FSBEI HE Prof. V.F. Voino-Yasenetsky KrasSMU MOH Russia
Department of faculty surgery named after professor Yu.M.Lubensky
Head of the Department: Dr.Med.Sc. Assoc.Prof. Zdzitovetskiy Dmitriy Eduardovich

DISEASES OF THE SMALL INTESTINE: CROHN'S DISEASE, DIVERTICULA, FISTULAE

Lecture for 4th grade students
in speciality 31.05.01 «General Medicine»

Cand.Med.Sc. Assoc.Prof. Borisov Roman Nikolaevich

Lecture plan

1. **Crohn's disease:**
   1. *Epidemiology*
   2. *Aetiology and pathogenesis*
   3. *Pathological morphology*
   4. *Clinical picture*
   5. *Diagnosis and differential diagnosis*
   6. *Principles of conservative therapy*
   7. *Indications for and principles of surgical treatment*
2. **Small intestine diverticula**
3. **Intestinal fistulae**

Definition

Crohn's disease is a chronic relapsing disease of the gastrointestinal tract with unclear aetiology characterised by transmural segmental distribution of the inflammation process with development of local and systemic complications.

Epidemiology

Recently, growth in the incidence of ulcerative colitis and Crohn's disease has been registered in economically developed countries.

Primary incidence of Crohn's disease: 2-4 subjects per 100,000 population per year.

Prevalence: 30-50 cases per 100,000 population.

USA: 1.5 mil. patients.

Russia: no official statistics available.

Pioneers

Dr. Burril B. Crohn

- The disease is named after an American physician Bernard Burrill Crohn who was the first to describe its symptoms in 1932 (together with Gordon D. Oppenheimer and Leon Ginzburg) basaed on 14 clinical observations

Pioneers

Further observation showed that the inflammation process analogical to one described by Crohn also impairs:

- small intestine, caecum and the ascending colon тонкую кишку, слепую и восходящую ободочную кишки (B. Crown, 1949),
- stomach and duodenum (H. Fahimi et al., 1963),
- oesophagus (N. Dyer et al., 1969)
- in isolation: large intestine as well as the anal canal (H. Lockhart-Mummery et al., I960, 1964)

Aetiology: Bacteria.

Mycobacterium paratuberculosis

Pro: the similarity between the clinical picture of Crohn's disease and intestinal tuberculosis as well as the presence of granulomas.

Contra: the absence of mycobacteria in the granulomas, negative attempts to infect guinea pigs, negative Mantoux test and uselessness of antitubercular therapy.

Aetiology: Viruses.

Measles virus

Pro: capable of inducing vascular disorders in the intestinal wall that define the peculiarity of the clinical picture.

Contra: modern virological tests do not make it possible to detect the measles virus in the intestinal tissues.

Aetiology: Autoimmune theory.

- There is increased production of antibodies and a shift in the ration between IgG and IgA with elevation of IgG production.
- Increase in local production of antibody may mediate the effector functions (complement activation, cellular cytotoxicity).
- A large number of different factors participate in activation of B-lymphocytes and control over their functions.
- The absence of proliferation response of T-cells of the mucosa-associated lymphoid tissue (MALT) may serve as a confirmation of their regional suppression.

Aetiology: Genetic theory.

- Scholars from Harvard Medical School have revealed the role of XBP-1 gene in development of Croihn's disease and ulcerative colitis.
- The research group worked using mice. The experimental mice had this gene deleted from the epithelial cells: the anterior line of intestinal mucosa, on which the immune response forms to the presence of different microorganisms residing in the bowel.
- It has been revealed that the experimental mice spontaneously developed an inflammatory intestinal disease resembling Crohn's disease.

Aetiology: Genetic theory.

- The insufficiency of this gene impaired the interaction of the bowel walls with the intestinal flora and lead to an incorrect immune response and a subsequent disease.
- In Crohn's disease and non-specific ulcerative colitis, epithelial cells assume a strategic position between the intestinal bacteria and the human immune system.
- Epithelial cells are directly involved in the process of disease development if there are certain genetic abnormalities.

Pathological morphology. Macroscopic changes.

- Diameter of the intestine is not enlarged.
- In separate areas, it is possible to reveal narrowing of the intestine.
- The serous membrane is heterogeneously plethoric, nebulous in different loci, with infrequent small round tubercles (granulomas).

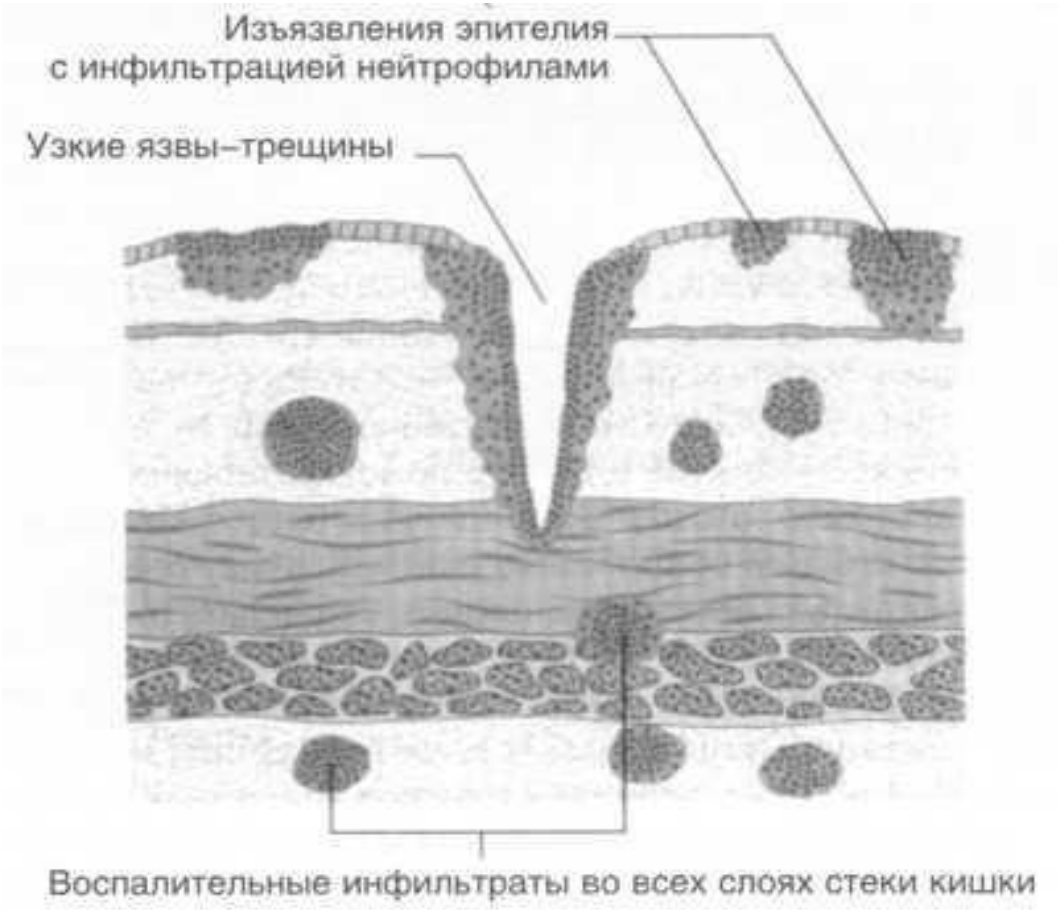
Pathological morphology. Macroscopic changes.

- In the lesions, there are deep narrow ulcers with even edges resembling knife cuts.
- The ulcers are usually distributed along and transversely to the axis of the intestine, have even non-undermined edges, areas of oedematous mucosa retained between them, and give the intestinal surface similarity with a cobblestone boulevard.

Pathological morphology. Macroscopic changes.

- There is segmental impairment of the intestine with narrowing of the lumen with the length of 5-15cm (the “suitcase handle”); the intestinal wall is not change above and below such a segment.
- Sometimes, the narrowed segments have a greater length and a thickened wall, which gives them a resemblance of a water hose. Oftentimes, such segments are located in the small intestine.
- A very characteristic feature is the presence if several impairment areas separated by a non-changed mucosa.

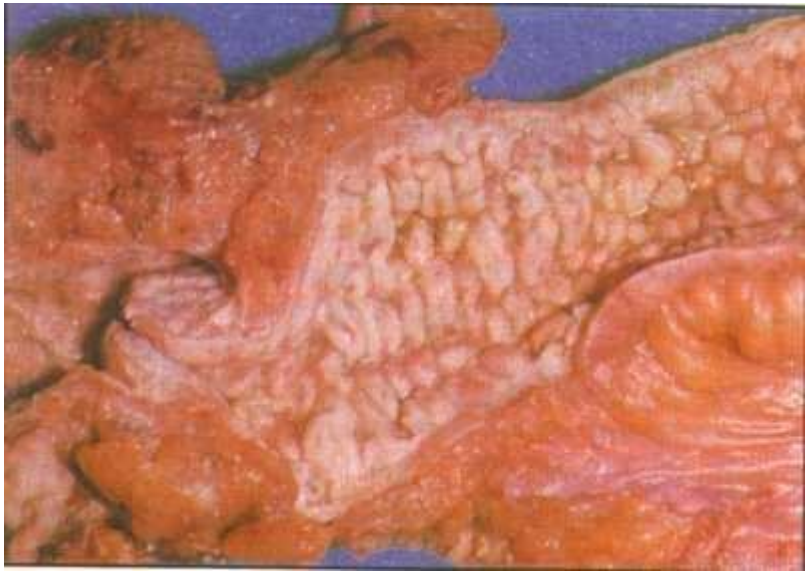
Scheme of intestine impairment in Crohn's disease



Pathological morphology. Macroscopic changes

- The ileum lumen is opened with multiple aphthous ulcerations are visible on its mucosa.

Pathological morphology. Macroscopic changes



- The lumen of the terminal section of the ileum is opened. The "cobblestone boulevard" changes of the mucosa are clearly visible.

Pathological morphology. Macroscopic changes

- The ileum with characteristic bands: the "suitcase handle". The impaired segments of the intestine are separated from relatively healthy segments.

Pathological morphology. Macroscopic changes

- The same preparation: the intestinal lumen is opened in the band area.
- The intestinal wall is thickened due to fibrosis and the intestinal lumen is narrowed: such stenosis in Crohn's disease may lead to bowel obstruction!

Pathological morphology. Macroscopic changes

- Interintestinal fistula (iliac-sigmoid) in Crohn's disease

Pathological morphology. Microscopic changes

- The spread of inflammatory infiltration onto all layers of the intestinal wall (transmural inflammation).
- Lymphocytes are predominant in the infiltrate with somewhat smaller amounts of plasma cells, eosinophils and singular segmentonuclear leucocytes.

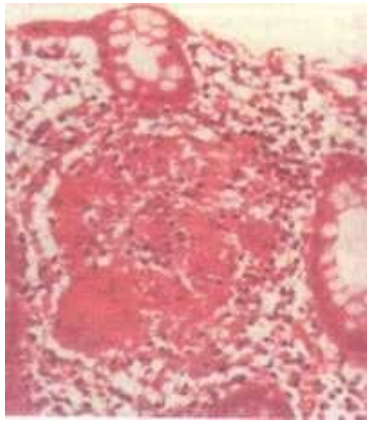
Pathological morphology. Microscopic changes

- A characteristic feature is the presence of granulomas. However, they are relatively rarely detected via microscopy (in less than 50% of cases even in the surgical specimen).
- Granulomas in Crohn's disease resemble their counterparts in sarcoidosis, which is why they are called "sarcoid".
- Typical granulomas are located in isolation and do not form large conglomerations.

Pathological morphology. Microscopic changes

- Granulomas consist of epithelioid and Pirogov-Langhans giant cells surrounded by a belt of lymphocytes, do not have clear borders and a fibrous rim characteristic to sarcoidosis. As contrary to tuberculous granulomas, caseous necrosis in them is absent.
- Examination of biopsy specimen only allows diagnosis of Crohn's disease in 23-30% of cases and granulomas are only discovered in 14-19% of cases.

Pathological morphology. Microscopic changes



Microscopic slide No.1.
Crohn's disease: sarcoid granuloma in the small intestine wall.

Microscopic slide No.2.
Crohn's disease: a fissure-like ulcer through almost the entire wall of the small intestine.

Classification by Bocus (1976 г.)

