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Research Article

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Results of Surgical Treatment of Patients with Symptomatic Abdominal Aortic Aneurysms

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RELEVANCE Abdominal aortic aneurysm is a common disease, manifested by an expansion of the abdominal aorta of more than 3 cm and accompanied by the development of serious complications with high mortality. There are symptomatic aneurysms, asymptomatic aneurysms and ruptured aneurysms. The timing of surgical intervention for symptomatic aneurysms still causes some controversy.

AIM OF STUDY To determine the tactics and timing of surgery in patients with symptomatic abdominal aortic aneurysms.

MATERIAL AND METHODS The medical histories of 188 patients with symptomatic abdominal aortic aneurysms admitted to the Department of Vascular Surgery of N.V. Sklifosovsky Research Institute for Emergency Medicine. There were 152 men (80.8%) and 36 women (19.2%). The average age of those admitted was 69.8±2.5 years (from 53 to 84 years).

RESULTS All patients were divided into three groups, depending on the time of operation from the moment of admission: those operated in the first 24 hours (n=27); those operated from 24 to 72 hours from the moment of admission (n=20) and those operated later than 72 hours (n=136). The mortality by group was 14.8% in the first group, 20.0% in the second group, 7.3%in the third group.

CONCLUSIONS Patients with symptomatic abdominal aortic aneurysm should be admitted to the intensive care unit for evaluation and preparation for delayed surgery. In cases where hospitalization in the intensive care unit is impossible or pain persists, the patient should be operated on urgently. When the pain syndrome is relieved and blood pressure is normalized, the patient can be further examined and operated on in a delayed manner.

Keywords: symptomatic abdominal aortic aneurysm, predictors of rupture of abdominal aortic aneurysm, treatment tactics for patients with symptomatic abdominal aortic aneurysms

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CT - computed tomography

INTRODUCTION

An abdominal aortic aneurysm is a pathological dilatation of the aorta greater than 3 cm or a condition where the aortic diameter is 1.5 times the diameter of the aorta at the non-dilated site [1, 2].

All aneurysms can be divided into three groups: symptomatic, asymptomatic and ruptured aneurysms [3, 4]. Asymptomatic aneurysms do not manifest themselves in any way and are detected during examination as incidental findings.

An aneurysm with rupture is characterized by a triad of symptoms: pain in the lower back and (or) abdomen, the presence of a pulsating mass in the abdominal cavity, and hypotension [1].

The difference between a symptomatic abdominal aortic aneurysm and an aneurysm with a rupture is that with rupture, a violation of the integrity of the aneurysm wall has already occurred and a retroperitoneal hematoma is observed. With a symptomatic aneurysm, there is pain in the abdomen, in the lower back, or pain on palpation of the abdomen, but the integrity of the aneurysm wall is not compromised, or episodes of embolism of the arteries of the lower extremities from the aneurysm cavity have been observed.

Clinical manifestations of symptomatic aneurysms are proposed to be divided, in turn, into acute and chronic [3]. Thus, acute symptoms are sudden pain in the abdomen, lower back, or pain on palpation of the abdomen, which is caused by rapid expansion of the abdominal aorta and partial tearing of the aneurysm wall, but the integrity of the aneurysm wall is not compromised. Other acute manifestations of a symptomatic aneurysm include acute ischemia of the lower extremities due to thromboembolism from the aneurysm cavity. Chronic symptoms are complaints of discomfort and a feeling of pulsation in the abdominal cavity. Such symptoms may bother you for a long time. As a rule, patients with such symptoms undergo delayed or elective surgery [3].

Symptomatic aneurysms are considered to have a higher risk of rupture than asymptomatic aneurysms, so the decision to surgically treat such patients is not controversial. At the same time, the optimal timing of the operation in the presence of "acute" symptoms, but without rupture of the aneurysm, causes much debate. Many studies have shown that immediate open repair of symptomatic abdominal aortic aneurysm without rupture is associated with a significant increase in intraoperative mortality [4].

Aim of the study: to determine treatment tactics for patients with symptomatic abdominal aortic aneurysms.

MATERIAL AND METHODS

For the period from 2010 to 2020 at the N.V. Sklifosovsky Research Institute for Emergency Medicine 555 patients with abdominal aortic aneurysm were treated, and 188 patients (33.8%) were admitted with symptomatic aneurysms.

There were 152 (80.8%) male patients and 36 female patients (19.2%). The average age of those admitted was 69.8±2.5 years (from 53 to 84 years).

