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Treatment of Infectious Complications of Acute Pancreatitis in a Specialized Department of Purulent and Septic Surgery

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AIM OF STUDY To show the implementation of routing, results and methods of surgical treatment of patients with infectious complications of acute pancreatitis in specialized department of septic surgery of a regional hospital.

MATERIAL AND METHODS After managing pancreatogenic shock and stabilization of the patient's condition, the emergency medical teams or the territorial center of disaster medicine transferred the patients to the regional septic center (Department of Purulent and Septic Surgery of Sverdlovsk Regional Clinical Hospital No. 1). Over the past 5 years, 422 patients with acute pancreatitis of severe and moderate severity were transferred: 62 patients with peripancreatic infiltrates and signs of infection, but without a liquid component; 76 patients with pancreatogenic abscesses, 284 patients with non-localized variants of septic sequestration.

RESULTS Infected peripancreatic infiltrates complicated by sepsis without a liquid component. An attempt of surgical separation and drainage was made in 19 patients out of 62. Nine patients (47.4%) died. Subsequently, the remaining 43 patients were treated conservatively and 11 (25.5%) patients died.

Pancreatogenic abscesses (delimited septic sequestration). All 76 patients were operated with the use of minimally invasive technologies (navigation punctures, navigation puncture drainage, drainage and sequestration from the mini-access). There were no deaths.

Non-localized pancreatogenic septic sequestration (pancreatogenic phlegmon). Suppuration areas within one quadrant (S1 or D1) occurred in 120 patients. All of them were simultaneously drained from 1–2 incisions of 3–5 cm, 16 patients died (13.3%), another 164 patients had more common variants of lesions (2–5 quadrants), including central localization (C), 64 patients of them were operated simultaneously, 18 patients died (28.1%). Another 100 patients were operated using stage-by-stage drainage tactics, and 21 patients died (21%).

CONCLUSION 1. The modern treatment of patients with purulent-septic forms of pacreatogenic lesions of retroperitoneal cellular spaces requires effective resuscitation support, verification of the form of the inflammatory process, high-precision visualization of foci of suppuration and the use of a wide range of modern minimally invasive surgical technologies.

2. The development and implementation of regional programs for routing patients with infectious complications of acute pancreatitis and providing them with staged medical care can improve the results of surgical treatment and reduce mortality from 28.1% to 19.3%.

Keywords: regional routing, severe acute pancreatitis, septic sequestration, minimally invasive surgical treatment, staged tactics of treatment

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CT — computed tomography
IMC — inter-municipal centers
MRI — magnetic resonance imaging
SRCH No. 1 — Sverdlovsk Regional Clinical Hospital No. 1

INTRODUCTION

The treatment of infectious complications of severe pancreatitis requires a clear organization of the treatment and diagnostic process, the use of high-tech diagnostic methods, monitoring and surgery [1-3] due to the variety of options for purulent-septic changes, the course of organ dysfunctions and high mortality when using traditional surgical treatment [4, 5]. At the same time, retroperitoneal tissuue becomes the main site of pancreatogenic disorders [6], and the period of its unlimited septic sequestration becomes the most difficult, costly and technologically multicomponent stage of treatment, which is difficult to implement in a general surgical hospital of a general network of medical institutions [7, 8].

Aim of study: to show routing, results and methods of surgical treatment of patients with infectious complications of acute pancreatitis in a specialized department of purulent surgery of the regional hospital.

MATERIAL AND METHODS

Our clinic has been involved in the centralized provision of surgical care in the Sverdlovsk Region for patients with severe forms of acute pancreatitis since 2002. Then, at a general meeting of surgeons and anesthetists of the Region, a phased tactics of treatment of such patients was adopted. During the aseptic course of the disease, all hospitals providing emergency surgical care were recommended to implement the developed criteria for the rapid diagnosis of severe pancreatitis and hospitalize patients in intensive care units immediately from the emergency room. It was recommended to avoid laparotomic interventions, and if tactical difficulties arise, seek advice from the Sverdlovsk Regional Clinical Hospital No. 1 (SRCH No. 1).

After arresting pancratogenic shock and stabilizing the patient in case of signs of infection of the inflammatory focus, the patient should be transferred to the Department of Purulent Surgery of SRCH No. 1. We used means of Territorial Disaster Medicine Center and regional emergency services for repeated hospitalization.

