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Endoscopic transluminal interventions and percutaneous drainage in acute infected necrotizing pancreatitis: experience of a specialized center

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Acute infected necrotizing pancreatitis is a life-threatening complication. Over the past 25 years, the introduction of minimally invasive techniques has significantly improved treatment outcomes. However, variations in disease progression, anatomical characteristics, and the need for optimal personalized invasive strategies remain subjects of ongoing debate.

Objective – to evaluate and compare the treatment outcomes of acute infected necrotizing pancreatitis with peripancreatic and combined (parenchymal + peripancreatic) lesions, using endoscopic transluminal interventions versus the traditional «step-up» approach.

Materials and methods. A retrospective study involving 67 patients (mean age – 50.5 ± 10.9 years) was conducted from 2021 to 2024. Group 1 (n = 28) underwent endoscopic transluminal interventions (ETI), including endoscopic necrosectomy when necessary, while Group 2 (n = 39) was treated using the traditional «step-up» approach, which involved percutaneous drainage (PD) and open necrosectomy if indicated. There were no significant differences between the groups in baseline characteristics or in the size of the walled-off pancreatic necrosis (WON). Clinical success was categorized as complete, partial, or absent. Statistical analysis was performed using χ^2 and the Mann-Whitney U test.

Results. The ETI group required fewer repeat procedures: a single procedure was sufficient for 50 % of patients in Group 1, whereas in Group 2, the majority of patients needed ≥ 3 interventions (p = 0.013). Complete clinical success was achieved in 64.3 % of patients in Group 1, compared to only 25.6 % in Group 2 (p = 0.004). External pancreatic fistulas occurred only after PD (12.8 %, p = 0.049). The mortality rate in the ETI group was lower (10.7 % vs. 23.1 %), although this difference was not statistically significant (p = 0.193). Additionally, Group 1 had a shorter average hospital stay (56.2 ± 27.2 days) compared to Group 2 (63.4 ± 23.7 days).

Conclusions. Endoscopic transluminal interventions within a multidisciplinary «step-up» approach are safer and more effective than isolated percutaneous drainage. ETI reduce the need for repeat interventions, lower the incidence of complications, and contribute to improved clinical outcomes in cases of acute infected necrotizing pancreatitis. PD and ETI are not mutually exclusive and can be incorporated into hybrid treatment strategies.

Keywords
acute infected necrotizing pancreatitis, localized necrotic collection, endoscopic transluminal necrosectomy, percutaneous drainage.

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In approximately 20 % of cases, acute pancreatitis is complicated by necrosis, and secondary infection develops in 30–70 % of these cases [16, 17, 26]. Acute infected necrotic pancreatitis (AINP) is associated with a high mortality rate (up to 30 %) and requires prompt invasive treatment. Although open surgical necrosectomy remains an effective treatment option, it is frequently associated with severe complications such as organ dysfunction, pancreaticocutaneous fistulas, and prolonged hospitalization [32].

The contemporary management of AINP has evolved from open necrosectomy to a minimally invasive «step-up» approach, beginning with initial drainage followed by necrosectomy if indicated [2, 5, 8, 31]. Percutaneous drainage (PD), a minimally invasive procedure, was widely adopted in the early 2000s [7, 27]. Between 2009 and 2012, endoscopic transluminal interventions (ETI) gained increasing adoption as part of this treatment paradigm [10, 22].

Currently, PD and ETI form the basis of the modern «step-up» approach for AINP, significantly reducing complication rates and mortality compared to open surgical procedures [2, 6, 15, 21, 31]. However, the choice of the optimal minimally invasive method remains a subject of ongoing debate. For instance, M. Jagielski et al. [14] reported that PD as monotherapy is successful in 44–56 % of patients but is associated with complications in 28–71 % of patients. Conversely, cohort analysis have demonstrated higher effectiveness of ETI as an initial treatment approach (72.7 %) [13]. Additionally, some experts recommend a combined strategy (PD + ETI), particularly in cases of large or centrally located necrotic collections [19].