Forms of the disease

- Jejunitis
- Ileitis
- Jejunoileitis
- Enterocolitis
- Granulomatous colitis
- Impairment of the anal area
- Pan-regional impairment of the intestine with involvement of the upper part of the gastrointestinal tract (stomach, duodenum)

Classification by V.D. Fedorov (1982)

Forms of the disease

- Enteritis
- Enterocolitis
- Colitis

Classification by the severity

- Mild
- Moderate
- Severe

Classification by the complications

- Intestinal obstruction
- Infiltrates and abscesses in the abdominal cavity
- Intestinal fistulae
- Perforation into the abdominal cavity
- Intestinal bleeding
- Toxic megacolon

Frequency of impairment of different parts of the digestive tract

- Isolated impairment of the small intestine is observed in 25-30% of Crohn's disease cases.
- Ileocolitis: 40-50% of cases.
- Isolated impairment of the large intestine: 15-25%.
- The terminal part of the ileum is involved into the process in approximately 90%.
- Inflammation in the rectum is revealed in 11-20% of patients with Crohn's disease; anorectal impairments (anal fissures, fistulae, abscesses) occur much more frequently (30-40% of cases).
- Oesophagus, stomach and duodenum are rarely impaired: only in 5-7% of patients.

Frequency of impairment of different parts of the digestive tract

- In Crohn's disease, any parts of the GIT may be impaired: from the oral cavity to the anus.
- In the great majority of cases, the pathology initially appears in the ileum and then spreads to other parts of the GIT.
- The ileocaecal part is impaired most often.

Clinical picture: Symptoms

- Abdominal pain
- Bleeding
- Diarrhoea

Local symptoms: Pain

- Abdominal pain is a classical symptom in Crohn's disease and occurs in 85-90% of the patients.
- Recurrent pain in the right lower quadrant of the abdomen is characteristic.
- May copy the picture of acute appendicitis or intestinal obstruction.
- Strong pain may be absent and the main manifestations of the disease are the sensation of discomfort, heaviness in the abdomen, bloating and moderate cramping pain.

Local symptoms: Diarrhoea

- Diarrhoea is observed in 905 of the patients.
- If only the small intestine is involved into the process, the frequency of defecation varies between 2-5 times per day and 3-10 times per day in case of enterocolitis.
- The consistency of stool is more often mushy than liquid.
- Severe diarrhoea is observed in patients with widespread impairments, e.g. in jejunoileitis.

Clinical picture: General symptoms

- Fever
- Weakness
- Body mass decrease

Clinical picture: Extraintestinal manifestations

- Acute arthropathy
- Sacroiliitis
- Episcleritis and uveitis
- Erythema nodosum
- Pyoderma gangrenosum

Complications:

Anal and perianal impairments

- Indolent paraproctitis, anal fissures and fistulae.
- Anal fissures in Crohn's disease are distinguished by the indolent course and slow regeneration.
- Rectal fistulae are formed as a result of spontaneous or surgical opening of the perianal or ischiorectal abscesses.

Complications: Bleeding

- Source: deep fissure-like ulcers within a certain part of the intestinal wall.
- Massive intestinal bleeding considered as complication of the disease are registered in 1-2% of the patients.
- Massive bleeding is more characteristic for impairment of the large bowel.
- In case of localisation of bleeding in the small or large intestine, it is necessary to perform differential diagnosis with ulcerative colitis, ischaemic colitis, angiodysplasia, cancer and haemorrhoids.

Complications: Perforation

- Perforation into the free abdominal cavity is a more characteristic complication of ulcerative colitis.
- Acute abdomen signs may be unclear due to hormone therapy.
- Free gas in the abdominal cavity is not always possible to register through survey X-ray.
- The diagnosis is often confirmed through immediate laparotomy.
- The majority of perforations is located at the side opposite to the mesenteric edge of the intestine.

Complications: Toxic dilatation

- Observed extremely rarely.
- Provoked by the intake of anti-diarrhoeal medicines, lower gastrointestinal series or colonoscopy as well as by infection.
- Often associated with late diagnosis of the disease.

Complications:

Infiltrations and abscesses

- Frequently observed in Crohn's disease with predominant localisation of the process in the right iliac area.
- The high frequency of this complication necessitates introduction of Crohn's disease into the differential diagnosis list together with appendicular infiltration, cancer and tuberculosis in case of right-sided localisation and with cancer and diverticulitis in case of the left-sided one.

Complications:

Intestinal obstruction

- A pathognomonic complication of Crohn's disease, especially if the changes are localised in the small intestine.
- Inflammation of the intestinal wall, oedema, and subsequent cicatricial changes in the intestine lead to narrowing of the lumen and disorder in passage of intestinal contents.
- As a rule, development of complete small and large bowel obstruction is not observed, which makes it possible to choose the expectant management of obstruction in Crohn's disease.

Principles of diagnosis

- Radiological examination
- Endoscopy
- Biopsy with histological analysis
- Ultrasound
- CT
- Fistulogram

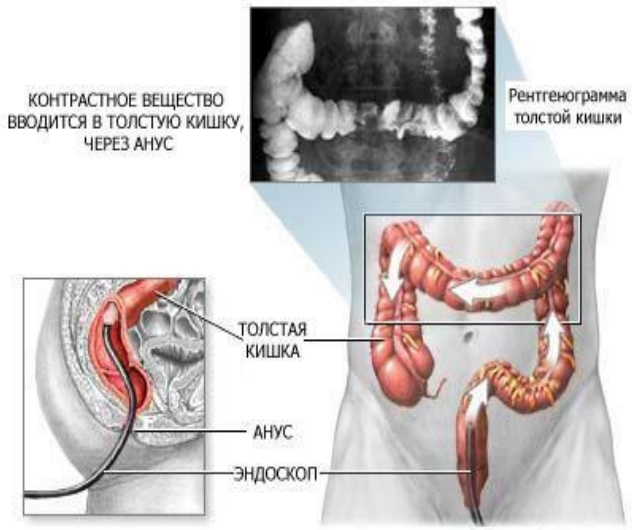
Radiological examination

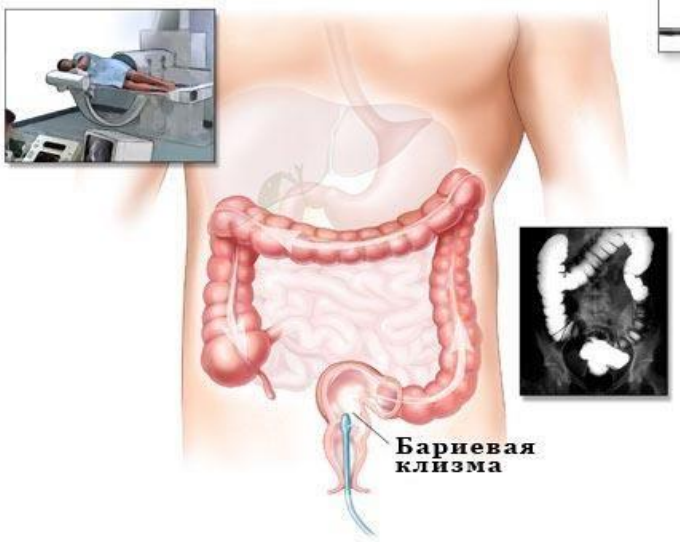
- Discontinuous impairment of the bowel.
- Involvement of the small and the large intestine.
- Right-sided localisation of the process in the colon.
- Formation of deep fissure-like ulcers, internal fistula, retroperitoneal abscesses with formation of fistulae and blind sinuses.

Radiological examination
Doble contrast

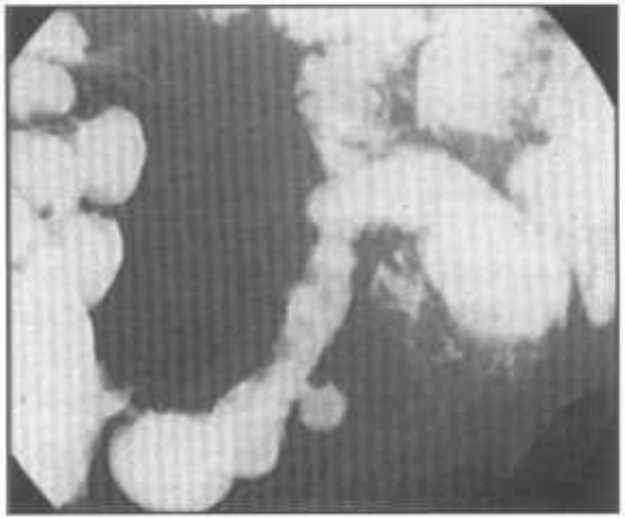
- Clearer detection of narrowing of the impaired part of the intestine, the irregularity of its contours, pseudo-diverticular protrusions, wall rigidity, a sharp border between the impaired and normal tissues.
- If the intestinal bloating is not acute, there is clear pneumorelief of the inner surface.
- Large pseudo-polypoid masses against the background of air show the picture of additional shadows located at the wall, sometimes in the form of a chain.

Radiological examination
Lower gastrointestinal series





Radiological examination
Lower gastrointestinal series



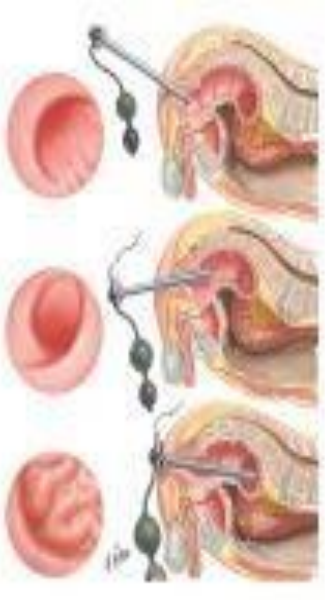
Endoscopy. Biopsy.

- Heterogenous thickening of the mucosa, presence of thin fissure-like ulcers, narrowing of the intestinal lumen: the "cobblestone boulevard" picture.
- At initial stages of the disease and formation of cicatricial changes, this typical picture is not observed.
- In Crohn's disease, the pathological process initially appears in the submucosal layer.
- It is necessary to include the area of the submucosal layer into the biopsy specimen.
- It is by no means not always possible to detect sarcoid granulomas pathognomonic for the Crohn's disease.

Endoscopy: Anoscopy

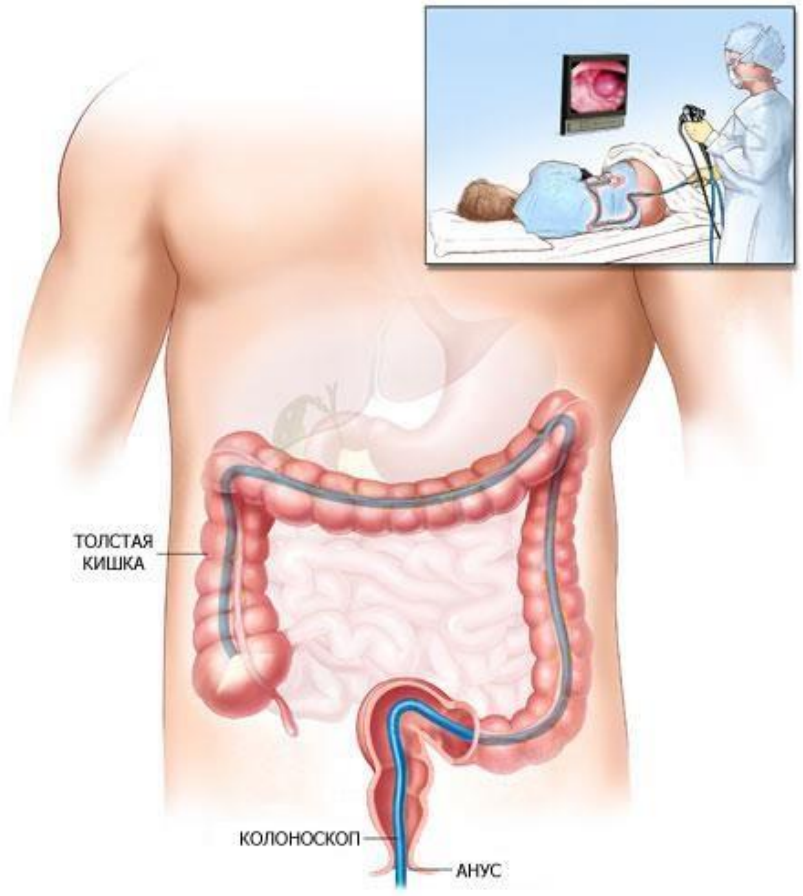
- Anoscopy is a method of instrumental examination of the rectum through visual examination of its internal surface using a special tool – anoscope – introduced through the anus.
- The examination is designed for visual examination of the anal canal and the rectum to the depth of up to 12-14cm.