All patients were delivered on an emergency basis. Through the "emergency medical care" channel, 144 patients (76.6%) were immediately admitted to the institute from home; 44 patients (23.4%) were transfered from other medical institutions. Due to pain, these patients were hospitalized in other hospitals with suspected acute surgical pathology of the abdominal cavity, where an examination revealed an abdominal aortic aneurysm, and after that they were transferred to the Research Institute for Emergency Medicine for further treatment.

Previously, 68 patients (36.2%) were diagnosed with "Aneurysm of the abdominal aorta" among those admitted. They were prepared for surgery as planned, but the appearance of abdominal pain caused emergency hospitalization.

All patients had concomitant diseases (Table 1).

Table 1

Related diseases

Accompanying illnesses	Number of patients
Hypertonic disease	188 (100%)
Cardiac ischemia	172 (91.5%)
Acute cerebrovascular accident	16 (8.5%)
Chronic kidney disease	46 (24.5%)
Peptic ulcer of the stomach or duodenum	35 (18.6%)
Laparotomy and abdominal surgery	40 (21.3%)

All patients underwent ultrasound examination of the abdominal cavity and retroperitoneal space upon admission. Infrarenal abdominal aortic aneurysm was confirmed in 100% of cases (Fig. 1).

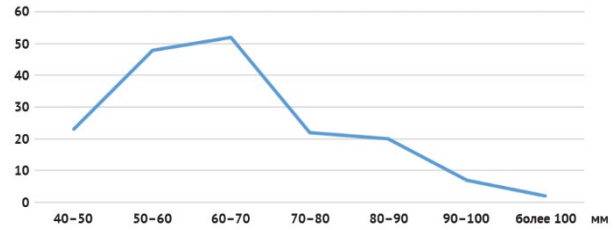

Fig. 1. Diameter of the abdominal aortic aneurysm according to ultrasound examination

The graph shows that in most patients the size of the symptomatic abdominal aortic aneurysm was from 6 to 7 cm (27.6%) in diameter.

According to the results of ultrasound in 23 patients (12.2%), the presence of a rupture and retroperitoneal hematoma could not be excluded.

Computed tomography (CT) with intravenous contrast was performed in 126 cases (67.0%), and in 3 patients (2.3%), the conclusion indicated the presence of a rupture and para-aortic hematoma in a volume of 20–30 cm^3.

When performing a CT scan, evaluating the images, firstly, we excluded the presence of a rupture and retroperitoneal hematoma, and secondly, we paid attention to the presence of such predictors of rupture and signs of aneurysm instability as:

— hemorrhage into a parietal thrombus (a sign of a hyperdense "sickle");

— fissured parietal thrombus;

— local tear of the aortic wall;

— sign of draping aorta;

— compaction of para-aortic tissue (Fig. 2).

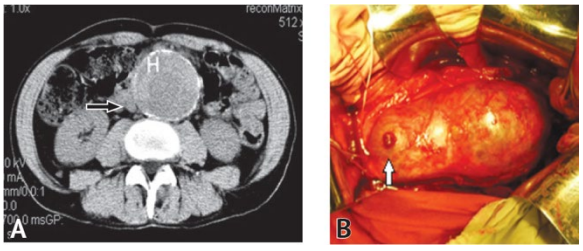

Fig. 2. Computed tomography scan of the abdomen, axial section without contrast enhancement of a 66-year-old man admitted to the clinic with acute abdominal pain (A). In the lemen of the aneurysm, a crescent-shaped area of increased density (H) is clearly defined near the wall. The arrow also indicates an area of diffuse, heterogeneous compaction of the para-aortic tissue (extraluminal predictor of aneurysm rupture). B — intraoperative data: the tear in the anterior wall of the aneurysm is determined, indicated by the arrow (own data)

RESULTS

Fifty-six patients (29.8%) out of 188 were hospitalized from the emergency department directly to the intensive care unit, and 132 (70.2%) were admitted to the vascular surgery department for antihypertensive therapy, necessary additional examination and preparation for surgery. Against the background of antihypertensive, antispasmodic, and analgesic therapy, the pain syndrome was relieved in 136 patients (72.3%).

Of 188 patients with symptomatic aortic aneurysms, 185 were operated on. Among patients hospitalized in the department of vascular surgery, 5 (3.8%) had an aneurysm rupture several hours after admission. Of these, 3 died without surgery, 2 were urgently operated on and died on the operating table during laparotomy at the revision stage.