The choice of a minimally invasive approach depends on factors such as anatomical localization, the stage of necrosis evolution, and technical accessibility of the necrotic focus. Therefore, conducting clinical studies in specialized centers is essential for optimizing treatment strategies.

Objective – to evaluate and compare the treatment outcomes of AINP with peripancreatic and combined (parenchymal + peripancreatic) lesions, using endoscopic transluminal interventions versus the traditional «step-up» approach.

Materials and methods

A total of 67 patients were included in the study 38 men (56.7 %) and 29 women (43.3 %), with mean age of 50.5 ± 10.9 years, who were treated for AINP at our medical institution between 2021 and 2024.

Based on the treatment approach, patients were divided into two groups. The main group (Group 1, n = 28) underwent endoscopic transluminal drainage and/or necrosectomy, while the comparison group (Group 2, n = 39) was treated with the traditional «step-up» strategy, which included ultrasound-guided PD, if necessary, followed by open necrosectomy without the endoscopic stage.

Inclusion criteria for both groups

- Diagnosis of acute necrotizing pancreatitis that has progressed to an infected, localized necrotic collection (walled-off necrosis (WON) according to the Atlanta 2012 classification), confirmed by abdominal contrast-enhanced computed tomography (CT) or abdominal magnetic resonance imaging (MRI), which directly contacts the stomach and/or duodenum.
- Duration of illness ≥ 4 weeks from the onset of abdominal pain (≥ 28 days).
- Clinical and laboratory indications for intervention.
- Age ≥ 18 years.

Inclusion criteria for the main group

- Underwent endoscopic transluminal drainage and/or necrosectomy.
- Prior single percutaneous drainage (PD) was not an exclusion criterion.

Inclusion criteria for the comparison group

- Underwent PD as the initial stage of treatment.
- No endoscopic intervention was performed.

Exclusion criteria from the study

- Isolated parenchymal necrotizing pancreatitis.
- «Dry» necrotizing pancreatitis.
- Post-traumatic necrotizing pancreatitis.
- Extensive necrosis with pericolonic, pelvic, mediastinal, intra-abdominal spread, including the development of purulent peritonitis.
- Pancreatitis associated with malignancy.
- Severe concomitant diseases.
- Previous surgical interventions on the pancreas before inclusion.
- Lack of complete data on interventions.

Indications for ETI and PD

- Presence of a localized necrotic peripancreatic collection that, according to abdominal contrast-enhanced CT or abdominal MRI, directly contacts the stomach and/or duodenum.
- Duration of illness from the first attack of pain ≥ 4 weeks (≥ 28 days).
- Presence of external compression of the stomach and/or duodenum confirmed by esophagogastroduodenoscopy (EGD).

For diagnosis, a comprehensive assessment included general and biochemical blood tests, microbiological methods, ultrasonography, EGD, abdominal contrast-enhanced CT, or abdominal MRI. Given the complexity of the disease, patient management was multidisciplinary, involving surgeons, endoscopists, anesthesiologists, critical care physicians, radiologists, interventional ultrasound physicians, and other clinicians as needed (e.g., therapists, cardiologists, endocrinologists, and psychiatrists).

Characteristics of intervention in Group 1

Patients in Group 1 underwent ETI for drainage of the WON cavity, followed, if necessary, by endoscopic necrosectomy.

A duodenoscope Olympus TJF-150 (Japan) was used to create access and perform drainage, while a gastroscope Olympus GIF-Q150 (Japan), with a distal cap was used for direct necrosectomy. The procedures were performed under general anesthesia with endotracheal intubation, with patients placed in the supine position.

Access to the cavity was established at the point of maximal protrusion into the gastric lumen, and in one case, through a spontaneous cystoduodenal fistula. The fistulous tract was created using a cystotome or a needle papillotome with appropriate electrocoagulation settings, followed by dilation of the balloon catheter to 15–20 mm.

One to two double pigtail stents (10 Fr, 50 mm) were placed to ensure fistulous tract patency and facilitate endoscopic orientation during procedure.

The lavage of the WON cavity via transgastric access was performed with 1 % hydrogen peroxide solution in volume up to 400 ml., with subsequent aspiration of the contents.

