

The surgical approach to acute necrotizing pancreatitis treatment

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Abstract

The aim of this work was to estimate the efficiency of the proposed surgical treatment for acute necrotizing pancreatitis. **Materials and Methods:** We analyzed the outcomes of the treatment of 317 patients with acute necrotizing pancreatitis in whom the proposed surgical treatment was used over the period of 2013–2019. The new postoperative onset of organ failure, duration of intensive care treatment, postoperative complications, and mortality rates was studied. **Results and Discussion:** We used the step-up approach to surgical treatment, which started from either diapaetic transcutaneous ultrasound-guided procedures in 48.2 % and endoscopic ultrasound-guided – in 46.2 % of cases. Transcutaneous procedures were followed by less complication rate in acute necrotic collection cases whereas endoscopic operations – in walled-off pancreatic necrosis patients. Wide laparotomic necrosectomies were applied in 14.5 % of patients after the 4th week of the disease onset. The overall mortality rate was 3.5 %, and after the surgical treatment – 6.5 %. Application of step-up surgical treatment in patients with ANP decreases the need to perform wide laparotomic necrosectomies and reduces the rate of postoperative complications.

Keywords: Acute necrotizing pancreatitis; minimally invasive treatment; echo-video endoscopy; multimodal step-up approach

INTRODUCTION

The incidence of acute pancreatitis is increasingly growing by 2.5-3.1% annually and varies between 15 and 80 cases per 100,000 people in Europe and North America, respectively [1]. The disease is developed as the primary aseptic acute inflammatory in the pancreas and peripancreatic tissues as a result of the enzymatic damage to the acinar parenchyma followed by the development of necrosis focuses [2]. This damage is characterized by a transition from local to systemic inflammatory response, accompanied by various disorders, causing functional insufficiency of internal organs with possible multiple-organ-failure syndrome development. Subsequently, in case of an unfavorable course of the disease, infection is added to aseptic inflammation. Despite the advances in diagnostics, conservative, and surgical treatment, the mortality of severe ANP forms is still high and varies between 15-45% [3, 4].

At the same time, views on the place, role and methods of surgeries for ANP differ significantly, there is no single point of view on the indications for the use of minimally invasive treatment and laparotomic necrosectomy depending on the disease duration, its spread, nature, and localization of abnormal focuses [5-7].

The aim of the work was to assess the developed surgical approach efficiency for the treatment of acute necrotic pancreatitis.

MATERIALS AND METHODS

Outcomes of treatment of 317 patients with ANP were analyzed, in whom a step-up surgical approach favoring minimally invasive treatment was used during 2013-2019. The patients being examined involved 145 (45.7%) women and 172 (54.3%) men, aged 18 to 78 (the average age was 48 ± 1).

ANP was diagnosed on the basis of anamnesis, clinical pattern, data obtained from the laboratory (blood amylase and urine diastase), and instrumental (ultrasonography and enhanced in contrast computed tomography) studies. ANP severity was assessed in accordance with the recommendations given by the acute pancreatitis

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reclassification group (Atlanta, 1992), the international consensus in 2012 [8], based on the transient or constant ANP and APACHE II (Acute Physiology and Chronic Health Evaluation II) score. To determine ANP, the functions of the respiratory, cardiovascular system and kidneys were evaluated based on the modified Marshall score, and neurological failure - based on the Glasgow coma score [7]. Pancreonecrosis focus infection was diagnosed by the signs of the systemic inflammatory response, computed tomography data, bacteriological examination, positive Procalcitonin or Presepsin tests [9].

All patients were given individually-selected conservative therapy, the basic principles of which involved: pain relief, correction of central hemodynamics and peripheral circulation disorders, early enteral nutrition, adequate protein-energy supply, purulent infection prevention, suppression of pancreatic secretion, detoxification therapy, immune disorder corrections, stress ulcer prevention, and hepatoprotection [10, 11]. To assess the efficiency of surgical treatment of patients with ANP, de novo postoperative organ failure, duration of postoperative intensive therapy, infectious and postoperative complications, and postoperative mortality were used.

DISCUSSION

All ANP treatment stages started with conservative therapy, the scope of which was determined by the severity of patient condition on admission and complication risks [9].

Surgical therapy was carried out consistently, diapeutic transcutaneous or endoscopic surgeries were used as the first step, depending on the localization and morphological characteristic of the abnormal focuses.