Endoscopy: Sigmoidoscopy



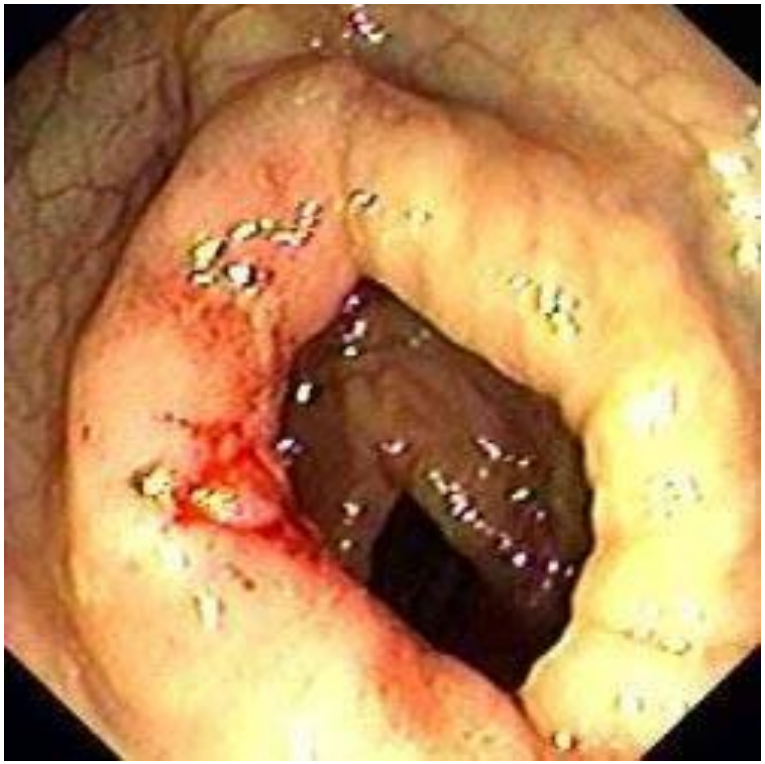
Sigmoidoscopy is the most popular, precise and reliable method for examination of rectum and the lower part of the sigmoid colon. This examination makes it possible to visually assess the internal surface of the rectum and the distal third of sigmoid colon up to the level of **20-35cm from the anus**.

Endoscopy: Colonoscopy

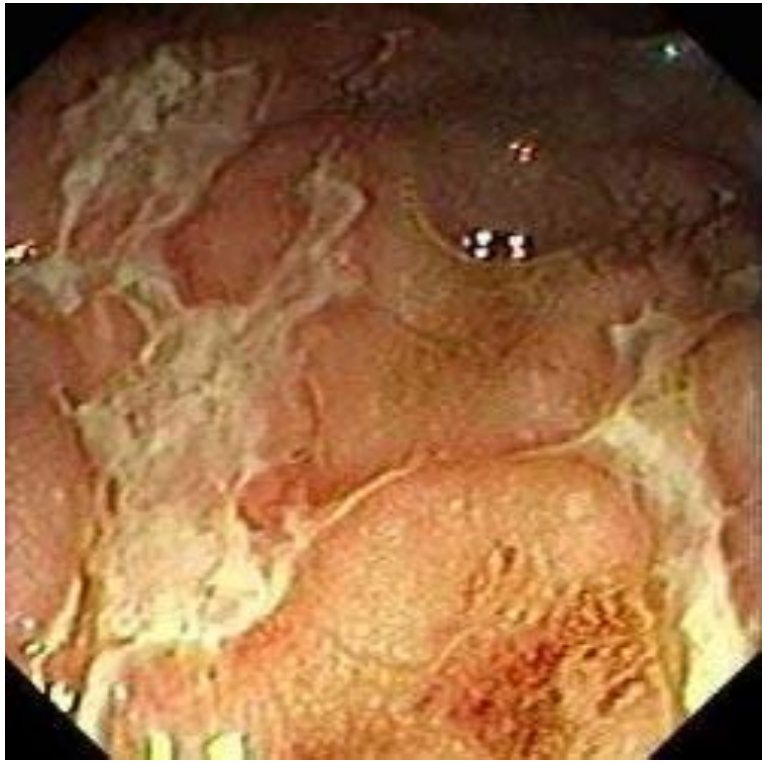


- Colonoscopy (fibrocolonoscopy, colonofibroscopy): a method of endoscopy for diseases of the large intestine.

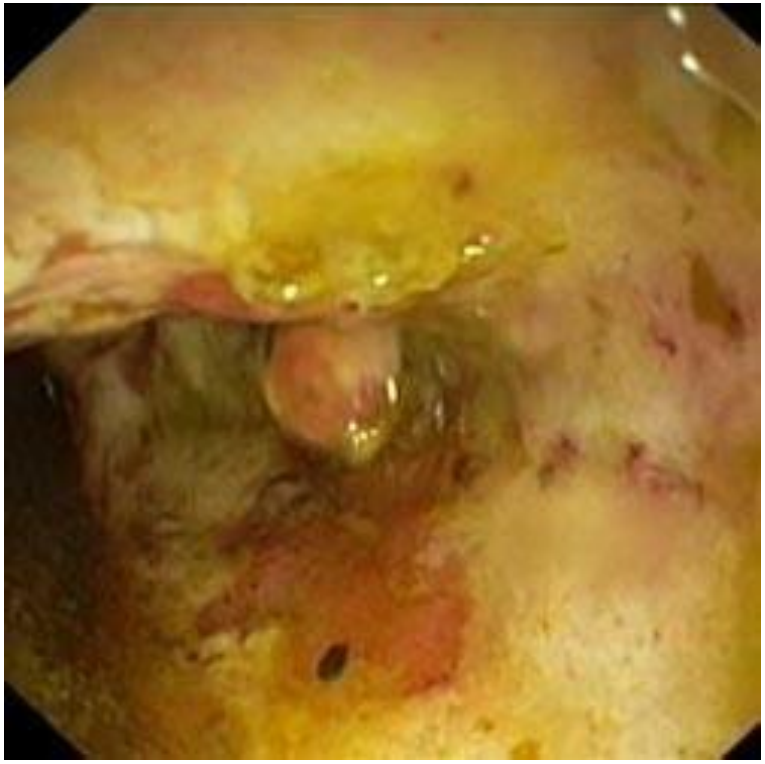
Endoscopy



Endoscopy



Endoscopy



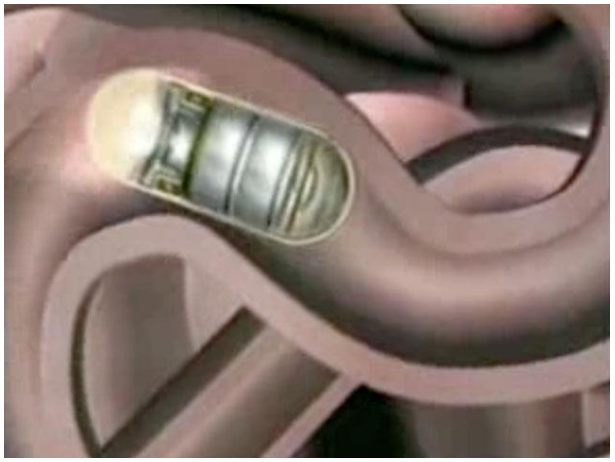
Video capsule endoscopy

- For examination with videoendoscopy, the patient swallows a capsule or a small tablet that contains a camera. While the camera is passing through the intestine, it sends signals with images to the receiver that is located on the belt. The images are stored and seen on the computer, providing detailed information about early signs of Crohn's disease.
- Possible complications:

✓ obturation of the small intestine lumen

✓ the capsule may become stuck and lead to intestinal obstruction.

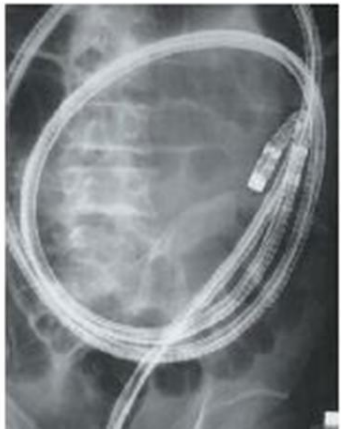
Video capsule endoscopy



Enteroscopy

Антеградное введение

Ретроградное введение



Ultrasound. CT. Fistulogram

- Ultrasound and CT of the abdominal cavity provide valuable data in abscess diagnosis.
- In presence of external fistulae, Fistulogram is indicated.

Differential diagnosis of NUC and Crohn's disease in the large intestine (*Morson B.C., Dawson J.M., 1972, enlarged edition*)

Ulcerative colitis

- Continuous impairment
- The rectum is always impaired
- Anal impairments in 25%
- Small intestine impairment in 10%
- Large and small ulcers, no fissure-like ulcers.
- Characteristically plethoric vessels
- Unchanged serous membrane
- The intestine is shortened, rare stricture
- Absence of fistulae
- Inflammatory polyps are rarely observed
- Malignant degeneration is observed in the chronic course

Crohn's disease

- The impairment may be discontinuous
- The rectum is impaired in 50%
- Anal impairments in 75%
- Small intestine impairment in 75%
- The ulcers are fissure-like, form the "cobblestone boulevard"
- Plethoric vessels are not characteristic
- Serositis, adhesions
- Fibrous strictures occur, the shortening is irregular
- Intestinal and cutaneous fistulae in 10%
- Rare occurrence of inflammatory polyps
- Malignant degeneration is rarely observed

Принципы консервативной терапии

- **Aminosalicylates** (sulfasalazine, mesalamine, etc.). These pharmaceuticals are fully capable of arresting the symptoms in many patients.
- **Antibiotics** (e.g. ciprofloxacin and metronidazole), foremost when the intake of aminosalicylates is insufficient.
- **Corticosteroids** (e.g. budesonide or prednisolone) prescribed for oral intake against inflammation for several weeks or even months.
- **Immunosuppressants** (pharmaceuticals suppressing the immune system) such as azathioprine (AZA), 6-mercaptopurine (6-MP) or methotrexate.
- **Antagonists of the tumour necrosis factor** (TNF) such as infliximab (Remicade).

Treatment of complications: Bleeding

- Bleeding in Crohn's disease is rarely profuse
- Effective means are haemostatics and haemotransfusion
- Endoscopic haemostasis
- Surgery

Treatment of complications:

Perforation. Peritonitis.

Emergency surgical intervention!!!

Treatment of complications:

Toxic dilatation

- In absent signs of perforation into free abdominal cavity and peritonitis, the treatment tactics begins from conservative procedures (withdrawal of liquid, food and medicines intake, aspiration of the gastric contents through the nasogastric tube).
- Steroids, antibiotics, parenteral nutrition.
- Efferent treatment methods if required.
- If toxic megacolon is not resolved within 24 hours using medication therapy: surgical intervention (sector resection or colectomy).

Treatment of complications:

Inflammatory infiltrations

- At the present time, two medication schemes are used at the initial stage of abscess: the combination of "aminosalicylates + azathioprine + trichopol" or "prednisolone + azathioprine + trichopol"
- In absence of effect and growth of persistent intoxication: open or puncture drainage of the abscess.
- Drainage must be adequate and installed for a long period of time.
- Perforation of mesenteric abscess into the free abdominal cavity with development of generalised peritonitis is observed extremely rarely.

Treatment of complications:

Intestinal obstruction

- Notwithstanding the degree of narrowing and in presence of active inflammatory process, the patient should be given medication therapy, against the background of which the phenomena of partial intestinal obstruction are eliminated due to the liquidation of the inflammatory component of the narrowing.
- In presence of cicatricial stricture, even in the remission period, accompanied by the signs of partial intestinal obstruction, elective surgical treatment is indicated.

Surgical treatment

- Is not radical, while the granulomatous inflammation may develop in any part of the GIT.
- Purpose: management of complications and improvement of the patients' quality of life when it is impossible to achieve through non-medication means.
- Throughout life, up to 70% of Crohn's disease patients are subject to one or another surgical intervention: from paraproctitis opening to massive intestinal resections.
- Continuous course of the disease and the possibility of severe relapses necessitate long-term postoperative medication therapy in order to avoid the necessity of repeated surgery.