Necessary retraining of surgeons and anesthesiologists area was provided at the Department of Surgery, Coloproctology and Endoscopy.

Initially, the financing of the appropriate medical support for all resuscitation departments of medical institutions of the general network was provided by a special financing program for the Governor of the Sverdlovsk Region. Later, in 2012, the Ministry of Health of the Sverdlovsk Region introduced the relevant provisions in the regional regulations for the provision of medical care (order of the Ministry of Health of the Sverdlovsk Region dated December 29, 2012 No. 1566-p).

In accordance with the above documents, over the past 5 years, 422 patients with moderate and severe acute pancreatitis in the septic sequestration phase were transferred from the general network of healthcare institutions to the Purulent Surgery Department of SRCH No. 1.

The indications for the transfer were the presence of signs of septic sequestration (clinical manifestations, laboratory results, ultrasound data, computed tomography (CT) and magnetic resonance imaging (MRI) and the patient's state of transportability). As a rule, this situation arose by the end of the 2nd week from the onset of the disease after the relief of pancreatogenic shock and stabilization of the patients.

The presence of signs of septic shock was a contraindication to transportation. Such patients continued to be treated in the conditions of the inter-municipal centers (IMC), centrally providing them with advisory assistance. The presence of delimited abscesses in the presence of conditions in the MMC for their minimally invasive drainage in recent years hasn't been considered an urgent reason for transferring the patient to SRCH No. 1.

Of the 422 patients, 294 patients (69.7%) were men, 128 (30.3%) were women. The mean age ($M \pm m$) was 47.2 + 12 years. Most often, patients arrived to the clinic 12-14 days after the onset of the disease. Upon admission to SRCH No. 1, the condition of 108 patients was regarded as moderate, and 314 cases were serious. Despite the fact that septic shock was a contraindication for transportation, its presence was detected in 50 patients. Patients in serious condition were hospitalized immediately in the intensive care unit. As a rule, the next 12-24 hours were required to stabilize the condition of patients and prepare them for surgical treatment. The primary task of diagnosis during this period was to detail the stage of pancreatitis, clarify the variant of purulent-inflammatory changes, their location and degree of prevalence using ultrasound, CT with bolus enchancement, fine-needle punctures. Visualization of the results obtained and their discussion were crucial in choosing the method, access and sequence of minimally invasive drainage of foci of suppuration.

According to the indication we performed fibrogastroduodenoscopy and MRI. In case of arrosive bleeding, selective angiography was performed, followed by endovascular occlusion of the bleeding source. The monitoring of the course of organ dysfunctions was carried out according to the *SOFA (Sequential Organ Failure Assessment)* scale. Microbiological control included studies of blood, urine, wound and fine needle puncture material.

RESULTS

Pancreatogenic infiltrates (Fig. 1) with signs of infection and microabsection were detected in 62 patients. This type of pathological process in 27 patients (43.5%) developed within the first week, in 24 (51.6%) within the second week, and in 3 (4.8%) cases within the third week from the onset of the disease. The condition was moderate in 51 patients (82.2%), and severe in 11 (17.7%)patients. In all cases, infiltration was located in the projection of the pancreas and around it (*S*1). Initially, the ineffectiveness of conservative treatment of infected infiltrate was considered an indication for surgery. Nineteen of these patients were operated on. An attempt of surgical separation and drainage of the infection zone was performed. Of these, 9 (47.4%) patients died, 5 patients died from the effects of damage to blood vessels, stomach and intestinal loops in a difficult to differentiate infiltrate. Subsequently, 43 patients out of 62 were treated exclusively conservatively, refusing surgical intervention until fluid accumulations appeared, including with the progression of the disease. Of 43 patients, treated conservatively, 11 patients died (25.6%). The cause of death was the progression of organ dysfunctions. In the section, in all cases in the peripancreatic tissue, the presence of zones of diffuse edema and infiltration with the inclusion of foci of sterile necrosis and purulent-inflammatory infiltration without significant fluid accumulations was confirmed.