Direct necrosectomy was performed using an endoscopic tripod. Necrotic tissue that was tightly fixed was left for subsequent intervention. After each procedure, residual debris was documented for further evaluation.

During the clinical course in cases with prior PD, the irrigation of WON cavity was performed through a drain. In the absence of PD, at the end of intervention, a 7 Fr nasocystic drain was installed into the WON cavity for fractional irrigation. If necessary, balloon catheter dilation of the fistulous tract was performed again during the next procedure [18].

Characteristics of intervention in Group 2

Patients in Group 2 received treatment according to the «step-up» approach, starting with ultrasound-guided PD of the infected WON cavity. In some patients, PD was performed early in the course of acute pancreatitis (up to 28 days) in the presence of acute fluid collections, based on clinical indications (deterioration of the patient's condition, suspected or confirmed infection, abdominal compartment syndrome). If, after 28 days, the pathological process evolved into an infected WON, these patients were included in the study.

Interventions were performed under local anesthesia, with gradual dilation of the drainage canal in several stages based on clinical dynamics.

The drainage was inserted through the point of optimal access, taking into account the lesion topography as determined by CT or ultrasound data. Initially, a drain with a diameter of 9 Fr was used. If there was insufficient effectiveness or a large volume of contents, the drain was replaced or sequentially dilated to larger sizes – 12–14 Fr (second procedure), 16–18 Fr (third procedure), and 22 Fr (fourth procedure). Fractious irrigation of the drains with a saline solution was performed every 6–8 hours to maintain patency and remove debris.

The goal of staged drainage was to reduce systemic toxicity, decrease purulent-necrotic content, and gradually form a separated cavity with subsequent debridement. In cases of multiple chambers of the WON cavity or insufficient effect, additional drains were placed in other anatomical zones.

If PD treatment was ineffective, if there was progression of sepsis, or in evidence of large, dense sequestra, open necrosectomy was performed.

A multidisciplinary team made decisions regarding surgical intervention in both groups.

Criteria for treatment effectiveness

The results of endoscopic transluminal drainage and/or necrosectomy were evaluated based on the degree of clinical success, which was classified as complete, partial, or absent clinical success. The technical success of the procedure was assessed by successful access to the WON cavity.

The main criterion for complete clinical success was the patient's discharge in satisfactory condition without the need for additional surgical interventions due to necrosectomy or complications.

Other criteria for treatment effectiveness at the time of discharge included:

- Absence or significant reduction of symptoms related to the primary disease (e.g., abdominal pain, hyperthermia, signs of compartment syndrome such as nausea, vomiting, and digestion problems).
- Imaging findings (ultrasound, contrast-enhanced CT, or MRI).
- Absence of fluid accumulations, or the presence of a cystic cavity < 3 cm that does not require surgical intervention.

Partial clinical success was defined as a reduction in pain syndrome, resolution of symptoms of gastric or duodenal obstruction, and/or reduction in hyperthermia, without significant improvement in the patient's overall condition. It also included cases where open surgical intervention was needed within the «step-up» strategy.

Absence of clinical success was defined as a fatal outcome, regardless of whether an open operation was performed within the «step-up» strategy.

Technical success of the endoscopic procedure was defined as the creation of a direct transluminal access to the WON cavity, which allowed for balloon catheter dilation of the created fistulous tract, placement of stents (drains), or passage of an endoscope into the WON cavity, regardless of the final

clinical treatment outcome. PD was considered successful if a pig-tail drain of the necessary diameter was installed into the WON cavity.

Complications were categorized into two groups: those directly related to necrosectomy (intraoperative complications) and those associated with the disease course that required surgical intervention (peritonitis, fistulas, and others).

Statistical analysis of the collected data was performed using IBM SPSS Statistics 22. Descriptive statistics were conducted. Quantitative data are presented as mean (M) ± standard deviation (SD). For qualitative features, absolute numbers (n) and percentages were used. To assess the correspondence between observed and expected frequencies in categorical data, a one-sample χ^2 test was applied. Comparative analysis of quantitative variables was carried out using the Mann-Whitney U test. The null hypothesis of variable equality was rejected at $p < 0.05$.

