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9. სტატიის თან უნდა შეადგინოთ: ა) დამატებითობა ან შეთქმები ჟურნალმა წინამდებარე შეფასება, განკუთვნილება ჟურნალმა ყურადღები ხელმძღვანელობით ან დამატებითობა შეთქმულ დამატებით მოთხოვნები, რომელთა შეთქმები იძლევა ჟურნალში, შეფასებით შეფასებით გამოყოფა.

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არსებით შეფასების დამატებით შემოწმება სტატიით ან დამატებით.
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Musayev SA.
EVALUATION OF THE QUALITY OF LIFE AFTER REVASCULARIZATION AND RECONSTRUCTIVE OPERATIONS ON MITRAL VALVE IN PATIENTS WITH CORONARY HEART DISEASE.
EFFICACY OF THE ALGORITHMIC STEP-UP APPROACH OF INTERVENTIONAL TREATMENT OF PATIENTS WITH ACUTE NECROTIZING PANCREATITIS

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Abstract.

Aim: To estimate the efficacy of the algorithmic step-up approach of interventional treatment of acute necrotizing pancreatitis (ANP).

Material and methods: We performed a prospective observational cohort study of the efficacy of the developed approach of surgical treatment of 317 patients with different morphological forms of ANP. The following parameters were collected for each episode: length of hospital stay, mortality rate, occurrence of organ failure and local complications.

Results: Transcutaneous puncture/drainage procedures were performed as the first step in 37 patients with necrotic collections. In the presence of walled-off pancreatic necrosis (WOPN) endoscopic procedures were preferred in case their close localization to the stomach or duodenum in 65 observations. Initial surgical treatment was not effective in 18.8% and video-assisted retroperitoneal debridement in patients with ANP or necrosectomies under endoscopic control in cases of WOPN were performed. Involuntary laparotomic necrosectomies were conducted in 14.5% of patients as a final step of the suggested algorithmic approach. During postoperative period complications occurred in 28.3% of patients. They included 7 new episodes of organ failure, 4 cases of aseptic hemorrhage, and 5 cases of pancreatic and duodenal fistulas. Overall mortality rate was 3.3%, after laparotomic surgical treatment – 6.5%.

Conclusions: Surgical treatment in patients with ANP based on the developed algorithmic step-up approach is followed by acceptable complication and mortality level.

Key words. Acute necrotizing pancreatitis.

Introduction.

The occurrence of acute pancreatitis 2.5-3.1% increases annually and ranges from 15 to 80 cases per 100,000 of the population in the countries of Europe and North America [1]. The development of primary aseptic acute inflammatory process in the pancreas, peri-pancreatic tissues as a result of enzymatic damage to the acinar parenchyma with the subsequent formation of necrosis foci is the basis of the disease. This damage is characterized by a transition from the local to systemic inflammatory response, accompanied by various disorders causing dysfunction of the internal organs with the possible occurrence of multiple organ failure syndrome. Subsequently, when the course of the disease becomes unfavorable, infection joins the aseptic inflammation. Irrespective of the advanced diagnostics, conservative and surgical treatment, mortality rate in severe forms of acute necrotizing pancreatitis (ANP) remains high and ranges from 15% to 45% [2-4]. At the same time, the ideas concerning the place, role and methods of surgical procedure in ANP are significantly different, there is no single point of view concerning the indications for the use of mini-invasive methods of treatment and laparotomic necrosectomy depending on the terms of the disease, extension, nature and localization of pathological foci [5-6].

Aim.

The aim of the study was to estimate the efficacy of the algorithmic step-up approach of interventional treatment of ANP.

Materials and methods.

