Research Article

Problems of the Diagnosis and Treatment of Acute Mesenteric Ischemia: a Single-Center Experience

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Submitted: 02 Dec 2018; **Accepted**: 14 Dec 2018; **Published**: 19 Dec 2018

Abstract

Objective: *To improve the diagnosis and treatment of acute mesenteric ischemia by using available methods of early diagnosis and modern methods of treatment.*

Summary Background Data: *The number of patients with disorders of the mesenteric circulation is increasing all over the world. In comparison with the occlusion of the coronary, cerebral arteries and peripheral veins, acute obstruction of the mesenteric arteries and veins is diagnosed much later, which causes a high mortality rate from 53 to 100%.*

Methods: *In this study the experience of treatment of 162 patients with acute mesenteric ischemia was analyzed. All patients underwent treatment in Institute of Urgent and Recovery Surgery (IURS NAMS, Donetsk, Ukraine) from 2002 to 2017.*

Results: *From 162 patients: 112 patients were with acute occlusive and 50 patients with acute nonocclusive mesenteric ischemia. The intravital diagnosis was not confirmed in 26 patients (16 %). 119 of patients died, the level of mortality was 73, 5%. 104 patients were operated, 32 patients were discharged (30,8 %), 72 patients died, a mortality rate was 69,2 %. Operations with restore of blood flow were performed in 14 patients, 5 patients died, 9 patients left the hospital. Conservative therapy was performed in 22 patients, in 11 patients with good results (50 %).*

Conclusions: *The early diagnosis of this pathology is crucial and it can reduce the high mortality rate of patients with AMI. Treatment of OAMI should be carried out in a community of general, vascular and endovascular surgeons. Restoration of blood flow through mesenteric vessels with the help of endovascular technology and implementation of thrombembolectomy during open surgical intervention in a number of cases allows to avoid intestinal resection.*

Introduction

The diagnosis and treatment of acute mesenteric ischemia (AMI) is one of the most crucial problems of modern surgery. The number of patients with disorders of the mesenteric circulation is increasing all over the world. In comparison with the occlusion of the coronary, cerebral arteries and peripheral veins, acute obstruction of the mesenteric arteries and veins is diagnosed much later, which causes a high mortality rate from 53 to 100% [1-3]. The purpose of our work is to improve the diagnosis and treatment of acute mesenteric ischemia by using available methods of early diagnosis and modern methods of treatment.

Methods

We observed 162 patients with acute mesenteric ischemia (AMI),

who underwent treatment in Institute of Urgent and Recovery Surgery (IURS NAMS, Donetsk, Ukraine) between 2002 and 2017. Of these, with occlusive acute mesenteric ischemia (OAMI) there were 112 patients, with non-occlusive acute mesenteric ischemia (NAMI) - 50 patients. There were 112 men (69%), women - 50 (31%). The average age of patients was 66.8 years old. Of these, 43 patients were discharged (26.54%), 119 - died (73.46%). Of the 112 patients with acute occlusive mesenteric ischemia, the reasons for occlusion were acute thrombosis of the visceral arteries in 84 patients, embolism in 22, and venous thrombosis in 6 patients. One patient had a rupture of a superior mesenteric artery aneurysm.

Out of 50 patients with non-occlusive acute mesenteric ischemia, NAMI developed in the nearest postoperative period in 31 patients. Of these,

11 patients were after aortocoronary bypass with valve replacement, in 20 patients after abdominal operations and reconstructive operations on the abdominal aorta. In 10 nonoperated patients, the cause of NAMI was severe cardiac dysfunction: 3 patients with acute myocardial infarction, 5 patients with cardiac rhythm disturbances, 2 patients with chronic heart failures. In 4 patients, the cause of NAMI was unclear. The diagnosis of acute mesenteric ischemia was verified after examinations: duplex scanning of visceral arteries, selective angiography, operating findings and pathoanatomical material. of the 162 patients, 119 patients died, the overall mortality rate was 73.5%. 104 patients (64.2%) were operated because of OAMI, 58 patients were not operated (some of them due to the extreme severity of the disease). Of these, in 26 patients the diagnosis was not verified during life, it was diagnosed during the pathoanatomical autopsy. 104 patients were operated, 32 of them (30.8%) were discharged, 72 died, and the lethality rate was 69.2% [4-6].

Out of 104 operated patients: 39 patients underwent intestinal resection (37.5%), intestinal resection with restoration of blood flow - 3 patients (2.88%), restoration of blood flow (stenting of the superior mesenteric artery (SMA), angioplasty of the SMA, embolectomy from the SMA, thrombectomy from the aorta) - 11 patients (10.57%), diagnostic laparoscopy (including dynamic laparoscopy) was performed in 25 patients (24%), laparotomy in 16 patients (15.38%). Selective prolonged angiography was performed in 14 patients (8.64% of the total number of patients). In total, 14 patients were operated for blood flow restoration, 5 patients died, 9 patients were discharged. Conservative therapy was performed in 22 patients, in 11 (50%) with satisfactory results. For diagnosis we used special methods, which included Duplex scanning and Doppler ultrasonography, aortography in two projections and angiography of the visceral arteries [7,8]. According to the indications, CT angiography, laparoscopy, laser doppler flowmetry and mechanocolography were performed [9,10].