Results

Patients in both groups exhibited no significant differences in the initial baseline parameters (Table 1).

Additionally, in both groups of patients no significant differences were found in clinical symptoms (Table 2) at the time of the initial procedure of endoscopic transluminal necrosectomy (ETN) or percutaneous drainage (PD), when the disease had progressed to a morphological form of infected WON (not earlier than 28 days).

The average size of WON was assessed using diagnostic imaging methods (abdominal contrast-enhanced CT and, less frequently, abdominal MRI). The maximum dimensions of the cavity (conventional width and length) were measured separately in the axial and coronal planes. Four measurements were obtained, summed, and averaged (Figure). In Group 1, the average size of WON was 109.6 ± 32.9 mm; in Group 2, it was 114.5 ± 33.1 mm, p = 0.518.

Patients in Group 1 underwent a total of 48 endoscopic transluminal interventions, with half of the patients (50 %) requiring only one procedure. In contrast, patients in Group 2 underwent 88 procedures in total, with the most common number of interventions being three per patient (43.6 %), as detailed in Table 3.

The distribution of patients by the number of interventions showed a statistically significant difference between the groups (p = 0.013), indicating a greater need for repeat procedures in patients of Group 2, likely due to the lower initial efficacy of the treatment strategy.

The average intervals between successive procedures (1–2, 2–3, 3–4) did not show a statistically significant difference between the groups. However, these intervals were significantly shorter in Group 2 (Table 4).

Table 1. **Baseline characteristics of study patients**

Characteristics	Total (n = 67)	Group 1 (n = 28)	Group 2 (n = 39)	p
Males	38 (56.7 %)	15 (53.6 %)	23 (59.0 %)	0.660
Females	29 (43.3 %)	13 (46.4 %)	16 (41.0 %)	
Age, years (M ± SD)	50.5 ± 10.9	52.6 ± 12.5	48.9 ± 9.4	0.184
Time to admission, hours				
< 6	14 (20.9 %)	5 (17.9 %)	9 (23.1 %)	0.936
6–24	15 (22.4 %)	6 (21.4 %)	9 (23.1 %)	
24–72	5 (74.6 %)	2 (7.1 %)	3 (7.7 %)	
> 72	33 (49.3 %)	15 (53.6 %)	18 (46.2 %)	
Hospitalization status				
First-time admission	57 (85.1 %)	23 (82.1 %)	34 (87.2 %)	0.568
Readmission	10 (14.9 %)	5 (17.9 %)	5 (12.8 %)	
Pancreatitis etiology				
Gallstone disease	39 (58.2 %)	15 (53.6 %)	24 (61.5 %)	0.642
Alcohol	25 (37.3 %)	11 (39.3 %)	14 (35.9 %)	
Hypertriglyceridemia	2 (3.0 %)	1 (3.6 %)	1 (2.6 %)	
Tumor (ampullary adenoma)	1 (1.5 %)	1 (3.6 %)	0	
Severity of acute pancreatitis				
Moderate	46 (68.7 %)	19 (67.9 %)	27 (69.2 %)	0.905
Severe	21 (31.3 %)	9 (32.1 %)	12 (30.8 %)	

Table 2. **Primary conditions and symptoms in patients with infected walled-off necrosis at first treatment procedure**

Conditions and symptoms	Total (n = 67)	Group 1 (n = 28)	Group 2 (n = 39)	p
Hyperthermia	63 (94.0 %)	27 (96.4 %)	36 (92.3 %)	0.483
Abdominal pain	57 (85.1 %)	25 (89.3 %)	32 (82.1 %)	0.412
Pronounced general weakness	54 (80.6 %)	22 (78.6 %)	32 (82.1 %)	0.722
Sepsis	44 (65.7 %)	19 (67.9 %)	25 (64.1 %)	0.750
Gastric outlet obstruction/vomiting	42 (62.7 %)	17 (60.7 %)	25 (64.1 %)	0.777
Pancreatic ascites	33 (49.3 %)	15 (53.6 %)	18 (46.2 %)	0.549
Loss of appetite and nausea	34 (50.7 %)	14 (50.0 %)	20 (51.3 %)	0.918
Sleep disturbances	28 (41.8 %)	13 (46.4 %)	15 (38.5 %)	0.514
Splenoportal thrombosis	19 (28.4 %)	8 (28.6 %)	11 (28.2 %)	0.974
Pleural effusion	19 (28.4 %)	8 (28.6 %)	11 (28.2 %)	0.974
Infection (positive bacteriological culture from WON aspirate)	64 (95.5 %)	27 (96.4 %)	37 (94.9 %)	0.751

