CASE REPORT

Diagnostic Approach to Acute Mesenteric Ischemia

Nizama Salihefendic1, Muharem Zildzic1, Zoran Licanin2

University Clinical center Tuzla, BiH 1
Clinical center of University of Sarajevo, BiH2

Summary
Acute mesenteric ischemia is one of the most important urgent states in internal medicine. Diagnosis set on time is the key to success in treatment of this disease. In practice, setting adequate diagnosis is usually late, because the first symptoms and physical findings were not proportioned to pathogenic changes. When a complete clinical picture of illness develops with signs of ileus and septic shock it is usually too late for adequate treatment. Early diagnosis can be set, if during the occurrence of acute abdominal pain in patients who have status with precipitating factors for the formation of emboli, thrombosis and mesenteric vasospasm, in the early evaluation of disease thought to the possibility of acute mesenteric ischemia, and undertake specific diagnostic procedures. In the first place we must distinguish urgent situations of mesenteric vascular diseases that are made by embolism and thrombosis of superior mesenteric artery (AMS) from chronic states such as chronic mesenteric ischemia or intestinal angina, celiac compression, ischemic colitis and chronic mesenteric venous thrombosis. This article shows the case of patient with acute mesenteric ischemia – arterial thrombosis, which had predisposing factors and has developed an image of vascular ileus. Color Doppler and standard abdominal ultrasound can detect the disease at an early stage, and set the indication for arteriography procedures and surgical procedures.

Key words: mesenteric ischemia, vascular ileus, abdominal color Doppler ultrasound

1. INTRODUCTION
Intestinal ischemia is the clinical syndrome with leading symptom of acute abdominal pain caused by reduced perfusion or decreased blood flow in gastrointestinal tube. Reduced flow of blood occurs in three arterial branches of abdominal aorta: celiac trunks (TC), superior mesenteric artery (AMS) and inferior mesenteric artery (AMI) (1). Acute intestinal or mesenteric ischemia is a disease with stable incidence increase, which is explained with population aging and often application of specific diagnostic procedures. Although accounts for about 2% of hospitalized in gastroenterology departments this syndrome should be considered in differential diagnosis with every appearance of acute abdominal pain in adults, especially the elderly, because delay in diagnosis leads to extensive intestinal infarction, intestinal gangrene, rapid development of ileus and death. Despite progress in diagnosis and treatment mortality is still more than 60% (1, 2).

Acute vascular incidents in celiac-mesenteric arteries lead to the rapid decline in perfusion of ileus and colon, the formation of edema, bleeding, infection, infarction and wall gangrene. In Figure 1 are shown the target organs that may be affected by vascular ischemia with consequent intestinal gangrene and clinical picture of ileus with the rapid progression in the state of sepsis and irreversible shock. According to blood vessels obstruction occurrence pattern this state can be divided into following clinical entities:

• thrombosis on basis of atherosclerosis of the same blood vessels,
• thrombosis of mesenteric veins,
• celiac compressive syndrome,
• mesenteric vasospasm or non occlusive mesenteric ischemia (NOMI) (1, 2, 3).

Mesenteric ischemia is rare (<1%), but very serious complication of cardiac surgeries with high mortality (over 50%), and very frequently used drugs in cardiology, such as digitalis and diuretics, can lead to non-occlusive mesenteric ischemia (NOMI) with also high mortality (3, 4, 5). Reconstructive surgery of abdominal aorta often compromise AMI circulation, so ischemic colitis occurs in 15 to 20% of cases. Since occlusive blood vessels disease is often accompanied by abdominal and coronary disease, vascular disease of gastrointestinal system may mask the emergence of acute myocardial infarct (2, 3, 6).

