Acute and chronic disorders of mesenteric circulation

Department of Hospital Surgery, OrSMU
Orenburg

Bala et al. World Journal of Emergency Surgery (2017) 12:38
DOI 10.1186/s13017-017-0150-5

World Journal of Emergency Surgery

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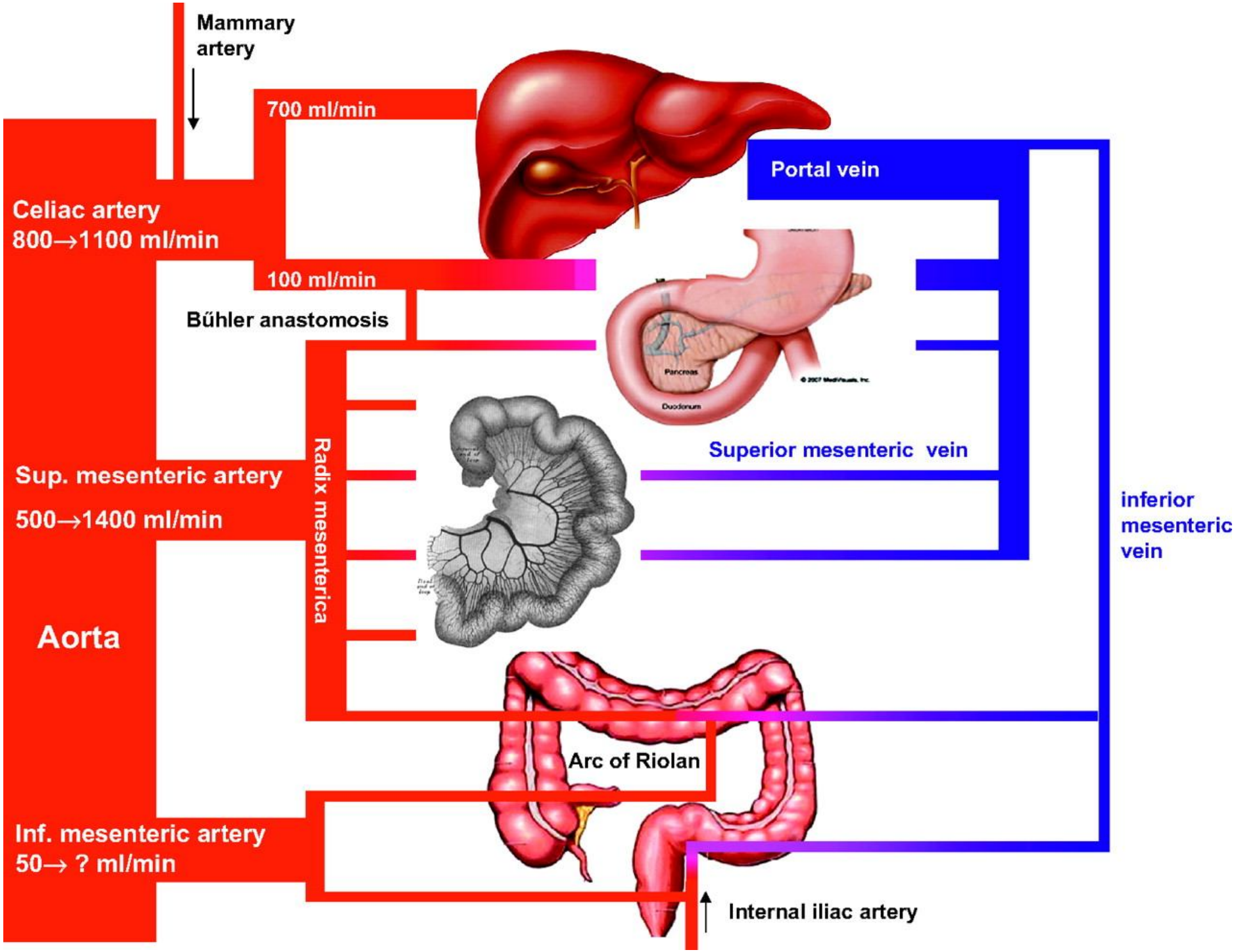
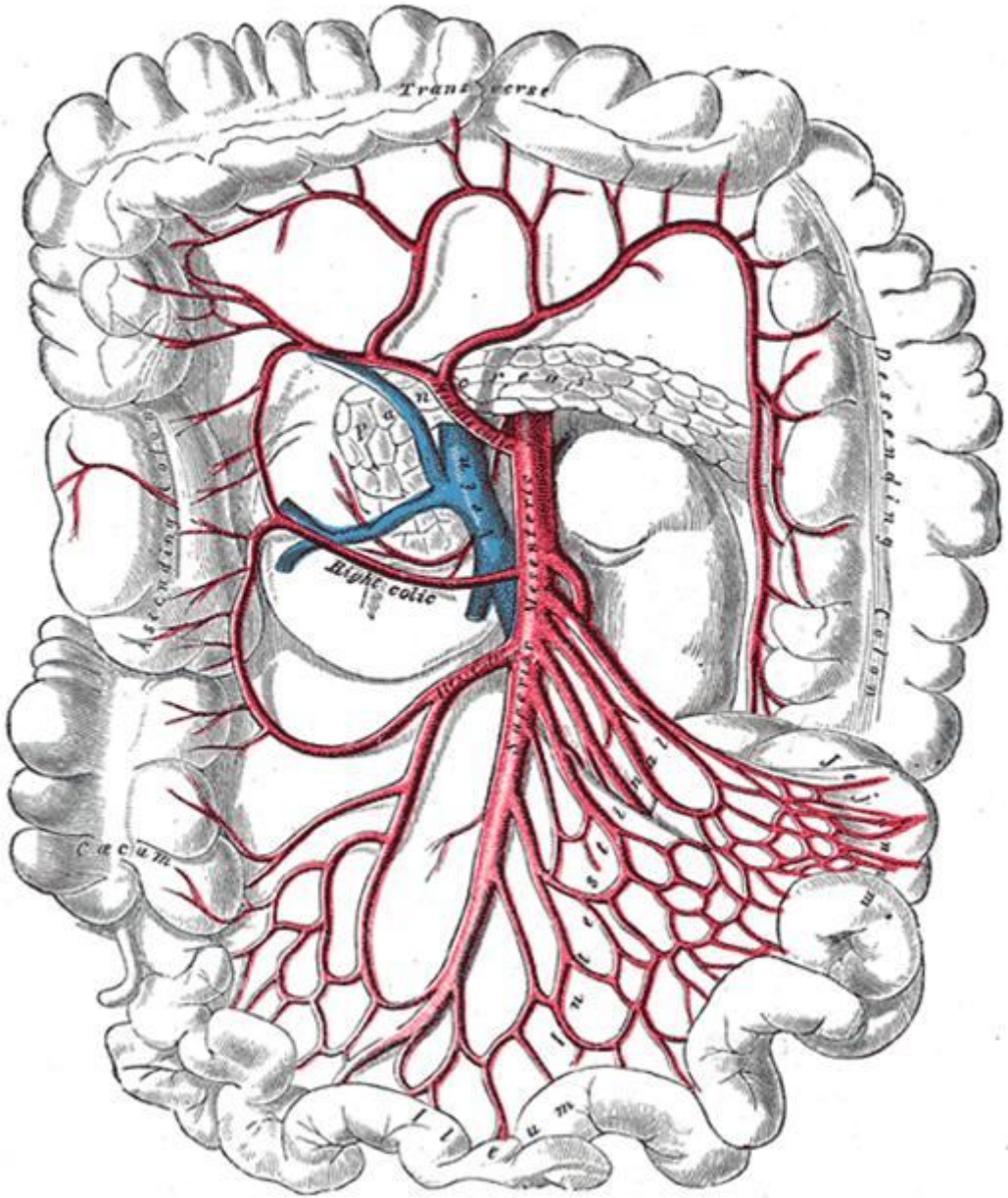
Acute mesenteric ischemia: guidelines of the World Society of Emergency Surgery

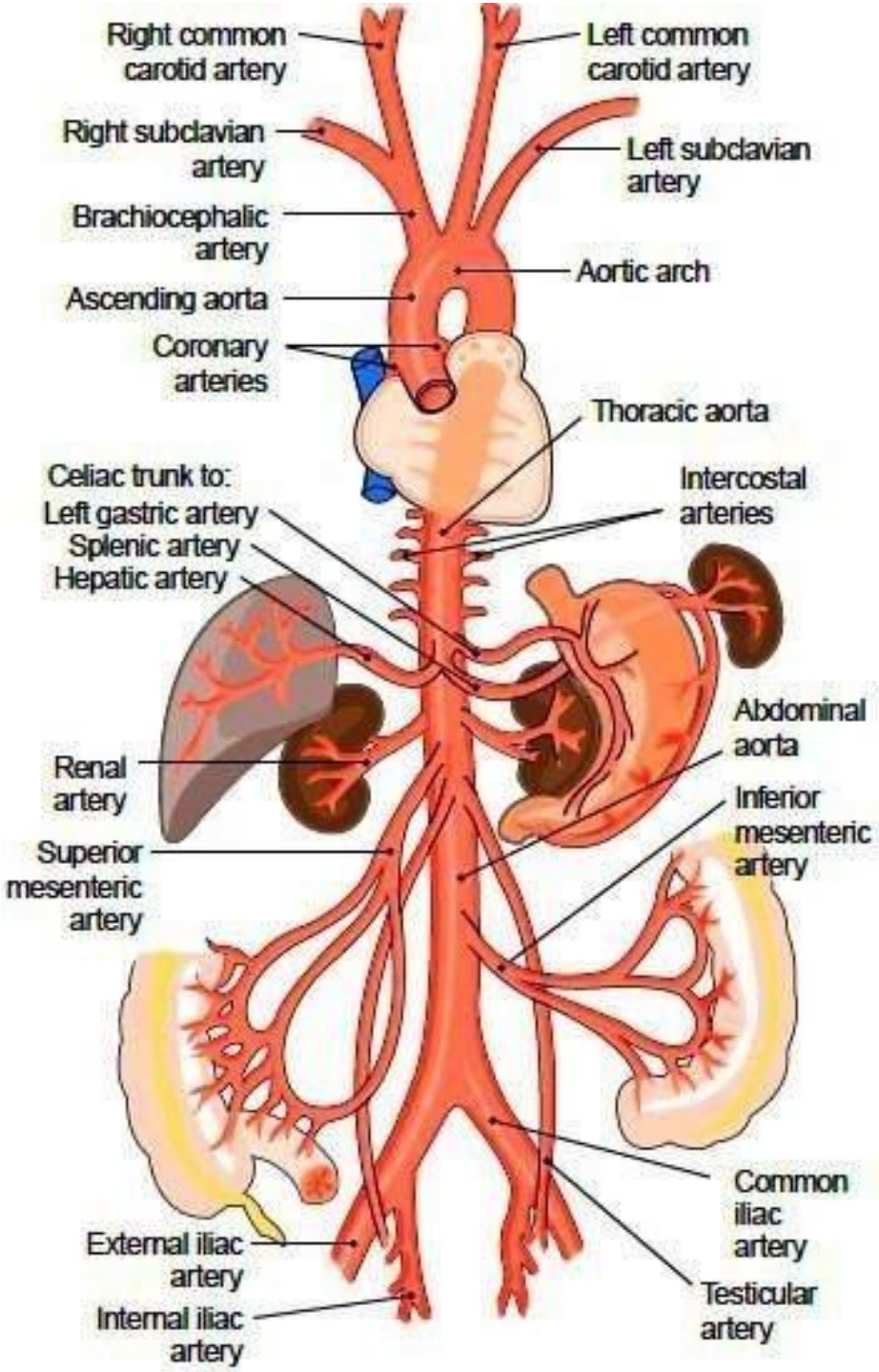
Miklosh Bala[1*], Jeffry Kashuk[2], Ernest E. Moore[3], Yoram Kluger[4], Walter Biffl[5], Carlos Augusto Gomes[6], Offir Ben-Ishay[4], Chen Rubinstein[7], Zsolt J. Balogh[8], Ian Civil[9], Federico Coccolini[10], Ari Leppaniemi[11], Andrew Peitzman[12], Luca Ansaloni[10], Michael Sugrue[13], Massimo Sartelli[14], Salomone Di Saverio[15], Gustavo P. Fraga[16] and Fausto Catena[17]

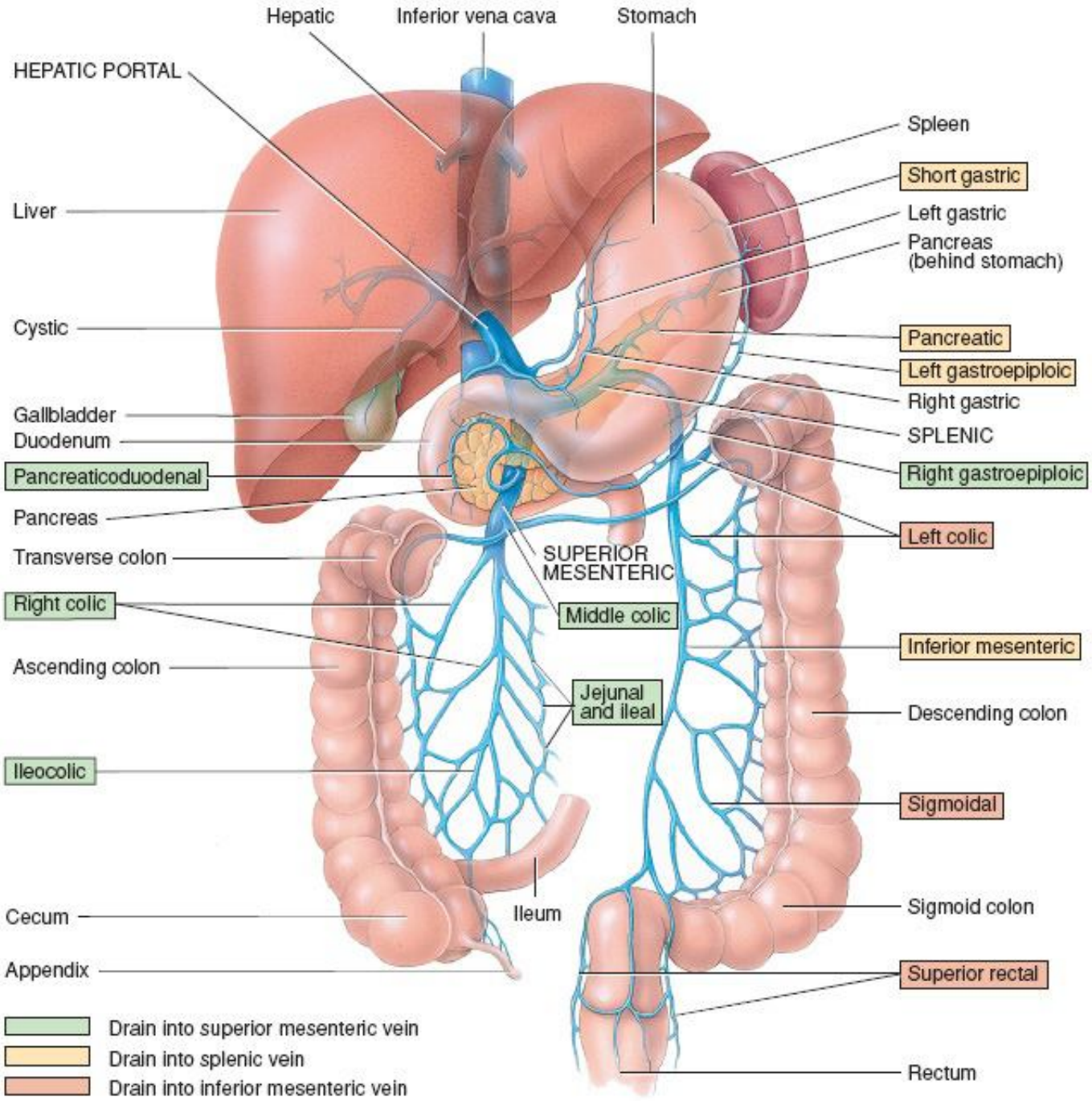
Historical reference

- Despre. Bulletin of the Paris anatomical society, 1834. A case of intestinal gangrene in a woman with persistent constipation and obliteration of the superior mesenteric artery is described.
- The first clinical description of the intestinal infarction is Tiedemann and Virchov. 1847.
- Opolzer in 1862 for the first time on the basis of clinical data diagnosed embolism of the superior mesenteric artery.
- In 1930, V.A. Oppel introduced the concept of hemostatic intestinal obstruction.
- Shaw and Rutledge, 1957. The first case of recovery after embolectomy from the superior mesenteric artery.


Mammary artery
700 ml/min
Celiac artery
800→1100 ml/min
100 ml/min
Bűhler anastomosis
Portal vein
Pancreas
Duodenum
Superior mesenteric vein
Radix mesenterica
Sup. mesenteric artery
500→1400 ml/min
Aorta
inferior mesenteric vein
Arc of Riolan
Inf. mesenteric artery
50→ ? ml/min
Internal iliac artery


Transverse
Ascending Colon
Right colic
Descending Colon
Cæcum
Ileum


Right common carotid artery
Left common carotid artery
Right subclavian artery
Left subclavian artery
Brachiocephalic artery
Aortic arch
Ascending aorta
Coronary arteries
Thoracic aorta
Celiac trunk to:
Left gastric artery
Splenic artery
Hepatic artery
Intercostal arteries
Abdominal aorta
Renal artery
Inferior mesenteric artery
Superior mesenteric artery
Common iliac artery
External iliac artery
Internal iliac artery
Testicular artery



(a) Anterior view of veins draining into hepatic portal vein

Ischemic abdominal disease - acute or chronic circulatory insufficiency in the basins of the celiac, superior and inferior mesenteric arteries, leading to insufficient blood flow in individual areas or in all parts of the intestine.

- Acute mesenteric ischemia (AMI) may be defined as a sudden interruption of the blood supply to a segment of the small intestine, leading to ischemia, cellular damage, intestinal necrosis, and eventually patient death if untreated

International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) Version for 2010

- **K55 Vascular disorders of intestine**
- **K55.0 Acute vascular disorders of intestine**
  - Acute: fulminant ischaemic colitis, intestinal infarction, small intestine ischaemia
  - Mesenteric (artery)(vein): embolism, infarction, thrombosis
  - Subacute ischaemic colitis
- **K55.1 Chronic vascular disorders of intestine**
  - Chronic ischaemic: colitis, enteritis, enterocolitis
  - Ischaemic stricture of intestine
  - Mesenteric: atherosclerosis, vascular insufficiency
- **K55.2 Angiodysplasia of colon**
- **K55.8 Other vascular disorders of intestine**
- **K55.9 Vascular disorder of intestine, unspecified**
  - Ischaemic: colitis, enteritis, enterocolitis

Acute mesenteric ischemia

causes:

- occlusive,
- non-occlusive

Acute mesenteric ischemia

Non-occlusive

1. **Incomplete occlusion of arteries**
2. **Angiospasm**
3. **Centralization of hemodynamics** (low cardiac output in cardiogenic shock, stasis of mesenteric blood flow when inotropic support is prescribed, decreased perfusion pressure, hypovolemia)

Acute mesenteric ischemia occlusive

- **mesenteric arterial embolism (50%),**
- **mesenteric arterial thrombosis (15–25%),**
- **mesenteric venous thrombosis (5–15%)**
- Closure of arteries from the aorta due to atherosclerosis and thrombosis
- Occlusion of arteries as a result of exfoliating aortic aneurysm
- Compression (invasion) vascular by tumors
- Ligation vessels

Acute mesenteric ischemia

- The overall incidence is low (0.09 to 0.2% of all acute admissions to emergency departments)
- High mortality rates (50 to 80%)
- blood supply must be reduced by more than 50% before the small intestine becomes ischemic
- mesenteric ischemia does not occur until the patient's mean arterial pressure is <45 mmHg
- the small intestine is able to compensate for a 75% reduction in mesenteric blood flow for up to 12 h

Acute mesenteric arterial embolism, 50% of all cases

- dysrhythmias (atrial fibrillation and others)
- endocarditis
- atherosclerotic aorta
- rheumatic heart diseases
- SMA is affected most often because of the large diameter and small angle of the aorta.
- more than 20% of emboli to the SMA are associated with concurrent emboli to the spleen, or kidney

Acute mesenteric arterial thrombosis (25% of cases)

- atherosclerotic disease → stenosis
- rarely: vasculitis, mesenteric dissection, or a mycotic aneurysm

Virchow's triad (thrombosis):

1. hypercoagulability (or thrombophilia)
2. damage to the vascular wall (endothelial dysfunction, atherosclerotic plaque)
3. stagnated blood flow (stasis, turbulence)

Acute non-occlusive mesenteric ischemia (20%)

- SMA vasoconstriction associated with low splanchnic blood flow
- Hypovolemia and the use of vasoconstrictive agents may precipitate non-occlusive mesenteric ischemia

Mesenteric venous thrombosis (5-15 10%)

- **20% are idiopathic**
- **80% - Virchow's triad:**

1. **stagnated blood flow** (portal hypertension, pancreatitis, inflammatory bowel disease, sepsis, and trauma)
2. **hypercoagulability** (Factor V Leiden, prothrombin mutation, protein S deficiency, protein C deficiency, antithrombin deficiency, antiphospholipid syndrome, malignancies, hematologic disorders, and oral contraceptives)
3. **vascular inflammation, endothelial dysfunction**

for acute mesenteric ischemia

1. compensation of mesenteric blood flow.
2. subcompensation of mesenteric blood flow.
3. decompensation of the mesenteric blood flow - a rapidly progressing slowly progressing

Classification

1. **Ischemia stage** (6-12 hours) (hemorrhagic impregnation with venous thrombosis)
2. **Stage of intestinal infarction** (12-24 hours)
3. **The stage of peritonitis** (> 24 hours).