Additionally, the patients underwent a radiography of the abdominal cavity organs, ultrasound of the abdominal cavity organs, fibrogastroduodenoscopy, colonoscopy, complete and biochemical blood count and urine test.

Results and Discussion
The results of treatment of patients with AMI remain unsatisfactory. The difficulties lie in the nonspecific clinical picture of the disease, the late diagnosis, the absence of specific laboratory markers of ischemia. Besides this, a significant prolongation of the admission of patients with acute abdominal ischemia in the surgical department should be noted. Thus, up to 24 hours, only 53 patients (32.7%) entered the surgical department, 68 (41%) patients on the second and third days, 41 patients - after the third day. In 42 patients, AMI arose in the postoperative period, often in extremely severe patients. 21 patients were with peritonitis of unknown etiology. In 17% of patients the diagnosis of mesenteric thrombosis, abdominal ischemic syndrome was confirmed. In other patients, a differential diagnosis was made with acute surgical abdominal pathology: acute bowel obstruction (14%), acute cholecystitis, pancreatitis (12%), perforated ulcer (8%), gastrointestinal bleeding (2%), acute appendicitis 4%), an aneurysm rupture of the abdominal aorta (10% of patients). The time of the diagnosis confirmation of acute mesenteric ischemia ranged from 12 hours to 7 days. The main complaints of patients with AMI were the following: abdominal pain - in 93.75% of patients, bloating - in 75% of patients, nausea - in 62.5%, vomiting - 43.75%, presence of blood in stool in 18.35% of patients.

It should be noted that the significant clinical signs were: severe pain without rebound tenderness and abdominal guarding at the onset of the disease, intensification and then disappearance of peristalsis; nausea, vomiting, sometimes diarrhea with blood. The extremely severe condition of patients in some cases did not allow performing a number of diagnostic studies, which led to late diagnosis and death. High leukocytosis with a left upper shift (up to 20-28x 109/L) was observed practically in all patients, however at the initial stages the appearance of high leukocytosis did not always indicate the severity of necrotic changes and could indicate bacterial translocation.

Careful anamnesis control was also crucial. In the analysis of concomitant pathology, we found that almost all patients with acute occlusive mesenteric ischemia had concomitant atherogenic diseases: atrial fibrillation, generalized atherosclerosis, aortic aneurysm, previous myocardial aneurysm in history, valve defects or heart failures. Non-occlusive mesenteric ischemia in a number of patients occurred in the postoperative period after abdominal operations, operations on abdominal aorta, after bypass surgery, in postoperative myocardial infarction, cardiac arrhythmias, acute coronary syndrome, hypovolemia.

For a differential diagnosis, the data of abdominal X-rays and ultrasound of the abdominal cavity were not highly informative. In some cases, the presence of free fluid in the abdominal cavity, distended bowel loops, the absence of peristalsis, difficulties of the passage of barium through the gastrointestinal tract, edema of the intestinal wall were diagnosed. However, these changes did not have a specific character and did not always help in the diagnosis.

During examination of these patients, rewarding information can be provided by duplex scanning of the visceral arteries. Thus, in acute thrombosis or embolism of the visceral arteries we observed a lack or decrease in the velocity of blood flow in the superior mesenteric artery, in a number of cases, thrombotic masses were visualized. And in NAMI we observed signs of a nonocclusive reduction of arterial blood flow. It should be recognized, however, that visualization of the visceral arteries was impossible due to the pronounced pneumatization of the intestinal loops.

Computer tomography can also provide important information for diagnosis. However, due to the severity of the disease, this study was performed only in 5 patients. But the most valuable method for early diagnosis and treatment of patients with AMI was angiography. It still remains the "gold standard" for the diagnosis of mesenteric ischemia. With the help of angiography, we had the opportunity not only to reliably confirm the diagnosis of AMI, but also to verify the type, location and extent of the lesion. However, it is impossible to assess the viability of the intestine with angiography; in this case it is necessary to perform diagnostic laparoscopy or laparotomy.

Due to vague symptoms and clinical diagnosis, in some cases diagnostic laparoscopy was used. Diagnostic laparoscopy was performed at the early stages of ischemia without an objective assessment of the degree of blood flow and it was uninformative in 4 patients. Therefore, in the future laparoscopy with laser flowmetry often was performed. The study was used to clarify the diagnosis of AMI and to assess the degree of intestinal ischemia and determine the tactics of further treatment.