Chronic ischemia or mesenteric angina is very often the situation in daily practice, but it is rarely diagnosed. This condition is characterized by abdominal postprandial pains (which are often interpreted as gastric illness) and loss of body weight (1, 3). Prognosis depends on the degree of blood vessels occlusion, occlusion location, as well as the diagnostic speed and fast implementation of adequate surgical and hormonal therapy (1,2). Embolism as cause of acute mesenteric ischemia occurs in 50% of all cases. Emboluses are parts of the thromb which are mostly located in the left ventricle or left atrium within coronary diseases with rhythm
disorder, such as: valvule heart problems with atrial fibrillation, cardiomyopathies of different etiology and heart ischemic disease with mural thrombs. Parts of the thromb, as emboluses, may be from the area of aneurysms of thoracic or abdominal aorta. Emboluses found in celiac-mesenteric arteries may also appear in invasive cardiovascular procedures such as angiography and surgical procedures. Injuries of cardiovascular structures are isolated causes of mesenteric emboli. Artery colic media is usually the place of occlusion with embolus, but may affect the four important branches of AMS. Place of occlusion with embolus is in the area of arteries narrowing, and it is typically 3 to 8 cm from the starting point of AMS. Angiography usually detects almost complete obstruction of lumens with minimal athereosclerotic changes (1,2).

Thrombosis causes 15 to 25% of cases of acute mesenteric ischemia. Thrombosis refers mostly to the AMS. Thrombosis location is at the beginning of the arteries, at distance of 3 cm. Thrombosis syndrome is always associated with generalized atherosclerotic changes. Risk factors for AMS thrombosis are the same as for other blood vessels atherosclerosis: age, hyper lipids and proteins, diabetes mellitus, hypertension and smoker status. There are also local risk factors for the development of thrombosis at the initial part of AMS, such as aneurysms, dissection of abdominal aorta, fibro muscular dysplasia and vasculites. AMS thrombosis may be associated with states of hyper coagulation such as thrombocitosis, peticitemia of vera edge, intra abdominal neoplasm and resistance to activated factor C (1, 2, 4, 6). Most patients with AMS thrombosis have chronic signs of illness: postprandial pain, early satiety and loss of body weight. Thrombosis of superior mesenteric vein (VMS) constitutes 5% of cases of acute intestinal ischemia. The course of illness is milder and mortality significantly lowers than in arterial vascular incidents. There is a lot of predisposing pathological conditions that are related to the formation of VMS thrombosis. Primarily that refers to the primary and secondary hyper coagulation states. Diseases related to the liver and especially cirrhosis and states of portal hypertension are important risk factors for the emergence VMS thrombosis. Precipitating factors may be inter abdominal inflammatory processes: peritonitis, pancreatitis, chronic inflammatory intestinal diseases (M. Crohn and ulceration colitis) and the states after intrabdominal surgeries (7).

Non occlusive mesenteric ischemia is a result of the reduction of blood flow in mesenteric blood vessels below the critical limit, as a consequence of hypotension and hypovolaemia without signs of obstruction, and this condition is called mesenteric vasospasm. Vasoconstriction is the most important pathophysiological mechanism in the development of intestinal ischemia. Vasoconstriction occurs in arterioles of mesenteric arteries in order to maintain cardiac and cerebral flow. If last for long time necrosis and infarctions of intestines occurs, as well as irreversible changes that give the clinical picture of acute mesenteric ischemia and vascular ileus. NOMI constitutes 20-30% of cases of acute mesenteric ischemia (1, 3, 5).

Cardiac glycosides digitoxine and digoxine may be the most important factors in the emergence of this state because of its clear vasoconstrictive effect on mesenteric blood vessels. Around 90% of patients, who develop NOMI were treated with digitalis, and is considered to have intoxication with digitalis, in cases that have hypovolaemia may be a decisive factor for further development of ischemic intestines infarct with catastrophic consequences (mortality rate over 80%). Simultaneous appearance of hypocalcaemia condition makes intestinal ischemia worse. Diuretics and ergotamine derivatives may have similar effects as digitalis in the development of this ischemia. Patients who have surgeries on the open heart carry increased risk for this complication (5). Compression of initial part of celiac trunk by diaphragm ligaments can lead to the appearance of clinical signs of intestinal ischemia: postprandial pain, nausea and vomiting. This situation often occurs in younger people, especially women. The general state of the patient looks good, and at physical examination can be heard systolic noise in epigastric region which is stronger during expiration. Angiography can demonstrate the typical finding of compression in initial part of TC (1, 2, 6). When it comes to abrupt interruption of blood circulation, as happens in the case of emboli and extensive thrombosis of mesenteric blood vessels, intestine becomes pale, cyanotic and in permanent phase of contraction. After the fall of protective functions of the mucous membranes bacterial invasion within the structure of intestines and disorders in transport of water and electrolytes. Endogent toxic chemical substances, bacterial endotoxines and activated pancreatic enzymes leading to edema, extensive necrosis and bleeding, which are expanding from the mucous membranes in the deeper layers of intestinal wall. Transmural necrosis and bacterial invasion lead to gangrene and possible intestinal perforation, and spreading of infection to the peritoneum (4). Mild or moderate disability in circulation have reversible lesion in intestinal mucous membranes, which can be followed with edemas of mucous with disorders of absorption and motility. Clinical manifestations depend on the extent of ischemia and size of affected segments, regardless of etiology factors which led to disturbances in the circulation (1, 2, 4, 6).