Segmental structure of the superior mesenteric artery

а — a. colica media;

б — a. ileocolica;

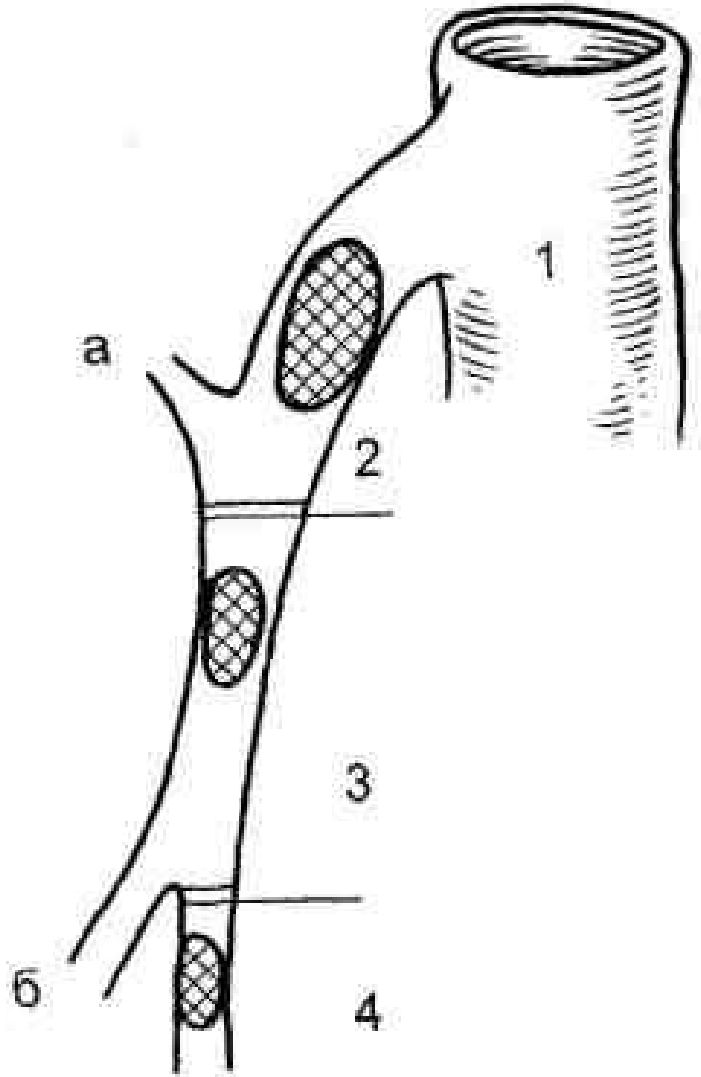
1 — устье (5,2 %);

2 - I segment (64.5%);

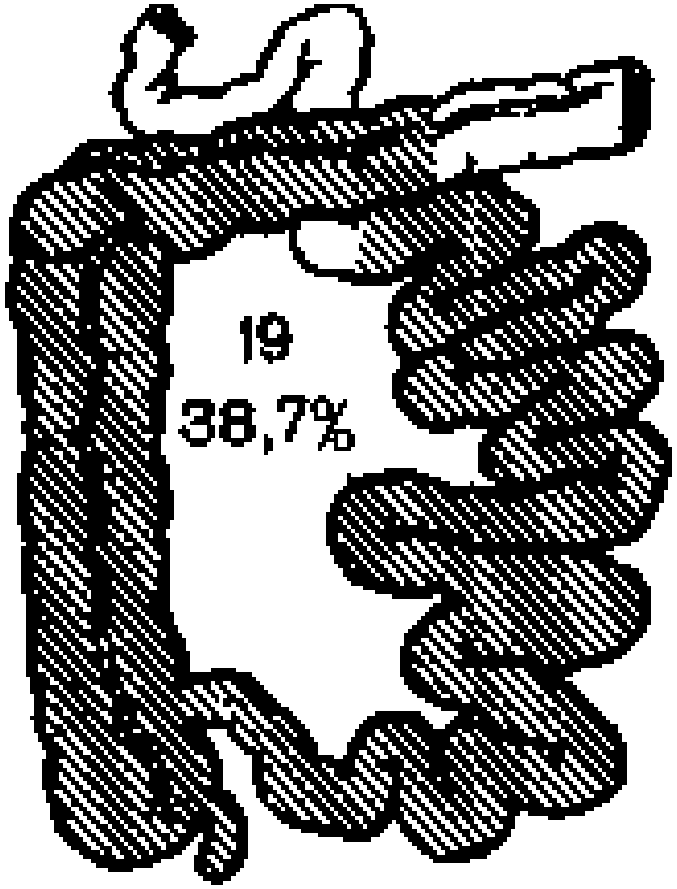
3 - II segment (27.6%);

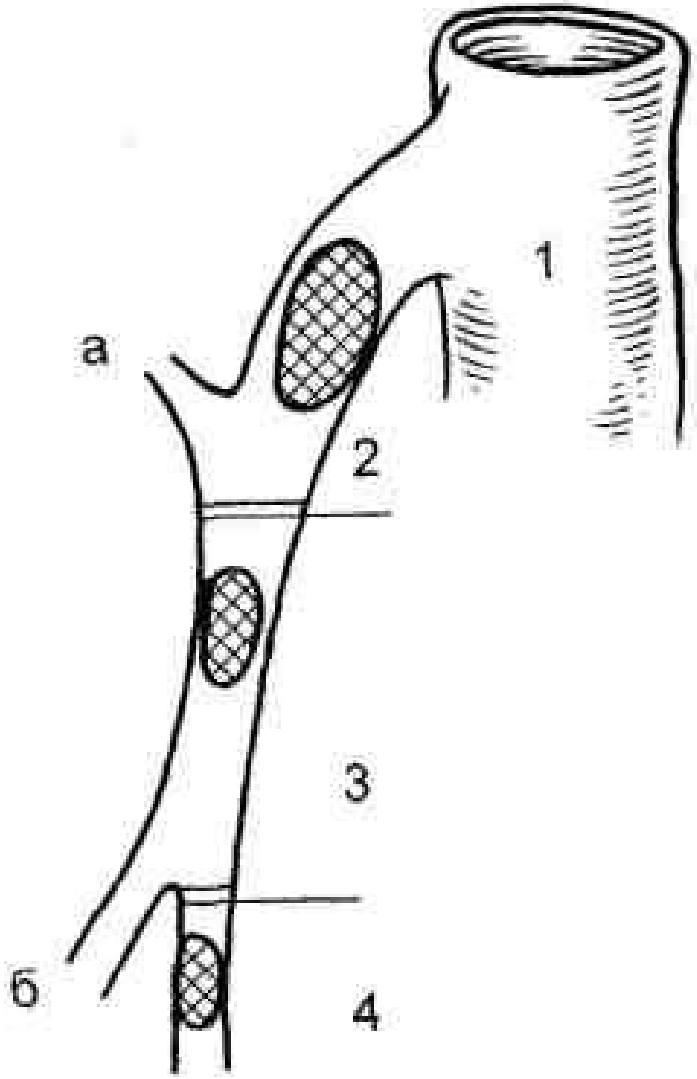
4 - III segment (7.9%).

(frequency of embolism according to B.C. Saveliev and IV Spiridonov)

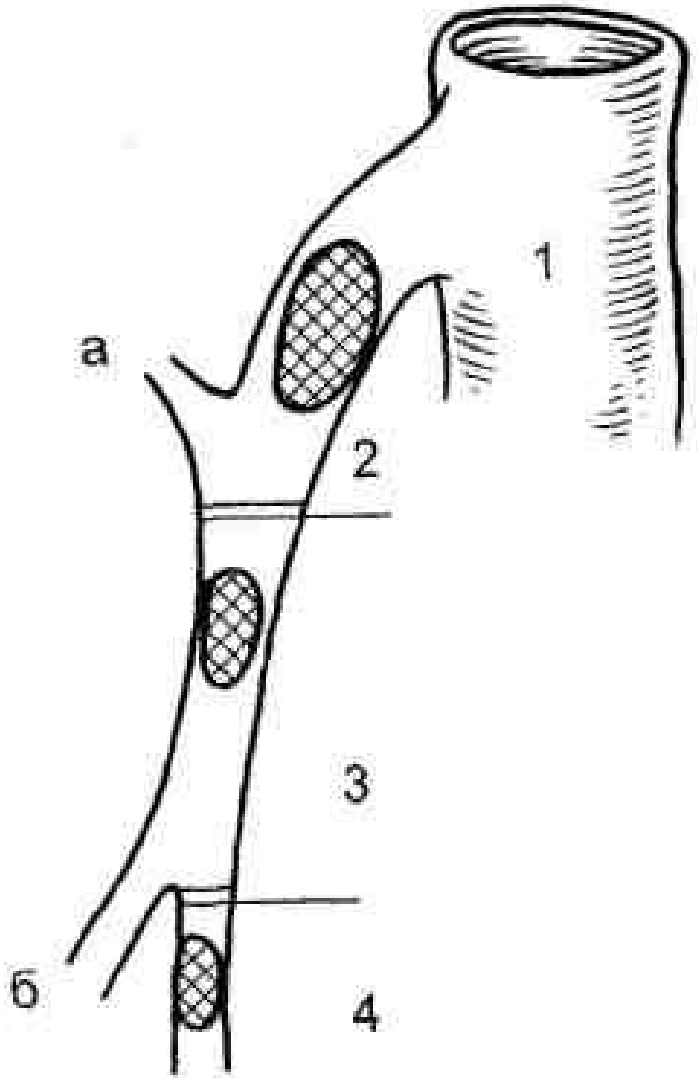


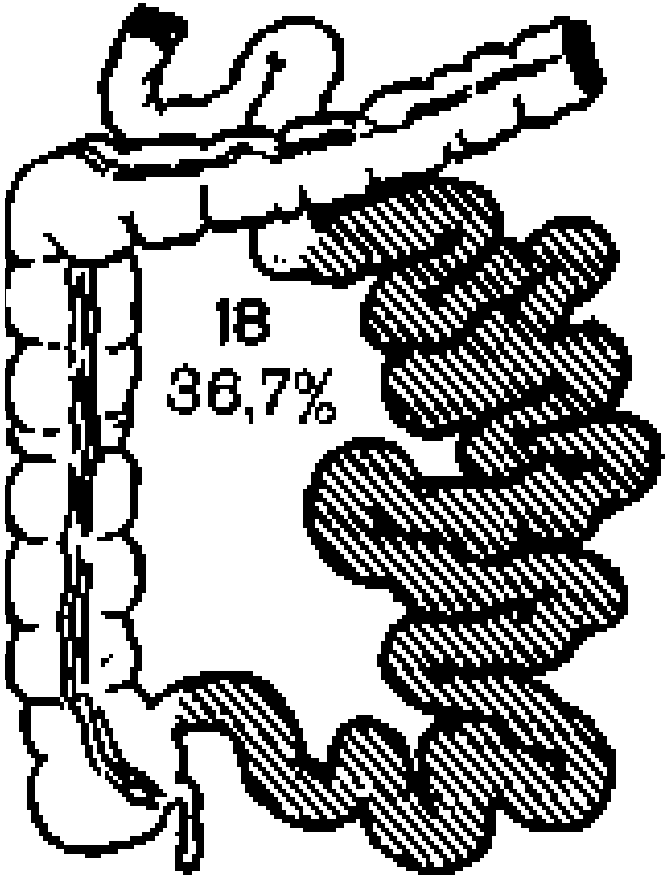
embolism of the first segment

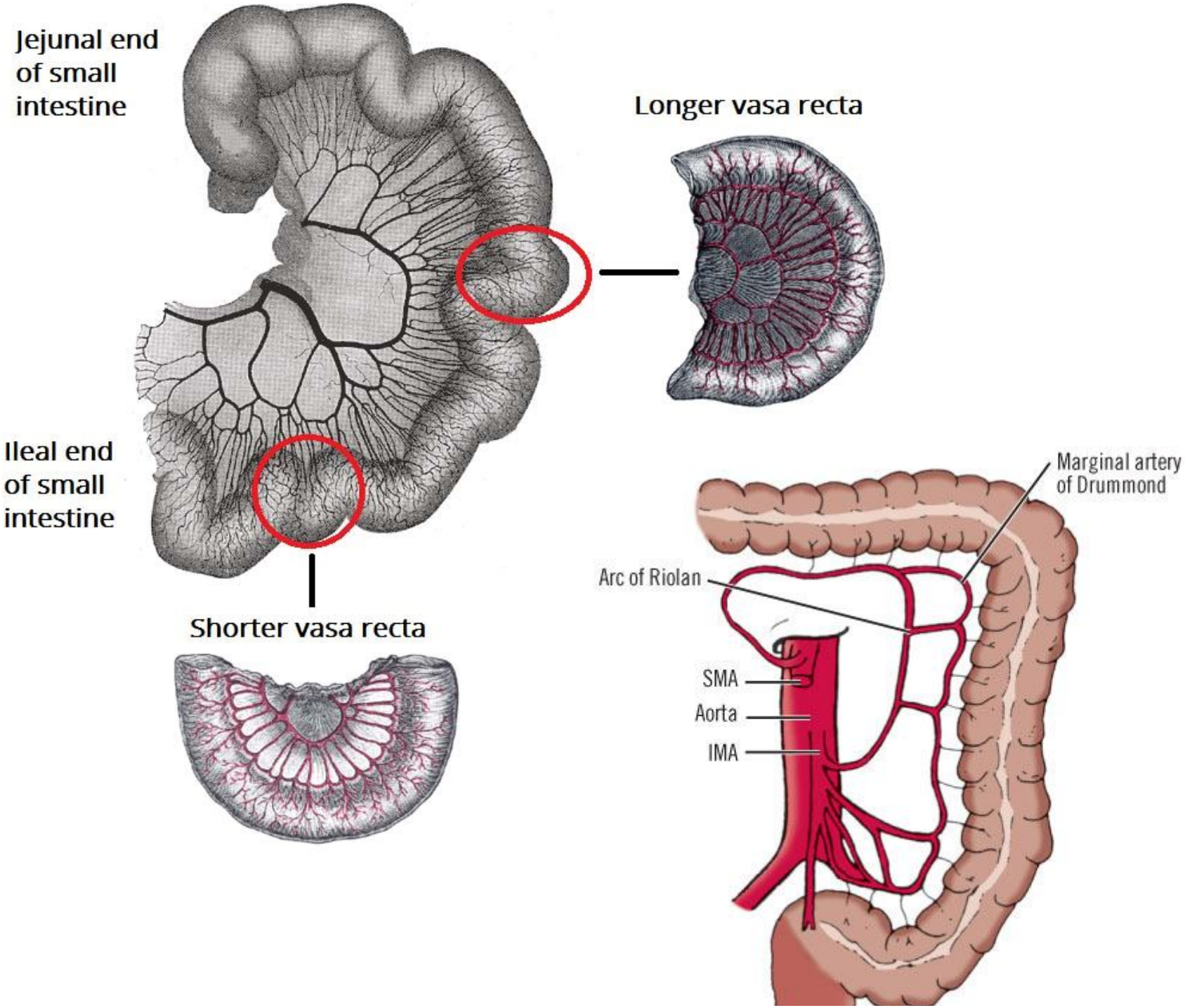


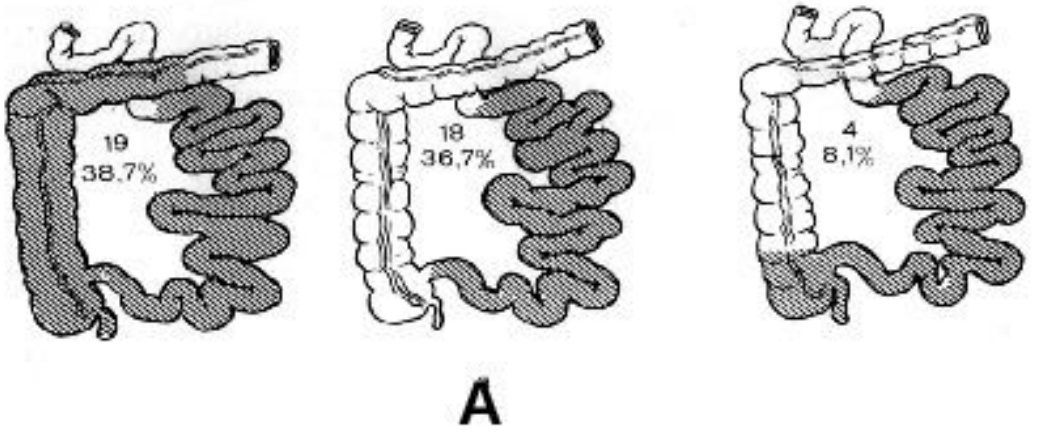


embolism of the second segment

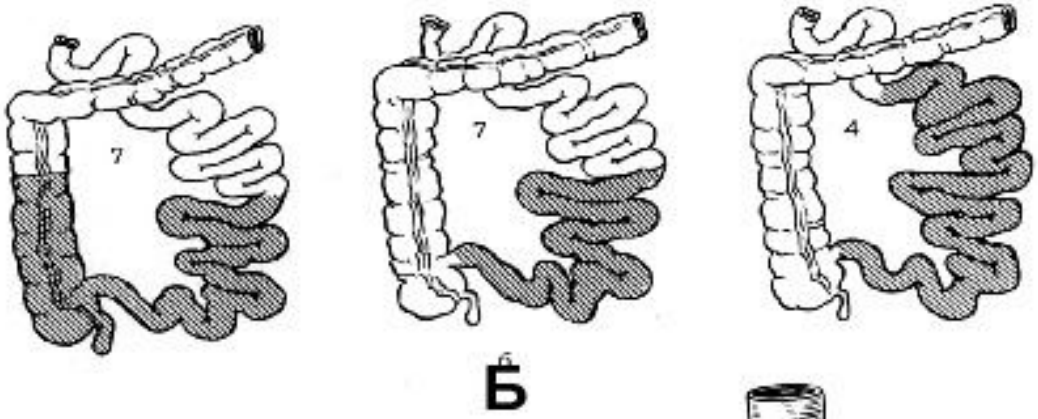




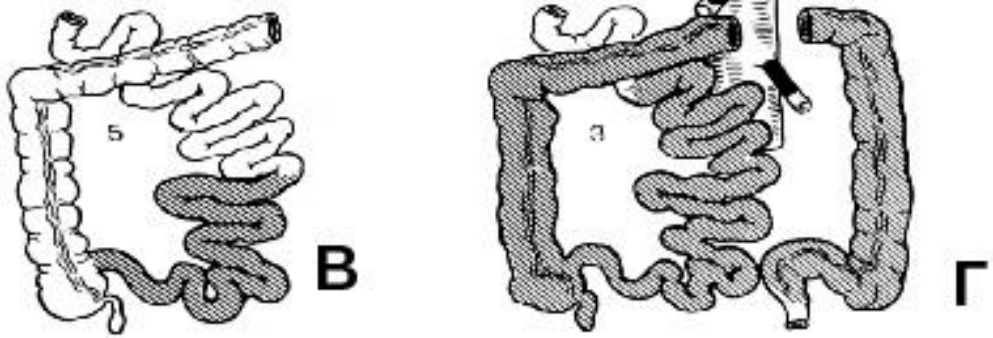

Jejunal end of small intestine
Longer vasa recta
Ileal end of small intestine
Shorter vasa recta
Marginal artery of Drummond
Arc of Riolan
SMA
Aorta
IMA



А



Б



В Г

Локализация и протяженность поражений кишечника при эмболиях верхней брыжеечной артерии