The results of treatment of 317 patients with ANP who underwent with application of the algorithmic step-up approach for 2016-2020 years were analyzed. Acute pancreatitis was defined according to the 2012 Revision of the Atlanta Classification as an association of two out of the three following features: typical abdominal pain (acute onset of a persistent, severe, epigastric pain often radiating to the back), serum lipase or amylase activity at least three times higher than that of the upper range of the normal one, and characteristic findings of acute pancreatitis on abdominal cross-sectional imaging studies [7]. Necrotizing pancreatitis was characterized by inflammation and associated pancreatic parenchymal necrosis and/or peripancreatic necrosis, demonstrated by the lack of pancreatic parenchymal enhancement and/or the presence of findings of acute necrotic collection and walled-off necrosis on contrast-enhanced computed tomography (CT). The CT-protocol for pancreatic evaluation consisted in a retarded venous phase after 35 s of venous contrast administration. CT scans were taken in all patients for making the diagnosis of ANP between 72-96 h after the onset of abdominal pain and were repeated if indications for surgery arose. Only those patients with the interventional treatment indicated were included into current study. Besides, persons were excluded if any of the following criteria were present: a) age < 18 and > 80 years; b) recent surgical interventions; c) psychoses; d) pregnancy; e) previously history of chronic pancreatitis. After exclusion of the above-mentioned cases 317 patients with ANP were enrolled into the current study (Table. 1) including 145 females (45.7%), and 172 males (54.3%), aged from 18 to 78 years (the average age was 48 ± 1 year). The severity degree of ANP was assessed according to the recommendations of the International Pancreatitis Classification Review Group (Atlanta, 2012) [7] by the presence of transient or constant organ failure. There were 190 (40.2%) patients with moderate and 127 (39.2%) – with severe ANP. Initial treatment of every patient started with individually chosen conservative measures. The main principles of the intensive therapy were the following: effective analgesia, fluid resuscitation for correction of disorders of the central hemodynamics and peripheral circulation, early enteral nutrition, and adequate protein-energy supply. Nasojejunal enteral feeding was initiated when the oral one was not tolerated after 48-72 hours after admission.
If there were problems with nasojejunal intubation, nasogastric tube feeding was indicated. Parenteral nutrition was only initiated when oral route was not tolerated or sufficient, but at least small amount of enteral feeding was present in all the patients. Antibacterial prophylaxis was not indicated, and antibiotics were administered only for patients with suspected infectious complications.

According to the international guidelines, interventional treatment was performed in case of suspected or confirmed infection of pancreatic necrosis or peri-pancreatic necrosis and gastrointestinal obstruction due to compression by necrotic collections [8-9]. The decision to perform surgery was mostly based on clinical signs (i.e., deterioration). Infected necrosis was diagnosed on CT findings of retroperitoneal gas, positive blood culture or concentration of presepsin over 600 pg/ml or procalcitonin over 1.8 mg/ml [10]. Suspected infected necrosis was defined as persistent clinical manifestations of sepsis without presence of gas in the peri-pancreatic collection on CECT. Whenever possible, surgery was postponed until approximately four weeks after the onset of disease.

Surgical treatment was performed by the algorithmic step-up approach (Figure 1). Depending on the localization and morphological characteristics of the pathological foci, transcutaneous or EUS-controlled punctures/drainages were used as a first step. Transcutaneous punctures under ultrasound control were preferred for the patients with acute necrotic collections (ANC) independent of their localization. EUS procedures were applied as the initial invasive treatment in the presence of walled-off pancreatic necrosis (WOPN) and its close localization to the stomach or duodenal wall. If initial surgical treatment wasn’t effective minimally invasive necrosectomies were performed. Video-assisted retroperitoneal debridement (VARD) was applied during the period till the 4th week of illness. In patients with WOPN, adjacent to the stomach or duodenum, endoscopic necrosectomy was preferred. Combined application of both procedures was used in patients with extended necrotic collections. If the above-mentioned interventions could not be performed or their effectiveness was insufficient, we passed on to the final step - performance of open laparotomic necrosectomy.

Criteria of inefficacy of the suggested treatment were lack of control of infectious process in necrotic collections, worsening or occurrence of new organ failure, abdominal organ compression by necrotic collections with symptoms of gastrointestinal obstruction. The necessity for the following step of treatment depended on an individual patient basis and the agreement with a multidisciplinary team experienced in the management of ANP (including surgeons, anesthesiologists, physicians, gastroenterologists, and interventional radiologists).

Figure 1. Chart flow of algorithmic step-up approach of surgical treatment of symptomatic acute necrotizing pancreatitis.

Table 1. Patient’s characteristics.

<table>
<thead>
<tr>
<th></th>
<th>Amount of patient (n=317)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBW, kg/m²</td>
<td>26.4±1.8</td>
</tr>
<tr>
<td>Severity at admission, n (%):</td>
<td></td>
</tr>
<tr>
<td>- moderate</td>
<td>190 (60.2)</td>
</tr>
<tr>
<td>- severe</td>
<td>127 (39.8)</td>
</tr>
<tr>
<td>APACHEII, points</td>
<td>11.3±0.33</td>
</tr>
<tr>
<td>Spread of pancreatic necrosis, n (%):</td>
<td></td>
</tr>
<tr>
<td>- less than 30%</td>
<td>132 (41.6)</td>
</tr>
<tr>
<td>- 30-50%</td>
<td>145 (45.8)</td>
</tr>
<tr>
<td>- more than 50%</td>
<td>40 (12.6)</td>
</tr>
<tr>
<td>Local complications:</td>
<td></td>
</tr>
<tr>
<td>- acute necrotic collections</td>
<td>188 (59.5)</td>
</tr>
<tr>
<td>- walled-off necrosis</td>
<td>129 (40.5)</td>
</tr>
<tr>
<td>Infectious complications before intervention, n (%)</td>
<td>193 (60.9)</td>
</tr>
</tbody>
</table>
of the invasive treatment in 72 (81.1%) of these patients. EUS procedures were used as the initial step of surgical treatment in 69 (22.2%) patients with walled-off pancreatic necrosis and close localization of the pathological foci to the stomach or duodenum wall. The efficiency of EUS procedures reached 87.2% (in 60 cases there was no necessity for further treatment).