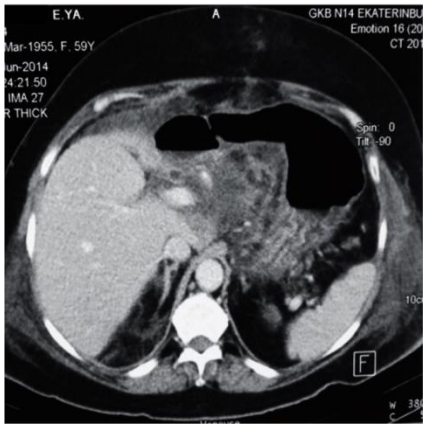

Fig. 1. CT scan of a patient with peripancreatic infiltrate (S1). Diffuse edema and tissue infiltration spread from pancreatic tissue to the omental bursa, subhepatic space, left upper quadrant of retroperitoneal tissue, and even to the left lumbar region. In this case, significant fluid accumulations and signs of delimitation of inflammation are absent

The appearance of fluid accumulations in patients with acute pancreatitis in a phase of pyoseptic sequestration significantly changed surgical tactics.

Pancreatogenic abscesses (peripancreatic accumulations of pus, delimited from surrounding tissues) were diagnosed in 76 patients using ultrasound and CT (Fig. 2). The condition of patients in this group turned out to be more favorable, which was associated with the presence of delimitations: in 23 patients — satisfactory, and in 53 — moderate. This type of pathological processes was formed later than pancreatogenic infected infiltrates. It developed in only 4 patients (5.2%) within the first week from the onset of the disease, in 28 patients (36.8%) within the second week, and in 45 patients (57.8%) within the third week. In all 76 cases, drainage of delimited abscesses was performed without a wide laparotomy. Abscesses up to 5 cm in size were treated with navigational punctures with aspiration of the contents, 5–7 cm with puncture drainage, over 7 cm and containing sequesters from mini-accesses using the Mini-Assistant ring and blade retractors. All these patients recovered.

Fig. 2. A large peripancreatic abscess containing sequestration, visualized on a CT scan in the region of the pancreatic head. The abscess is delimited by a pyogenic capsule. The surrounding parts of cellular spaces are minimally changed

Unlimited variants of pancreatogenic septic sequestration (pancreatogenic phlegmon) of retroperitoneal tissue were revealed in 284 out of 422 patients (Fig. 3). They developed in 14 patients (4.9%) within the first week, in 93 (32.7%) patients within the second week, in 134 (47.1) patients within the third week and in 43 patients (15.1%) later.

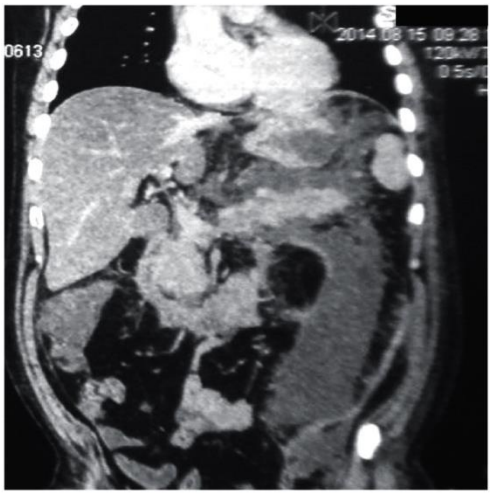

Fig. 3. On the CT scan, a large area of suppuration in the retroperitoneal fat tissue with a liquid component is visualized, extending to the upper and lower quadrants to the right of the diaphragm to the ilium without signs of delimitation

Suppuration zones were located in one quadrant (*S*1 or *D*1) in 120 cases. All of them were simultaneously drained from 1–2 incisions of 3–5 cm length. Sixteen patients died (13.3%).