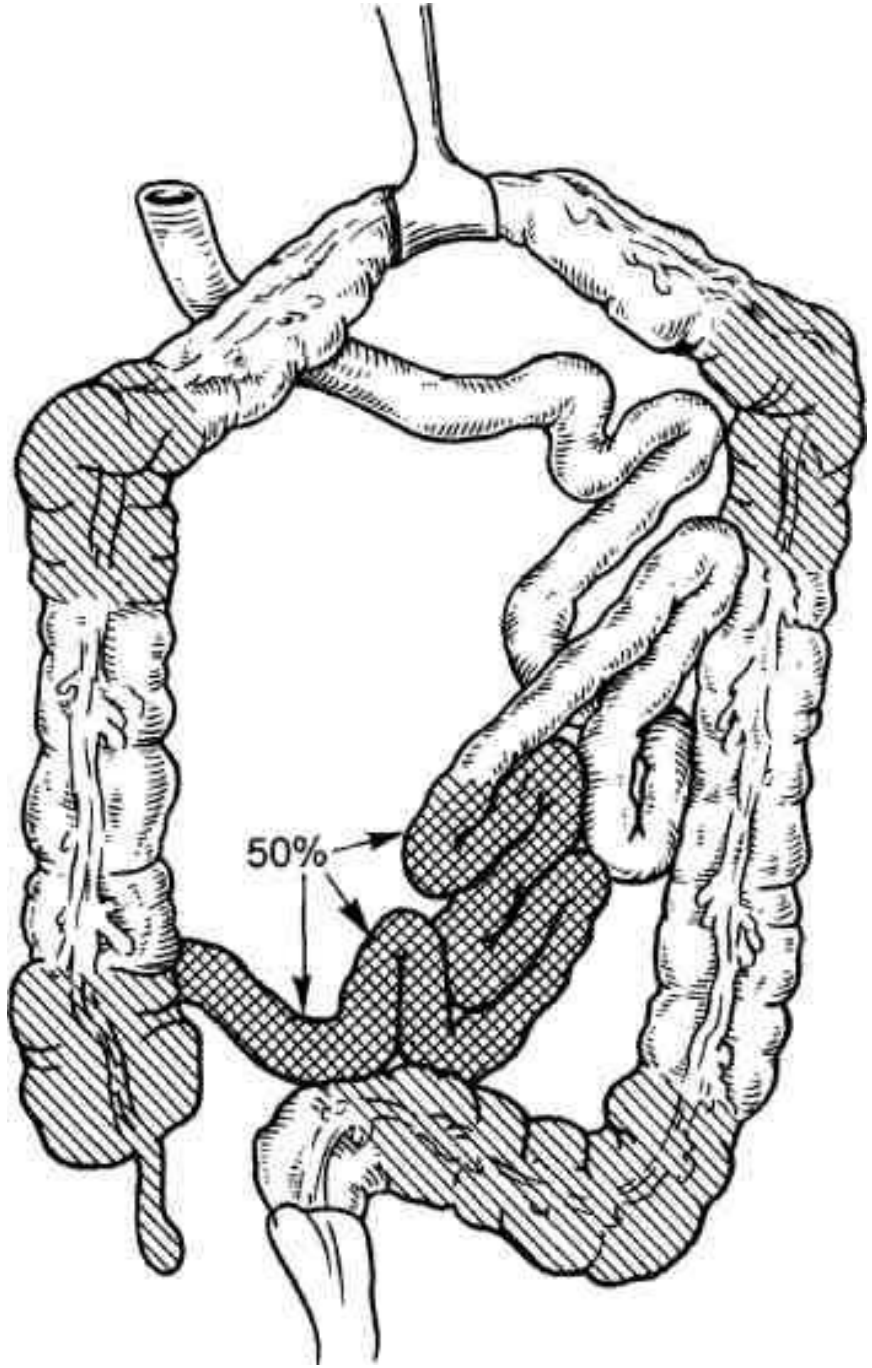
А – I сегмент

Б – II сегмент

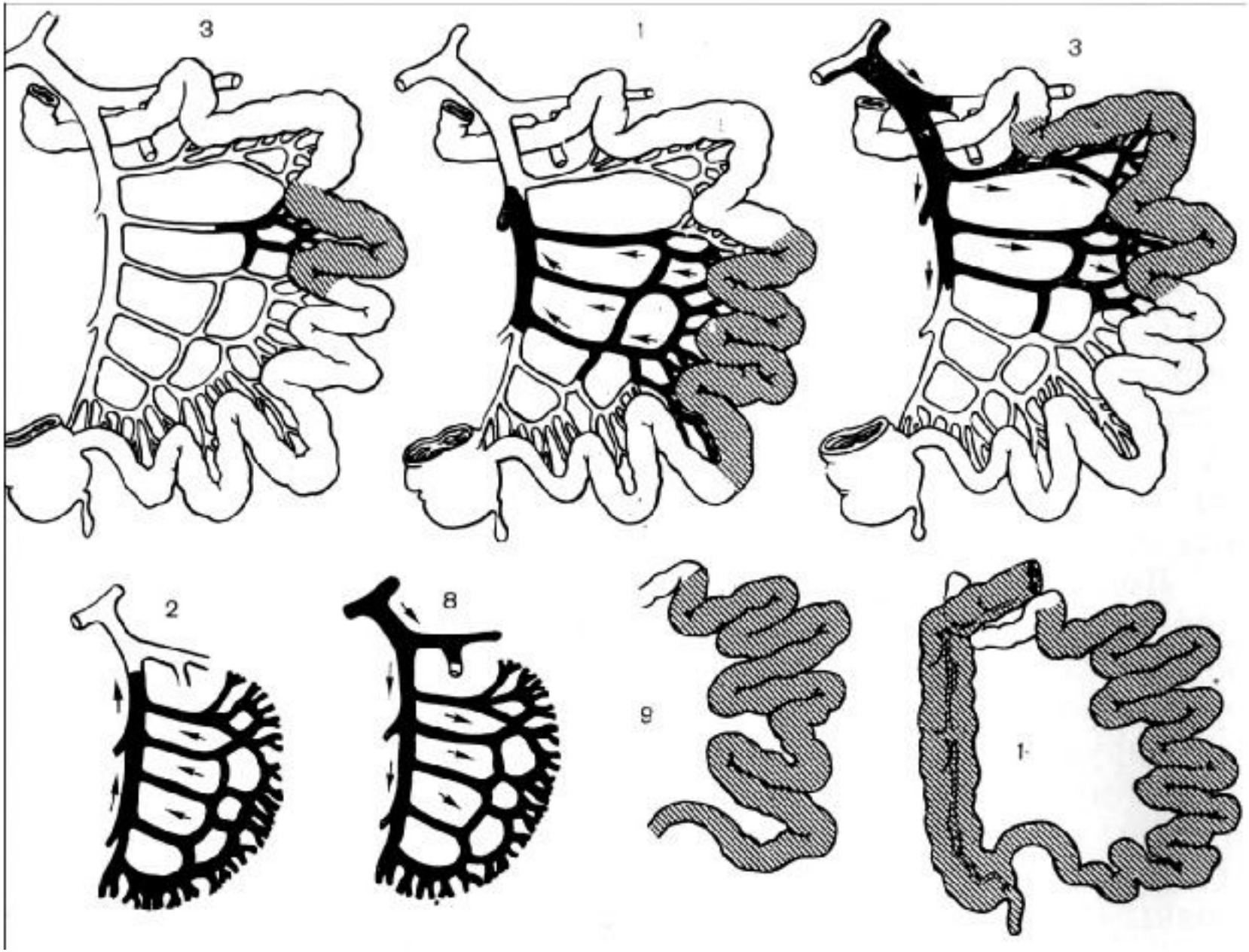
В – III сегмент

Г – эмболия I сегмента на фоне окклюзии нижней брыжеечной артерии

Typical sites of intestinal lesion in non-occlusive disorders of mesenteric circulation (по В.С. Савельеву и И.В. Спиридонову)



Локализация и протяженность инфаркта кишечника у больных с венозным тромбозом



Stages of
Acute mesenteric ischemia

- Ischemia
- Infarction
- Peritonitis

Pathogenesis

ischemia

- hemorrhagic impregnation
- the formation of anaerobic metabolism products
- there is no translocation of microflora
- severe pain syndrome

Pathogenesis

intestinal infarction

- cell death
- sweating of blood into the lumen of the intestine and into the abdominal cavity
- translocation of microflora
- destruction of the intestinal wall (from mucous to serous membranes)

Pathogenesis

peritonitis

- infection of transudate (a consequence of translocation of microflora)
- transmural degeneration of the intestinal wall
- abdominal sepsis

Pathogenesis

Venous thrombosis

- infarction of the intestine after 1 day - 3 weeks
- hemorrhagic impregnation + massive bowel edema
- bowel hypoxia is weaker
- hypovolaemia / dehydration
- peritonitis

In the history should take into account:

- atherosclerosis (cardiovascular manifestations)
- arrhythmia
- defect of the heart valves
- heart failure
- diarrhea (diarrhea mixed with blood occurs at mucosal necrosis)

Clinical manifestations
Debut of disease

- Acute (occlusion of the trunk of the SMA);
- Gradual (thrombosis);
- In two stages - severe pain, disappearance of signs of abdominal catastrophe - after several hours or days the pain syndrome appears again (only with embolisms).

clinical manifestations

- abdominal pain - 95% of patients (5% - shock and metabolic acidosis)
- nausea - in 44% of patients
- vomiting - in 35%
- diarrhea - in 35%
- heart rate> 100 - in 33%
- “rectal blood" - in 16%
- constipation - in 7%

Park WM, Gloviczki P, Cherry KJ et al. Contemporary management of acute mesenteric ischemia: Factors associated with survival. J. Vasc. Surg. 2002. Vol.35 (3): 445–52..

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Severe abdominal pain out of proportion to physical examination findings should be assumed to be AMI until disproven. (Recommendation 1B)

clinical manifestations in the stage of ischemia

- Severe abdominal pain (patient groans, rushes, does not find a comfortable position)
- Nausea, vomiting
- Liquid stool (ischemic bowel movement)
- Soft abdomen with sharp pain
- Tachycardia, arrhythmia
- Varlamov's symptom - in the stage of ischemia - absence of pain with deep palpation (in 50%)
- Blinov's symptom > systolic BP up to 200 mm. with pain
- hyperperistalsis

clinical manifestations in the stage of **infarction**

- Pain less intense, persistent
- muscle tension of abdominal wall
- Dullness in sloping areas of the abdomen
- Mondor's symptom - when palpation is defined as a semi-soft tumor-like formation (gut)
- Periodically vomiting, sometimes like "coffee grounds"
- Stool with blood in 1/3 of patients
- Absence of peristalsis
- Bloating, stool and gas retention (50%)

clinical manifestations in the stage of **infarction**

- Dehydration
- Intoxication
- Hypovolemia
- Blood loss

clinical manifestations in the stage of peritonitis

- clinical manifestations of secondary peritonitis

Risk factors for specific phenotypes of AMI

	Pathogenesis of AMI			
	Acute mesenteric arterial embolism	**Acute mesenteric arterial thrombosis**	**NOMI**	**Mesenteric venous thrombosis**
Risk factors	Atrial fibrillation Recent MI cardiac thrombi Mitral valve disease Left ventricular aneurysm Endocarditis Previous embolic disease	Diffuse atherosclerotic disease Postprandial pain Weight loss	Cardiac failure Low flow states Multi-organ dysfunction Vasopressors	Portal hypertension History of VTE Oral contraceptives Estrogen use Thrombophilia pancreatitis

AMI acute mesenteric ischemia, *NOMI* non-occlusive mesenteric ischemia, *MI* myocardial infarction, *VTE* venous thromboembolism

ACG Clinical Guideline: Epidemiology, Risk Factors, Patterns of Presentation, Diagnosis, and Management of Colon Ischemia (CI) Am J Gastroenterol 2015

- "If people, especially predisposed to the development of acute MT complain of severe persistent pain in the abdomen, which did not exist before, it is likely that they MT"
- "... before patients seek medical help, 50% of them 3-4 days before the first symptoms appear, which, as a rule, are rather weakly expressed"
- "People who suffer from various kinds of arrhythmias and complain about abdominal pain, most likely, obturation of mesenteric vessels occurred, until the opposite is proven"

Usual diagnostics

- General clinical studies: determination of heart rate, blood pressure, body tº.
- Laboratory diagnostics: general blood test, general urine analysis, biochemical blood test (bilirubin, glucose, albumin, creatine kinase (CK), **lactate**, lactate dehydrogenase (LDH)), blood group and Rh factor, coagulogram, **D-dimer**

diagnostics

- Decreased hemoglobin levels, low serum albumin, and the presence of metabolic acidosis can be used to predict severity of AMI
- There are no laboratory studies that are sufficiently accurate to identify the presence or absence of ischemic or necrotic bowel, although elevated l-lactate, and D-dimer may assist. (Recommendation 1B)

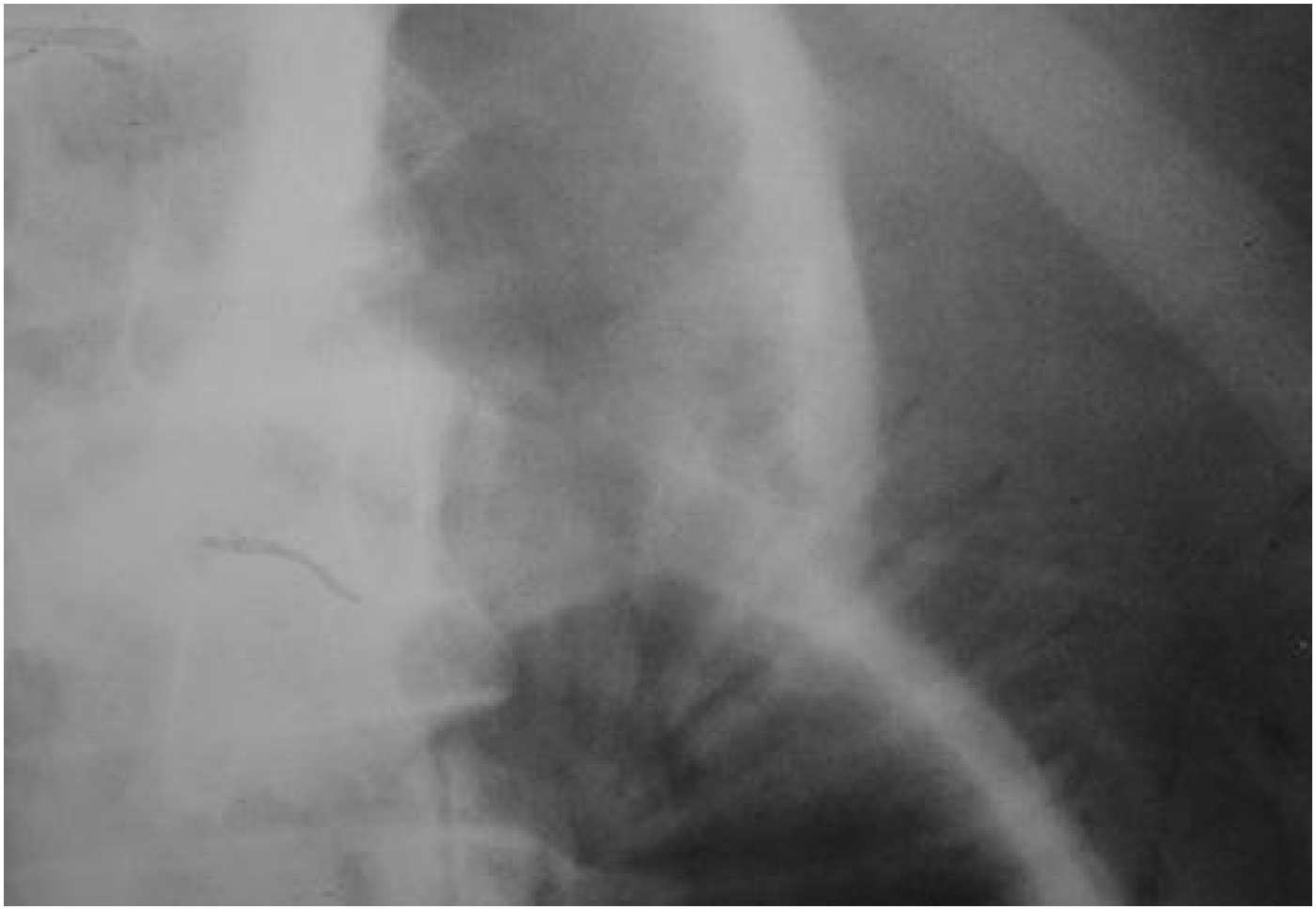
diagnostics

- Panoramic abdominal X-ray;
- ECG (for all patients),
- chest X-ray,
- Ultrasound of the abdominal cavity.
- CT, MRI
- Angiography
- Laparoscopy

diagnostics

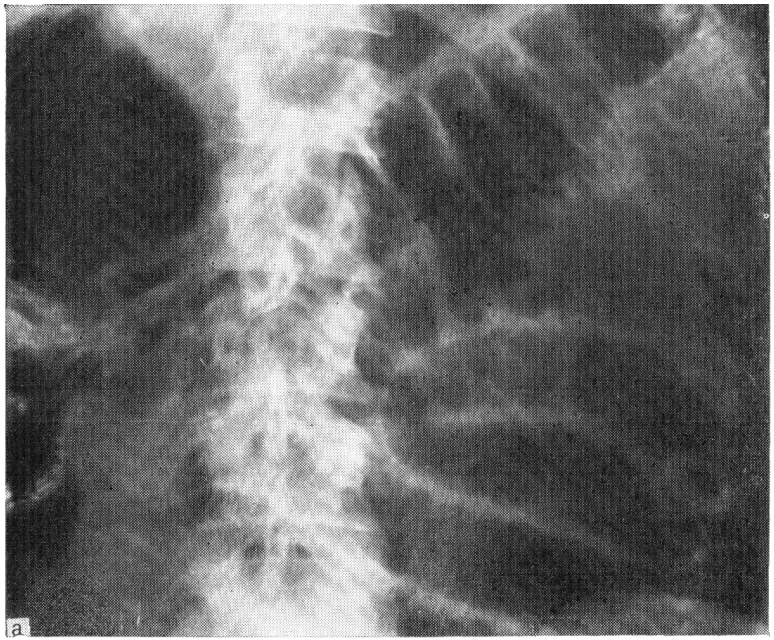
- Conventional plain X-ray films have limited diagnostic value in evaluating AMI, although signs of intestinal perforation may be seen. (Recommendation 1B)

Intestinal pneumatosis, black strips of air



Intestinal pneumatosis

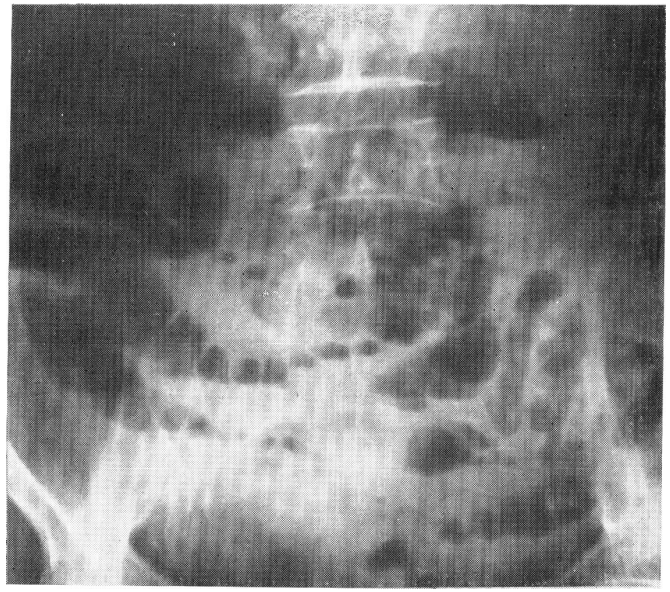
Symptom of the "gas column"



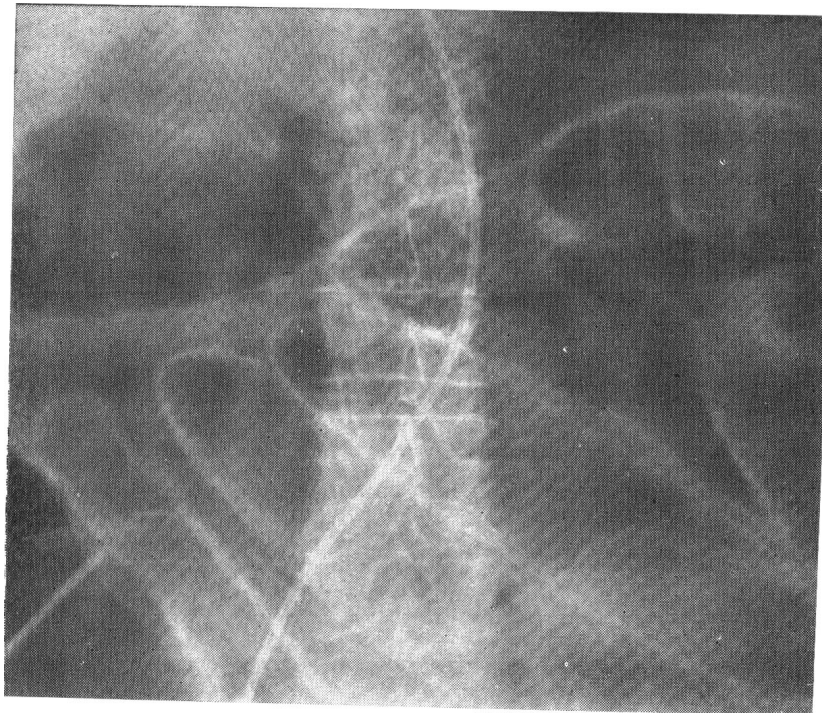
Embolism of the superior mesenteric artery. Stage of peritonitis.

Pneumatization of the small intestine.

Bowl of Clauber and small levels of liquid.

