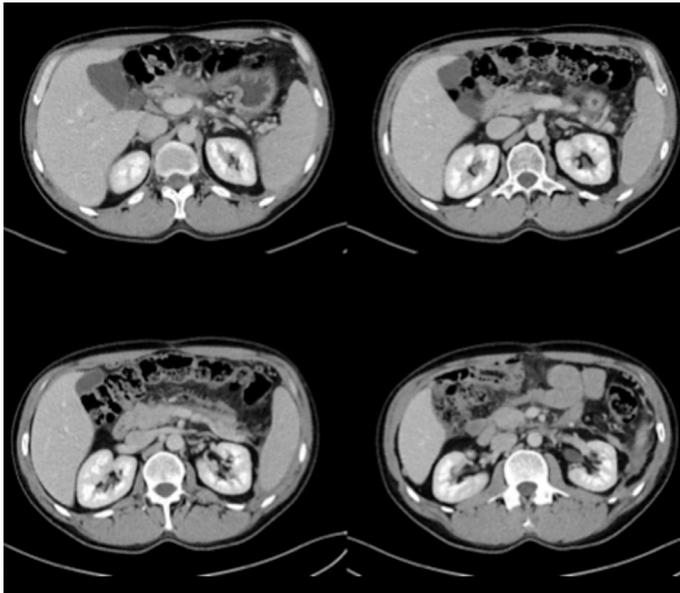


Fig. 11. The control CECT of the abdomen performed after six months from the end of active endoscopic drainage. CECT proved complete regression of WOPN. No recurrence of pancreatic collection was spotted.

DISCUSSION

The paper presents a description of the treatment of a patient with a severe form of acute necrotizing pancreatitis. In the late period of the disease, endoscopic (intra-gastric) drainage of the extensive walled-off pancreatic necrosis was performed. Initially, a single intravascular access was made, which proved to be ineffective and it was necessary to extend access to necrotic spaces. The basis for the therapeutic management strategy was the multiplication of access to necrotic areas with the use of multiplied access by one transluminal fistula. In the course of transmural drainage performed, endoscopic necrosectomy was performed nine times under the control of a fluoroscopic image.

Single transluminal gateway techniques (SGT) consist in removing the necrotic substance through one fistula created between the lumen of the necrosis reservoir and the light of the gastrointestinal tract (stomach or duodenum) [5,7]. The technique described is an effective treatment for single-chamber necrotic reservoirs. In the majority of patients, pancreatic walled-off necrosis is

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a multi-chamber space divided by partitions. In addition, during interventional treatment, as a result of decompression of the necrosis reservoir, there are separate necrotic spaces that form separate chambers (non-drained areas) that communicate through narrow channels [8]. Then, single access to the tank is insufficient. Additional routes of access to necrosis [4,6] or the use of other endoscopic techniques are necessary [5,8,9,10,11].

In the first reports on transmural endoscopic drainage of pancreatic necrosis, a fistula created between the lumen of the alimentary canal and the light of the necrosis of a small diameter (10-12 mm) was performed [7]. As the method became more common, the diameter of the fistula was increased to 20 mm [10], which enabled the fiberoscope to be inserted into the necrosis area and endoscopic necrosis could be performed [10].

With the development of endoscopic treatment methods, not only the diameter of the fistula was increased, but also the number of fistulas. In 2011, Varadarajulu et al. were the first to describe the treatment method (multiple transluminal gateway techniques - MTGT), which consisted of several transmural fistulas between the gastrointestinal lumen and the light of the walled-off pancreatic necrosis reservoir [9]. The authors have demonstrated that the use of several (2-3) routes of transmural access to pancreatic necrosis (MTGT) is a more effective method of treatment than drainage with the use of single transmural access [9]. Three years later, in 2014, Mukai et al. presented a method by which, from one fistula, it is possible to reach the single transluminal gateway transcystic multiple drainage (SGTMD) without the need for additional transventricular access, especially if the necrosis reservoir chambers are distant from the walls of the digestive tract [8].

The presented evolution of endoscopic techniques significantly increased the efficiency of transmural drainage. Currently, endoscopic transmural drainage is a widespread and a commonly used method of treatment for patients with walled-off pancreatic necrosis [4,5,6]. Endoscopic treatment is an alternative to other low-invasive methods of treatment of pancreatic necrosis. In an increasing number of patients with pancreatic necrosis, endotherapy can be the only method of treatment. The choice of the access route to walled-off pancreatic necrosis should depend on the spread of necrosis and the clinical center's experience [4,5,6].

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