Original Article

Justification of the differentiated approach to minimally invasive and open surgeries for acute pancreatitis complications

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Abstract

Results of treatment of 177 patients, suffering from acute pancreatitis complications, were analyzed. The introduction of dynamical monitoring has promoted the reduced rate of open surgeries as well as the reduced postoperative morbidity and lethality rate. Conservative therapy has appeared to be effective in 87 patients, in 66 patients minimally invasive surgeries were applied, and in 24 patients open surgeries were performed. There were significant indications for the performance of minimally invasive and open surgeries for acute pancreatitis.

Keywords: Acute pancreatitis; complications of pancreatitis; minimally invasive operations; open surgeries

Introduction

Acute pancreatitis (AP) is one of the most difficult cases in abdominal and retroperitoneal space diseases [1-3]. Its complications cause high fatality and high costs [4-6]. Wide introduction of minimally invasive operations in surgery for AP complications allowed to improve the treatment results [7]. At the same time, in case of severe AP complications, it is advisable to perform open surgeries. 15-20% of patients with AP develop severe forms of the disorder. Total AP fatality is 3-15%, pancreatic necrosis fatality is 24-50% [4, 5, 8, 9].

The common use of minimally invasive technologies in AP diagnosing and therapy is not always appropriate and effective, particularly for the atypical disease progression, concomitant obesity, diabetes mellitus and the like. In such situations, conditions are created for liquid accumulations in the abdominal cavity, its infection and spread to the peripancreatic mass.

Introduction of the diagnostic and therapeutic algorithms, liquid accumulation puncture with ultrasonic guidance, and pathogenetically substantiated conservative therapy contribute to the lowered severe complications rate, and in case of their occurrence allow timely open surgery performance. Thus, modern monitoring diagnostics using ultrasound and computed tomography (CT) provide timely detection and management of complications, preventing infection.

If earlier, open surgeries were favored, arguing that minimal invasive operations do not provide sufficient radicality and destruction area sanitation [4, 5, 8, 9], then over the last 5 years, minimally invasive treatment is considered priority [8, 10-12]. In practice, there are many inconsistencies in technical and tactical issues. In our view, a justification for a differentiated approach to the performance of minimally invasive and open surgeries for AP complications will contribute to the improved results of patient care.

The study aimed to improve the results of patient care with AP complications by using minimally invasive and open surgeries.

Materials and Methods

The treatment outcomes for 177 patients with AP disorders were analyzed over the period from 2014 to 2019. Patients aged from 17 to 79 were involved. There were 128 (71.3%) men and 49 (28.7%) women.

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From 2014 to 2019, 177 patients (treatment group) were treated based on the developed algorithm using a minimally invasive treatment.

175 patients (control group) were treated in a standard way for AP and its complications throughout 2012-2015. In case of complications, common open surgeries were performed.

The algorithm of the comprehensive program for the treatment group patients involved permanent monitoring of general clinical, laboratory, biochemical, and instrumental research methods. Ultrasound was performed every 3-5 days, and CT was performed every 14-16 days. In complex diagnostics, the algorithm involved laparoscopy.

Ranson prediction criteria were used to assess patients' state. The research involved patients whose state was rated from 3 to 11 scores based on the Ranson criteria, on average, (5.2 ± 0.4) scores in the treatment group, and (5.0 ± 0.3) scores in the control group.

The groups are represented by the patients' age, gender, disease etiology and severity, however, they are non-representative by the number of patients who underwent open surgeries.

Conservative therapy is an important AP treatment element at all its stages, aimed at the main pathogenetic mechanisms of autolysis suppression and organ abnormalities. It was assigned to all patients immediately after hospitalization. The invasive therapeutic approach was applied alongside with clinical, laboratory and instrumental patients' state monitoring. After stabilization of patients' health conditions, a non-invasive therapeutic approach was used, with laboratory and instrumental control continuing. When detecting complications, a surgical approach that started with minimally invasive operations was used.

In the treatment group, due to the developed algorithm introduction [13], omentobursitis was diagnosed in 32 patients, retroperitoneal phlegmon in 26 patients, pancreatogenic abscess in 17 patients, and acute pancreatic pseudocysts in 10 patients. Patients hospitalized with AP complications underwent minimally invasive surgeries at the early treatment stages. The puncture was performed under local anesthesia. Accumulated liquid content was sent for bacteriological and biochemical analysis. All patients undergone puncture were under the supervision of the duty staff. There were 66 (37.3%) of such patients in the treatment group.

Laparoscopy with abdominal drainage was performed for enzyme peritonitis. However, 24 (13.6%) patients from the treatment group had insufficient opportunities for conservative therapy and minimally invasive operations for one reason or another, and they underwent open surgeries.