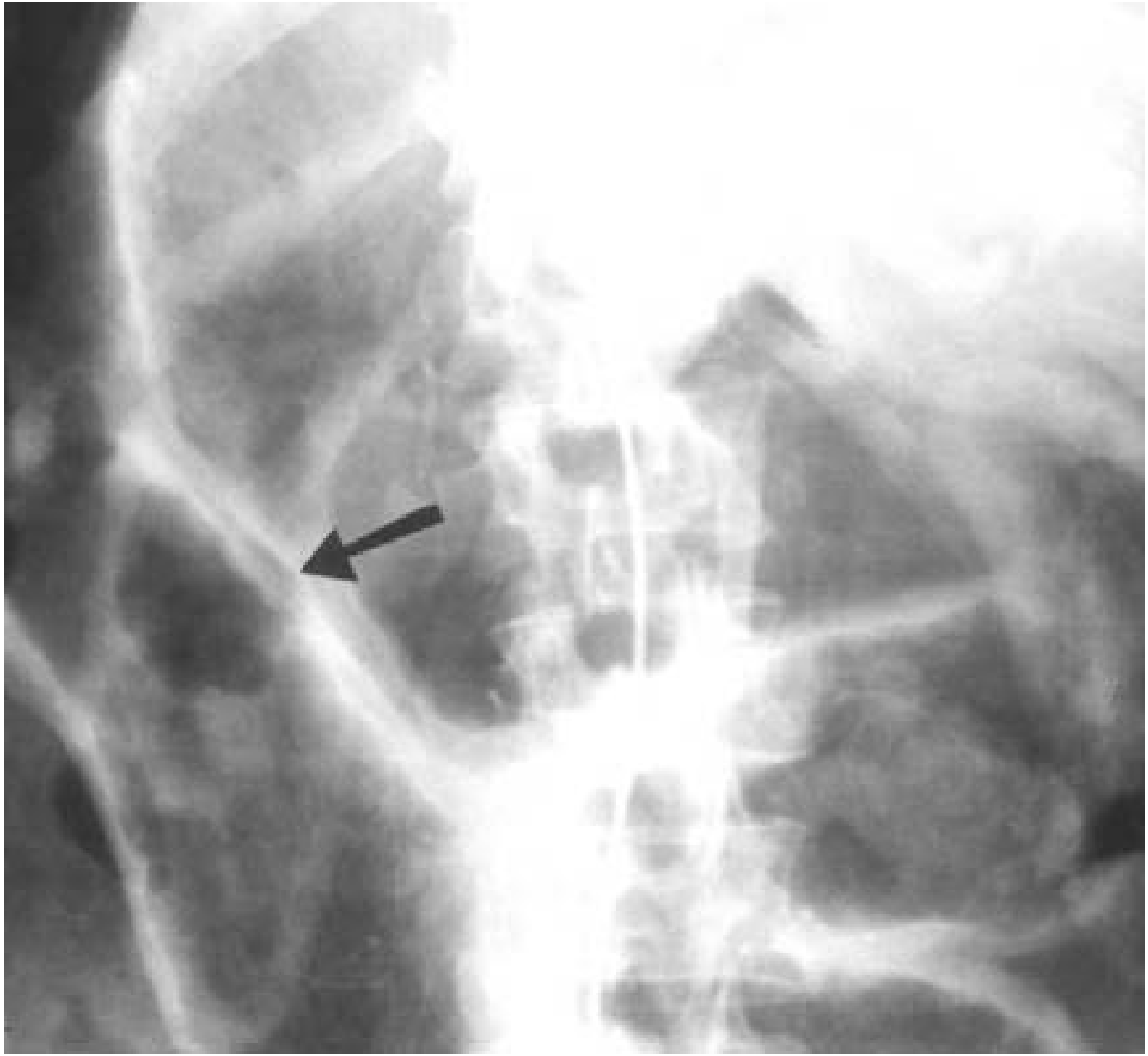


Swollen loops of the intestine, thickened wall of the small intestine up to 9 mm. (N = 1.5 mm)



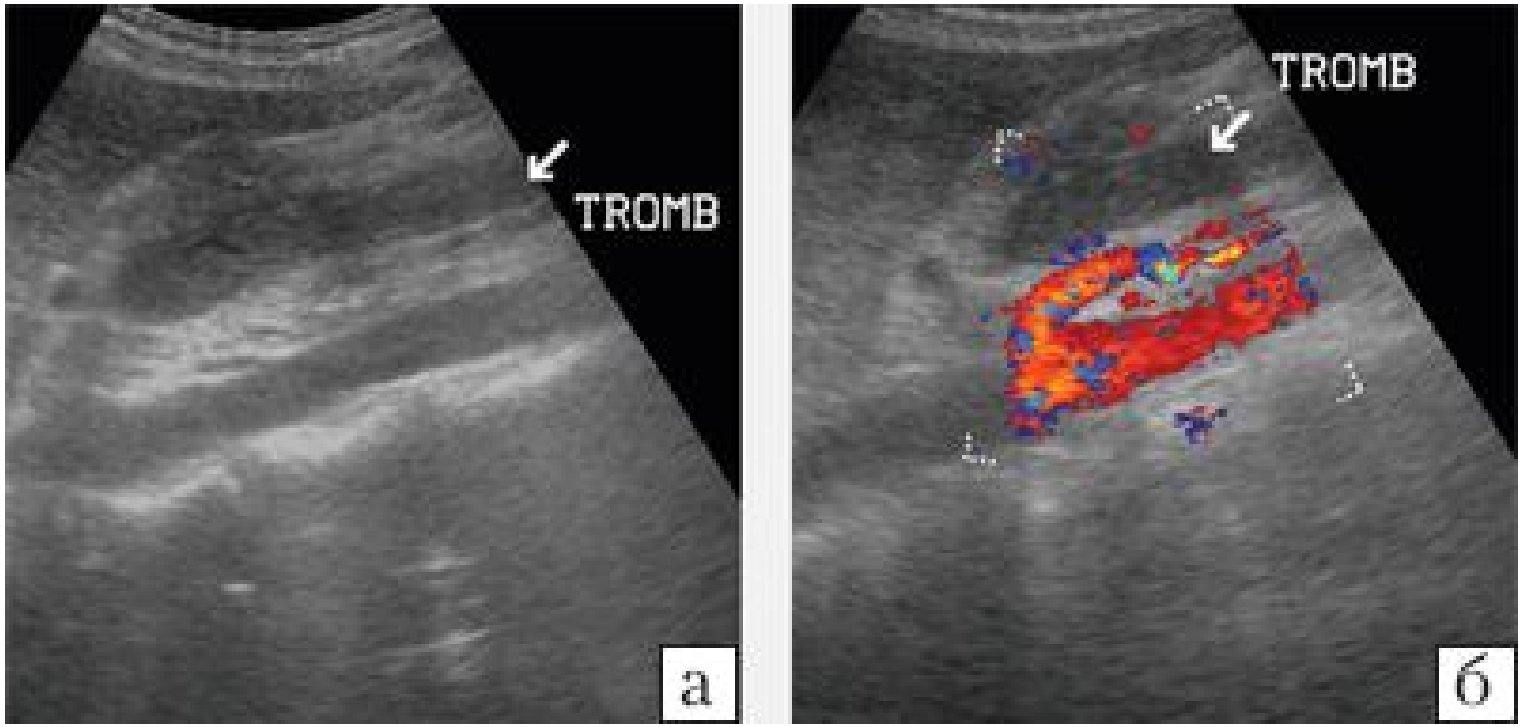
- intestinal spasm
- (early sign of ischemia).

Gas in the wall of the bowel



X-ray semiotics

- Symptom of intramural gas
- Symptom Kolerova (homogeneous darkening of the abdomen) due to the accumulation of fluid in the intestines and abdominal cavity.
- Signs of dynamic intestinal obstruction - gas-expanded small intestine, swelling of the folds of the mucosa
- Rarely - gas in the portal or upper mesenteric veins - late symptom (necrosis).

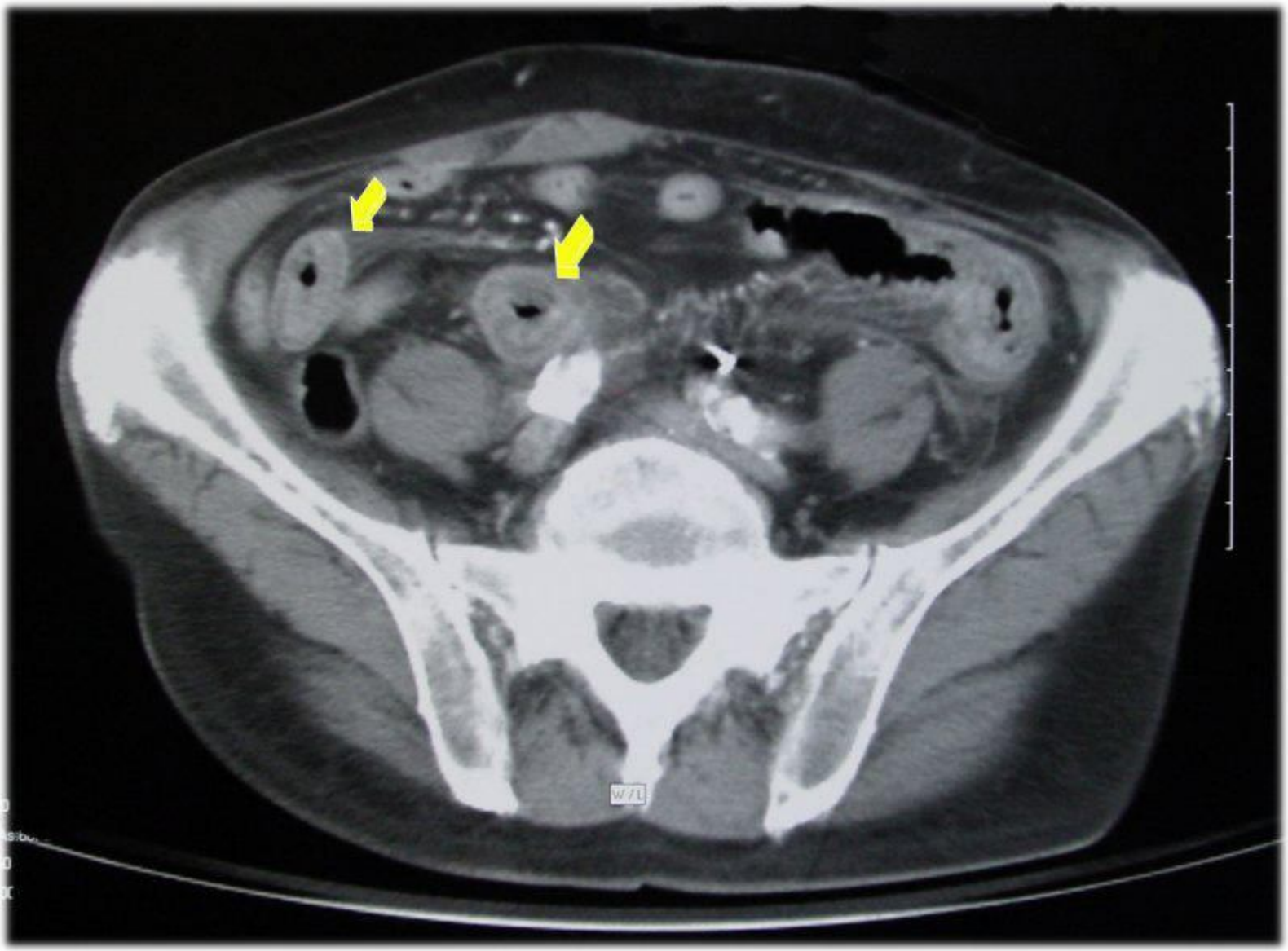


Echogram of thrombosis of the superior mesenteric vein

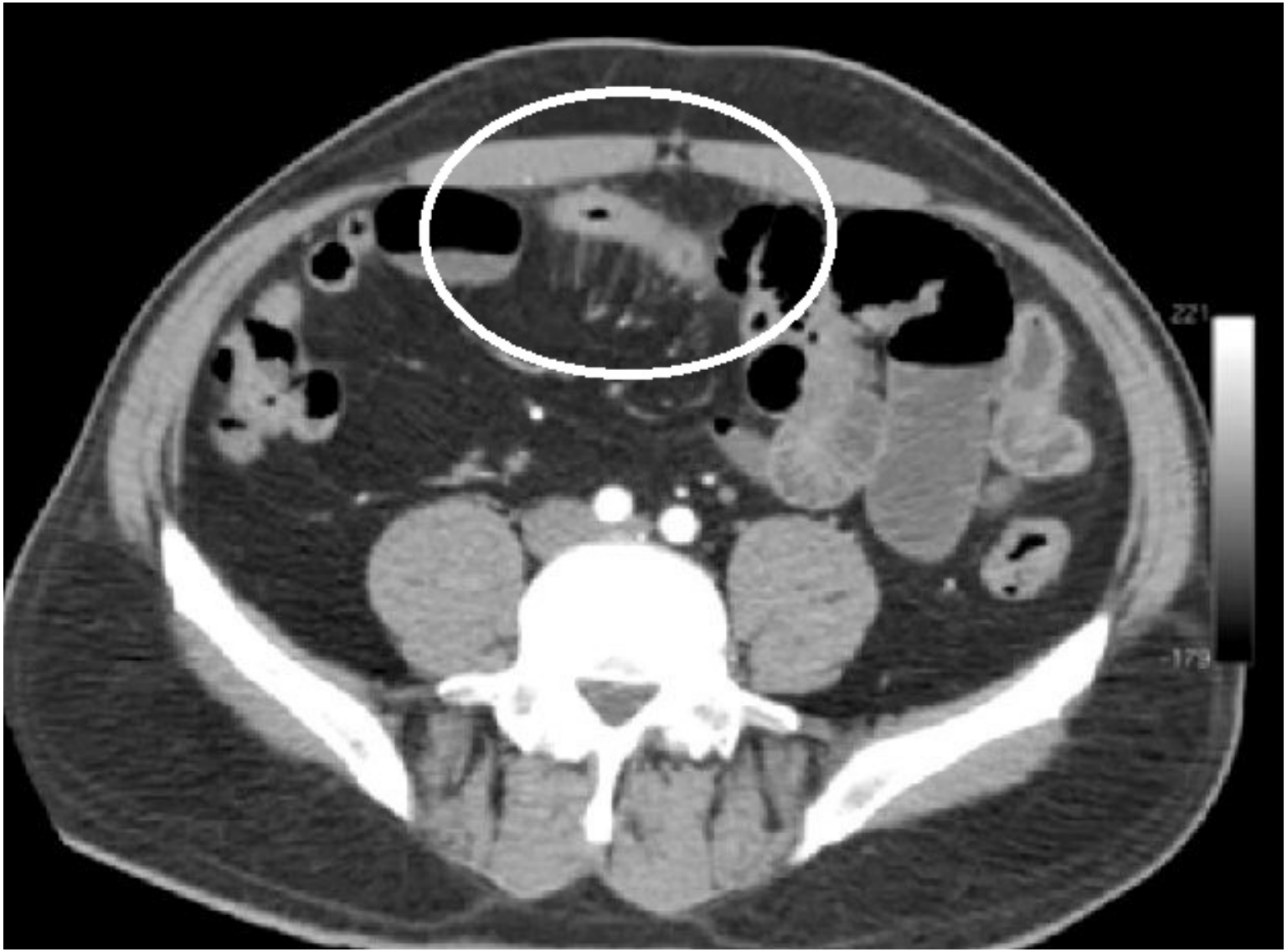
a - B-mode: in the lumen is determined
heterogeneous formation of increased echogenicity (arrow);
b - there is a partial absence of Doppler signals inside the lumen of the vessels,
the Doppler signal is determined in a network of small collaterals.

diagnostics

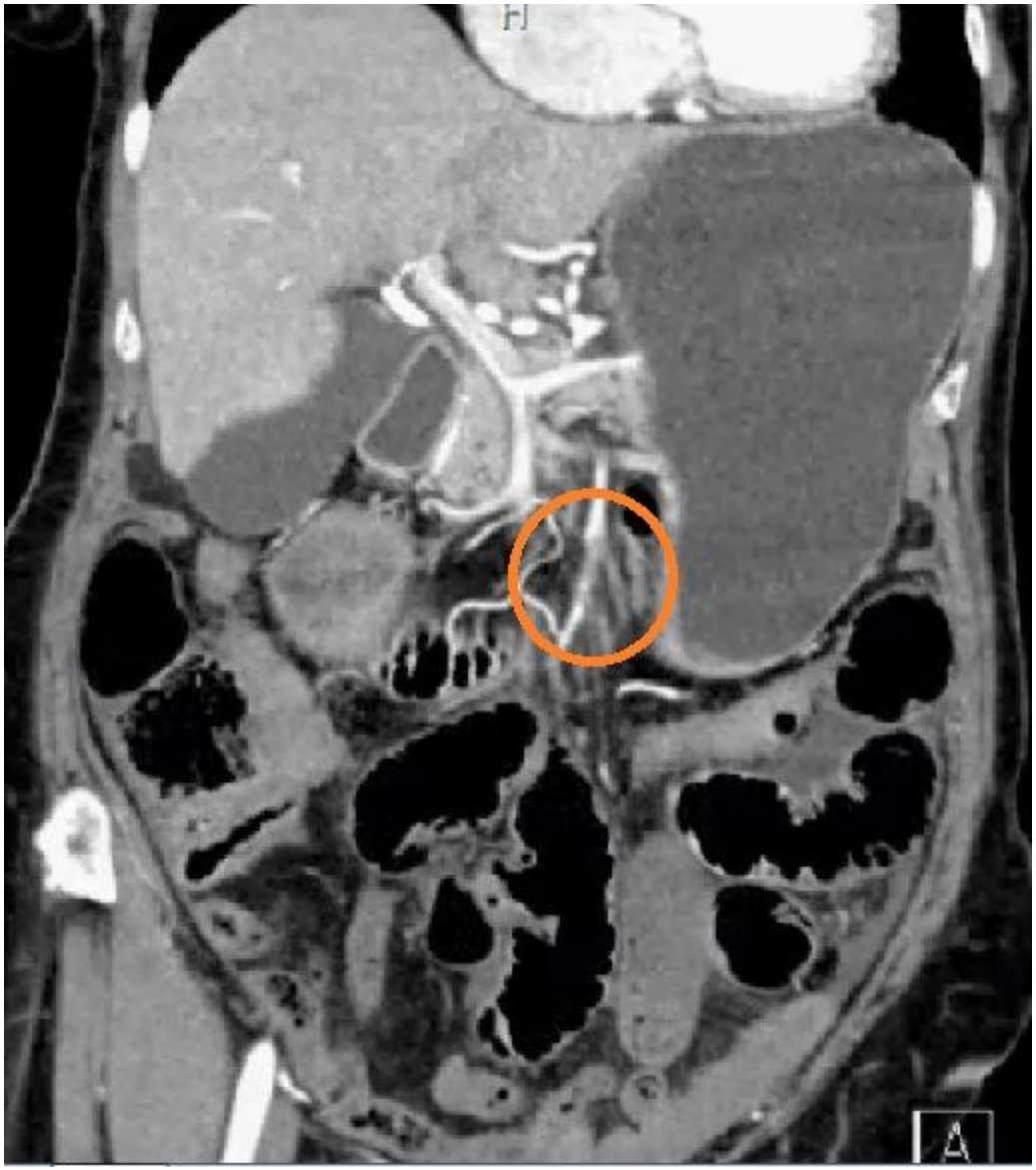
- Ultrasound of the abdominal cavity (for all patients with abdominal pain - to exclude another abdominal pathology).
- Duplex ultrasound scanning often does not provide reliable information due to intestinal paresis and low sensitivity in identifying distal intestinal vessel lesions.
- Spiral computed tomography with bolus contrast allows to establish the localization and extent of occlusion, the severity of collateral blood flow, differentiate arterial or venous ischemia.