In the clinical picture of mesenteric ischemia leading symptom is intense, sudden pain in periumbilical region. In the beginning, also can be expressed general symptoms of gastrointestinal illnesses: nausea, vomiting and inflatated abdomen. In the late stage of disease may occur intensive vomiting, bloody mucous stools, heavy prostration and shock. Stronger intensity of symptoms and rapid progression of illness indicate embolism and thrombosis as
etiology factors, because the sudden obstruction does not allow the quick development of collateral blood flow. Patients with acute mesenteric ischemia based on emboli coming to the hospital soon after the start of illness due to intensive pains and rapid progressions of disease, while acute mesenteric ischemia based on thrombosis develop the full clinical picture in days because of previous changes in the blood vessels on the basis of atherosclerosis and the impact of the development of collateral blood circulation. Patients who have thrombosis of mesenteric veins have pain for days before they develop a picture of acute abdominal disease. Probability that affected part of intestine retain vitality depends on the duration of illness until it is finally diagnosed. In case of arterial embolism it is case of hours and first contact with patients with acute abdominal pain must be in differential diagnosis considered the possibility of this disease (9). With sudden abdominal pain some anamnesis and clinical data can be vital to solve doubts: a) simultaneous emboli of other organs; b) patients with cardiac weakness and rhythm disorders; c) presence of vascular diseases; d) hyper coagulation states.

Data on dehydration, hypotension and use of digitals and diuretics, with strong periumbilical pain, can immediately imply the diagnosis of non obstructive intestinal ischemia. The appearance of diarrhea and hematochezia indicates ischemic colon disease on the basis of emboli or thrombosis of AMI (4, 8). Predilated place for ischemic changes is iliiljelal flexure due to weakest blood flow in the area. In the mentioned case, abdominal pain may be related to the upper left quadrant of the abdomen. Dyspnea, pain in the chest and the appearance of cyanosis can be a sign of primary cardiac disease.

2. CASE REPORT

Patient F.B., born in 1940, treated several times on the Clinic for internal disease of the University Clinical Center Tuzla for high blood pressure and angina pectoris. On several occasions admission followed a phenomenon of paroxysmal atrium fibrillation with absolute arrhythmias of the ventricles. During previous hospitalizations at the Clinic verified is ischemic and hypertension miocardiopathy with the appearance of disorder paroxysmal rhythm disorder. Echocardiograph registered the left hypertrophy of left ventricle, dilatation of left vestibule, moderate mitral insufficiency and reduces ejection fractions. Because of these illnesses treated with ACE inhibitors and diuretics irregularly. Smoker with obesity.

Earlier during this year patient is admitted again as an emergency case because of pain in the chest and palpitations. During admittance patient provides information about the occurrence of strong diffuse pain in the stomach with nausea and feeling strong stomach inflation. Because of registered paroxysmal tachyarrhythmia and pain in the cheeks began treatment of cardiac diseases at coronary department. Clinical suspicion is placed on gastric esophageal reflux disease and peptic ulcer, and treatment with proton-pump inhibitors started. Regardless of this therapy general condition of patient is getting worse with appearance of hypotension and very intensive diffuse pains in the abdomen. Biochemical and hematological tests, except for expressed leucocytosis (17000), did not show deviations from the reference values. In coagulation chart there was not any abnormal value. Physical findings of the abdomen at the beginning showed distension of abdominal wall with meteorism and existence of the minimum pain sensitivity. Stenotic vascular noise was not heard. Abdominal ultrasound showed signs of ileus.