Indications for an open surgery included:

- pancreatogenic abscess, infected pancreas pseudocyst, septic phlegmon of the retroperitoneal space developing after drainage in 5 patients;
- phlegmon of the retroperitoneal space, extended to the small intestine in 7 patients;
- adhesive obstruction resulting from infection of steatonecrosis areas, and sequesters in 2 patients;
- arrosion bleeding into the cyst in 3 patients;
- hollow organ perforation in 4 patients;
- interloop abscesses in 2 patients;
- pancreatic fistula in 1 patient.

In 99 patients of the control group, typical open surgeries without the use of minimally invasive technologies were performed.

Discussion

In the treatment group, conservative therapy was effective in 85 (48.5%) patients, minimally invasive surgeries in 65 (36.7%) patients, the disease was severely acute in the rest of the patients which required other treatment approaches.

Open surgeries were performed in 5 (20.8%) patients for cystic formations due to the lack of possibility to use minimally invasive treatment. There was no possibility to detect a safe "window" to place the drain taking into account cysts and multi-chamber pseudocysts with a mass of dense tissues - sequesters. The key surgery stages involved sequestrnecrectomy with pus pocket drainage and bursostoma formation.

3 patients had open surgeries for small intestine fistula, for the middle intestine in 1 patient. In 1 patient, repeated surgery was performed on the 21st day for fistula of the inferior part of the duodenum, 7 days after the surgery, the same fistula was formed, 3 cm more proximal. The surgery involved perforated hole suturing using a one-row suture and draining. On the 10th day after the last surgery, the patient was dismissed to outpatient treatment. Conservative treatment was successful in 2 patients for small intestine fistula and in 3 patients for large intestine fistula.

In 3 (12%) patients, an open surgery was performed for arrosion bleeding into the cyst cavity. Patients were hospitalized diagnosed with AP. According to the ultrasound data, the accumulation of liquid in the omental sac was detected, blood was obtained in the course of its puncture. In such situations, open surgeries are prioritized. Intraoperatively, 19 × 16 cm omental sac cyst filled with a blood clot and fresh blood was detected. When the cyst envelope was opened, up to 100 ml of blood was released under pressure. During the cyst examination, a hole on the splenic artery, not more than 1 mm in diameter, was detected. The hole was sutured with an atraumatic needle. On the 12th day, the patient was dismissed to outpatient treatment.

Of particular difficulty for operative therapy was to detect steatonecrosis areas in the mesocolon and between the small intestine loops. If complications are not diagnosed at early stages and surgery is not performed, steatonecrosis causes the formation of such dense adhesions that some technical problems occur even during open surgeries, leading to massive deserialization and the intestinal wall damage. In such patients, open intestinal obstruction surgery was performed out of necessity after conservative AP treatment in the regional hospital. The laparoscopic method is widely used to detect such complications.

The optimal term to perform surgery is the 14th day and later after the disease onset. It is during this period that the necrotized pancreas areas sequestration is completed. During this period, the situation should be assessed and further therapeutic approach should be decided. If necrosis progresses showing abscess or phlegmon formation, surgery is offered.

Surgery makes it possible to carry out complete purulonecrotic areas sanitation and to place the drain tubes so that the spread of infection would be prevented. Step-by-step nature of a surgery is recognized by the leading surgeons, as there are no criteria to assess the extent of irreversible destructive pancreas changes. Even the sequester removal does not ensure the necrotic progress termination.

In 7 (29.2%) patients, open surgery was performed for the common cases of phlegmon in the retroperitoneal space. In 2 patients, phlegmon spread to the scrotum.

Surgery was performed under endotracheal anesthesia using upper-middle access. The liquid content was sent for bacteriological and biochemical analysis. After the exudate evacuation, a comprehensive abdominoscopy was performed. Steatonecrosis areas were detected in all segments, in a greater and lesser omentum mainly, ligamentum gastrocolica, and rippled colon. Abdominoscopy was performed starting from the lower abdomen. A greater omentum was lifted, the mesocolon was examined. In case of a defect, it was necessarily sutured. A full examination of the small intestine was performed. In case no pathological changes were detected, the omental sac was wide-opened with step-by-step vascular ligation and junction of ligamentum gastrocolica. This procedure performed in the case of a destructive AP is always technically complex due to ligament shortening, venous engorgement, and edema. Care must be taken not to damage the transverse colon and the arteria colica media particularly. If it is damaged after the surgery, a colonic fistula is formed. The pancreas omental sac, the omental foramen abdominoscopy was carried out.