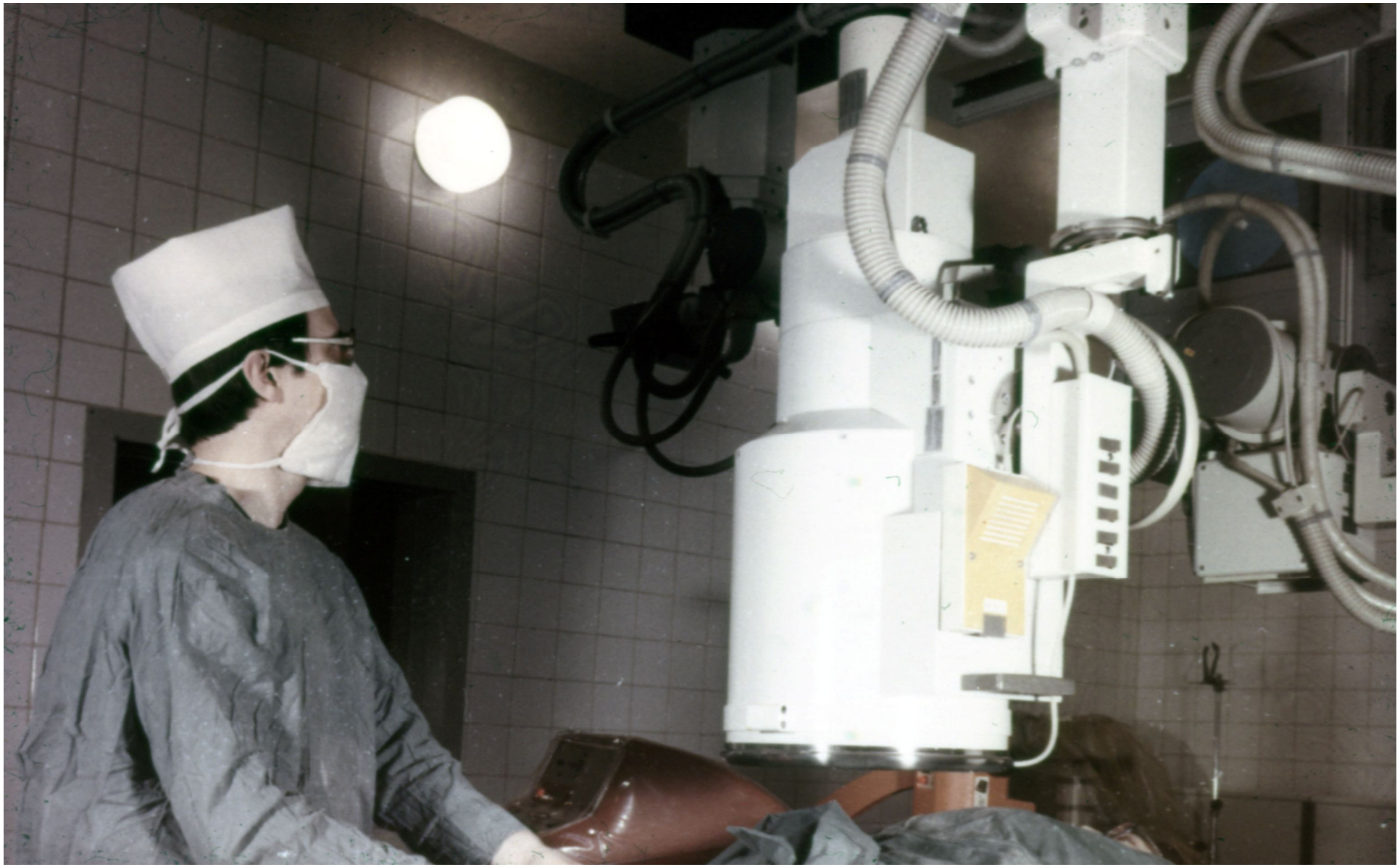
CT with contrast.
Non-occlusive mesenteric ischemia.
Edema of the intestinal wall (arrows).



CT. Thrombosis of the superior mesenteric artery.
Symptom of the comb, adenopathy in the mesentery.
Constriction of the lumen of the gut with enlargement of the proximal parts


A

Abdominal aorto-angiography



Mesentericography

Direct signs of vascular disease

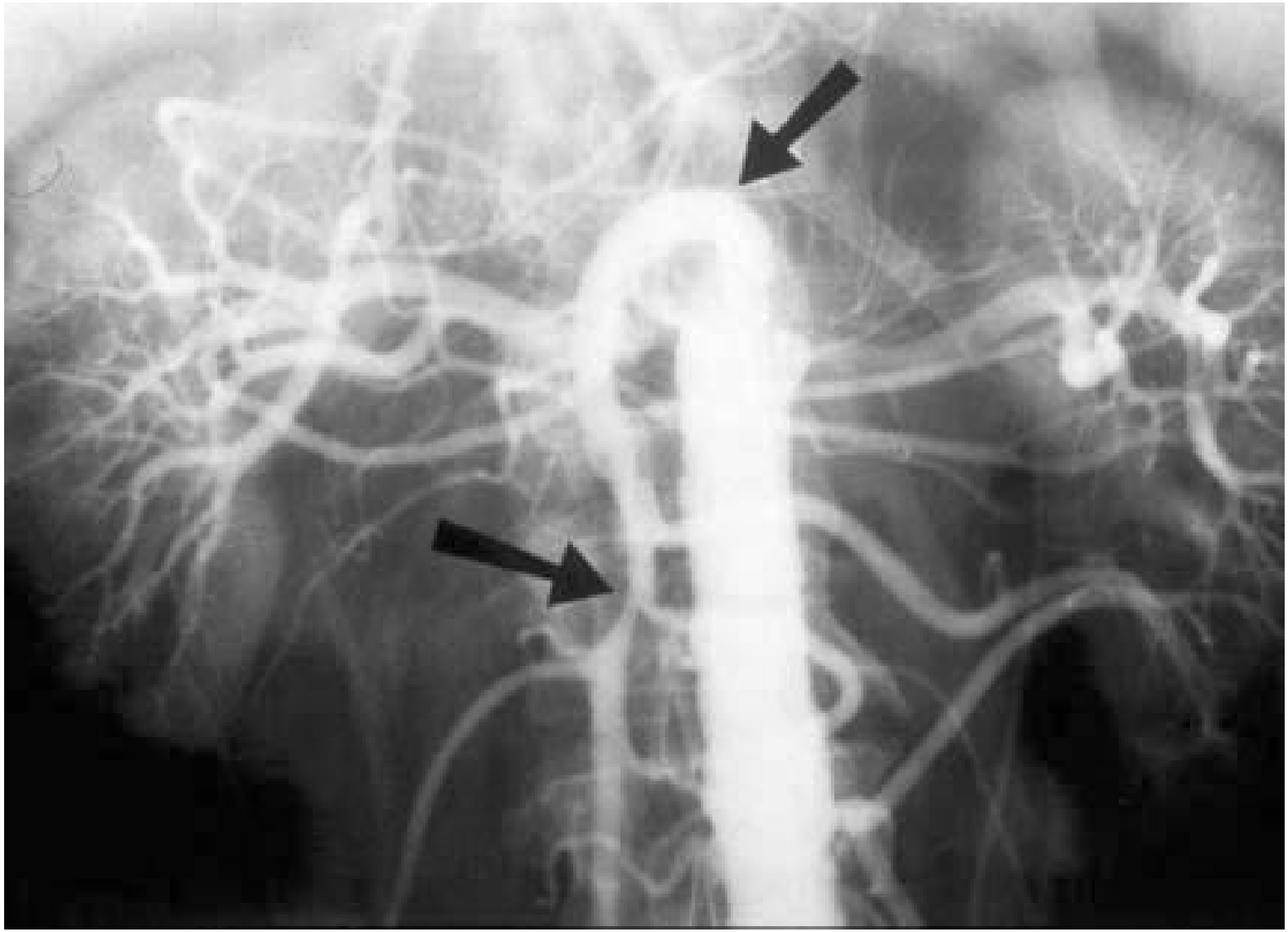
- Stenosis;
- Occlusion;
- Post-stenotic enlargement;
- Deformation of the main arteries.

Indirect signs of arterial disease

- Retrograde filling;
- Expansion of collaterals;
- Contrast delay;
- Reducing contrast;
- No reverse reset.

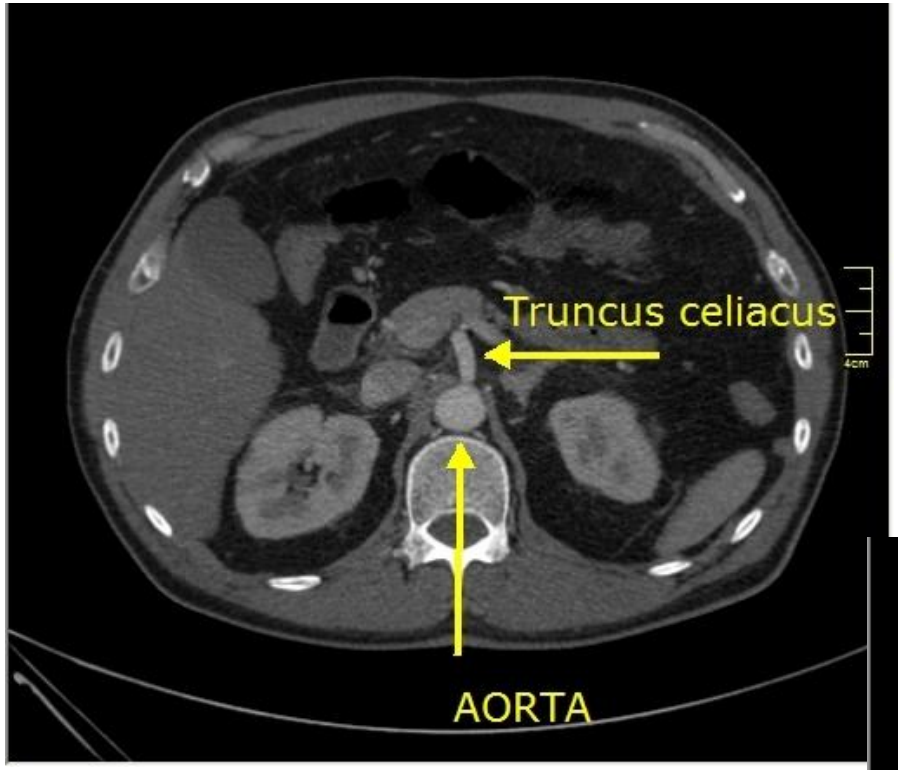
Angiographic signs of decompensation of blood flow

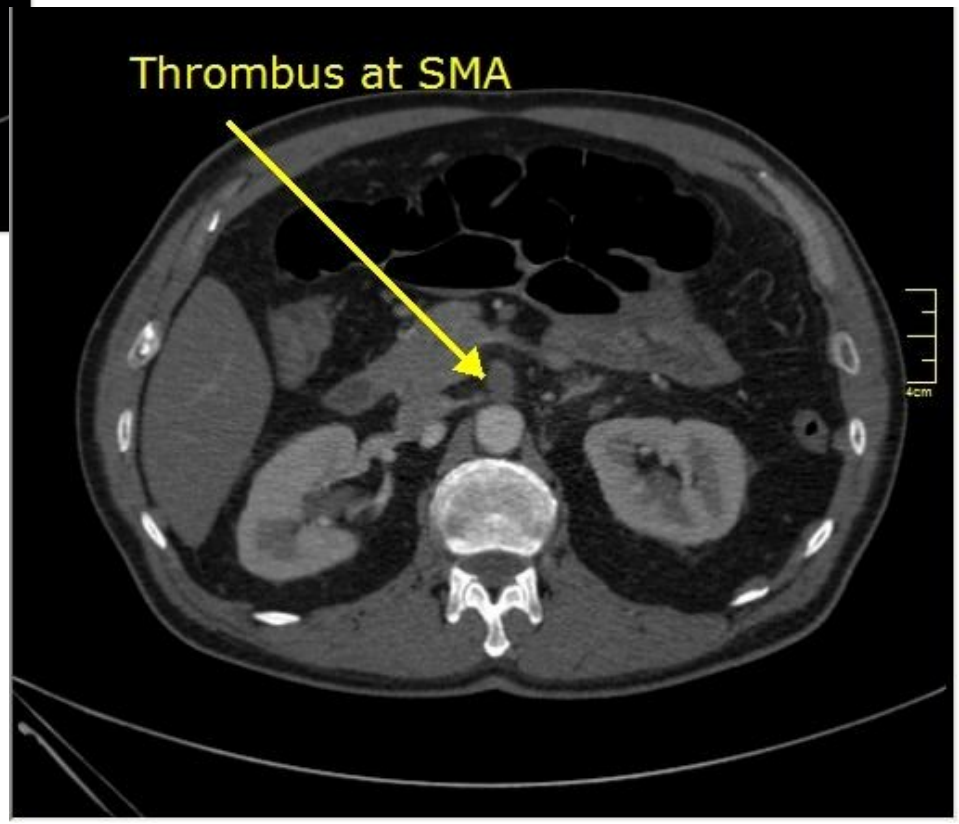
- Absence of filling of the trunk and branches of the mesenteric artery;
- Absence of capillary and venous phases in the switched off zone.



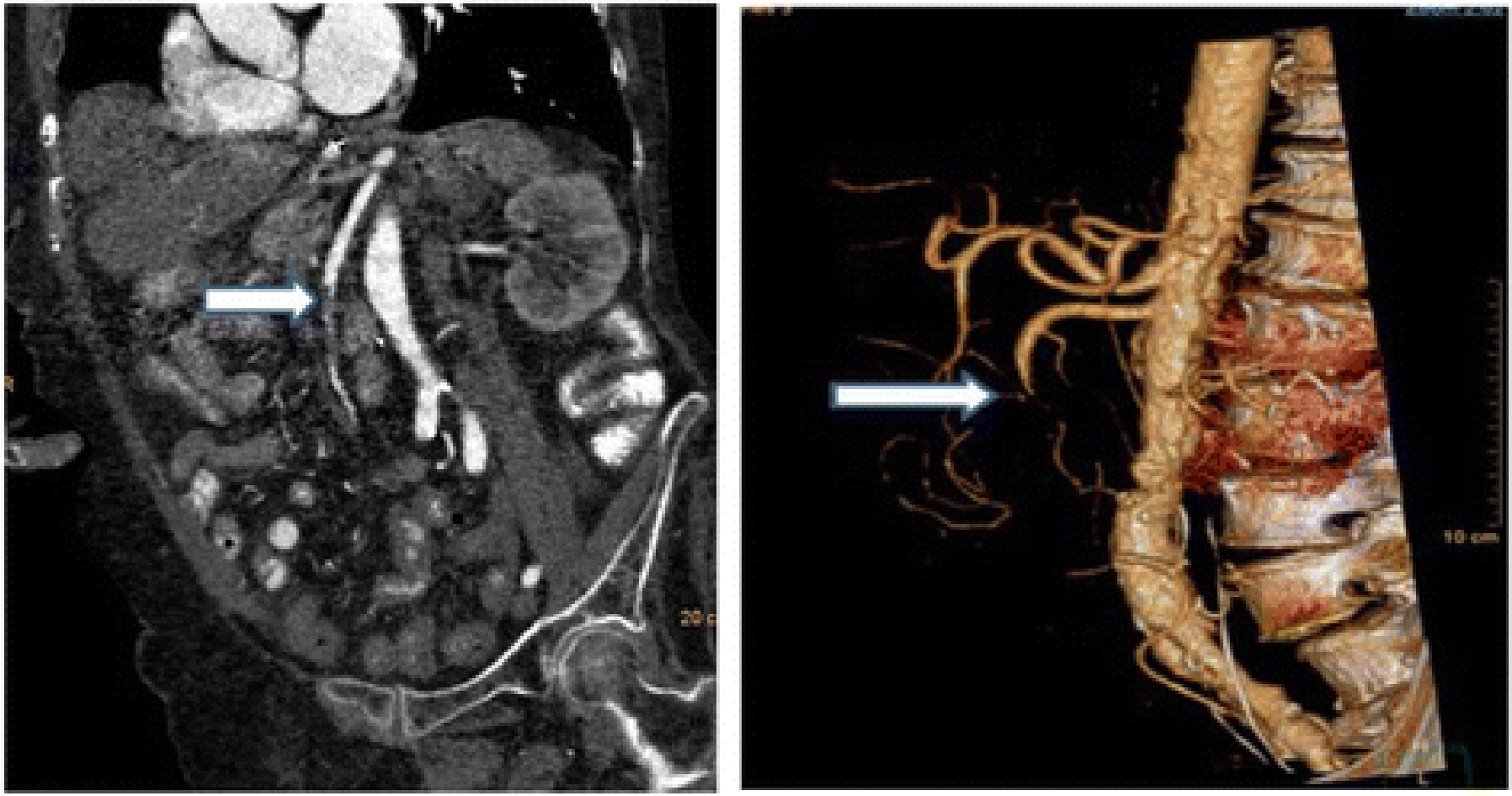
Computed tomography angiography (CTA) should be performed as soon as possible for any patient with suspicion for AMI. (Recommendation 1A)

The multi-detector CTA has supplanted formal angiography as the diagnostic study of choice. Multi-detector computed tomography (MDCT) scanners are essential for the early diagnosis of AMI, but often require specialized personnel to perform and interpret the findings

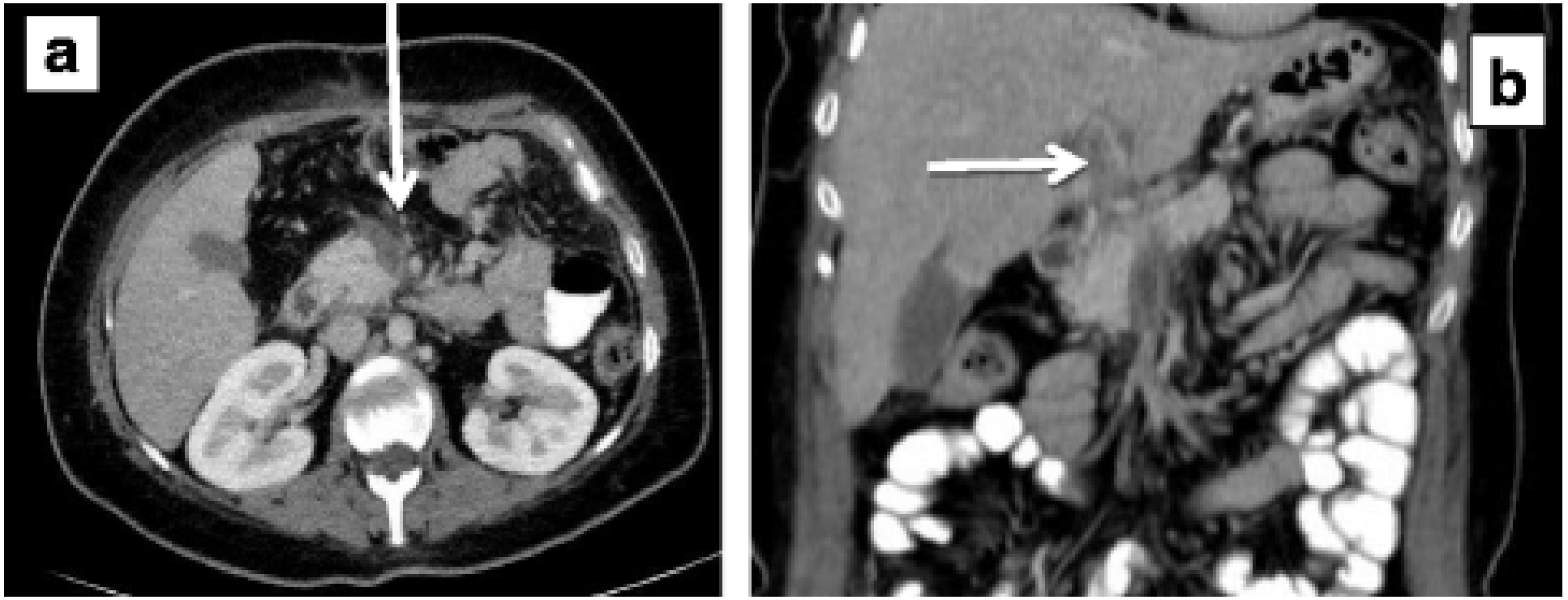

Truncus celiacus
AORTA


Thrombus at SMA


SMA thrombosis
4cm



Selected image from a CTA scan of a patient with acute mesenteric ischemia secondary to occluded SMA from an embolic source (arrow). 3D reconstruction is demonstrates mid occlusion of SMA (arrow)



30-year-old patient with acute superior mesenteric vein **a** and portal vein thrombosis **b** due to hypercoagulable state. No signs of bowel ischemia were noted,

Bala et al. World Journal of Emergency Surgery (2017) 12:38
DOI 10.1186/s13017-017-0150-5

World Journal of Emergency Surgery

REVIEW Open Access

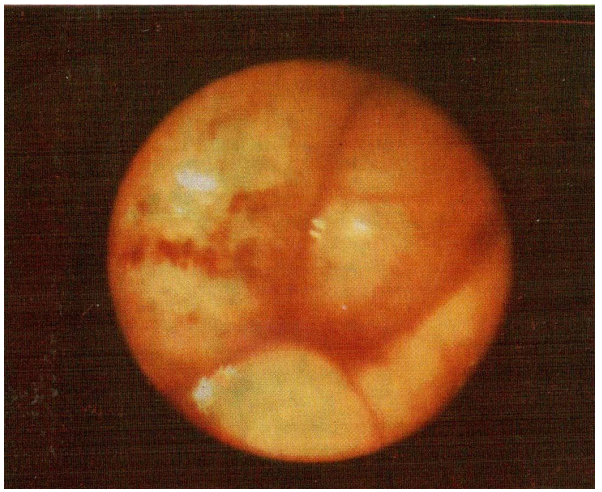
Acute mesenteric ischemia: guidelines of the World Society of Emergency Surgery

Miklosh Bala[1*], Jeffry Kashuk[2], Ernest E. Moore[3], Yoram Kluger[4], Walter Biffl[5], Carlos Augusto Gomes[6], Offir Ben-Ishay[4], Chen Rubinstein[7], Zsolt J. Balogh[8], Ian Civil[9], Federico Coccolini[10], Ari Leppaniemi[11], Andrew Peitzman[12], Luca Ansaloni[10], Michael Sugrue[13], Massimo Sartelli[14], Salomone Di Saverio[15], Gustavo P. Fraga[16] and Fausto Catena[17]

Non-occlusive mesenteric ischemia (NOMI) should be suspected in critically ill patients with abdominal pain or distension requiring vasopressor support and evidence of multi-organ dysfunction. (Recommendation 1B)

Laparoscopic semiotics

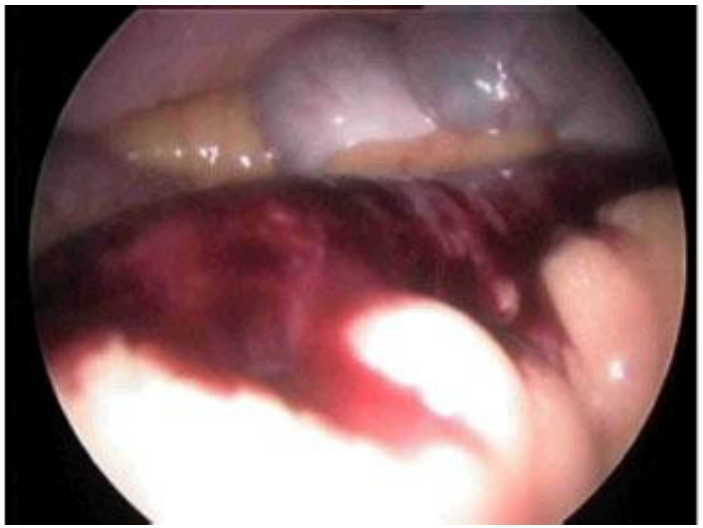
Ischemia



- Peritoneus smooth, shiny
- There is no effusion
- intestines pale pink
- Spastic peristalsis with the appearance of whitish serosa
- Disappearance of peripheral vascular pulsation
- A sharp decrease in the number of transverse blood vessels in the intestinal wall!