Surgical treatment: Indications

- Cicatricial stenosis and formation of external intestinal fistulae.
- Due to inflammation of a segment of the bowel, there is initially development of its narrowing, which transforms to cicatricial stenosis in case of resistance to conservative therapy.

Surgical treatment: Principles

- In Crohn's disease in the small intestine, either resection of the impaired part or strictureplasty is performed.
- The choice of surgery method is defined by the longitude of intestinal impairment. Выбор метода операции определяется протяжённостью поражения кишки.
- Strictureplasty is only possible for small stricture below the size of 4-5cm.

Surgical treatment: Principles

- In case of widespread infiltrations, bypass interintestinal anastomoses are used.
- The same intervention is performed for duodenal stenosis.
- After small bowel resection, end-to-end anastomoses are preferable, and the resection line must be no closer than 2cm from the macroscopically determined border of the impairment.
- Strictureplasty of limited (smaller than 3-4cm) cicatricial impairments is performed without opening the lumen of the small intestine: the dissection of the scar to the mucosal layer is performed longitudinally and suturing of the formed defect – transversely.

INTESTINAL DIVERTICULA

- Diverticula are protrusions of the wall of the small or large intestine that may occur in any segment.

Meckel's diverticulum

- Forms as a result of incomplete reverse development of the Vitelline duct. This diverticulum protrudes from the ileum at an average distance of 60cm from the ileocecal angle and may be present as a fibrous band or a pouch, the cavity of which is larger than the lumen of the ileum. The length of the diverticulum equals 4-6cm and its diameter is 2-3cm.

Meckel's diverticulum

- Microscopically, the structure of the diverticulum wall does not differ from that of the small intestine. However, in one half of the cases, heterotopic insulae of functional gastric mucosa may be revealed in the mucosal membrane of the diverticulum, which may cause formation of a peptic ulcer with subsequent haemorrhage.
- Inflammatory process may develop in diverticula as well, which results on the symptoms similar to those in acute appendicitis.

Meckel's diverticulum

- Diverticula rarely occur in the large intestine, especially in the sigmoid colon.

- Two factors are significant in the pathogenesis of diverticula:

✓ *loss of resistance in a segment of the wall due to the weakness of the muscular layer,*

✓ *difference between blood pressure in the lumen of the large intestine and the abdominal cavity.*

Intestinal fistula

Fistula is a pathological anastomosis between hollow organs (*internal fistula*) or a hollow organ and the environment (*external fistula*)

Intestinal fistula is a pathological anastomosis between the lumen of the intestine and the environment.

Causes based on pathological processes in the abdominal cavity

- Inflammatory destructive process continuing or appearing in the abdominal cavity after surgery (peritonitis, suppuration of the surgical wound).
- Incompetence of anastomosis seams, the sutured wound, the duodenal stump, the stump of the resected small or large intestine
- Foreign bodies in the abdominal cavity (tissues, drainages)
- Gastric or intestinal trauma (impact injury, haematomas, ruptures)
- Partial intestinal obstruction developed in the postoperative period
- Malignant intestinal tumours growing through the abdominal wall, that cause a phlegmon therein and development of an intestinal fistula
- Necrotic changes in the intestinal wall as a result of impaired blood circulation

Causes based on tactical errors

- Errors in choice of the method for anaesthesia as well as during its performance
- Incorrect choice of the surgical access
- Removal of the vermiform process or the gallbladder from dense infiltrate
- Insufficient sanitation of the abdominal cavity
- Inadequate drainage of the abdominal cavity, long presence of sponges and drainages therein.
- Incorrect assessment of vitality of the intestine. Incorrectly chosen volume of intestinal resection.
- Errors during laparotomy and revision of the abdominal cavity in acute intestinal obstruction
- Untimely drainage of the purulent focus
- Late diagnosis of intestinal eventration and a wrong tactics chosen in this situation
- Errors in choice of method for application of the therapeutic fistula

Causes based on technical errors

- Wounding or deserosing of the intestine
- Accidental suturing of the intestine to the anterior abdominal wall
- Technical errors in formation of anastomoses and therapeutic fistulae
- Accidental loss of gauze tissues in the abdominal cavity or its organs.

Classification of external gastrointestinal fistula by the localisation

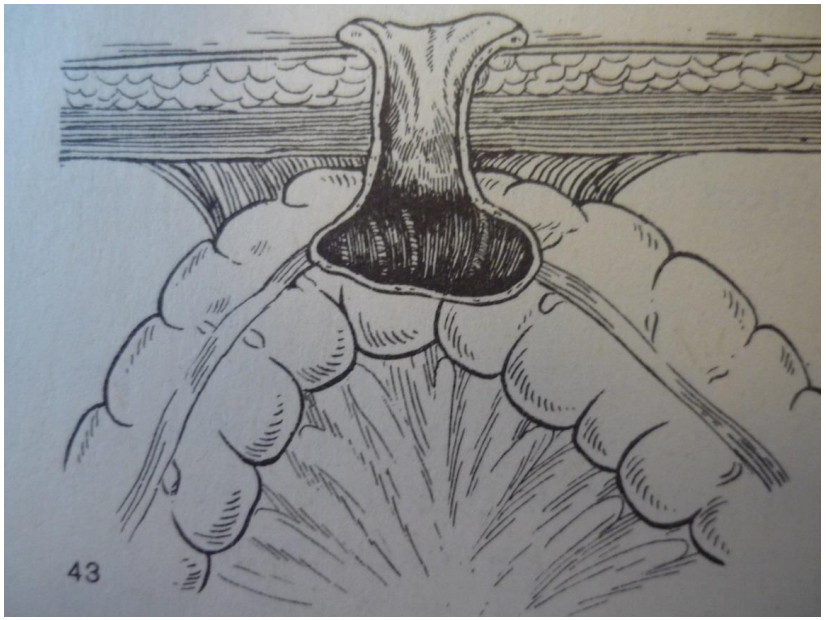
- oesophagus
- stomach
- duodenum
- jejunum
- ileum
- caecum
- ascending colon
- transverse colon
- descending colon
- sigmoid colon
- rectum
- biliary ducts

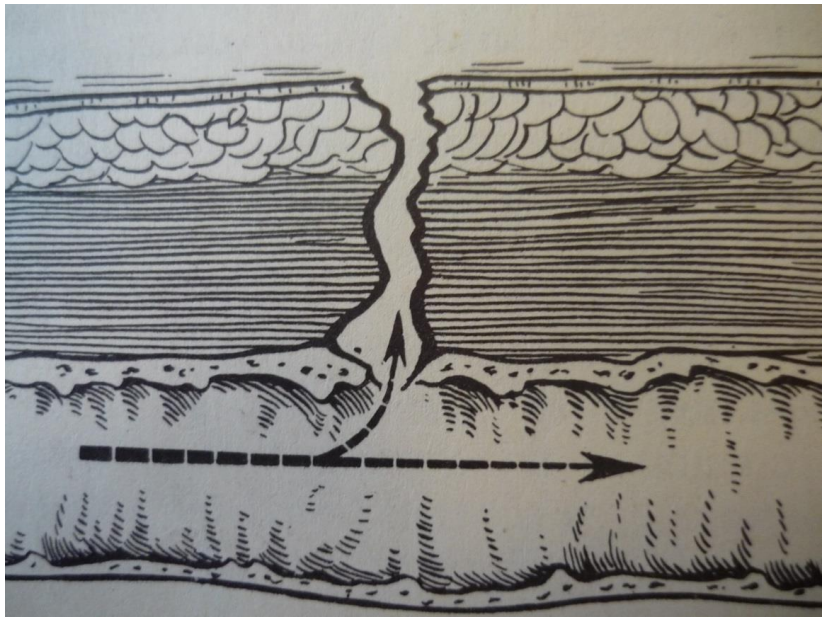
Classification of external gastrointestinal fistula by the aetiology

- Congenital
- Acquired
- Applied with the therapeutic purpose

Classification of external gastrointestinal fistula by the morphology

- **Lip-shaped fistula** – with adhesion between the mucosa and the skin
- **Tube-shaped fistula** – with a canal connecting the intestine with the skin, covered by granulation or cicatricial tissue





Classification of external gastrointestinal fistula by the functioning intensity

- with large volume of loss of the intestinal content (over 500ml per day)

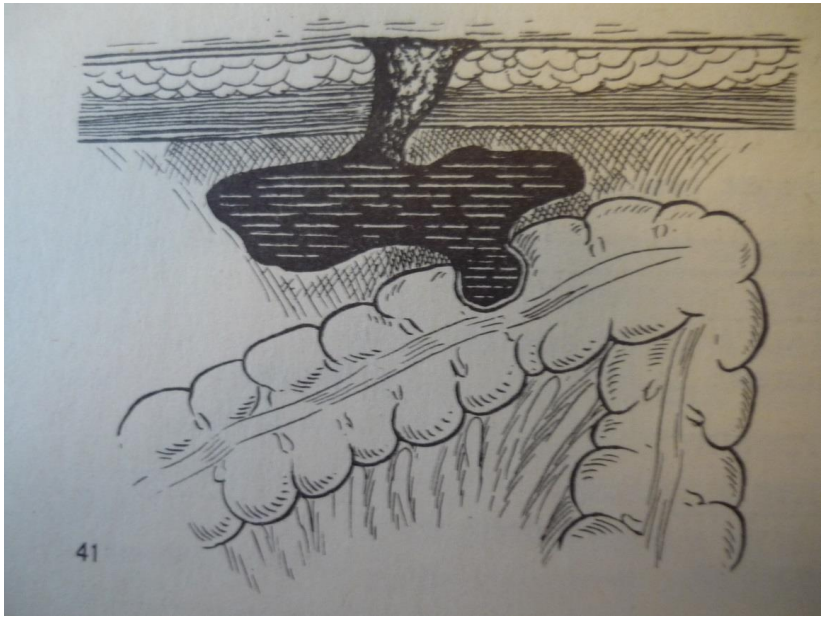
- with large volume of loss (less than 500ml per day)

Classification of external gastrointestinal fistula by the degree of formation

- Unformed fistulae:
  - ✓ fistula in a free intestinal loop opening into a purulent wound;
  - ✓ fistula opening into a purulent cavity;
  - ✓ fistula opening into a granulating wound;
  - ✓ fistula, the mucous membrane of which has partially merged with the skin

- Formed fistulae

Classification of external gastrointestinal fistula by the degree of formation

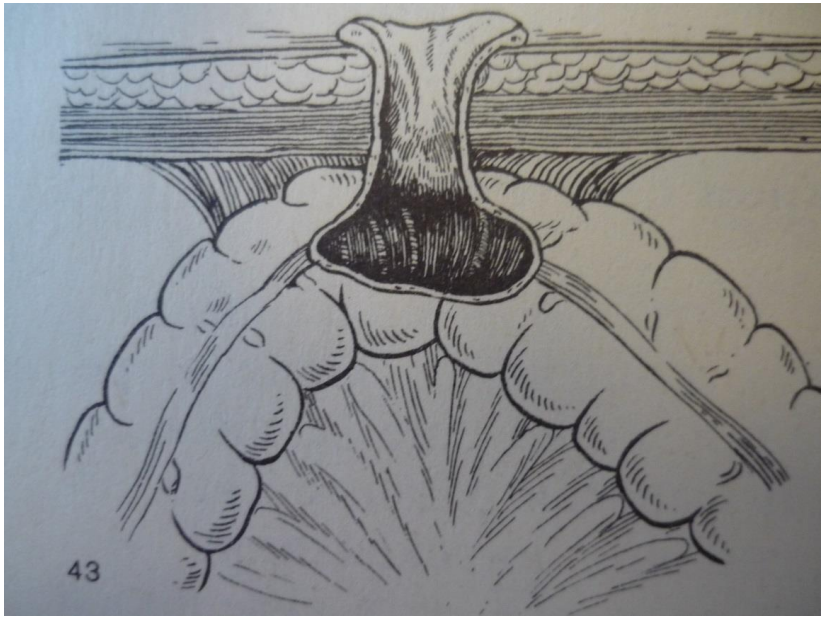


- Unformed intestinal fistula

Classification of external gastrointestinal fistula by the degree of formation

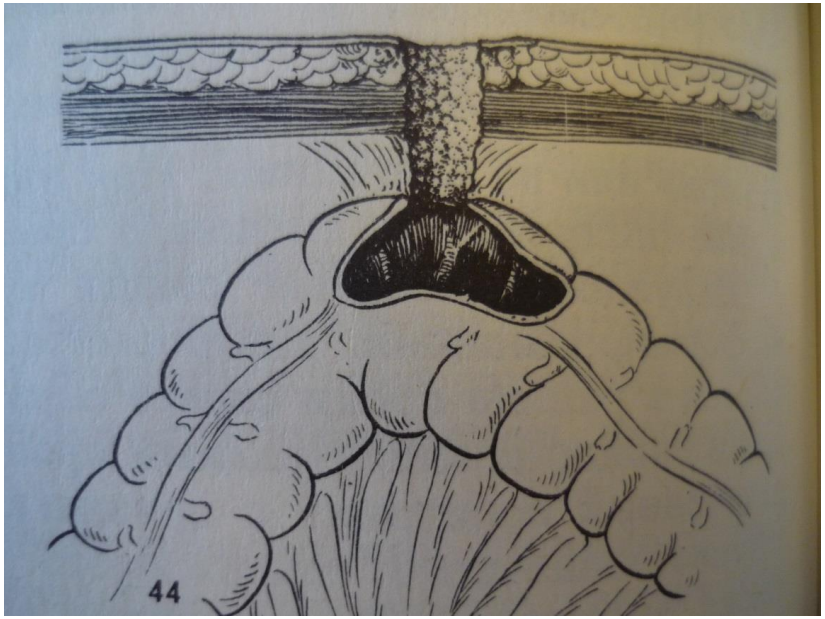
- Transient (partially formed) intestinal fistula