Table 2. Efficacy of surgical treatment of patients with acute necrotizing pancreatitis.

<table>
<thead>
<tr>
<th>Interventional procedures</th>
<th>Amount of operated patients, n, (necessary for further laparotomy, %)</th>
<th>Acute necrotic collections</th>
<th>Walled-off necrosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mini invasive puncture/drainages:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- transcutaneous</td>
<td>37 (18,9)</td>
<td>55 (29,9)</td>
<td></td>
</tr>
<tr>
<td>- endoscopic</td>
<td>15 (26,6)</td>
<td>54 (7,4)</td>
<td></td>
</tr>
<tr>
<td>- combined</td>
<td>5 (20)</td>
<td>6 (0)</td>
<td></td>
</tr>
<tr>
<td>Mini invasive necrosectomies:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- transcutaneous video-assisted retroperitoneal debridement</td>
<td>4 (0)</td>
<td>10 (10,0)</td>
<td></td>
</tr>
<tr>
<td>- endoscopic ultrasound guided necrosectomy</td>
<td>4 (26,7)</td>
<td>23 (13,0)</td>
<td></td>
</tr>
<tr>
<td>- combined approach</td>
<td></td>
<td>12 (0)</td>
<td></td>
</tr>
<tr>
<td>Open necrosectomies:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- mini laparotomy</td>
<td>-</td>
<td>7 (14,3)</td>
<td></td>
</tr>
<tr>
<td>- mini-lumbotomy</td>
<td>-</td>
<td>5 (20,0)</td>
<td></td>
</tr>
<tr>
<td>- conventional wide laparotomy</td>
<td>8 (37,5)</td>
<td>38 (10,5)</td>
<td></td>
</tr>
</tbody>
</table>

When using transcutaneous drainage, the need for repeated same interventions emerged in 64.5% of observations, and in case of endoscopic access - in 21.3% (p=0.033). Insufficient drainage of necrotic masses and advance of the purulent-inflammatory process were the reasons for their implementation. Factors contributing to the ineffectiveness of diapeutic procedures were the lesions of more than 30% of the pancreas, the presence of several necrotic foci, and their large volume with the predominance of solid content (p=0.025). In case of insufficient drainage of the necrotic content, the canal for drainage was expanded and replaced with a larger diameter canal. For large pathological foci in 10 observations, alternative access (endoscopic or transcutaneous one respectively) for repeated diapeutic intervention was used. Simultaneously, according to the results of antibiotic grams, antibacterial therapeutic correction was indicated. The following, more invasive step – mini-invasive necrosectomies, was used only in case of ineffectiveness of the previous methods and the presence of several factors of their insufficiency. Retroperitoneal access to the affected areas was preferred during the period till the 4th week of illness, lumbar video-controlled sanation by means of nephroscope was used for in 8 patients. In the presence of the separated pathological foci, adjacent to the stomach or duodenum, endoscopic necrosectomy was performed in 23 cases under echo-endoscopic control. Surgery was performed individually: for a small amount of solid component necrosectomy was completed with the introduction of two bilateral drainages of pig-tale type in 7 observations. When a large number of purulent masses was found, a cyst nasal probe to connect the system for continuous lavage with saline solution in the postoperative period was introduced into the cavity in 8 patients. With insufficient density of the surrounding capsule and a large amount of detritus, self-spreading coated metal stents were used in 8 patients to perform adequate and safe necrosectomy. Clinical improvement with a decrease in the signs of SIRS and organ failure was observed in all cases after the first endoscopic intervention. In 26 patients with large pancreatic necrosis, spreading into the retroperitoneal space, we have applied a combined retroperitoneal-video-endoscopic access, which simultaneously uses the benefits of endoscopic and lumbar video-controlled methods of necrosectomy. At the first stage, transcatheter drainage was monitored under ultrasound control; at the second stage - puncture formation was conducted through the wall of the stomach or duodenum by means of echo-video-endoscope and, if necessary, its internal drainage was performed using plastic or metal stents. Despite the severity and extension of the lesion, the method proved to be highly effective, 92% of patients did not require further intervention.

If the above-mentioned interventions could not be used or their effectiveness was insufficient, we passed on to the next step – open laparotomic necrosectomy. We have developed the technique of the selective mini-laparotomy and mini-lumbotomy, the use of which reduced the traumatism of surgery. Indications for their implementation were suppurated separated foci of pancreatic necrosis of a small (up to 5-7 cm in diameter) size. Selective mini-open interventions were performed in 12 patients of the main group, the need for more invasive treatment emerged only in two patients. Widespread laparotomic necrosectomy was performed in 46 (14.5%) patients of the main group (Table 3).