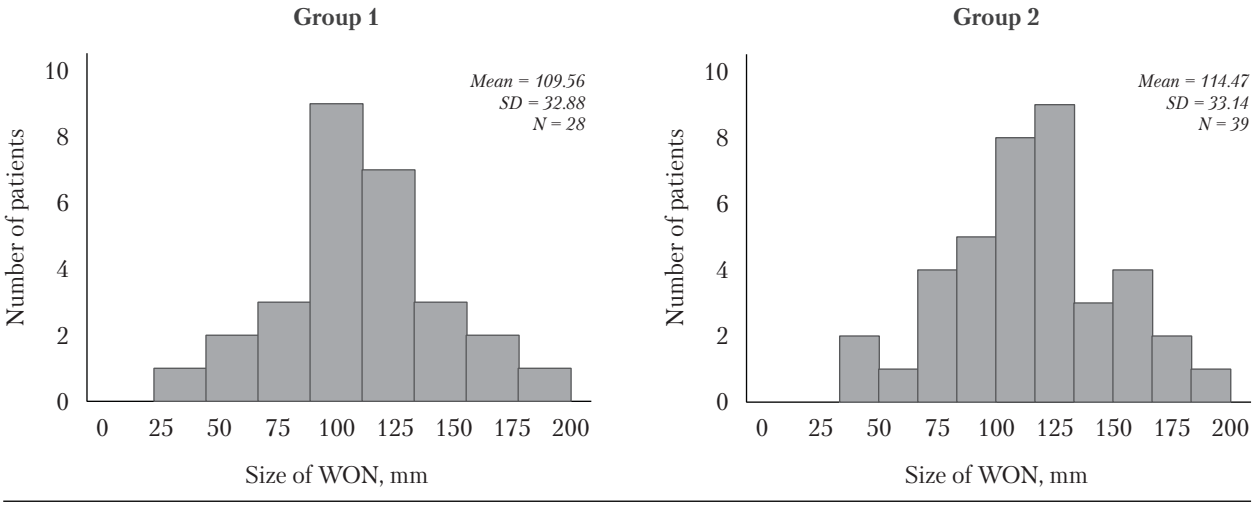

Figure. **Distribution of patients based on the average size of WON**

The initial intervention Group 1 was performed on average at 36.2 ± 16.1 days from the first episode of the disease, while in Group 2, it occurred at 30.6 ± 10.9 days (p = 0.094).

In Group 1, 14 (50 %) patients underwent ultrasound-guided percutaneous pig-tail drainage (diameter of 9–12 Fr) in the area of the fluid-necrotic collection at an average of 7 (5–9) days from disease onset prior to ETI. Additionally, 15 (53.6 %) patients underwent abdominal drainage for pancreatic ascites at different disease periods, and 8 (28.6 %) patients had pleural drainage due to

Table 3. **Distribution of patients by the number of procedures**

Number of procedures	Total (n = 67)	Group 1 (n = 28)	Group 2 (n = 39)
1	25 (37.3 %)	14 (50.0 %)	11 (28.2 %)
2	19 (28.4 %)	10 (35.7 %)	9 (23.1 %)
3	19 (28.4 %)	2 (7.1 %)	17 (43.6 %)
4	4 (6.0 %)	2 (7.1 %)	2 (5.1 %)