Operations performed:

— linear replacement of the abdominal aorta — 62 (33.5%);

— aortoiliac bifurcation replacement — 22 (11.9%);

— aorto-iliac on one side and aorto-femoral on the other - 8 (4.3%);

— aortofemoral bifurcation replacement — 91 (49.2%);

— laparotomy — 2 (1.1%).

When analyzing the results of treatment of 183 patients with symptomatic abdominal aortic aneurysms without rupture, three groups were identified:

— with persistence of pain, 27 patients (14.8%) were operated on urgently in the first 24 hours;

— with persistence of pain, operated urgently in the first 24–72 hours — 20 patients (10.9%);

— the pain syndrome was relieved, the patients were operated on in a delayed manner (on the 3rd–6th day from the moment of admission) — 136 patients (74.3%).

Patients operated on in a delayed manner underwent the necessary additional examination (echocardiography, pulmonary function, Doppler ultrasound of brachiocephalic vessels) and consultations with specialists.

A comparison of treatment results for patients with symptomatic aortic aneurysms by group is presented in Table 2.

Table 2

Treatment outcomes for patients with symptomatic abdominal aortic aneurysms

	Operated within the first 24 hours (*n* =27)	Operated from 24 to 72 hours (*n* =20)	Delayed surgery after 72 hours (*n* =136)
Intraoperative blood loss, ml	1,390	1,425	958
Duration of operation, h	3.1	3.2	2.5
Extubation time after surgery, hours	21.4	16.3	8.7
Average bed-day after surgery, days	16.1	14.4	14.5
Complications, *n* (%)	8 (29.6)	6 (30.0)	17 (12.5)
Repeated operations, *n* (%)	5 (18.5)	4 (20.0)	4 (2.9)
Died, *n* (%)	4 (14.8)	4 (20.0)	10 (7.3)

There were no differences in the volume of blood loss and time of surgery, the number of complications and mortality in the two groups of patients, those operated on on the first day and those operated on in the first 72 hours. In the group of patients undergoing delayed surgery, indicators such as blood loss, operation time and tracheal extubation time are significantly less. There are also fewer complications and mortality.

Complications after the operation were as follows:

— cardiac complications (acute myocardial infarction, cardiac arrhythmia) — 3 (9.7%);

— pulmonary complications (pneumonia, hydrothorax) — 9 (29.0%);

— kidney complications (acute pyelonephritis, acute renal failure) - 4 (12.9%);

— gastrointestinal complications (bleeding from an ulcer, perforation of an ulcer) — 3 (9.7%);

— thrombotic complications (thrombosis of the branch of the prosthesis, arteries of the lower extremities) - 5 (16.1%);

— iatrogenic complications (bleeding, intestinal eventration) — 4 (12.9%);

— spinal disorders (acute spinal circulation disorder, lower paraparesis) - 2 (6.5%);

— intestinal obstruction — 1 (3.2%).

12 patients (6.5%) were re-operated (13 operations were performed):

— relaparotomy for proximal anastomotic failure and bleeding — 3;

— relaparotomy for peritonitis, suturing of duodenal ulcer — 2;

— thrombectomy from the branch and femoral arteries — 5;

— femoral amputation — 1;

— surgery for intestinal eventration — 1;

— relaparotomy, elimination of intestinal obstruction — 1.

The overall mortality rate among all patients with symptomatic aneurysms, including cases of rupture that developed in the department, was 12.2%, 23 patients died. Mortality by group:

— 14.8% in the group of those operated in the first 24 hours;

— 20.0% in the group of those operated within the period of 24–72 hours;

— 7.3% in the group of those operated on later than 72 hours.

DISCUSSION

From 2010 to 2020 188 patients with symptomatic abdominal aortic aneurysms were admitted to the N.V. Sklifosovsky Institute. In our observation, the ratio of men to women was 4:1, which is slightly lower than the distribution described by other authors, 7.5:1 [3] or 5:1 [5]. The average age of those admitted was 69.8±2.5 years, which correlates with the data of other researchers [1].

Of the concomitant diseases, the most common were hypertension (100%) and coronary heart disease (94.1%), which is also comparable with the figures of other authors, 95% [6]. The presence of hypertension in all patients in our observation and increased blood pressure could have caused pain and caused emergency hospitalization.

The following diagnostic methods were used: Doppler ultrasound and CT with intravenous contrast. During the initial ultrasound, there was some overdiagnosis of the presence of a rupture in

patients admitted urgently with acute symptomatic abdominal aortic aneurysm in 12.2% of cases. This may be explained by the fact that the ultrasound was performed upon admission in the emergency department by the duty service. The patients were not prepared. During the repeated ultrasound, performed in the daytime after preparation, on a higher-quality device and by more qualified specialists, the initially obtained data were corrected.