Patient underwent color Doppler ultrasonography of the abdomen blood vessels which registered thrombosis of superior mesenteric artery.

In further course of illness occurs signs of ileus (distension, painful sensitivity and intestines paresis), so the patient is transferred to the Surgery Clinic due to surgical procedure, when the diagnosis of superior mesenteric artery is confirmed.

3. DISCUSSION

Acute mesenteric ischemia represents the most severe form of vascular diseases of gastrointestinal system. Without early intervention patients quickly developed peritonitis with paralytic ileus, circulatory and septic shock and eventually death. Besides emergence of leucocytosis, occurrence of refractority metabolic acidosis is an important sign of illness. Mesenteric or abdominal angina, similar to angina
Pectoris, generated in the disproportions between the need for increased blood circulation and the inability to flow through the stenotic arteries. Listed imbalances are generated during digestion. For instance, the state of pain occurs 15 to 30 minutes after meals, and lasts one to two hours. Intensity of pain gradually increases, reaching a plateau, which takes about half an hour and then gradually decreases. Because of the flow patients have a fear of eating, lose body weight and show signs of poor absorption. Second, following the non-specific symptoms, including nausea, vomiting, diarrhea and hypo protein edemas. Abdominal angina occurs in the case of hypo perfusion in two of the three main branches of abdominal aorta. Generalized risk factors for this disease are atherosclerosis, hypertension and smoking (10). Laboratory tests have no diagnostic value. In case of acute mesenteric ischemia high value of leukocytes (> 15000) is a common finding with signs of haemoconcentration. Amylase values may be higher if ischemic intestinal disease is followed by ischemic pancreatitis. Analysis of acid status may show refraction metabolic acidosis. To evaluate coagulation status of requires controls of protrombine and activated thromboplastine time.

Imaging (image diagnostic procedures) includes: X-ray of the lungs, native X-ray of the abdomen in levels and free air, abdominal CT and MRI, and abdominal color Doppler ultrasound, MRI angiography.

Method of choice for diagnosis of mesenteric ischemia is aortography and mesenteric angiography (1, 2, 9). Native abdominal X-ray, CT, MRI and abdominal ultrasound at the beginning of disease are not reliable diagnostic procedures, but may reveal other causes of abdominal pain. CT can be a method of choice for detecting thrombosis in veins. Color Doppler ultrasound is the best screening method, because it can detect interference in the flow with the estimated level of stenosis and thrombosis in vein system (9). MRI angiography may be alternative method to aortography and contrast angiography in patients with increased risks in contrast angiography (hypersensitivity and kidney dysfunction) (2, 9). In differential diagnosis of acute mesenteric ischemia in the first place come other forms of ileus, such as incarcerated herniations, adhesion, invagination and volvulus. In the prolonged phase of acute mesenteric ischemia all signs of peritonitis can be developed and the differential diagnosis is more general. Then we should consider the possibility of peptic ulcer perforation, severe forms of pancreatitis, and other sputum processes in the abdomen. Abdominal angina, with leading symptom of pain in the stomach and a loss of weight, in practice is usually replacement for malignant process, so unnecessary are undertaken many diagnostic procedures. Poor absorption syndrome and chronic pancreatitis are the diseases to be included in differential diagnosis (10).

4. CONCLUSION

Only early diagnosis and early adequate treatment can save patients from lethal outcome in case of acute mesenteric ischemia. Use of ultrasound diagnosis (routine abdominal and color Doppler ultrasound) may help in early diagnosis. Surgical procedures with restoring vascularisation can extend the life of patients and establish normal function of digestion. The natural course of chronic mesenteric ischemia or abdominal anginas leads to disease progression with the emergence of risk of ischemia and intestinal infarction. In the period of stable phase of disease preventive measures (smoking cessation, treating hyperlipoproteinemia, and diet regime) may slow down this process. During this chronic phase of the disease, it is necessary to take angiography invasive procedures and angioplasty with or without stent, at select patients. Application of these procedures significantly affects the reduction of mortality, but also quality of life (2, 10, 11).

REFERENCES


Corresponding author: Ass prof. Nizama Salihefendić, MD. E-mail: medicus.ord@bih.net.ba.