Another 164 patients had more common lesions *S*1 + *C*; *S*1+ *S*2; *D*1+ *S*1; *D*1+ *S*1+ *S*2, etc. Of these, 64 patients were also operated simultaneously. In this case, it was necessary to perform from 2 to 6 incisions and combine the suppuration zones into one. Eighteen patients died, which amounted to 28.1%. The high mortality that accompanies the simultaneous drainage of extensive suppuration of the pancreatogenic sequestration zones forced us to change surgical tactics. Subsequently, in 100 patients, common forms of purulent-septic sequestration were drained in stages. At the first stage, the main foci of drainage were drained from a single mini-access (usually omentobursostomy with localition *S*1 or *D*1), providing secondary decomposition with only some decompression. The remaining abscesses were drained 1-2 days after the relief of shock and improvement of the patient's condition. Out of 100, 79 patients (79%) recovered, the mortality rate was 21%. The absence of distinctions of the purulent process and its prevalence determined the severity of the condition of patients. All 284 patients were admitted in serious condition, and in 49 (17.3%) there were signs of septic shock. Empirical antibacterial therapy was prescribed for these patients upon admission according to existing recommendations. In the future, it was corrected taking into account the results of bacteriological studies of wound discharge, blood, urine and sputum. Gram-negative microflora in patients with wound discharge was detected in 52.5% of studies (*Pseudomonas aerugenoza* prevailed), gram-positive in 41% (*Enterococcus faecium* mostly) and fungi in 3.5% of cases. The results of microbiological examination of wounds were negative in 21.3% of cases. Six patients with severe acute pancreatitis in a phase neotgranichennoy pyoseptic sequestration were transferred to our hospital because of recurrent bleeding from areas of previously performed surgical procedures. In 2 patients, the source of bleeding was located in the splenic artery, in 1 - in its segmental branch, in 2 - in the gastroduodenal artery, in 1 - in the superior mesenteric, in 2 - in the pancreatoduodenal artery.

All of these patients underwent X-ray endovascular arrest of bleeding. CT angiography data made it possible to choose the optimal access and tools for X-ray endovascular intervention, embolization of the artery and control of arrosive bleeding. All pancreatogenic phlegmons were drained from individual small sections up to 5 cm long or their combinations: from 1 to 6 sections depending on the location and prevalence of the process (Fig. 4). The purpose of the drainage was the formation of joint purulent cavities suitable for minimally invasive program sanitation. To do this, during the drainage, intersections were separated, combining the foci of suppuration in a single cavity. All things being equal, they preferred extraperitoneal accesses. In the absence of such a possibility, the purulent cavity was delimited from the free abdominal cavity artificially: by sealing sutures during burso-omentostomy or by the formation of adhesions in the right hypochondrium during purulent processes in the upper right quadrant.

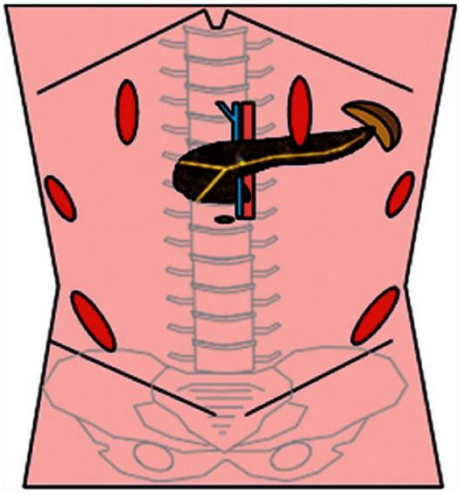

Fig. 4. Small accesses for drainage of retroperitoneal cellular spaces

Purulent processes in the omental sac and peripancreatic tissue located around the left pancreas (*S*1) were opened through a burso-omentostomy (Fig. 5), stitching the edges of the opened gastrocolic ligament to the parietal sac was straightened and the pancreas and retroperitoneburso-omentostomy. The cavity of the sac was drained through the wound lumen with pipe and glove drains. Recently, special drainage devices have been used that are connected to aspirators that provide negative pressure wound therapy. A peculiarity of drainage during the spread of pancreatogenic phlegmon *S*1 to the root of the mesentery of the small intestine (*C* - central location) was a careful expansion of the purulent cavity down along the superior mesenteric vessels. If necessary, burso-omentostomy was supplemented with a counter-incsicion in the left lumbar region. Because of fears of damage to the splenic bend of the colon and the vessels supplying it in recent years, we have abandoned attempts to conduct penetrating drainage from the omental sac into the lumbotomy incision. When performing this procedure, damage to the fold of the peritoneum in the lateral canal of the abdominal cavity should be avoided, which is facilitated by the use of blade-type retroperitoneoscopes (Fig. 6).