Laparoscopic semiotics

Infarction



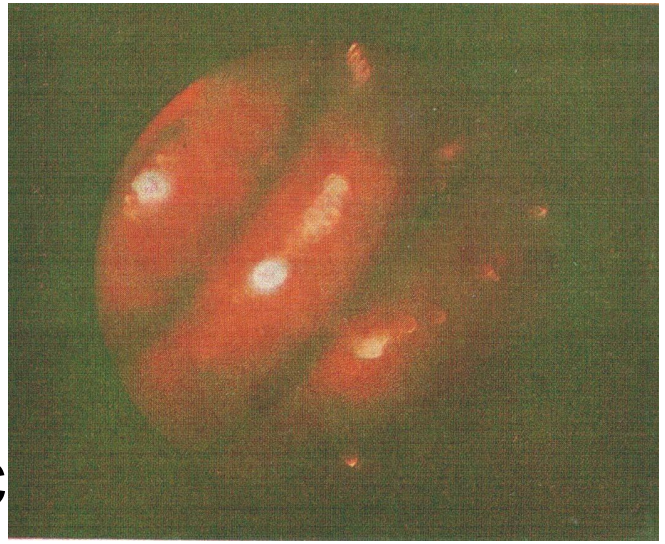
- Peritoneus smooth,

not shiny

- Exudation yellowish-orange
- Intestine in places spazmirovany, in places paretic, gray and red, with hemorrhages
- Peristalsis superficial, sluggish
- Vessels of serosa are only longitudinal

Laparoscopic semiotics

hemorrhagic infarction



- Hemorrhagic effusion
- The gut wall is red, edematic
- Peristalsis is absent
- The vascular pattern of the intestine is not visible
- Mesenteric vessels do not pulsate, venous congestion

Laparoscopic semiotics

Peritonitis

- A large amount of turbid, haemorrhagic effusion
- The peritoneum is dull, gray with fibrin
- The intestines are paretic, brown, black, green
- Peristalsis is absent

Finals

- Compensation - conservative therapy - recovery
- Subcompensation - chronic course (abdominal angina) - ulcers, enterocolitis, intestinal stenosis
- Decompensation - intestinal infarction - peritonitis.

Treatment

Surgical only

Place of therapeutic interventions - support.

STRATEGY DEPENDS ON STAGE

- restoration of mesenteric blood flow
- removal of nonviable gut sites
- struggle against peritonitis

DETERMINES OUTLET - early diagnosis

Preoperative period

- When the diagnosis of AMI is made, fluid resuscitation should commence immediately to enhance visceral perfusion. Electrolyte abnormalities should be corrected, and nasogastric decompression initiated. (Recommendation 1B)
- Broad-spectrum antibiotics should be administered immediately. Unless contraindicated, patients should be anticoagulated with intravenous unfractionacted heparin. (Recommendation 1B)

Preoperative period

- Recovery of the effective volume of circulating blood;
- Stabilization of cardiac activity;
- Correction of metabolic disorders;
- Reduction of intoxication.

Prompt laparotomy should be done for patients with overt peritonitis. (Recommendation 1A)

The goal of surgical intervention for AMI includes:

1) Re-establishment blood supply to the ischemic bowel.

2) Resection of all non-viable regions.

3) Preservation of all viable bowel.

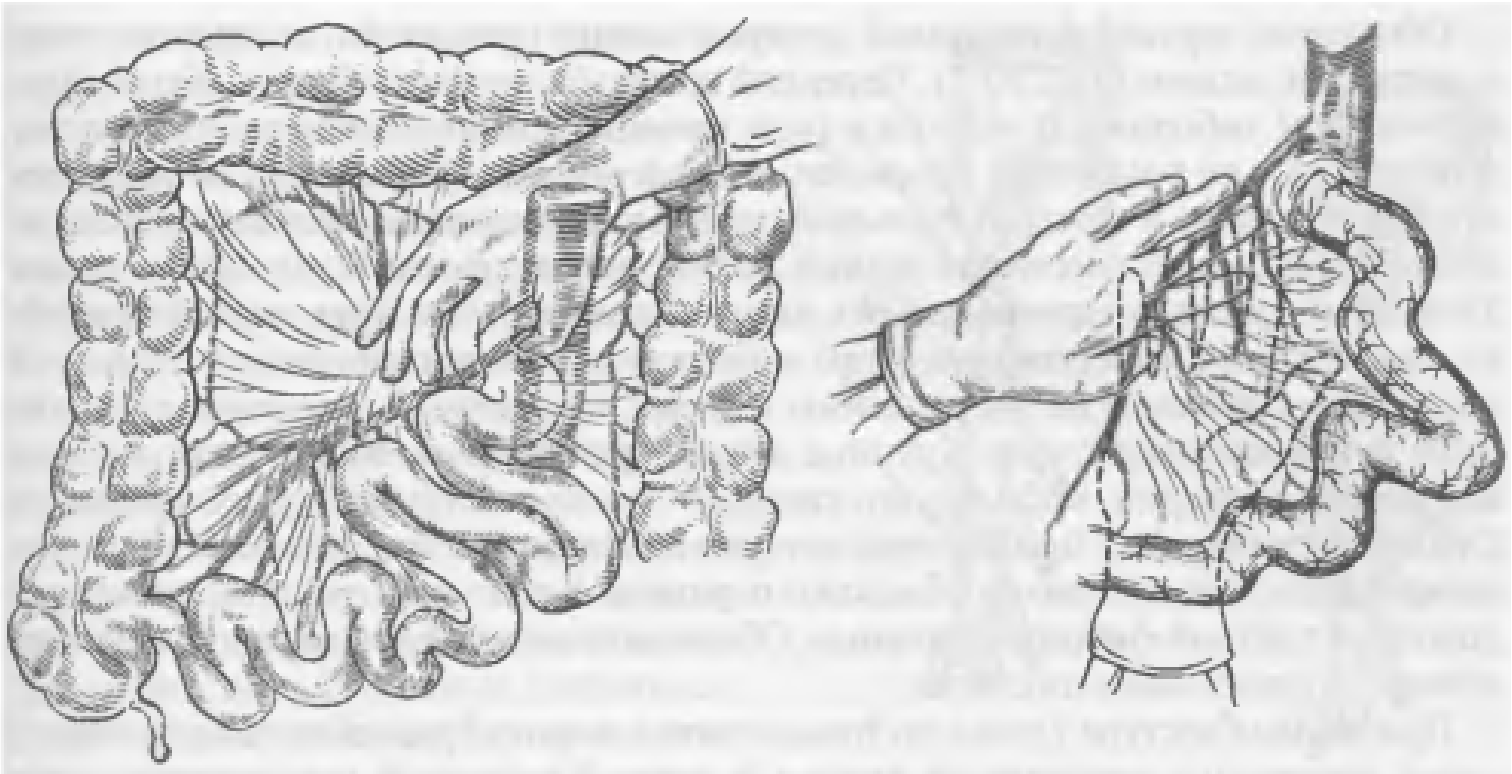
Types of surgical interventions

- Vascular surgery;
- Resection of the intestine;
- Combined interventions.

surgery

- Median laparotomy
- Revision (assessment of viability) of the intestine
- Revision of the main mesenteric vessels (palpation)
- Recovery of mesenteric blood flow
- Bowel resection, anastomosis application
- Sanitation, drainage of the abdominal cavity

Revision of the main mesenteric vessels

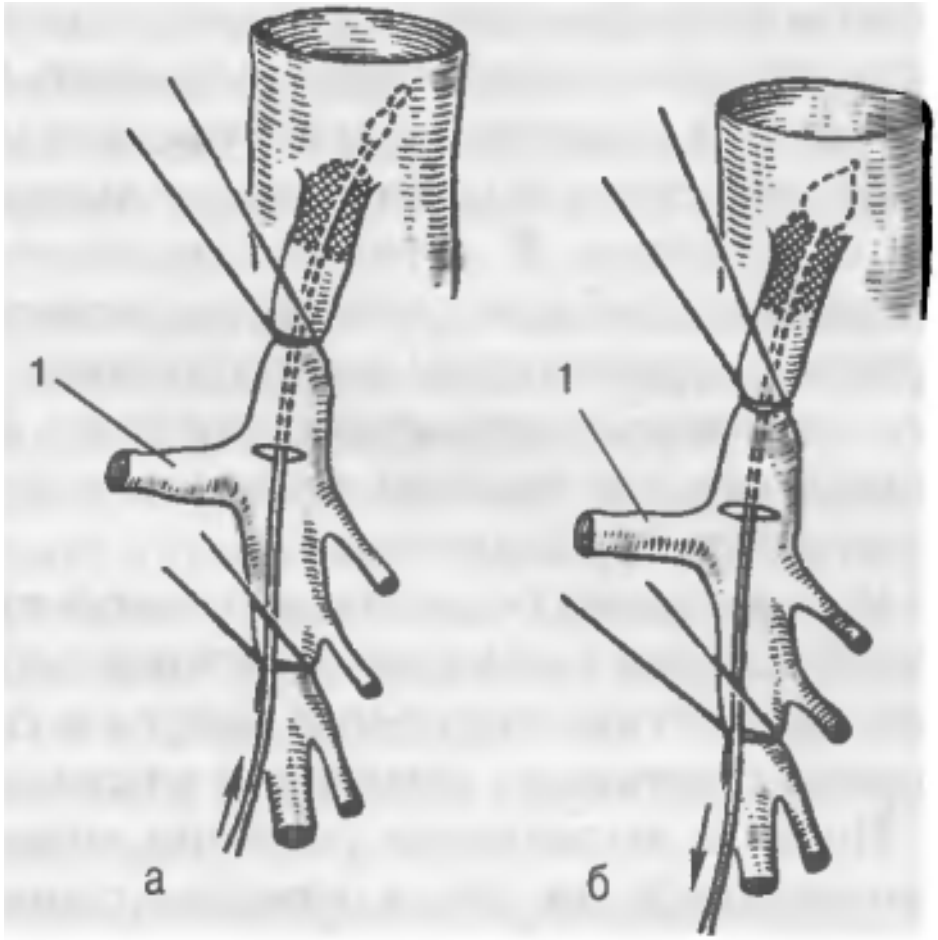


In cases of uncertainty, intraoperative Doppler may be helpful, as the presence of Doppler signals over distal branches of SMA facilitates bowel conservation, avoiding long-term disability.

Recovery of mesenteric blood flow

Embollectomy

- front access
- transverse arteriotomy
- embolectomy with Fogarty catheter
- suture of an arteriotomy
- novocaine blockade of the root of the mesentery



Recovery of mesenteric blood flow

Thrombectomy

* Unknown distal state

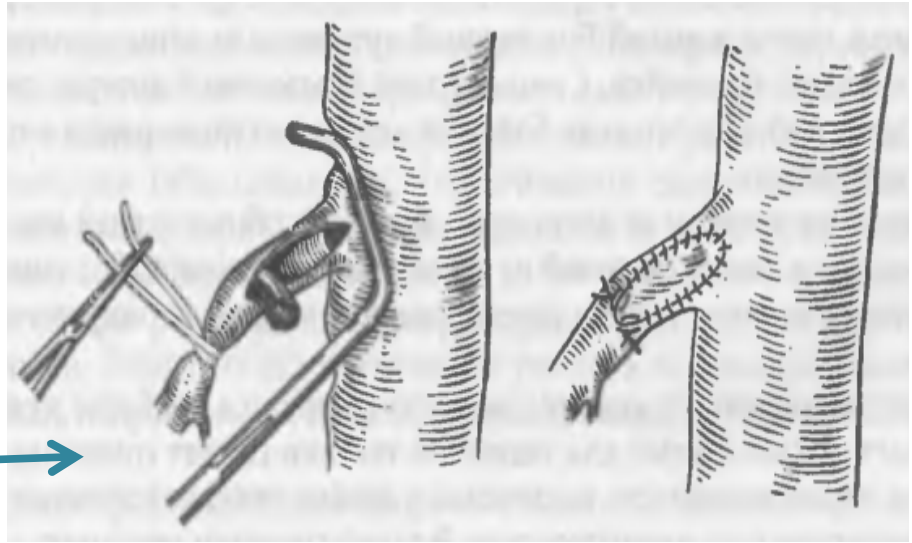
* rear access

•thrombinectomy + patch

•bypass shunting

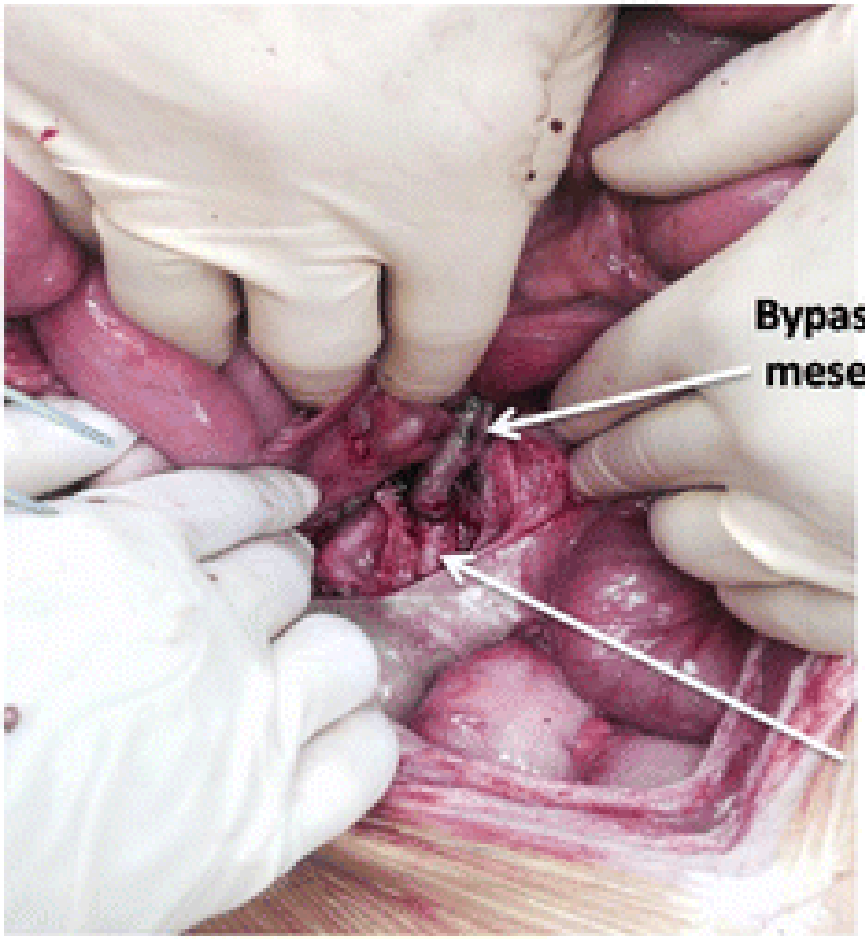
•reabsorption of SMA to the aorta

•prosthetics of the SMA



Vascular surgery

- Thrombintimectomy (with auto-vein plastic);
- Shunt operations;
- Prosthetics of the SMA;
- Thrombectomy of portal and mesenteric veins.
- Neither NOMI nor MVT typically require vascular repair.



Patient with acute thrombosis of SMA underwent left ileo–SMA bypass with a common femoral vein graft

Intestinal resection

Intestinal resection

- **Independent value**

1. **embolism / thrombosis of distal branches**
2. **restricted venous thrombosis**

- **After revascularization**

(requires effective revascularization before the onset of a intestinal infarction)

Intestinal resection

- The critical length of the remaining segment is 1 m
- deviate by 25 cm from the area of non-viable intestine to each side
- it is desirable to delay anastomosing for 2 days

Acute mesenteric ischemia: guidelines of the World Society of Emergency Surgery

- Endovascular revascularization procedures may have a role with partial arterial occlusion. (Recommendation 1C)
- Damage control surgery (DCS) is an important adjunct for patients who require intestinal resection due to the necessity to reassess bowel viability and in patients with refractory sepsis. Planned re-laparotomy is an essential part of AMI management. (Recommendation 1B)

Acute mesenteric ischemia: guidelines of the World Society of Emergency Surgery

- Full dose anticoagulation should be initiated on all patients prior to the surgical procedure. Unfractioned heparin is effective and easy to manage, especially in patients with acute kidney failure.
- It should be emphasized, however, that any evidence of bowel ischemia or infarction precludes the use of thrombolytic therapy

treatment after surgery

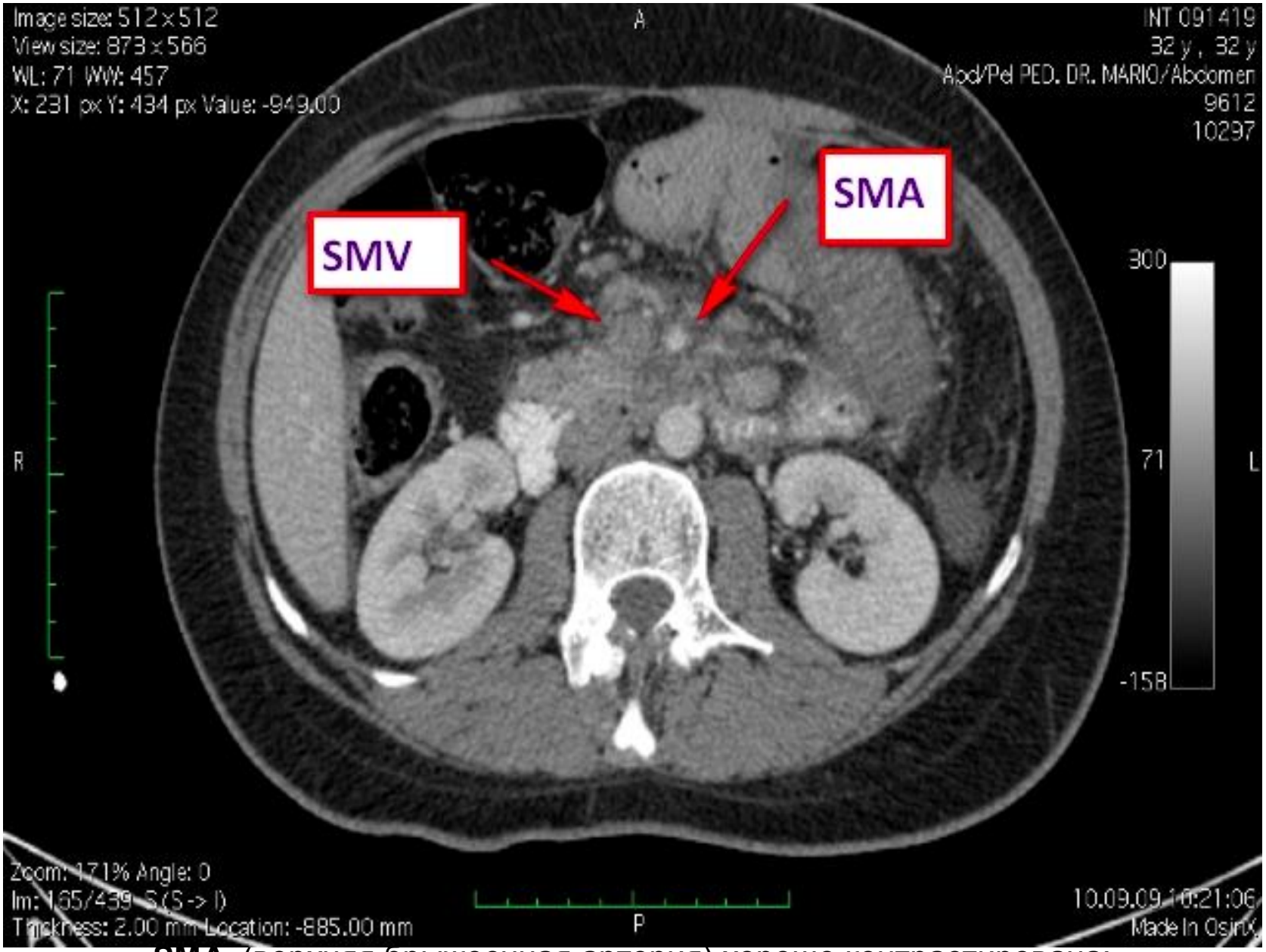
- Correction of hemodynamic disorders;
- Normalization of gas exchange;
- Correction of metabolic disorders;
- Replenishment of energy needs;
- Prevention and treatment of multiple organ failure;
- Treatment of intestinal paresis;
- Treatment and prevention of infectious complications
- Prevention of thrombosis
- Normalization of cardiac activity.