Analyzing the treatment of patients with AMI, the importance of a more active approach in the diagnosis and treatment of AMI, and the

immediate use of modern methods of examination should be noted. Only this approach can reduce the high mortality in patients with this severe pathology.

In case of arterial embolism or thrombosis with bowel ischemia, we tried to carry out the revascularization using open thrombectomy and balloon angioplasty with stenting of the superior mesenteric artery or selective thrombolytic therapy. However, the effectiveness of thrombolytic therapy is doubtful, there were 2 fatal outcomes in both patients who underwent thrombolysis.

In NAMI, complex therapy was used to restore adequate perfusion of tissues – the improvement of cardiac activity, administration of anticoagulants, recovery of the circulating blood volume, spasmolytic therapy (using selective administration of papaverine in the SMA within 24 hours up to 7 days). Of the 22 patients who underwent conservative therapy with NAMI, 11 patients were discharged from hospital.

In patients with AMI in the postoperative period, after the restoration of blood flow, the necessity for repeated surgical interventions according to different authors varies from 30 to 50%. This is due to the development of the "low flow" syndrome after ischemia/reperfusion of the intestinal wall. In this regard, the assessment of intestine viability in the postoperative period is important because it can reduce the mortality rate in this group of patients. We preferred a programmed dynamic laparoscopy.

In case of bowel infarction, revascularization was carried out, if it was possible. After the viability of intestine was assessed, the bowel resection was performed with anastomosis or stoma. With segmental infarction, revascularization was not carried out, only resection of the intestinal segment was performed. In cases of total necrosis of the intestine, exploratory laparotomy was used. In the case of venous thrombosis, preference was given to conservative anticoagulant therapy with laparoscopic dynamic monitoring. Operative intervention was performed in case of peritonitis signs. Planned relaparotomy or laparoscopy was performed if there were any doubts in restoring viability of the intestine within 24-36 hours.

It should be noted that with segmental ischemia of the small intestine, we preferred segmental resection and primary anastomosis. With large volumes of bowel resection, preference was given to the resection and double-barrel stoma with subsequent early restoration of intestinal continuity, which allowed to evaluate the viability of intestine without performing invasive studies in the postoperative period.

Timely endovascular and angiosurgical interventions can help in solving the problem of reducing high mortality in patients with AMI. It is also interesting that after surgical treatment and restoration of blood flow through the mesenteric arteries, it is possible to restore the vitality of those parts of the intestine where necrobiotic changes did not spread to the serous membrane. In the following, the patient may develop a postischemic stricture of the affected segments of the intestine.

For instance, should be paid attention to the history of the female, 52 years, whose angiographic examination revealed the stenosis of the superior mesenteric artery and the critical stenosis of the middle colonic artery. Stinting of the SMA and the middle colonic artery was performed with the restoration of blood flow. The patient was discharged from hospital without complications, but 20 days later she entered the surgical department with the clinical presentation of acute intestinal obstruction. The postischemic stricture of the small intestine was diagnosed. The surgical operation was performed - resection of the small intestine with primary anastomosis. Histological study of the removed bowel revealed complete atrophy of the mucosa and areas of replacement of the muscular membrane with a connective tissue.

In patients after restoration of blood flow due to the development of reperfusion injury of the intestinal wall, further progression of ischemic changes is possible. Therefore, to evaluate the viability of the intestine, programmed surgical interventions were used. "Second-look" operations in the period from 12 to 48-72 hours, or "relaparotomy on demand" were performed. Dynamic laparoscopy is a less traumatic intervention compared to relaparotomy. Dynamic laparoscopy was performed programmatically, within 12 to 24 hours using a tissue laser flow meter which is a highly informative device for assessing the degree of ischemia of the intestine in acute mesenteric ischemia. A significant aspect in the treatment of patients with this disease is also the prevention and treatment of the syndrome of reperfusion and multiple organ dysfunctions.

Despite the fact that now AMI belongs to a separate vascular pathology, often the strategy and approach to the patient remain purely surgical. And only the change in the approach to these patients, the involvement of vascular and endovascular surgeons in treatment and the use of the complex of examinations (Duplex scanning, angiography) at the early stages of the disease can change the situation for the better [11,12].

The early diagnosis of this pathology is crucial and it can reduce the high mortality rate of patients with AMI. Treatment of OAMI should be carried out in a community of general, vascular and endovascular surgeons. Restoration of blood flow through mesenteric vessels with the help of endovascular technology and implementation of thrombembolectomy during open surgical intervention in a number of cases allows to avoid intestinal resection.

Conclusion
The early diagnosis of this pathology is crucial and it can reduce the high mortality rate of patients with AMI. Treatment of OAMI should be carried out in a community of general, vascular and endovascular surgeons. Restoration of blood flow through mesenteric vessels with the help of endovascular technology and implementation of thrombembolectomy during open surgical intervention in a number of cases allows to avoid intestinal resection.

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