To fully examine the pancreas and peripancreatic mass, the organ was abominated by abdominal peritoneum along the upper and lower edges over the total length of the pancreas. This procedure helps estimate the course of the peripancreatic mass and the retroperitoneal space. The pancreas condition was evaluated on visual and manual inspection. Attention was paid to its size, surface, consistency.

In case there were steatonecrosis areas, they were removed using digitoclasia. Some researchers consider pancreas abdominization to be a historical fact, as modern laparoscopic methods make it possible for the procedure not to cause extra damage to the pancreas. We are convinced that in case of indications, this procedure prevents the spread of phlegmon over the retroperitoneal space. After the pancreas abdominization, there were no indications for its exsection.

The surgery was finished by draining. The drain tubes were placed through the left lateral section of the retroperitoneal space under the descending colon above the left kidney.

After the skin incision and lateral muscle dissection, the tubes were placed under the large intestine by blunt, towards and controlled by the left hand through the omental sac. In the case of inflammatory changes in the parapancreatic mass, this procedure was carried out easily. Sometimes it was necessary to pass the ligamentum Pancreaticocolicum. 2 drain tubes were placed, one on the lower edge of the pancreas, the other - on the upper edge of the pancreas.

Towards these drains, 2 drain tubes were placed through the omental foramen, through the right lateral section. If the omental foramen was sealed, there were attempts to restore its passability. 0.5 - 0.9 cm diameter polychlorovinyl tubes with lateral perforations were used for draining.

Descending of the left colonic flexure is considered impractical as the intersection of the ligamentum phrenicocolicum bares the lower abdominal area to infection. However, it is reasonable to descend the right colonic flexure in total pancreonecrosis or pancreatic head pancreonecrosis. This makes it possible to prevent the subhepatic recess abscess, since such infiltrate abscess causes compression of the duodenum, the common bile duct, increase of pressure in the pancreatic duct, and forces surgeons to perform relaparotomy to remove these complications; at the same time the colon or the duodenum, the common bile duct, the vena portae, and even the inferior vena cava can be injured through the dense adhesion. Consequently, such a simple procedure performed during the first laparotomy at an early treatment stage removes severe complications.

Intraoperatively, focuses of necrosis (less than 30% of pancreas tissue) were detected in 25% of patients, massive necrosis (30-60% of pancreas tissue) in 46% of patients, totally subtotal pancreonecrosis (more than 60% of pancreas tissue) in 29%. Thus, open surgeries were performed in case of the extensive pancreas necrotic damage and in case of complications that were impossible to remove with the use of minimally invasive treatment.

We agree with the researchers who argue that open surgeries greatly damage the patient, often cause post-surgical hernias,

the adhesive process, however, the criterion for their feasibility is the life price. Regarding the adhesive process, we have had wide experience operating patients a few years after destructive pancreonecrosis, however, the adhesions were pronounced.

There have been reports on successful endovisolaparoscopic treatment, including mini-assistant, finger assisted, hand-assistant technologies aimed to reduce postoperative fatality. We believe that such operations make the future, however, the widespread introduction of mini-approach technologies when treating purulonecrotic complications outside the omental sac requires to be studied carefully.

5 patients having undergone open surgeries died (postoperative fatality is 20.8%), which corresponds to the data presented by other researchers. However, it should be noted that our study selected the patients with really severe infected complications when conservative and minimally invasive treatment was not effective. The main cause of death in pancreonecrosis was a multi-organ failure, which amounted to 62.5% of fatality. It was caused by evolving pancreonecrosis, peritonitis. However, 3 patients died with concomitant diseases, 1 patient died with a heart attack, and 2 patients died with pulmonary artery thromboembolism.

In the control group, 99 (56.6%) patients had open surgery indication, which significantly increased the duration of their treatment in the hospital, the complication rate, caused patients' disability and increased financial expenditures.

Conclusion

1. Minimally invasive surgeries for AP complications are the priority, these are performed in 84.6% of patients, and open surgeries are performed in 13.6% of patients.
2. The use of permanent ultrasound monitoring every 3-5 days contributed to early detection of parapancreatic complications, justified feasibility of minimally invasive surgeries, reduced probability of purulent-septic complications progression and, accordingly, reduced the open surgery rate, reduced general fatality up to 4.5% in patients of the treatment group (up to 17.7% in the control group).
3. Open surgeries for AP complications are indicated in case of infected pancreonecrosis development, as detected using CT, mainly after the 14-16th day from the onset of the disease, formation of the sequester, the phlegmon of the retroperitoneal space, total pancreonecrosis, and peritonitis.

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