Prevention of complications

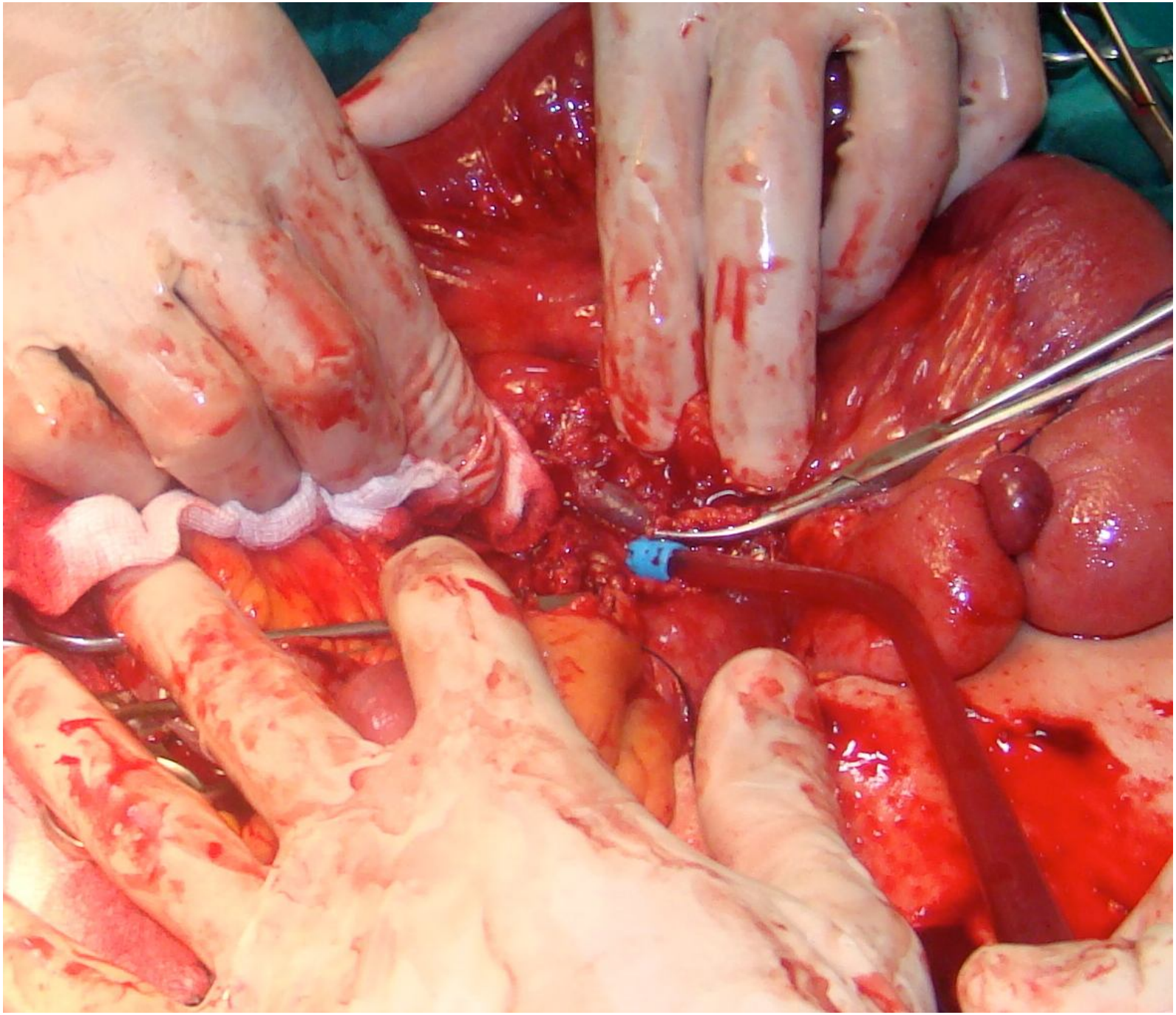
- Decompensation of pulmonary heart failure
- Reperfusion syndrome - toxic shock
- Pneumonia
- Pulmonary embolism
- Sepsis
- Continuing intestine gangrene

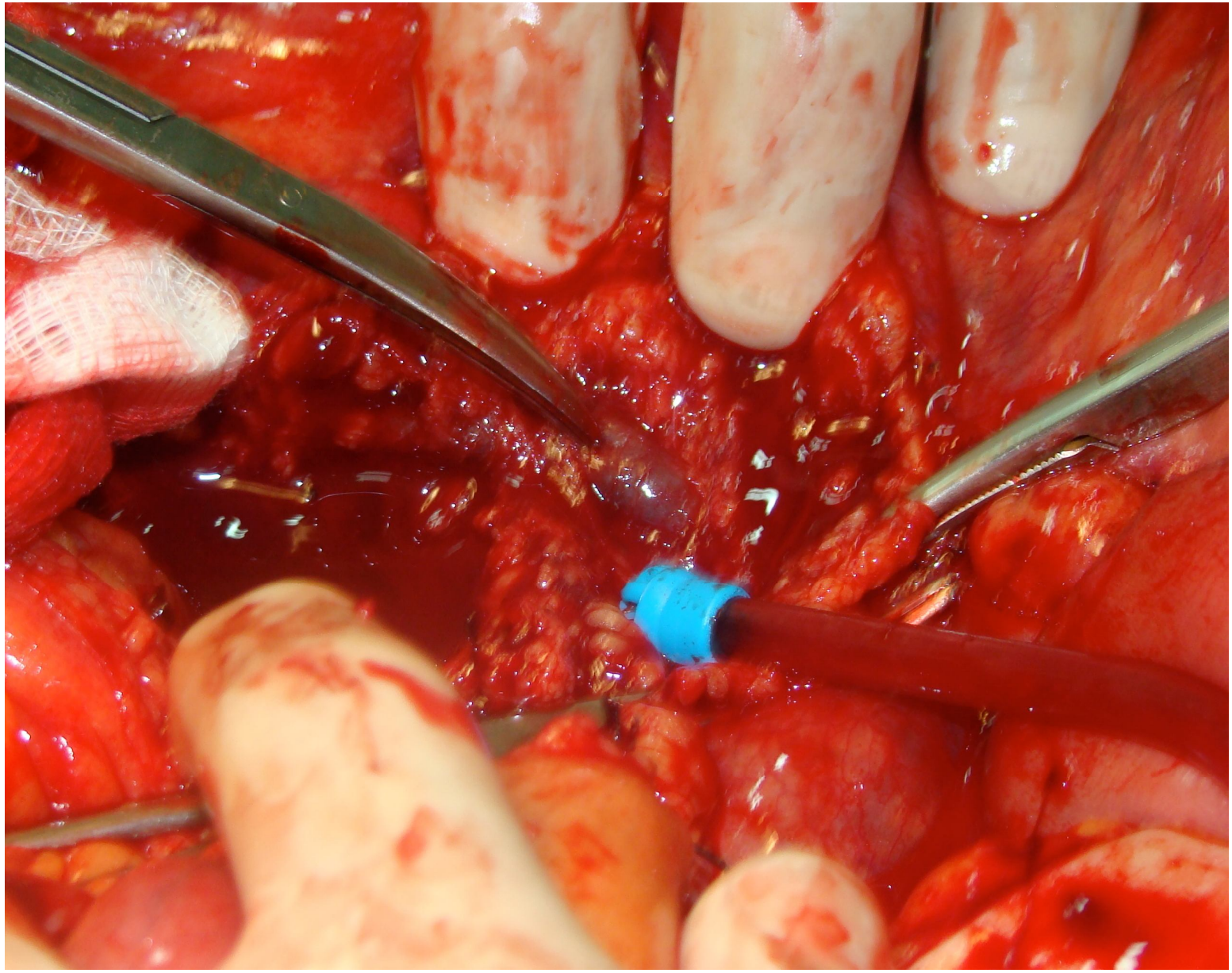
woman, 32 years old

- Hospitalized at night with severe diffuse pain in the abdomen.
- Panoramic X-ray of the abdomen - normal.
- Ultrasound - a lot of free fluid in the abdominal cavity, visceral organs without pathology.
- Pregnancy test - negative.
- The next day the patient's clinical condition worsened; pains increased, were not stopped by analgesics.



SMA (верхняя брыжеечная артерия) хорошо контрастирована;
SMV (верхне-брыжеечная вена) расширена,
контраст в просвете отсутствует - прямой признак тромбоза.





выполнена резекция участка тощей кишки с наложением анастомоза; верхняя брыжеечная вена была вскрыта, удалены все доступные тромбы

A woman, 85 years old, was diagnosed with intestinal bleeding.

- Thrombosis of the middle third superior mesenteric artery was detected.
- Diagnostic video laparoscopy - ischemic phase of thrombosis of mesenteric vessels.
- With angiography, the diagnosis was confirmed,
- Mechanical recanalization and installation of four stents in the main trunk, as well as in segments of the artery feeding the small intestine, were performed.
- The blood flow is restored, the small intestine is moderately hyperemic, and ceases.


ask:
mage:
un:
59:52

- Venous thrombosis - a fatal outcome in 32% of cases
- Arterial embolism - a fatal outcome in 54% of cases
- Arterial thrombosis - a fatal outcome in 77% of cases
- Mesenteric spastic ischemic syndrome - a fatal outcome in 73% of cases

Schoots IG, Koffeman GI, Legemate DA, Levi M, van Gulik TM (2004). «Systematic review of survival after acute mesenteric ischaemia according to disease aetiology».
The British journal of surgery 91 (1): 17–27.

Ischemic disease of the digestive system

- 1901 - Schnitzler, 1903 - Bacelli - introduce the concept of "Angina abdominalis"
- abdominal angina,
- visceral angina,
- intestinal angina,
- chronic ischemia of the intestine,
- intermittent anemic disperistaltic,
- intermittent angiosclerotic dyspragia,
- ischemic disease of the digestive system,
- abdominal ischemic syndrome.

Chronic abdominal ischemia

Intravasal factors

- Atherosclerosis
-nonspecific aorto-arteritis
-hypoplasia of the aorta and its branches
-fibromuscular dysplasia

Stages.

1. Relative compensation.

2.Subcompensation.

3.Decompensation.

Degree of arterial damage.

•Stenosis up to 50%.

•Stenosis more than 51%.

•Occlusion.

Prevalence.

Segmental (up to 1.5 cm).

Diffuse.

Localization.

- The celiac trunk.
- Upper mesenteric artery.
- Lower mesenteric artery.
- Multiple.

Clinical forms.

- Painful.
- Small intestine (enteropathy).
- Colon (colopathy).
- Mixed.
- steal syndrome

The most common cause is stenosis of the celiac trunk

- Blood flow -1,5 l / min
- Narrowing by 25% - <2 times
- Narrowing by 50% - 3 times
- Narrowing by 75% - 17 times!
- Clinical manifestations are observed with a decrease in blood flow by 20%

Clinical manifestation

- **In 1901, Schnitzler singled out a triad of symptoms:**
- **abdominal pain,**
- **bowel dysfunction,**
- **progressive weight loss.**

A.V. Pokrovsky (2004) identifies four forms of the disease:

- celiac (painful);
- proximal mesenteric - proximal enteropathy (small intestine dysfunction);
- distal mesenteric - terminal kolopatiya (preferably dysfunction left half of the colon);
- mixed.

The pain can be:

- cramped, aching, or blunt.
- not have a clear connection with the process of digestion.
- occur when walking or exercising.
- appear 15-30 minutes after eating and continue 2-2.5 hours (mesenteric form).
- have a periodic character.
- decrease with a sharp restriction of food intake.
- Appear after taking indigestible food.
- decrease after taking antispasmodics.
- decrease in the knee-elbow position (extravasal compression).

Pain localization:

- in the epigastric region (celiac trunk),
- in mesogastrium (the superior mesenteric artery)
- in the left iliac region (inferior mesenteric artery).

Bowel dysfunction

- heaviness in the abdomen,
- intestinal flatulence,
- diarrhea or constipation,
- stato- and creatorrhea.
- heartburn,
- eructation,
- feeling of a full stomach,
- nausea,
- vomiting.

- Progressive emaciation.
- Weight loss in patients during illness is sometimes up to 20-30 kg.

In the course of the disease, three stages are distinguished.

- Stage of compensation (asymptomatic) - there are no clinical manifestations.
- The stage of subcompensation - characterized by pain after eating, dyspepsia.
- The stage of decompensation - the symptoms are constant, intensified after taking a small amount of any food.

Oppression of the psychoneurological status

- asthenia (irritability, tearfulness, anxiety, anxiety),
- hypochondriasis (onkofobiya, cardiophobia, fear),
- depression.

Psychopathy is more pronounced in women

DIAGNOSTICS

- The variety of the clinical picture and the absence of specific symptoms make it difficult to diagnose early
- Complaints of persistent abdominal pain, their connection with food intake, emaciation, the defeat of other vascular pools, multiple examinations in various medical institutions, ineffectiveness of conservative treatment.
- Systolic murmur in the epigastric region - less than half of the patients. Noise appears with stenosis of the artery from 70 to 90%.

A number of tests based on provocation of pain syndrome by nutritional load

- Mikkelsen's test - within one hour the patient should drink 1 liter of milk. The appearance of pain testifies to the ischemic nature of it.
- The test of "forced feeding" - the patient is offered daily intake of high-calorie food (5000 kcal), which causes a typical clinic of intestinal ischemia.
- Nitroglycerin test is that a patient at the height of a painful attack is recommended to take a tablet of nitroglycerin under the tongue. If pain passes or decreases after 15-20 minutes, the test is considered positive.

DIAGNOSTICS

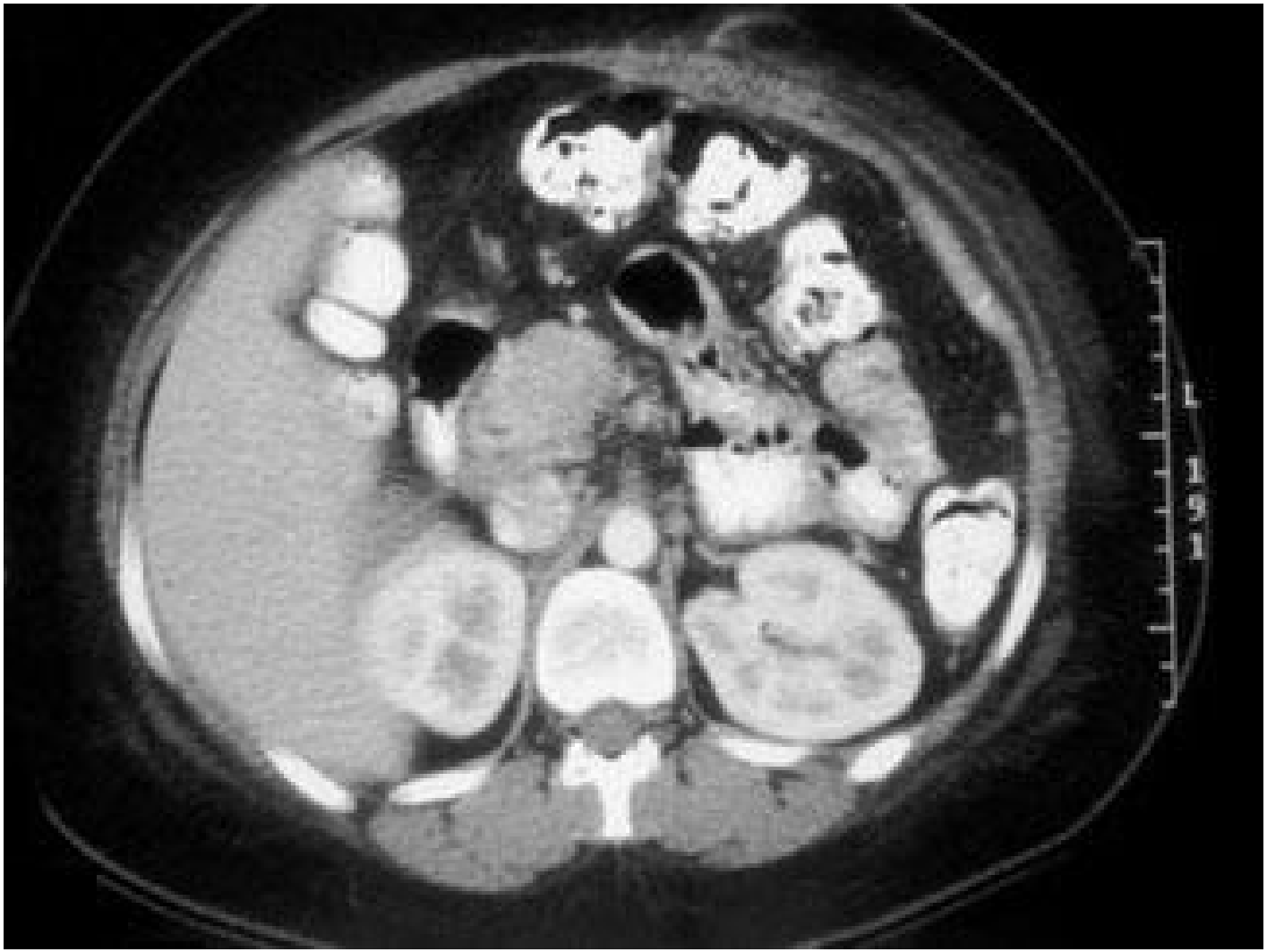
- general clinical analysis of blood, urine, feces;
- biochemical blood test;
- study of the lipid spectrum of the blood;
- research of thyroid hormones;
- study of the parameters of the blood coagulation system

DIAGNOSTICS

- Panoramic abdominal X-ray;
- ECG (for all patients),
- chest X-ray,
- Ultrasound of the abdominal cavity.
- CT, MRI
- Angiography

Ischemic stricture

cavernous alteration of the superior mesenteric vein as a consequence of venous thrombosis



Wandering artery
(radiographic
a sign of ischemia,
existing earlier).

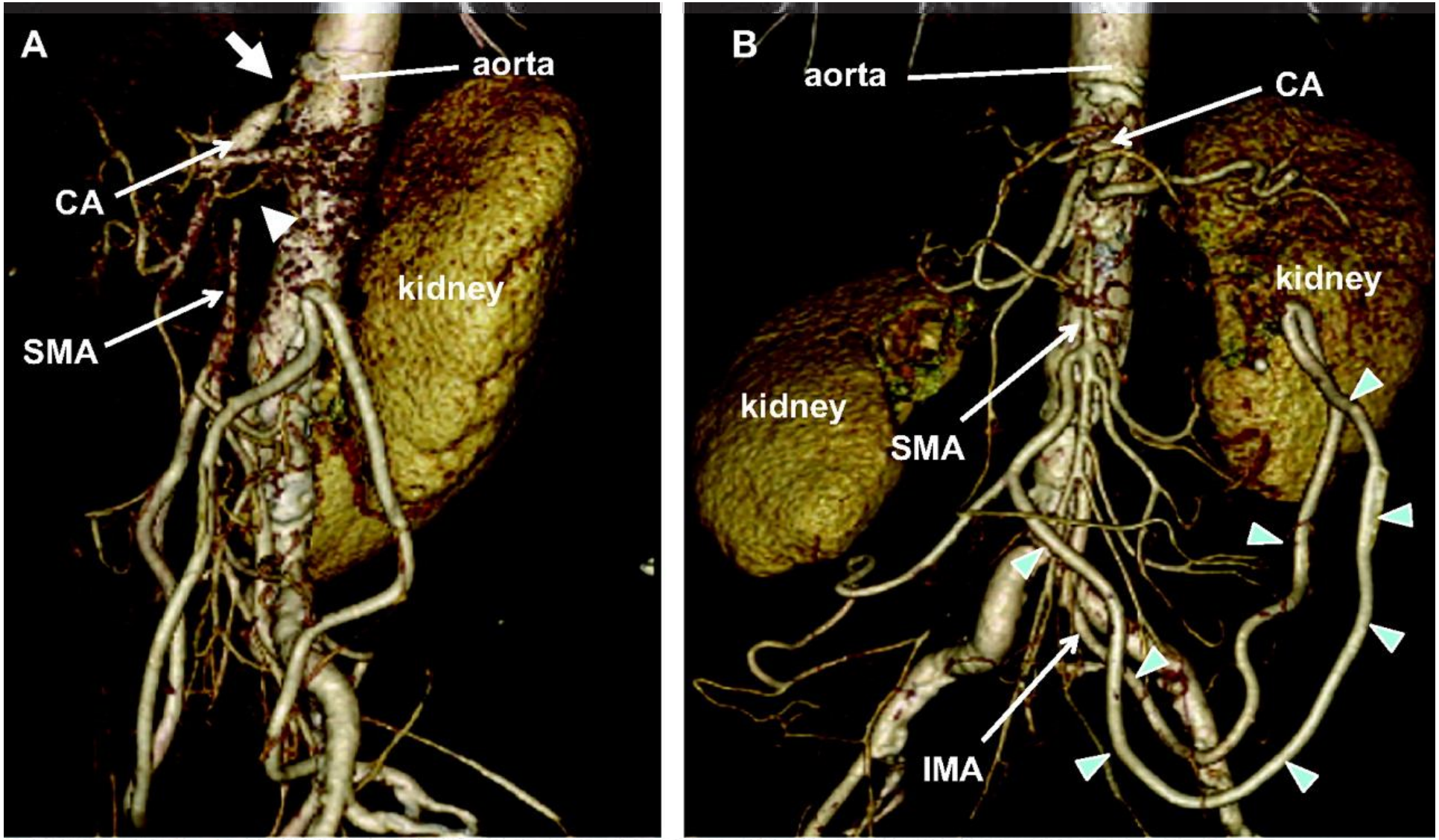


Рисунок 2. Трехмерная рентгеновская компьютерная ангиография (по P.B. Mensink et al. Gut doi:10.1136/gut.2009.199695)

The aim of the treatment is to restore the normal patency of the visceral arteries

- Conservative treatment is indicated for patients in the compensated stage and operated patients - for the purpose of rehabilitation in the postoperative period.
- In the stage of subcompensation, when you first consult a doctor, conservative treatment is usually also prescribed. It can be continued if it is effective.