Patients with acute necrotic collections were likely to be treated with a transcutaneous puncture and inserting silicone 10-12 Fr diameter drain tubes, guided by ultrasound. Tubes being actively administered were the final invasive treatment in 81.1% of patients. Echo-guided endoscopic surgeries were performed as an initial invasive treatment in 69 patients with localized pancreatic necrosis focuses adjacent to the stomach or the duodenum.

The treatment efficiency was 87.2%. In the postoperative period, all patients were treated with etiotropic antibiotic therapy on the basis of the results of regular bacteriological necrotic masses study, the efficiency of which was evaluated through the systemic inflammatory response syndrome severity and through the biological markers time pattern - C-reactive protein, procalcitonin, and presepsin. When transcutaneous treatment was used, there was a need for reintervention in 64.5% of cases, in 21.3% ($P < 0.05$) when using endoscopy. The reason was insufficient necrotic mass draining and purulent-inflammatory development. Factors that contributed to diapeutic surgery inefficiency involved pancreas lesion for more than 30%, several necrotic focuses

and the majority of focuses had solid masses. With insufficient draining of necrotic masses, the channel used for inserting drains was expanded and replaced with a channel of a larger diameter. For larger abnormal focus sizes, alternative (endoscopic or transcutaneous respectively) approach to the repeated diapeutic surgery was used in 10 cases. Simultaneously, according to the antibiogram data, antibacterial therapy was corrected.

Only in the case that the diapeutic treatment was inefficient, treatment proceeded to the next, more invasive step - the use of minimally invasive necrosectomies. In patients with acute necrotic collections, the retroperitoneal approach to the disease sites was favored, for which lumbotomic video-guided nephroscope sanitation was used in 8 patients. In the case of localized pancreatic necrosis focuses adjacent to the stomach or the duodenum, endoscopic necrosectomy was used guided by echo endoscopy in 23 cases.

Surgery was individualized, in 7 cases when there was a small amount of solid masses, necrosectomy was finished by inserting two double-sided pig-tale drains. In 8 people with extent purulent masses, a cystonasal tube was inserted into the cavity, through which a system for continuous physiological solution lavage in the postoperative period was connected. With an insufficient density of the surrounding capsule and extensive detritus, self-expandable metal stents ensuring an adequate and safe necrosectomy were de novo used in 8 patients. After the first endoscopy operation, clinical improvement progressed with the reduced signs of the systemic inflammatory response syndrome and ANP in all cases. In 26 patients with common pancreas abnormalities and its procedures to the retroperitoneal space, we de novo applied a combined retroperitoneal video-endoscopic approach, which simultaneously takes advantage of endoscopic and lumbotomic video-guided necrosectomy approaches.

At the first stage, US-guided transcutaneous drainage was inserted, at the second stage, the mass was punctured through the stomach or the duodenum wall by means of the echo-video endoscope and, if necessary, internal draining was performed using plastic or metallic stents. Despite the lesion severity and extension, the approach proved to be highly effective and 92% of patients did not need additional surgeries when applying it.

In the above-mentioned cases that surgeries cannot be applied or they are not sufficiently effective, the following step was taken to perform an open laparotomic necrosectomy. Selective open surgeries were applied to 12 patients with purulent localized pancreonecrosis small-sized focuses (up to 5-7 cm in diameter). Only two patients needed more invasive treatment. Wide laparotomic pancreatic necrosectomy was performed in 46 (14.5%) patients of the treatment group.

In 40 patients, surgeries were performed after the applied diapeutic transcutaneous or endoscopic surgeries and were

the last step in the proposed step-up approach to ANP surgical treatment. In 6 people who were admitted to the hospital or transferred from other treatment facilities after 4 weeks from the onset of the disease and had extensive purulent localized lesions with a sepsis clinical evidence, laparotomic surgeries were performed as the first and final stage of surgery treatment (Table 1).