Classification of external gastrointestinal fistula by the degree of formation



- Formed lip-shaped intestinal fistula

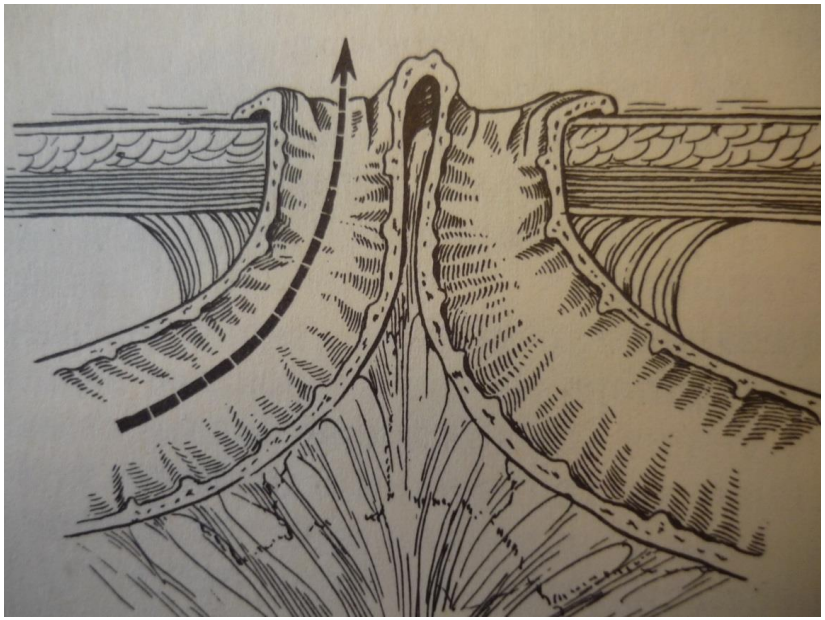
Classification of external gastrointestinal fistula by the degree of formation

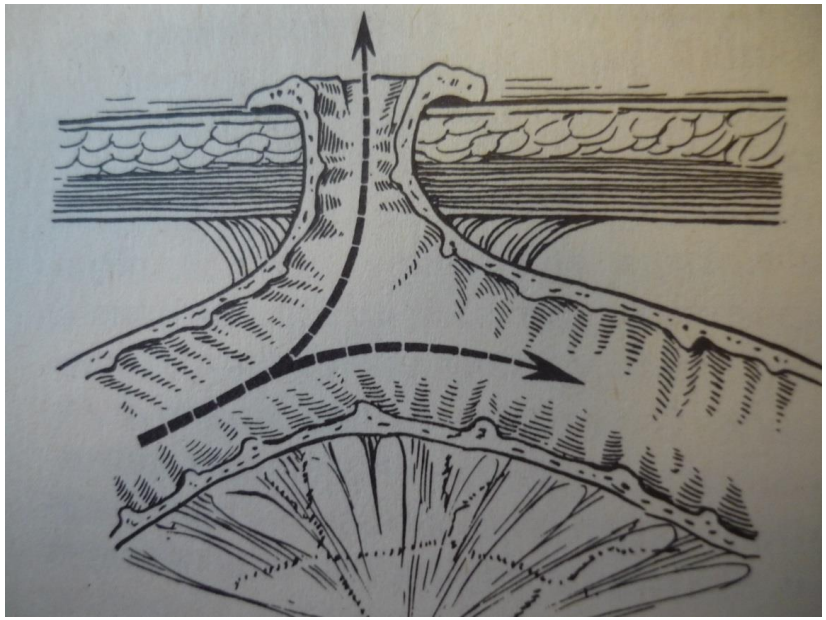


- Formed tube-shaped intestinal fistula

Classification of external gastrointestinal fistula by the function

- **Complete** – the intestinal contents flow outside completely
- **Incomplete** – part of the intestinal contents flows outside and the other part continues its passage through the gastrointestinal tract





Classification of external gastrointestinal fistula

- **Singular** fistula
- **Multiple** fistulae (*on one loop, on different loops of one segment of the intestine*)
- **Mixed** (*both the small and the large intestine*)

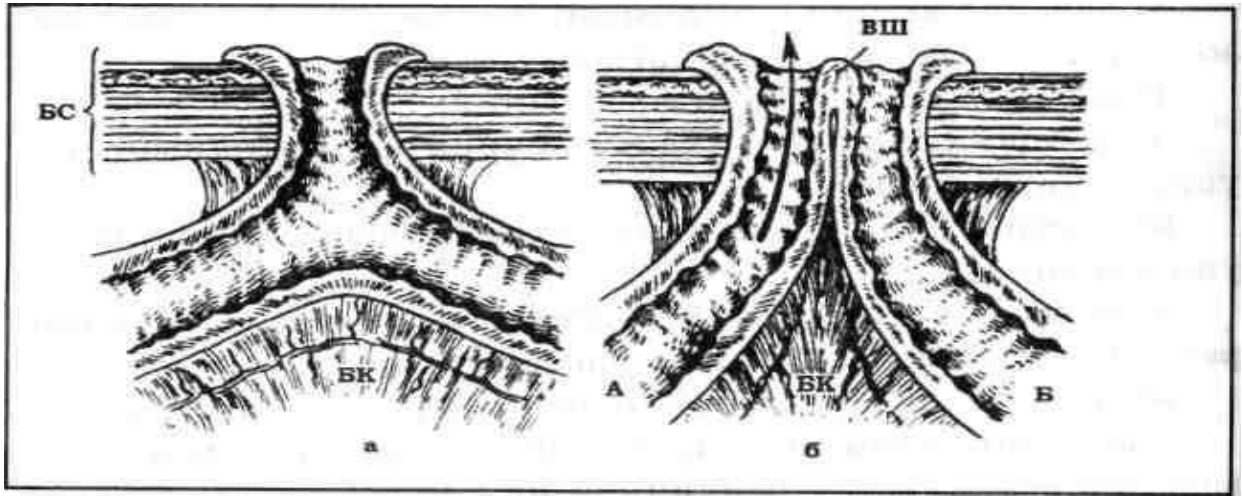
Classification of external gastrointestinal fistula by the complications

- **Local complications:** abscesses, phlegmons, purulent leakages, dermatitis, prolapse of the mucous membrane, enteritis, colitis, bleeding from the fistula

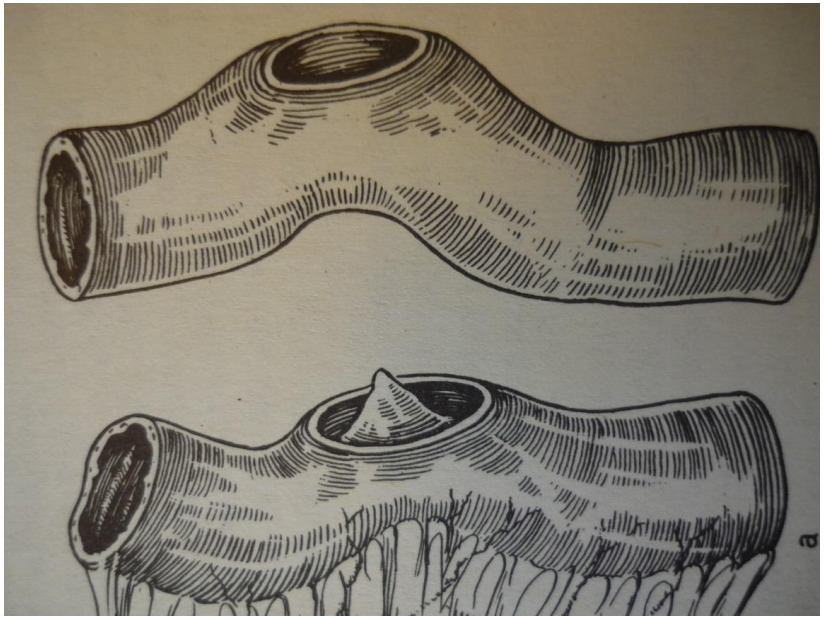
- **General complications:** disturbance of water-salt and protein exchange, kidney failure, exhaustion

Classification of external gastrointestinal fistula by the spur nature

- a soft spur not protruding into the fistula orifice
- a soft spur protruding into the fistula orifice
- a rigid spur protruding into the fistula orifice



Structure of external fistulae of the gastrointestinal tract



- A soft intestinal spur

Classification of external gastrointestinal fistula by the comorbidity

- peritonitis
- abscesses of the abdominal cavity
- partial intestinal obstruction
- eventration

Example of diagnosis wording No.1

Incomplete lip-shaped fistula of the large intestine opening into a purulent wound complicated by dermatitis and moderate disturbances of water-electrolyte balance; generalised peritonitis.

Example of diagnosis wording No.2

Complete lip-shaped fistula of the jejunum opening into a purulent wound complicated by dermatitis, significant disturbances of water-electrolyte balance and protein exchange.

Aims of the diagnostic stage

To determine:

1. Localisation of the fistula
2. Condition of the afferent and especially the efferent loop
3. Interrelation of the intestine with fistula and the adjacent organs
4. Presence of purulent leakages into the surrounding tissues

Methods for examination of patients with gastrointestinal fistula

- Traditional clinical examination methods (*with obligatory biochemical blood analysis*)
- Application of staining agents
- Finger examination
- Radiological examination
- Endoscopy
- Ultrasound and CT (*if indicated*)

Introduction of staining agents

- The patient is administered staining agents (*methylene blue, brilliant green, milk, carmine, activated carbon, red wine*) orally (*through the gastric probe*) or using an enema
- By the velocity of its excretion from the fistula, it is possible to indirectly judge on the presence and localisation of the fistula (*e.g. methylene blue flows from the stomach into the duodenum after 3-4 min*)
- The velocity of movement through the GIT equals 10 cm/min

Finger examination

- **Makes it possible to determine:**

✓ narrowing of the initial section of the efferent loop
✓ additional passages into the surrounding tissues
✓ spur nature

- The therapeutic tactics also depends on the results of this examination: for example, in cases of narrowing of the efferent loop or high rigidity of the spur, all methods for obturation of such a fistula will be ineffective.

Radiological examination (fistulogram)

- It is feasible to begin radiological examination from introduction of the contrast agent (30% suspension of barium sulfate, water-soluble contrast agents) into the efferent loop.
- The main goals of examination: assessment of velocity of contrast agent passage through the intestine and determination of the level of its delay
- Acquisition of such information is of large significance for the subsequent surgical intervention, during which it is necessary to eliminate not only the fistula but also the kinks and deformities of the efferent loop.
- For tube-shaped fistulae, only water-soluble radiopaque agents are to be used

The order of application of radiological examination methods

- Fistulogram
- Examination using a radiopaque enema
- Examination after intake of barium suspense per os

Endoscopy

- Endoscopy makes it possible to obtain additional information about the condition of the afferent and efferent loops of the small intestine.
- While examining the loops in case of lip-shaped fistulae, it is necessary to pay attention to the nature of the changed mucosa (*hypertrophy, atrophy, erosions, ulcerations, scars*) as well as to the spread of these changes.
- In cases of duodenal and jejunal fistulae in is necessary to perform endoscopy of the stomach (*EFGDS*), examine the gastrointestinal anastomosis and the afferent loop of the small intestine.
- For large bowel fistulae, fibrocolonoscopy is feasible.