Conservative treatment

- diet therapy,
- nitrates,
- antiaggregants,
- antisecretory drugs (omeprazole, etc.),
- statins,
- glucocorticoids, incl. pulse therapy with their high doses, often in combination with cytostatics,
- hemosorption, plasmapheresis.

three types of operations in the syndrome of chronic abdominal ischemia::

- conditionally-reconstructive (decompression);
- direct reconstruction;
- indirect reconstruction (creation of bypass grafts of blood flow).

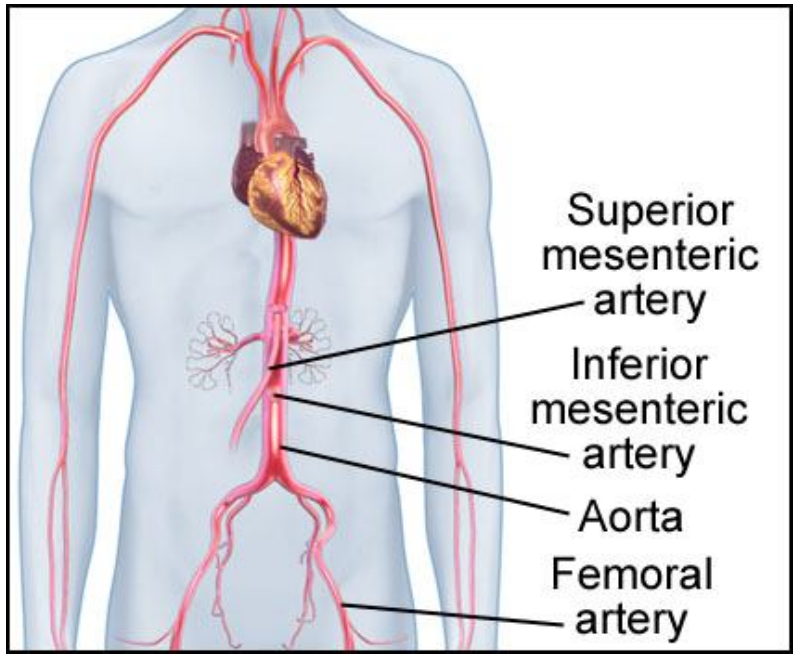
Conditionally reconstructive (decompressive) operations are performed with extravasal compression of the celiac trunk.

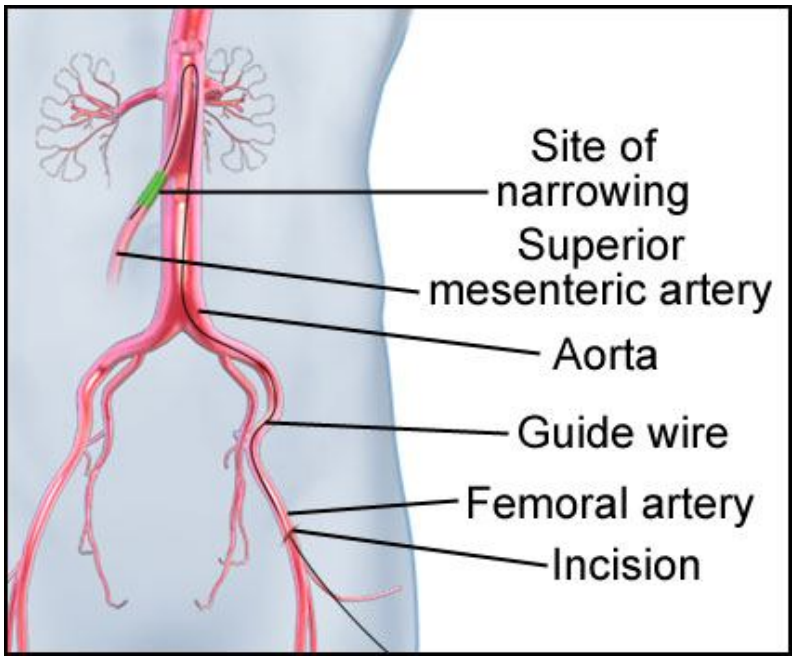
- Cutting of the crescent ligament of the diaphragm,
- the intersection of the medial stalk of the diaphragm (tsorotomiya),
- removal of ganglia and intersection of commissural branches of the celiac plexus,
- liberation of the artery from the fibrous case and elimination of the acquired compression factors (tumor, adhesions, fibrous cords, aneurysm).

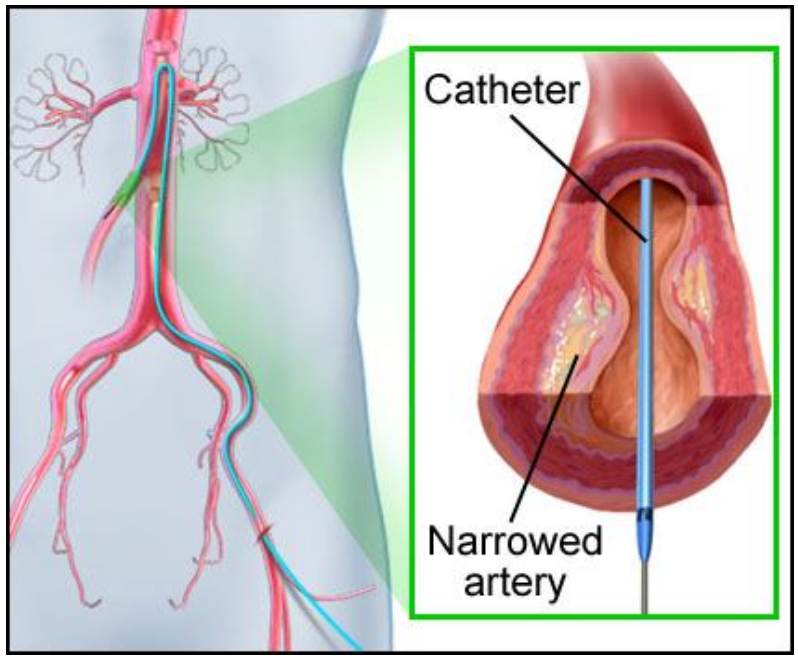
Reconstructive operations:

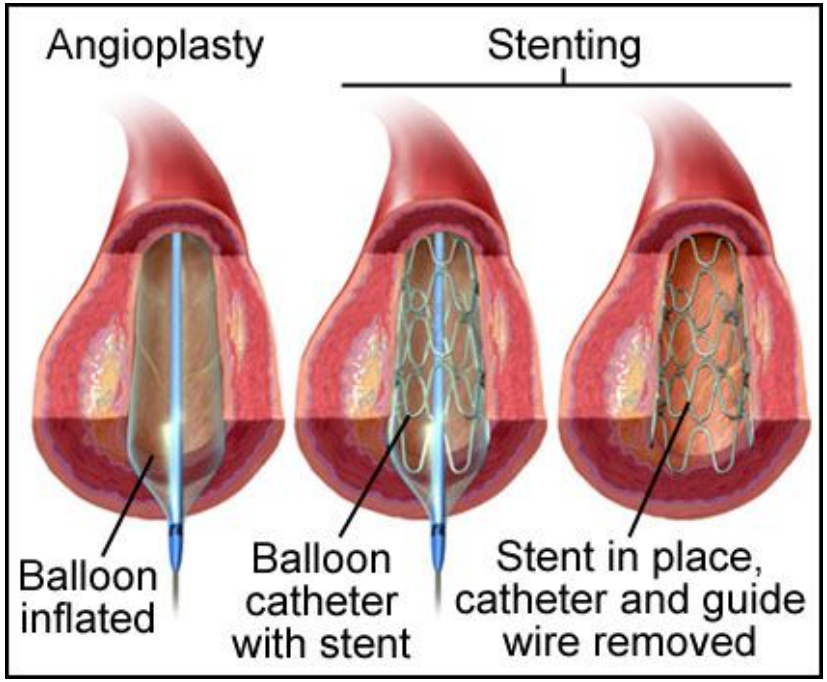
- endarterectomy;
- reimplantation (resection with reimplantation into the aorta);
- prosthetics;
- bypass surgery;
- balloon angioplasty;
- stenting.

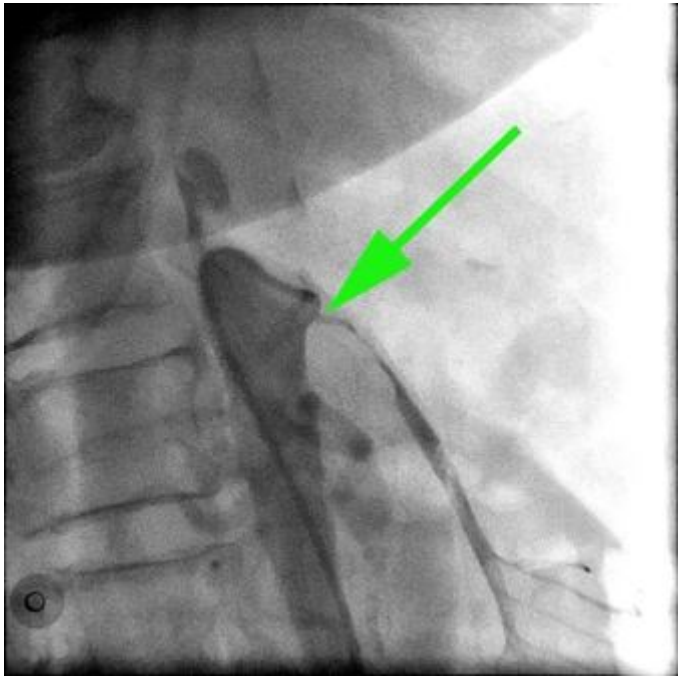
Endovascular interventions are indicated for atherosclerotic lesions of the celiac trunk and superior mesenteric artery


Superior mesenteric artery
Inferior mesenteric artery
Aorta
Femoral artery

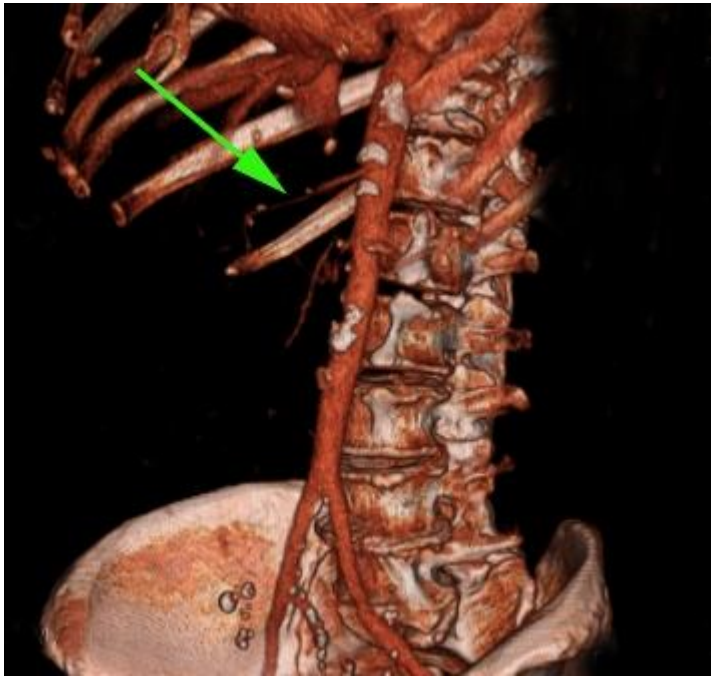

Site of narrowing
Superior mesenteric artery
Aorta
Guide wire
Femoral artery
Incision


Catheter
Narrowed artery


Angioplasty
Stenting
Balloon inflated
Balloon catheter with stent
Stent in place, catheter and guide wire removed

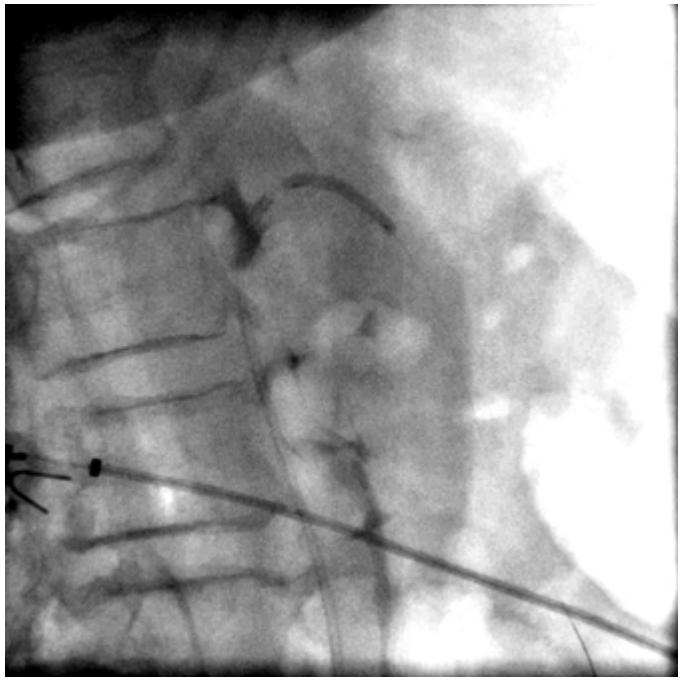


Ангиография.

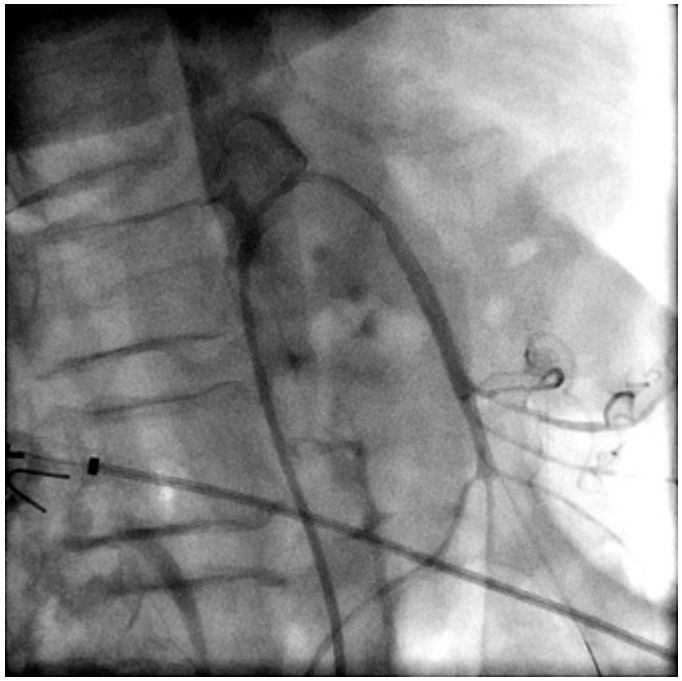


Компьютерная томография.
3D реконструкция.

The site of narrowing of the superior mesenteric artery is shown



Angiography. Stage of balloon dilatation of the upper mesenteric artery.



Angiography.
Result of treatment.
The superior mesenteric artery is passable.

SciMedCentral

Annals of Vascular Medicine & Research

Research Article

A Retrospective Study of the Effects of Iloprost Infusion on Peripheral Arterial Oxygen Saturation in Patients with Critical Limb Ischemia

Seyhan Yilmaz[1]*, Salih Ozcobanoglu[2] and Serdar Gunaydin[3]

[1]Department of Cardiovascular Surgery, Hitit Univer
Hospital, Turkey
[2]Department of Cardiovascular Surgery, Akdeniz Un
Hospital, Turkey
[3]Department of Cardiovascular Surgery, Ada Hospit

*Corresponding author
Seyhan YILMAZ, Department of Cardiovascular Surgery, Hitit University, Camlik str. No: 2- Corum, Turkey; Tel: 90-533-6838186; Fax: 903642230323; E mail: drlabarna@gmail.com

Submitted: 12 November 2014

Accepted: 22 December 2014

Published: 23 December 2014

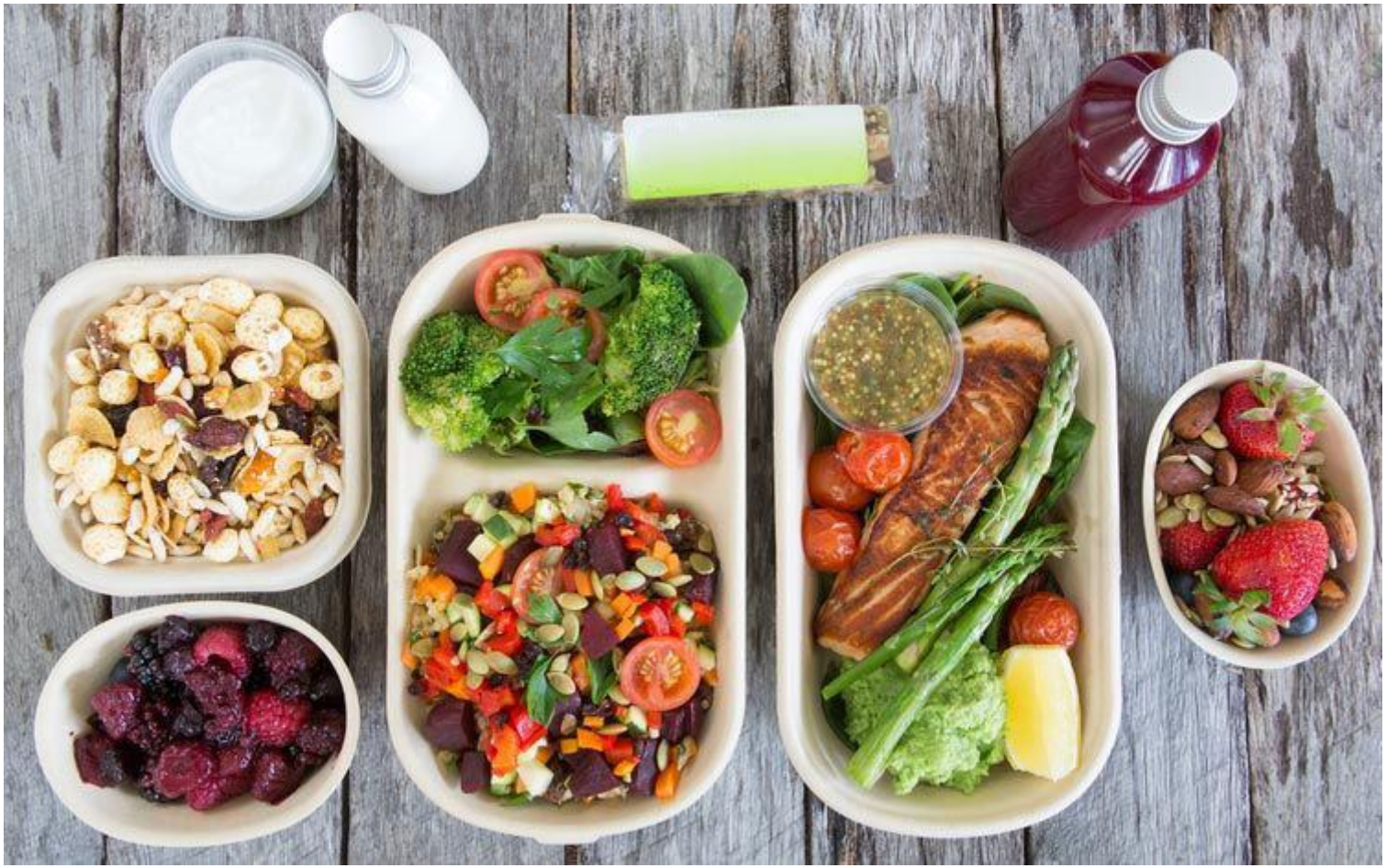
Keywords
- Pulse oximetry
- Iloprost
- Critical limb ischemia

Abstract

Purpose: To determine the usefulness of
iloprost infusion for treatment of critical limb isch

5-[Гексагидро-5-гидрокси-4-(3-гидрокси-4-метил-1-октен-6-инил)-2(1H)-пенталенилиден] пентаноевая кислота

Thank you for attention



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