Table 4. **Average intervals between procedures, days (M ± SD (Min–Max))**

Procedures	Group 1	Group 2
1–2	7.0 ± 2.2 (4–14)	4.8 ± 0.8 (4–6)
2–3	7.0 ± 1.4 (6–8)	3.7 ± 0.7 (3–5)
3–4	6.5 ± 0.7 (6–7)	3.0 ± 1.4 (2–4)

Table 5. **Treatment outcomes for acute infected necrotizing pancreatitis**

Clinical success	Total (n = 67)	Group 1 (n = 28)	Group 2 (n = 39)
Complete	28 (41.8 %)	18 (64.3 %)	10 (25.6 %)
Partial	27 (40.3 %)	7 (25.0 %)	20 (51.3 %)
No success	12 (17.9 %)	3 (10.7 %)	9 (23.1 %)

exudative pleuritis. In Group 2, 24 (61.5 %) patients underwent abdominal drainage for pancreatic ascites at various stages of the disease (p = 0.514), and 13 (33.3 %) had pleural drainage for exudative pleuritis (p = 0.679).

The technical success was achieved in all patients.

In one patient of Group 1, experienced gastric wall bleeding during the first intervention, which was managed by balloon catheter compression. No complications requiring surgical intervention were observed.

Patients in Group 1 demonstrated significantly better treatment outcomes for AINP. Specifically, the rate of complete clinical success was significantly higher – 64.3 % in the main group compared to 25.6 % in the comparison group (p = 0.004) – with fewer patients exhibiting partial response or no clinical improvement.

The distribution of treatment outcomes (complete, partial, or no clinical success) between the groups differed significantly between the groups (p = 0.007), indicating the superiority of the strategy used in Group 1 (Table 5).

Although the mortality rate was lower in the main group (10.7 %) compared to the comparison group (23.1 %), this difference did not reach statistical significance (p = 0.193). In Group 1, complete success was primarily achieved after 1–2 procedures (44.4 % and 38.9 %, respectively), whereas in Group 2, it was mainly achieved after 2–3 procedures (30.0 % and 60.0 %, respectively; Table 6).

In both groups, all cases of absent clinical effect occurred after 1–2 interventions, with a higher frequency after the first procedure. Overall, the data suggest a preference for a smaller number of interventions to achieve complete success in Group 1, reflecting a higher initial effectiveness of treatment in this cohort. However, worth noting, that 14 (50 %) patients in this group received ultrasound-guided 9–12 Fr percutaneous drainage into the area of fluid-necrotic accumulation, on average, on the 7th day (range 5–9 days) from disease onset, prior to ETI.

A key advantage for Group 1 was the absence of external pancreatic fistulas, which were observed in 5 (12.8 %) patients in Group 2 (p = 0.049).

Table 6. **Distribution of patients by treatment outcomes and the number of endoscopic procedures**

Clinical success	Total	Number of procedures			
		1	2	3	4
Group 1					
Complete	18	8 (44.4 %)	7 (38.9 %)	1 (5.6 %)	2 (11.1 %)
Partial	7	4 (57.1 %)	2 (28.6 %)	1 (14.3 %)	0
No success	3	2 (66.7 %)	1 (33.3 %)	0	0
Total	28	14 (50.0 %)	10 (35.7 %)	2 (7.1 %)	2 (7.1 %)
Group 2					
Complete	10	0	3 (30.0 %)	6 (60.0 %)	1 (10.0 %)
Partial	20	6 (30.0 %)	6 (30.0 %)	7 (35.0 %)	1 (5.0 %)
No success	9	5 (55.6 %)	0	4 (44.4 %)	0
Total	39	11 (28.2 %)	9 (23.1 %)	17 (43.6 %)	2 (5.1 %)

Despite longer intervals between procedures in Group 1, the average length of hospital stay was shorter (56.2 ± 27.2 days) compared to Group 2 (63.4 ± 23.7 days), mainly due to the reduced need for open surgery and a shorter postoperative course. However, this difference did not reach statistical significance (p = 0.183).