Aims of treatment

- Restoration of water-electrolyte and protein balance
- Provision of passage of the food contents through the GIT
- Prevention and treatment of dermatitis
- Surgery aimed at restoration of food passage

TREATMENT: Disturbance of water-electrolyte balance, protein exchange and their correction.

- In gastrointestinal fistulae, there is disorder in the activity of all organs and systems of the organism
- With higher localisation of the fistula and its increasing compliance with the complete type, there are more significant pathophysiological impairments in the patient's organism

TREATMENT: Disturbance of water-electrolyte balance, protein exchange and their correction.

- In gastrointestinal fistulae, isotonic dehydration is observed
- **Clinical picture:** тахикардия, снижение АД, потеря аппетита, жажда, рвота, вздутие живота.
- **I degree** – deficit of approximately 2 litres; **II degree** – deficit of approximately 4 litres (vomiting, ABP decrease); **III degree** – deficit of 5-6 litres (systolic ABP below 90mmHg, clouding of consciousness).
- Laboratory data: increase in the erythrocyte count, increase in haematocrit and haemoglobin levels

TREATMENT: Disturbance of water-electrolyte balance, protein exchange and their correction.

- Parenteral nutrition
- Enteral nutrition
- Inhibitors of gastrointestinal tract secretion (*octreotide*)

TREATMENT: Principles of parenteral nutrition.

- Balance of calories volume
- Balance of the main components (*proteins, fats, carbohydrates, ions*)

TREATMENT: Principles of parenteral nutrition.

- Dry eating and split meals
- Food, especially in high fistulae of the small intestine, must contain as much dietary fibre as possible.
- Application of modern mixtures for enteral nutrition
- If possible – introduction of the aspirated intestinal contents into the efferent loop through a probe

TREATMENT: Obturation of gastrointestinal fistula.

Obturation of the intestinal fistula makes it possible to successfully:

- manage dermatitis
- provide passage of the contents through the intestine
- facilitate elimination of hypovolemic disorders, disturbances of the protein and enzyme exchange within shorter time

TREATMENT: Contraindications to obturation of gastrointestinal fistula.

Absolute contraindications:

1. Unformed fistulae of the small intestine
2. Complete fistulae of the small and large intestine
3. Presence of a highly-located rigid spur
4. Obstruction of the efferent part of the intestine
5. Abscesses and phlegmons around the fistula, purulent passages and leakages in the fistula area

Relative contraindications:

1. Partially formed fistulae of the small intestine
2. Fistulae of specific aetiology (*tumours, Crohn's disease*)

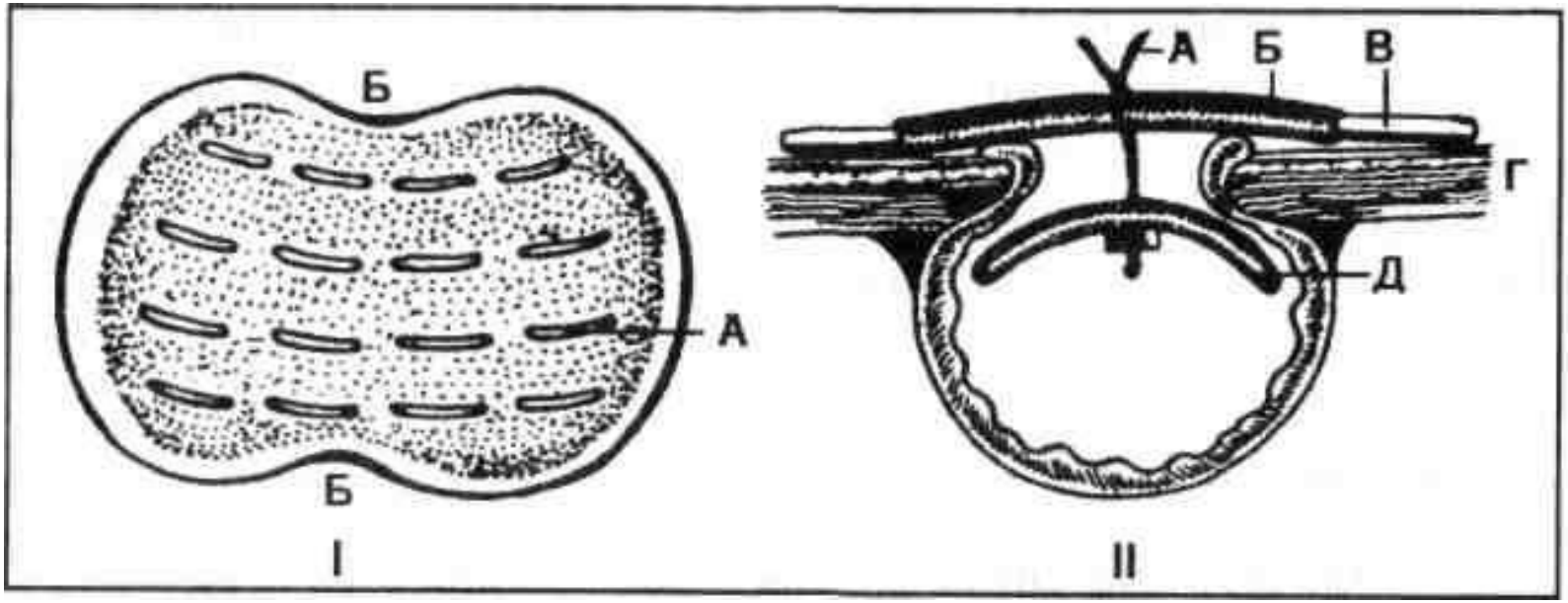
TREATMENT: Types of obturation of gastrointestinal fistula.

- Intraintestinal
- Extraintestinal
- Combined

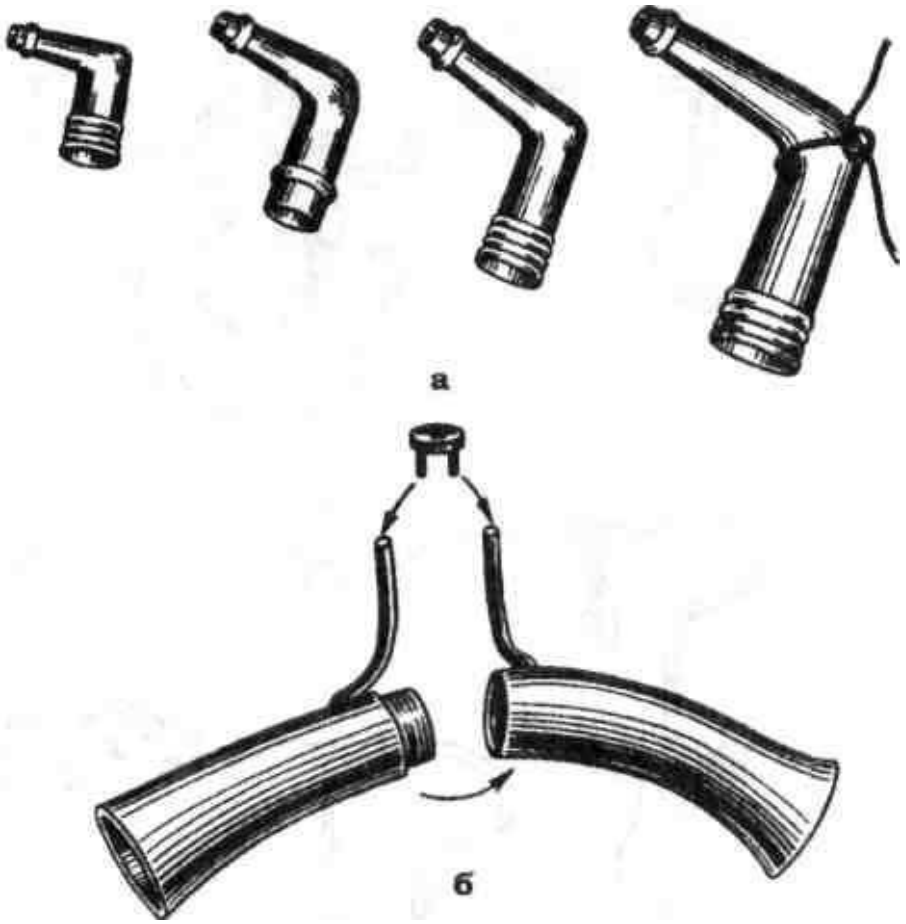
TREATMENT: Intraintestinal obturation.

- Khaskelevich's obturator is a piece of rubber tube that is cut longitudinally and sutured with U-shaped seams made of thin copper wire, which makes the tube unrolled in the shape of a plate. This plate, when introduced into the fistula, closes it from the intestinal lumen. Using a silk thread, it is fixed to the swab placed over the fistula.
- Paul's glass tube, Frisch's metal tube, different rubber, vinyl-chloride, silicon tubes introduced into the intestinal lumen and fixed using a silk thread to the swab placed over the fistula.
- Doronin's and Mitrokhin's obturators.
- Petzer's catheters Катетеры Петцера.
- Sponges, cotton and gauze obturators, meat and placenta-made swabs introduced into the intestinal lumen with a thread and covering the fistula from the inside.
- Kolchenogov's corrugated obturators.
- The method of obturation with application of polymer materials was developed by V.I. Chissov et al. (1984), in which the canal of the fistula is injected with glue (MK-7) using a needle-free injector and then a dry seal is planted that includes such components as rapidly polymerising composition of MK-7 glue, orotic acid and dioxydin.