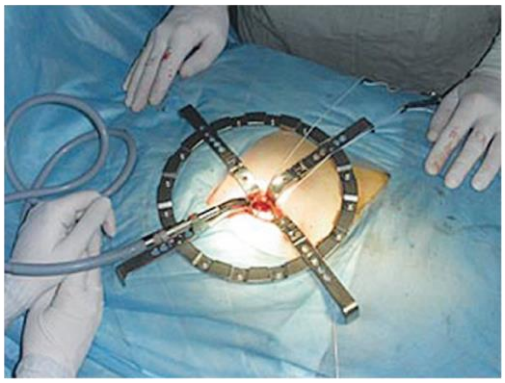

Fig. 5. Sanitation of the left upper quadrant of retroperitoneal fat tissue through bursomentostomy with the help of the ring retractor “Mini-Assistant”

Fig. 6. Blade-type retroperitoneoscopes

Program sanitations and necrosecestrectomy were started 3-4 days after the final delimitation of the omental sac and contrapertural drainage with an adhesive process in the abdominal cavity. Drainage of the right upper quadrant of retroperitoneal tissue (*D*1) around the pancreatic head was performed transabdominally from mini-access in the right hypochondrium using a ring retractor. According to indications, the quadrant *D*1 was supplemented with mini- lumbotomy on the right. This access is not initially delimited from the free abdominal cavity. The subhepatic space is only partially delimited: from above - by the inferior surface of the liver, from below - by the mesentery of the transverse colon and a large omentum. After introducing pipe and glove drains through an open mini-incision 3-4 days later, the subhepatic space thus drained is delimited by adhesions from the free abdominal cavity. Purulent fusion of the lower quadrants (*S*2 and *D*2) comes from the overlying sections of the retroperitoneal fat tissue. In the cases of their involvement in the overall process, drainage of the upper sections was completed by respective countrainsicions in the iliac region. Then, extraperitoneally, since this is done by extraperitoneal opening of the appendicular abscesses, mesocolonfat tissue was separated by hand or using a blade retractor until it connects to the superior purulent cavity. This technique made it possible to drain even the most extensive variants of purulent lesions spreading from the diaphragm to the pelvis on both sides (Fig. 7).

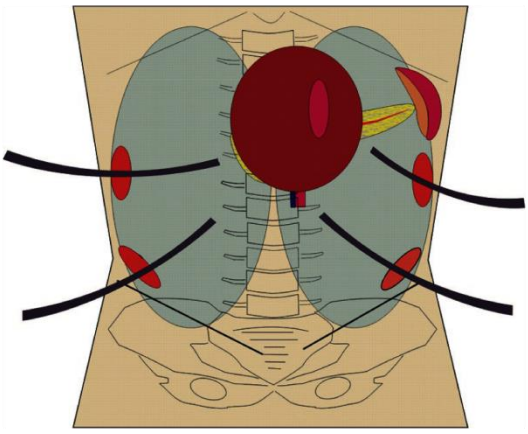

Fig. 7. Drainage scheme for common septic sequestration of infected pancreatogenic necrosis (pancreatogenic phlegmon) on the right and left

In total, out of 284 patients with pancreatogenic plegmons of retroperitoneal spaces, 229 people recovered (80.6%), and 55 (19.3%) died . The greatest difficulties arose during simultaneous drainage of foci in patients with common forms of septic sequestration (2–4 quadrants, “*S*1” with spread to “*C*”). So, out of 64 patients with common forms, 18 (28.1%) died, and 6 of them died within the first 2 days after surgery from the progression of organ dysfunctions.

The remaining 100 patients with common pancreatogenic phlegmons were drained in stages. At the first stage, one quadrant with the largest foci of suppuration was drained. After stopping the shock and stabilizing the patient's condition, the remaining foci were drained. Twenty-one patients (21%) out of 100 died. We did not specifically use the classic open surgery from the wide accesses to treat these patients. A total of 284 patients with severe and moderate acute pancreatitis in the septic sequestration phase, 55 patients died, the mortality rate was 19.3%.

FINDINGS

1. The modern treatment of patients with purulent-septic forms of pacreatogenic lesions of retroperitoneal spaces requires effective resuscitation support, verification of the form of the inflammatory process, high-precision visualization of foci of suppuration and the use of a wide range of modern minimally invasive surgical technologies.

2. The development and implementation of regional programs for routing patients with infectious complications of acute pancreatitis and providing them with staged medical care can improve the results of surgical treatment and reduce mortality from 28.1% to 19.3%.

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