Discussion

Over the past two decades, approaches to the treatment of infected necrotizing pancreatitis have undergone a significant transformation–from open surgical interventions to minimally invasive techniques focused on a gradual, stepwise approach. As early as 1998, P. C. Freeny et al. [9] demonstrated the effectiveness of PD in critically ill patients, achieving a mortality reduction to 12 %, which laid the foundation for further research supporting PD as the initial intervention.

The results of the multicenter PANTER study confirmed the advantages of the «step-up» approach with initial PD, allowing nearly half of the patients to avoid open surgery [30]. Contemporary literature reviews indicate that the success rate of PD alone in AINP ranges from 44 % to 56 %, representing a relatively high success indicator in clinical practice [14, 27]. However, PD has significant limitations, including the prolonged presence of external drains, risk of external fistula formation, incomplete debridement of central necrosis, and the need for subsequent necrosectomy [2, 7, 8, 31].

Since 2009, endoscopic transluminal interventions have been actively introduced into clinical practice. The pioneering study by N. Seifert et al. [22] was the first to demonstrate the efficacy of endoscopic necrosectomy, achieving a clinical success rate of over 80 % in multicenter research. Subsequently, numerous randomized studies and meta-analyses, including the study by O. J. Bakker et al. [3], the TENSION trial [28], and C. M. Haney et al. [12], confirmed the advantages of the endoscopic «step-up» approach over surgical and traditional PD. Advantages include a reduction in the recurrence of organ failure, pancreatic fistulas, hospital stay, and the need for additional interventions, all while maintaining comparable mortality rates. Our results are consistent with these findings. Thus, in the ETI group, patients required fewer procedures and shorter hospital stay, had no external pancreatic fistulas and a tendency toward reduced mortality (10.7 % vs. 23.1 % in the PD group). Notably, 50 % of patients in the ETI group required only a single procedure, which aligns with data from A. A. Siddiqui et al. [23] and D. Y. Bang et al. [4], who demonstrated the high efficacy of single-procedure debridement when using modern lumen-apposing metal stents (LAMS). The absence of external pancreatic fistulas in the ETI group aligns with the findings of T. V. Gardner et al. [10], S. M. van Dijk et al. [29], and the TENSION trial [28], which confirmed that internal endoscopic drainage significantly reduces the risk of this complication compared to percutaneous approaches.

The strategy of delayed interventions used in our study also aligns with current best practices. The POINTER trial [8] demonstrated that postponing interventions for ≥ 28 days allows for a reduction in the number of procedures without compromising safety and efficacy. In our research, the average time to the first endoscopic intervention was 36.2 ± 16.1 days, which may have positively impacted treatment outcomes.

Furthermore, it is important that 50 % of patients in the ETI group had prior PD, reflecting the concept of dual-modality drainage described by A. S. Ross et al. [20]. This approach combines the benefits of rapid initial decompression through PD with effective debridement of organized necrosis through ETI at a later stage.

Regarding mortality, the difference between the groups in our study did not reach statistical significance. A similar trend was observed in studies by S. M. Haney et al. [12] and R. Tang et al. [24], where complication and hospitalization rates were significantly lower in the ETI group, while mortality rates did not differ significantly. These findings highlight the advantages of the endoscopic approach primarily in reducing complications and enhancing patients' quality of life, rather than an impact on survival.

Overall, our results are consistent with current international guidelines from ESGE [2], AGA [6], ACG [25], which recommend: (1) if possible, delaying intervention until the formation of WON (about 4 weeks), (2) favoring endoscopic transluminal drainage and/or necrosectomy when access to WON from the stomach or duodenum is feasible, and (3) reserving necrosectomy for cases where drainage alone is ineffective.

Regarding timing, we, like T. H. Baron et al. [6], believe that PD can be performed as needed during the early acute phase (within 2 weeks of disease onset). In contrast, endoscopic transluminal interventions are reasonably performed after ≥ 4 weeks, once a «capsule» of WON has formed, which reduces the risk of complications. PD should also be considered as an adjunct to endoscopic drainage in cases where WON extends deeply into the paracolic spaces and/or the pelvic area. Additionally, PD may be used as a supplementary therapy after endoscopic or surgical necrosectomy if residual necrotic masses are present [6].