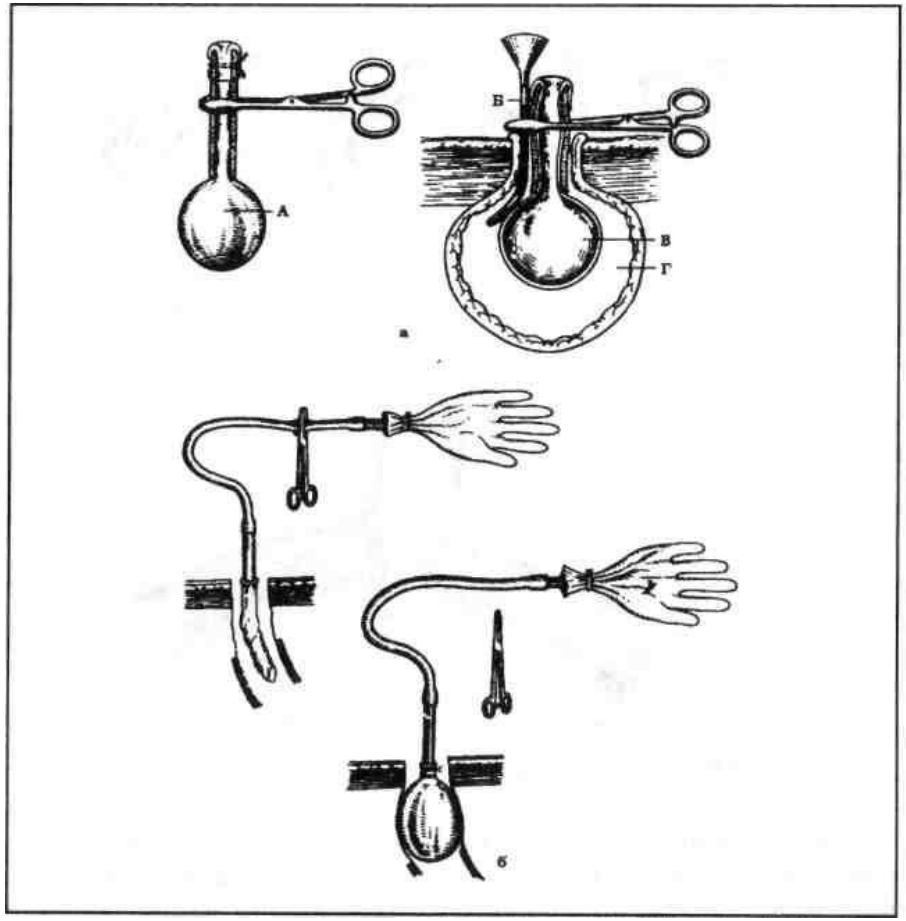
Khaskelevich's obturator



Paul's and Frisch's tubes



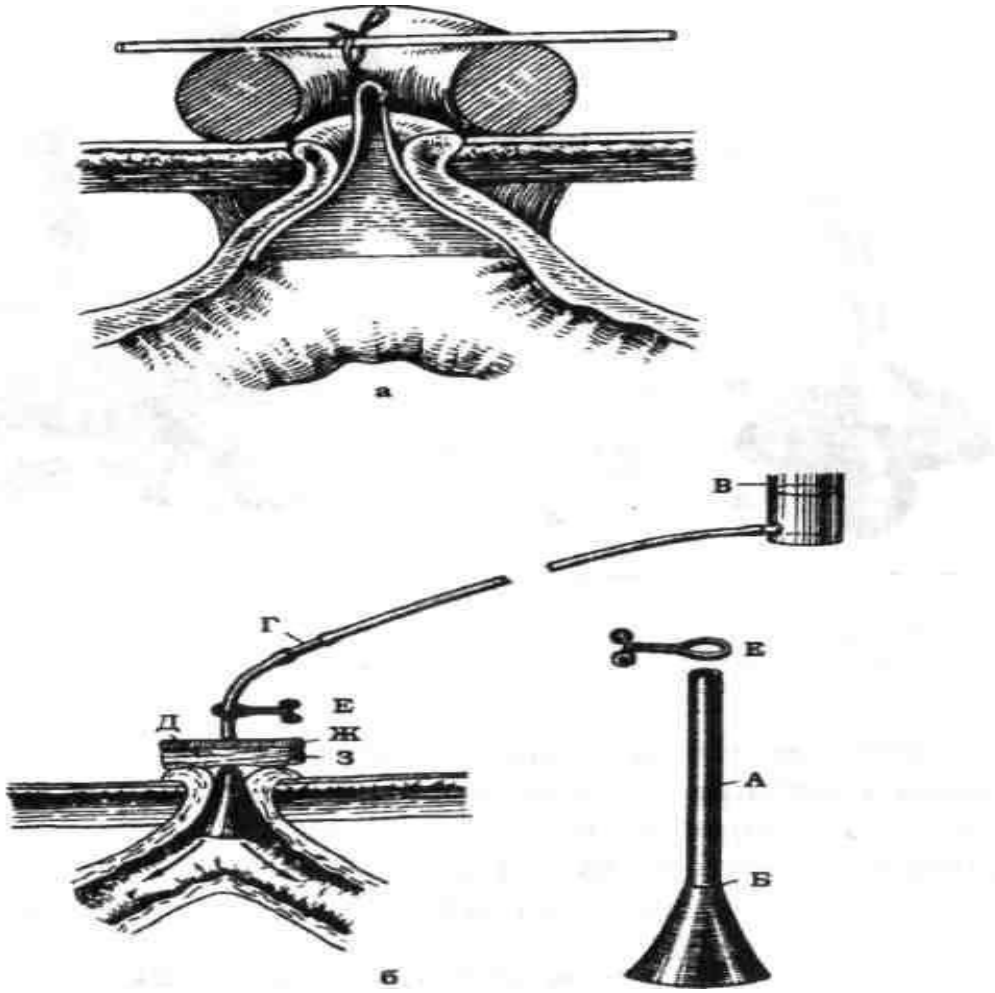
Doronin's and Mitrokhin's obturators



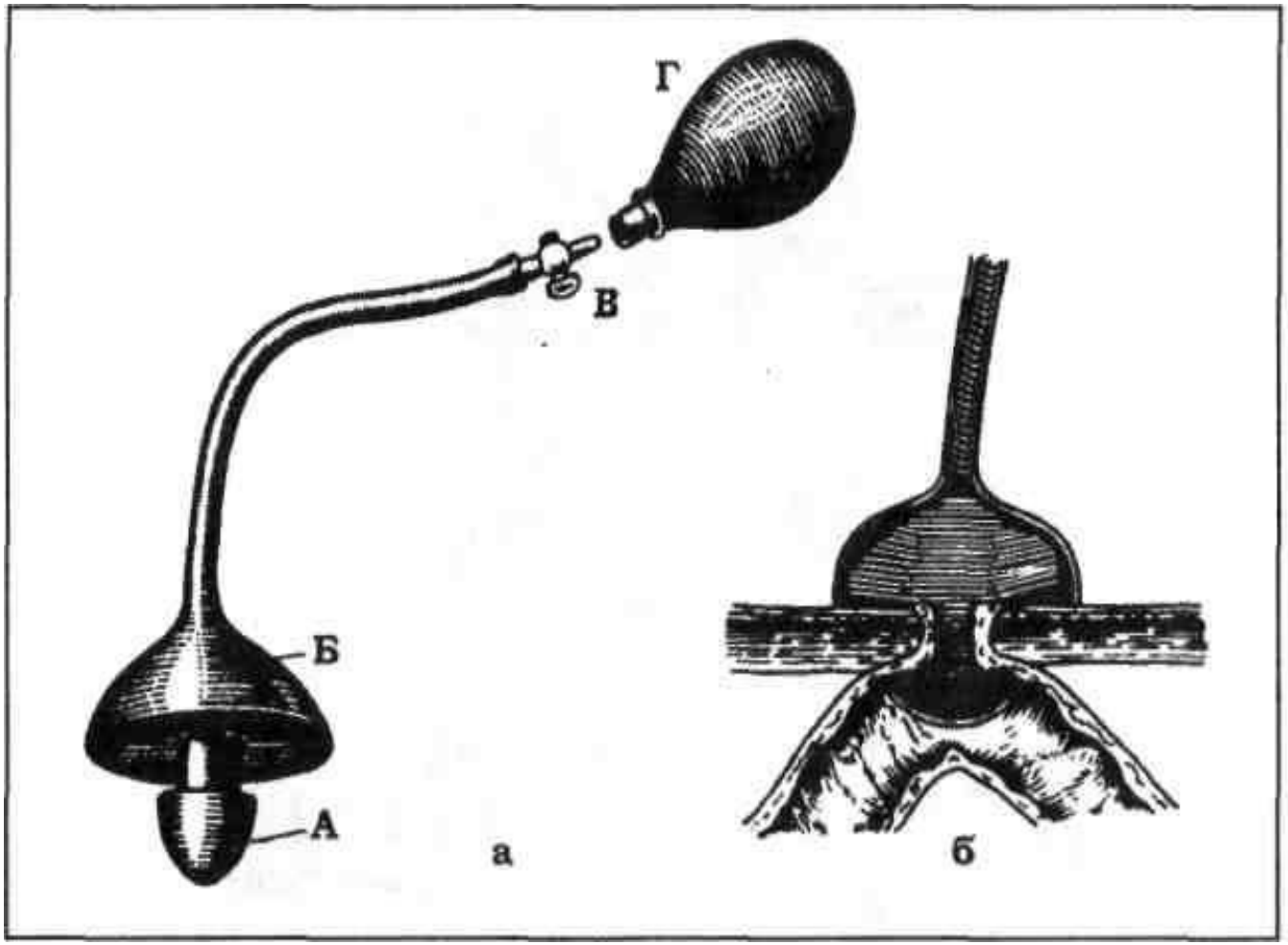
TREATMENT: Extraintestinal obturation.

Gauze swabs soaked in ointment; pressing dressings, bandages, foam tubes that are placed at the fistula and close it on the outside.

TREATMENT: Combined obturation methods. Kolchenogov's obturator.



TREATMENT: Combined obturation methods. Kuster's obturator.



TREATMENT: Combined obturation methods. Kolchenogov's technique.

- Restoration of passage through the intestine.
- Elimination of dermatitis.
- Possible introduction of enteral mixtures through the probe.

Procedures for prevention and treatment of dermatitis

- The issue of skin protection and dermatitis prevention is of large significance in preparation of the patient for the surgery, while the infection always present around the fistula may complicate the postoperative period if it spreads onto the macerated skin.
- The methods for skin protection from the impact of digestive juice are divided into biological, physical and chemical.

Biological methods for skin protection

Are used extremely rarely:

- Raw meat
- Meat juice
- Egg albumen
- Powdered milk

Physical methods for skin protection

- Applied in a thin coat on the skin around the fistula using a spatula:

✓ *salicyl zink paste*
✓ *zink ointment*
✓ *abucel*

- Ostomy bag installation

Chemical methods for skin protection

- Octreotide
- Local application of protease inhibitors (*trasylol*, *gordox*)
- Solutions of hydrochloric, lactic acid

Surgical treatment.

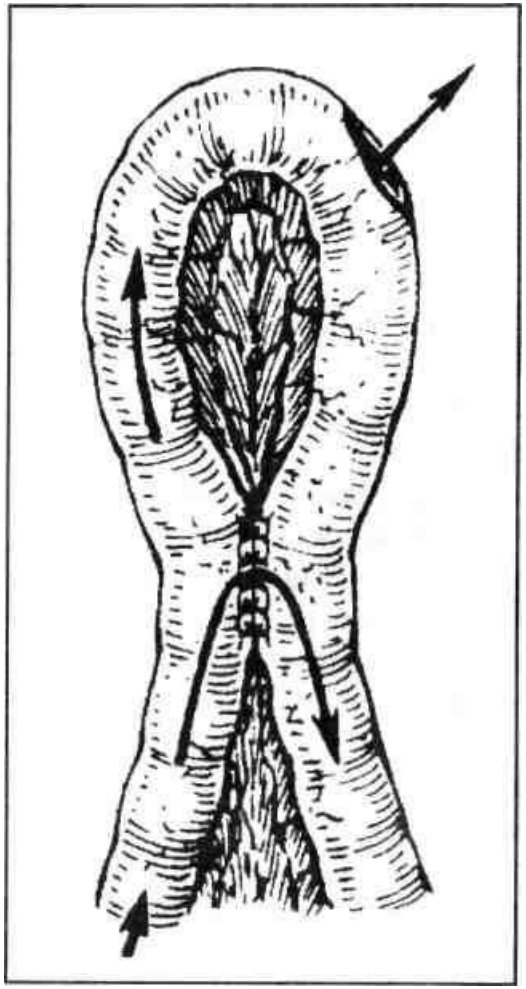
Indications to early surgery

- If, despite the intensive care, the patient's condition does not improve, the fistula does not form, a large volume of digestive juice is lost through it and the wound granulates inactively – early surgery is advised.

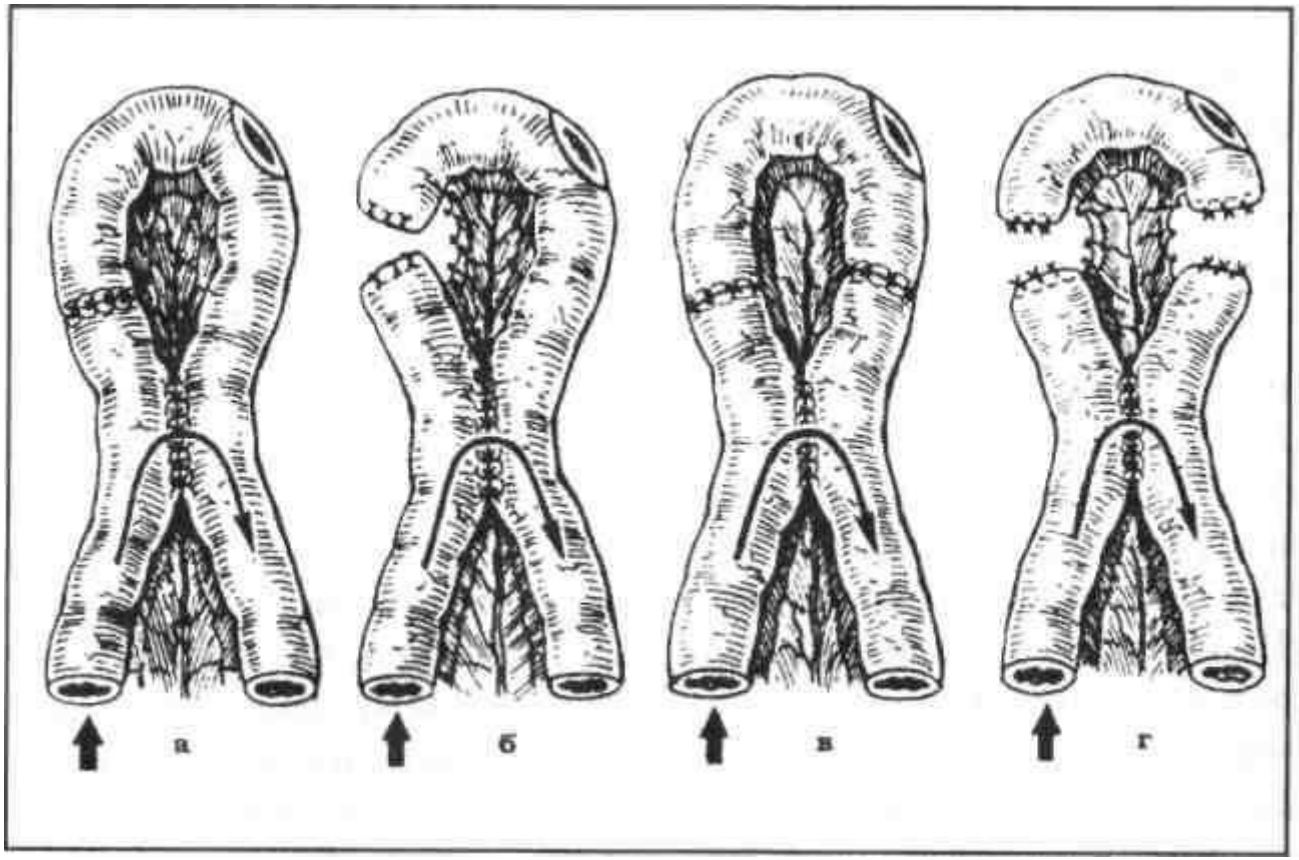
Principles of surgical treatment

- Exclusion of the fistula.
- Possible: resection of part of the intestine with the fistula and temporary exteriorisation of the afferent and efferent parts of the intestine.
- Later: reconstruction of the alimentary tract and the anterior abdominal wall.