Table 1. Efficiency of the surgical treatment stages for patients with acute necrotizing pancreatitis

Surgical treatment stages	The number of the patients operated, n, (laparotomy, %)	
	Acute necrotic collections	Localized necrosis focuses
Diapheutic surgeries including:		
- transcutaneous		
- endoscopic	37 (18,9)	55 (29,9)
- complex	15 (26,6)	54 (7,4)
	5 (20)	6 (0)
Minimally invasive necrosectomies including:		
- transluminal nephroscope-guided	4 (0)	10 (10,0)
- echo - video endoscopic surgeries	-	23 (13,0)
- retroperitoneal and video endoscopic approach	4 (26,7)	12 (0)
Open necrosectomies including:		
- by means of mini-laparotomy	-	7 (14,3)
- by means of mini-lumbotomy	-	5 (20,0)
- wide laparotomy	8 (37,5)	38 (10,5)

In the postoperative period, complications were diagnosed in 28.3% of patients and showed new acute necrosis development in 7 cases, arrosion bleeding in 4 cases, pancreatic and duodenal fistulas in 6 patients. The total mortality was 3.5%, after the wide laparotomic necrosectomies - 6.5%.

CONCLUSION

1. Surgical treatment for acute necrotic pancreatitis should consider the morphological form of the disease and should be based on the step-up surgical treatment. As the first step, diapheutic surgeries should be applied, the next step – minimally invasive necrosectomies and only in case of necrosectomies are ineffective, it is advisable to perform open laparotomic surgeries.
2. Transcutaneous minimally invasive surgeries guided by ultrasound are the optimal approach to primary surgical treatment in patients with complicated acute

necrotic collections (up to 4 weeks from the onset of acute necrotic pancreatitis): after nebulization, no postoperative complications were detected, in 19.8% laparotomic operations were intended.

3. In patients with extensive pancreonecrosis (after 4 weeks of the disease onset) endoscopic surgeries are more effective, the application of which was the final surgical step in 94.4% of cases.
4. Application of the proposed surgical treatment to use step-up minimally invasive surgeries lowered the need for wide laparotomic necrosectomies down to 14.5% and delayed their performance until 4 weeks after the onset of the disease in 82.6% of the operated patients, contributed to the reduced rate of postoperative organ failure to 15.2% and postoperative mortality - to 6.5%.

REFERENCES

1. Peery AF, Dellon ES, Lund J, Crockett SD, McGowan CE, Bulsiewicz WJ, Gangarosa LM, Thiny MT, Stizenberg K, Morgan DR, Ringel Y. Burden of gastrointestinal disease in the United States: 2012 update. *Gastroenterology*. 2012;143(5):1179-1187.
2. Deepti K, Vijender S, Mohammed A. Amelioration of Diabetes and Its Related Complications in Streptozotocin Induced Diabetic Rats by Herbal Formulations, *Int. J. Pharm. Phytopharm. Res.* 2019;9(2):1-13.
3. Usenko O.Y., Kopchak V.M., Khomak I.V., et al. Outcomes of surgical treatment for groove pancreatitis. *Clinical surgery*. 2019;85(11):5-8.
4. Drones O.I., Nastashenko I.L., Susak Y.M. et al. Surgical treatment of patients with acute biliary pancreatitis and bile hypertension. *Clinical surgery*. 2018;85(4):5-8.
5. Boyko V., Lichman W.M., Shevchenko O.M., et al. Therapeutic and diagnostic approach to fluid and cystic pancreatic development. *Clinical surgery*. 2019;86(3):3-6.
6. Alsfasser G., Schwandner F., Pertschy A. Treatment of necrotizing pancreatitis: redefining the role of surgery. *World J. Surg.* 2012;36(5):1142-1147.
7. IAP WG, Guidelines AA. IAP/APA evidence-based guidelines for the management of acute pancreatitis. *Pancreatology*. 2013 Jul 1;13(4):e1-5.
8. Banks PA, Bollen TL, Dervenis C, Gooszen HG, Johnson CD, Sarr MG, Tsiotos GG, Vege SS. Classification of acute pancreatitis—2012: revision of the Atlanta classification and definitions by international consensus. *Gut*. 2013;62(1):102-11.
9. Rotar O, Khomiak I, Nazarchuc M, Rotar V, Khomiak A, Taneja K, Railianu S. Utility of Presepsin for diagnosis of infected acute necrotizing pancreatitis. *JOP. J. Pancreas.(Online)*. 2019;20(2):67-71.
10. Shevchuk, I. M., Pilipchuk, V. I., Khrunik, A. D., Gedzik S. M. Surgical treatment of patients with chronic pancreatitis with biliary hypertension, *Clinical surgery*. 2017;8:27-30.
11. Savolik S. I., Sviridyuk B. V., Ivanko O. V. Quality- of-life assessment of elderly and senile patients after minimally invasive surgeries for acute calculous cholecystitis and choledocholithiasis. *Clinical surgery*. 2018;85(9):15-18.