Based on our experience, when performing transluminal access to WON, even for endoscopic drainage, it is necessary to dilate the created fistulous tract using a 15–20 mm balloon catheter rather than placing transluminal drains alone. This approach enables passage of an endoscope into the WON cavity during the initial procedure to assess its size and contents. If needed, immediate necrosectomy can be performed within accessible limits. Additionally, this approach facilitates more effective planning of further management. It also enhances conditions for debriding the necrotic tissue within the gastric lumen during active lavage of the WON cavity, whether through an existing percutaneous drain(s) or a nasocystic drain placed endoscopically.

Conclusions

The data obtained confirm that endoscopic transluminal interventions, particularly within a multidisciplinary «step-up» approach, are safe and effective for patients with peripancreatic or combined (parenchymal + peripancreatic) lesions. Their application is associated with reduced invasiveness, fewer procedures, reduced complication rates, and improved clinical outcomes. Overall, ETI and PD in the paradigm of minimally invasive approaches should be viewed as complementary rather than competing methods.

Declaration of interests

The authors declare that they have no conflicts of interest.

Authors contributions

Y. M. Susak: conception and design, manuscript writing, critical revision of the article; N. V. Puzyr: acquisition of data, analysis and interpretation of data, manuscript writing.

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Ендоскопічні транслюмінальні втручання та перкутанне дренування при гострому інфікованому некротичному панкреатиті в умовах спеціалізованого центру

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Гострий інфікований некротичний панкреатит є ускладненням, що становить загрозу для життя. Упровадження малоінвазивних технологій за останні 25 років суттєво поліпшило результати його лікування. Проте варіабельність перебігу захворювання, анатомічні особливості та потреба індивідуального вибору оптимальної інвазивної тактики в кожному клінічному випадку залишаються предметом дискусії.

Мета — оцінити ефективність ендоскопічних транслюмінальних втручань (ЕТВ) порівняно з традиційною тактикою «step-up» із перкутанним дренуванням (ПКД) у лікуванні хворих з гострим інфікованим некротичним панкреатитом у спеціалізованому центрі.

Матеріали та методи. Проведено ретроспективне дослідження 67 пацієнтів (середній вік — (50,5 ± 10,9) року), пролікованих у 2021—2024 рр. Група 1 (n = 28) отримала ЕТВ з можливістю ендоскопічної некрозектомії, групу 2 (n = 39) лікували за традиційною тактикою ПКД із відкритою некрозектомією за потреби. Групи не відрізнялися за вихідними характеристиками та розміром обмежених некротичних скупчень. Клінічний успіх оцінювали як повний, частковий або відсутній. Статистичний аналіз виконували з використанням χ^2 та U-критерію Манна — Уїтні.

Результати. У групі ЕТВ виникла потреба в меншій кількості повторних процедур: одного втручання було достатньо в 50 % пацієнтів групи 1, тоді як у групі 2 найчастіше потрібно було ≥ 3 сеансів (p = 0,013). Повного клінічного успіху досягнуто в 64,3 % пацієнтів групи 1 та лише в 25,6 % у групі 2 (p = 0,004). Зовнішні панкреатичні нориці виникали лише після ПКД (12,8 %, p = 0,049). Летальність у групі ЕТВ була нижчою (10,7 порівняно з 23,1 %), але різниця не досягла рівня статистичної значущості (p = 0,193). Середній ліжко-день у групі 1 був меншим ((56,2 ± 27,2) і (63,4 ± 23,7) доби).

Висновки. Ендоскопічні транслюмінальні втручання в межах мультидисциплінарного підходу «step-up» є безпечнішими та ефективнішими порівняно з ізольованим ПКД, зменшують потребу в повторних інтервенціях, частоту ускладнень і сприяють кращим клінічним результатам при гострому інфікованому некротичному панкреатиті. Перкутанне дренування та ЕТВ не є взаємовиключними, їх можна поєднувати в комбінованих тактиках лікування.

Ключові слова: гострий інфікований некротичний панкреатит, обмежене некротичне скупчення, ендоскопічна транслюмінальна некрозектомія, перкутанне дренування.

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