Table 3. Complications after wide laparotomic surgical operations.

<table>
<thead>
<tr>
<th>Complication</th>
<th>Amount of patient (n=46)</th>
</tr>
</thead>
<tbody>
<tr>
<td>New cases of organ failure, n (%)</td>
<td>7 (15,2)</td>
</tr>
<tr>
<td>Multi organ failure, n (%)</td>
<td>2 (4,3)</td>
</tr>
<tr>
<td>Arosive hemorrhage, n (%)</td>
<td>3 (6,5)</td>
</tr>
<tr>
<td>Gastrointestinal hemorrhage, n (%)</td>
<td>1 (2,2)</td>
</tr>
<tr>
<td>Intestinal fistula, n (%)</td>
<td>3 (6,5)</td>
</tr>
<tr>
<td>Pancreatic fistula, n (%)</td>
<td>3 (6,5)</td>
</tr>
<tr>
<td>Infected complications, n (%)</td>
<td>3 (6,5)</td>
</tr>
<tr>
<td>Sepsis, n (%)</td>
<td>1 (2,2)</td>
</tr>
<tr>
<td>Mortality, n (%)</td>
<td>3 (6,5)</td>
</tr>
</tbody>
</table>

In 40 patients, interventions were performed following the use of transcutaneous or endoscopic procedures being the last stage in the step-by-step approach to surgical treatment of ANP suggested by us. In six patients, who were admitted to the hospital or transferred from other medical institutions following 4 weeks from the onset of the disease and who had widespread suppurred separated lesions with clinical manifestation of sepsis, laparotomy interventions as the first and final stages of surgery were performed.
In the postoperative period, complications were observed in 28.3% including new cases of organ failure in 7 cases, erosive bleeding in 4 cases, pancreatic and duodenal fistulas in 6 people. The overall mortality rate was 3.5% and following open laparotomy necrosectomies use was 6.5%.

Discussion.
Our results obtained are indicative of a successful surgical treatment of ANP that requires an individualized approach including intensive care and step-by-step multimodal use of new methods of mini-invasive treatment. An important principle of surgical policy for the treatment of ANP should be a delayed surgical procedure to the time when necrotic accumulations are well separated. Mini-invasive transcutaneous or endoscopic puncture/drainage should be used as a first step in surgical treatment, especially if it is needed during the first weeks of the disease [10]. If such mini-invasive surgery is not effective enough, it should be repeated using another alternative approach. If it is not possible to control the focus of infection effectively, mini-invasive necrosectomy as the next step should be used. During the first 4 weeks, trans lumbar video-controlled sanation by means of nephroscope should be preferred. Endoscopic and combined methods of mini-invasive necrosectomy may also be used after separation of the necrotic foci. The further step of the surgical treatment in small pathological foci is the use of selective mini-laparo and mini-lumbotomy necrosectomies. If, despite the consistent application of the previously mentioned steps of mini-invasive surgical treatment, the disease continues to develop or reduced stages of ANP with rapid formation of retroperitoneal suppuration, increased severity of intoxication, occurrence of surgical complications are observed, a widespread laparotomy should be initiated as the last step.

The introduction of our developed technique contributed to the separation of pathological process, allowed to perform delayed open pancreatic necrosectomy with a minimal risk for the patient, which helped to reduce the incidence of the postoperative complications and mortality.

Conclusions.
1. Interventional treatment of patients with ANP based on elaborated algorithmic step-up approach is followed by acceptable complication and mortality level.
2. Mini invasive puncture/drainages should be applied as the first step of invasive treatment of patients with ANP, mini-invasive necrosectomies – as next more invasive step, whereas open laparotomy operation have to be performed only in case of inefficacy of the previous steps.
3. In patients with acute necrotic collections transcutaneous approach is followed by less complications rate whereas in case of walled-off pancreatic necrosis endoscopic route is preferable.

REFERENCES
ассистированная забрюшинная некрэкстрактомия у больных с ОНС или некрэкстрактомия под эндоскопическим контролем в случаях ОТПН. Вынужденные лапаротомные некрэкстрактомии произведены у 14,5% больных и являлись завершающим этапом предложенного алгоритмического подхода. В послеоперационном периоде осложнения возникли у 28,3% больных. Они включали 7 новых эпизодов органной недостаточности, 4 случая кровотечений и 5 наблюдений панкреатических и дуоденальных свищей. Общая летальность составила 3,3%, после лапаротомных вмешательств – 6,5%.

Выводы. Хирургическое лечение больных с ОНП на основе разработанного алгоритмического ступенчатого подхода сопровождается приемлемым уровнем осложнений и летальности.