To detect intact abdominal aortic aneurysms, the sensitivity of the method, according to the literature, reaches 100%, however, certain difficulties may arise when diagnosing an aortic rupture - errors can reach 50% [7].

CT scans in our observation showed that only 3 cases out of 126 (2.3%) concluded that aneurysm rupture and the presence of a paraortic hematoma cannot be excluded. Today, based on CT data, we can talk about the presence of predictors of rupture, such as: hemorrhage into a parietal thrombus (sickle sign); fissure of a parietal thrombus; local tear of the aortic wall; draping aorta syndrome. All this can help predict the rupture of a symptomatic aneurysm [8, 9]. Therefore, in stable patients without clear evidence of a ruptured aneurysm, CT with intravenous contrast should always be performed.

The tactics for patients with confirmed aneurysm rupture, especially in the presence of concomitant hypotension, is not in doubt - such patients are immediately sent to the operating room after admission. It's a different matter when a symptomatic abdominal aortic aneurysm is diagnosed without violating the integrity of the wall and without a retroperitoneal hematoma. Such patients are monitored and given antihypertensive and antispasmodic therapy. And, if the pain syndrome is relieved, then there is time to examine, prepare and operate patients in a delayed manner [3, 10]. The purpose of the preoperative examination is to assess how significant the concomitant pathology is and what can be done to minimize the risk of postoperative complications.

Many authors indicate that immediate surgery for acute symptomatic abdominal aortic aneurysm without rupture is associated with increased mortality. Yes, *S. Budinski et al.* noted a higher hospital mortality (16.67%) in patients with unruptured symptomatic abdominal aortic aneurysm operated on within the first 24 hours, compared with mortality (9.91%) in patients operated on later than 24 hours after admission [4]. *S.A. Sullivan et al.* reported a 5-fold increase in mortality: 26% versus 5.1% in patients with symptomatic abdominal aortic aneurysms with emergency versus delayed surgery [10]. Also, the authors explain the difference in mortality in the two groups by less favorable conditions for emergency operations due to the lack of a trained, experienced surgical and anesthesiological team, and sometimes the presence of only doctors on duty. In case of emergency surgery, the necessary examination and preparation of the patient is also skipped.

However, delaying surgery in patients with symptomatic abdominal aortic aneurysms can lead to rupture and death. According to *AL Tambyraja et al.*, aneurysm rupture occurred in 3 patients (12%) out of 25, in whom surgery was postponed for further examination of the patient. And the mortality rate in the group of emergency and delayed operations did not differ much, 9 and 12%, respectively. There were also no significant differences in postoperative complications and hospital stay [11].

In our observation, in 5 patients (2.7%) who were admitted urgently with acute symptomatic abdominal aortic aneurysm, the aneurysm ruptured within 24 hours, and the patients died. These patients were examined in the emergency department, aneurysm rupture was excluded, and the patients were hospitalized in the hospital department for further examination. There were no ruptured abdominal aortic aneurysms among patients hospitalized for observation, examination, and antihypertensive therapy in the intensive care unit.

In the groups of patients operated on the first day and urgently (24–72 hours), there were no significant differences in blood loss, operation time, complications and mortality.

In the group of patients operated on in a delayed manner in a planned operating room, blood loss, operation time, complications, and mortality were significantly lower and amounted to 7.3%.

CONCLUSION

Thus, the presence of a symptomatic aneurysm, taking into account the concomitant pathology and condition of the patient, is an indication for surgery, due to the high risk of rupture.

At the same time, it is necessary to take a differentiated approach to each observation. Patients with symptomatic abdominal aortic

aneurysm with pain should be hospitalized in the intensive care unit for monitoring, antihypertensive therapy, and necessary examination. In cases where hospitalization in the intensive care unit is impossible or pain persists, the patient should be operated on urgently. Or the operation should be performed urgently (48–72 hours) in the absence of sufficiently qualified surgeons at the time of patient admission. Emergency surgery is also indicated for patients with symptomatic aneurysm, who, according to computed tomography data, have predictors of rupture, such as: hemorrhage into a parietal thrombus (a sign of a hyperdense "sickle"); fissure of a parietal thrombus; local tear of the aortic wall; draping aorta syndrome.

When the pain syndrome is relieved and blood pressure is normalized, the patient can be further examined and operated on in a delayed manner (days 2–7).

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