Surgical treatment: Exclusion of the fistula.
Maisonneuve surgery.

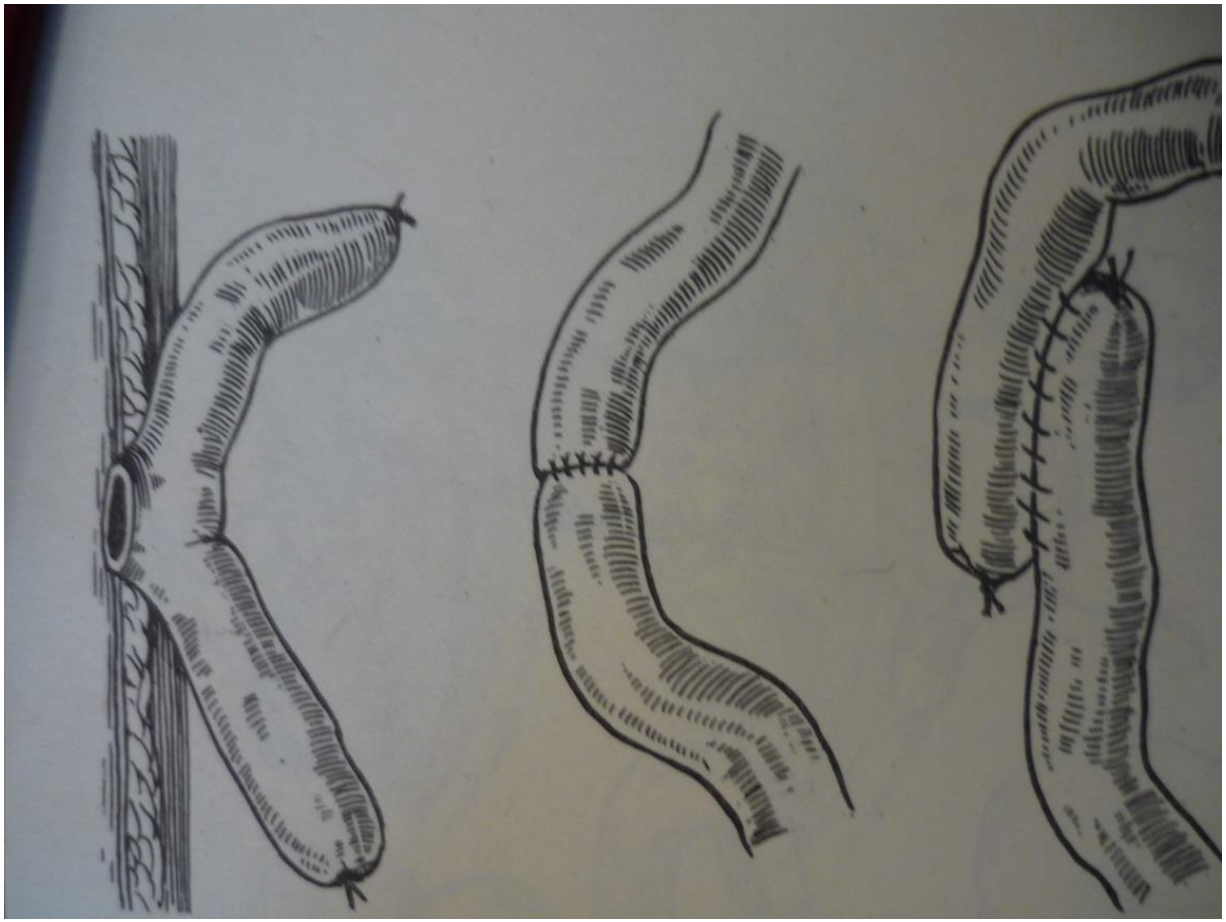


Surgical treatment: Exclusion of the fistula. Hacker-Dzhanelidze surgery.

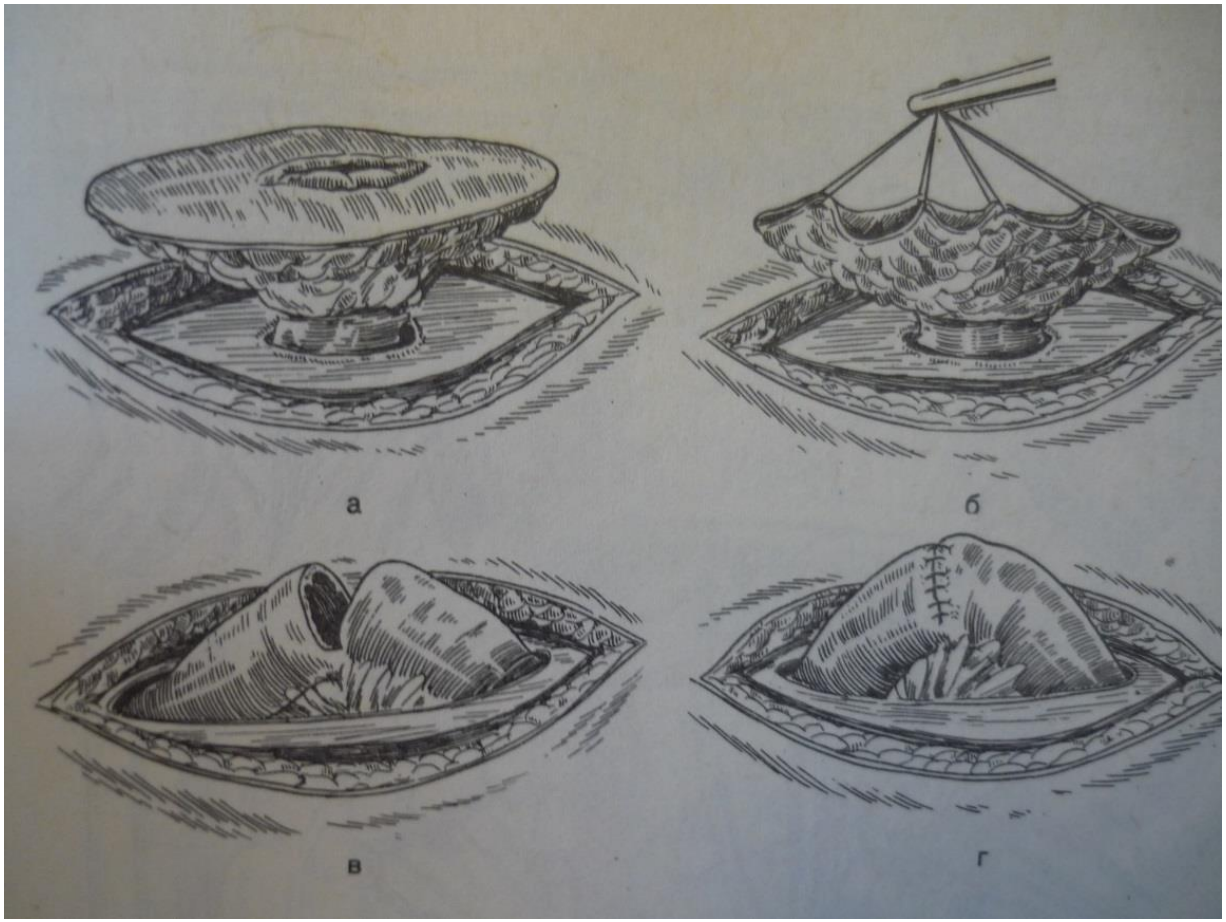


Surgical treatment:

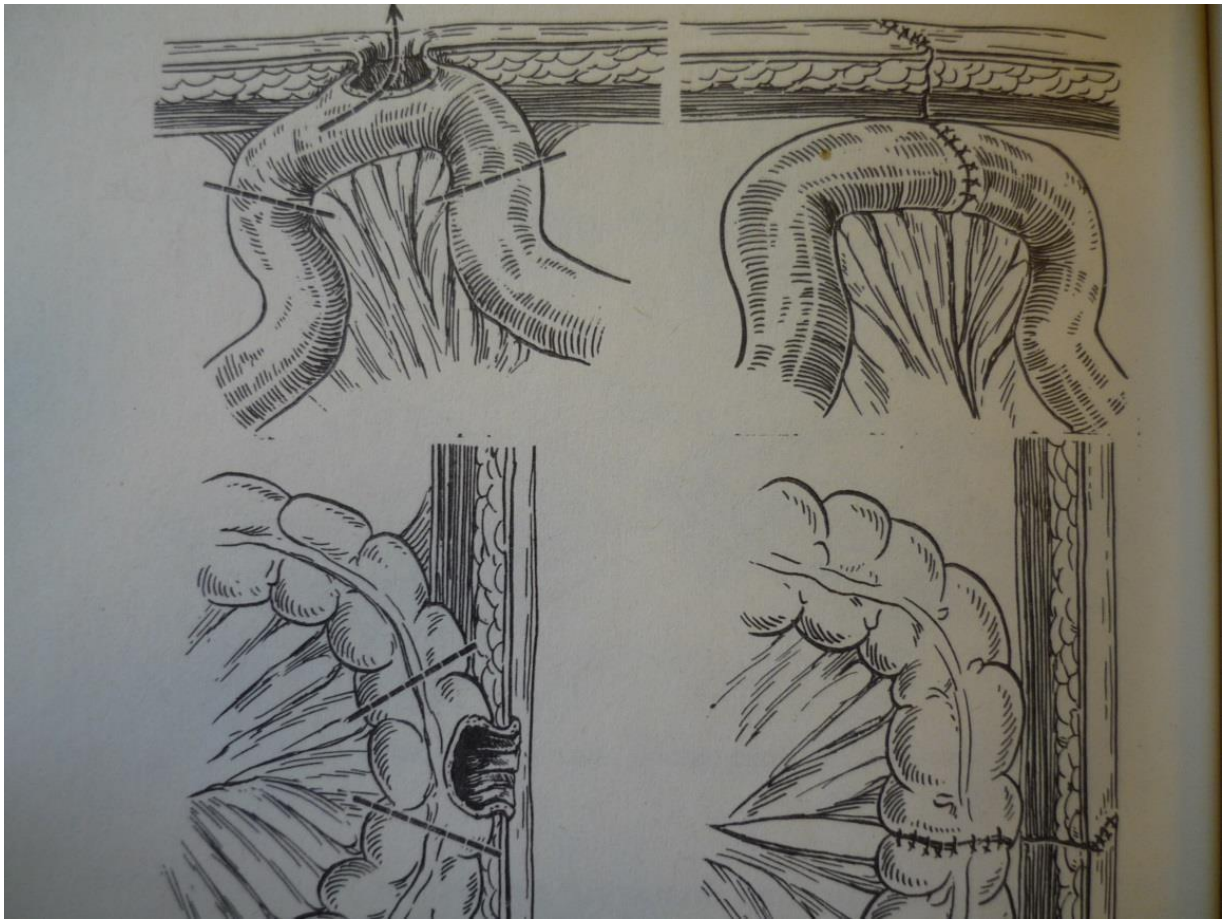
Complete exclusion of the fistula.



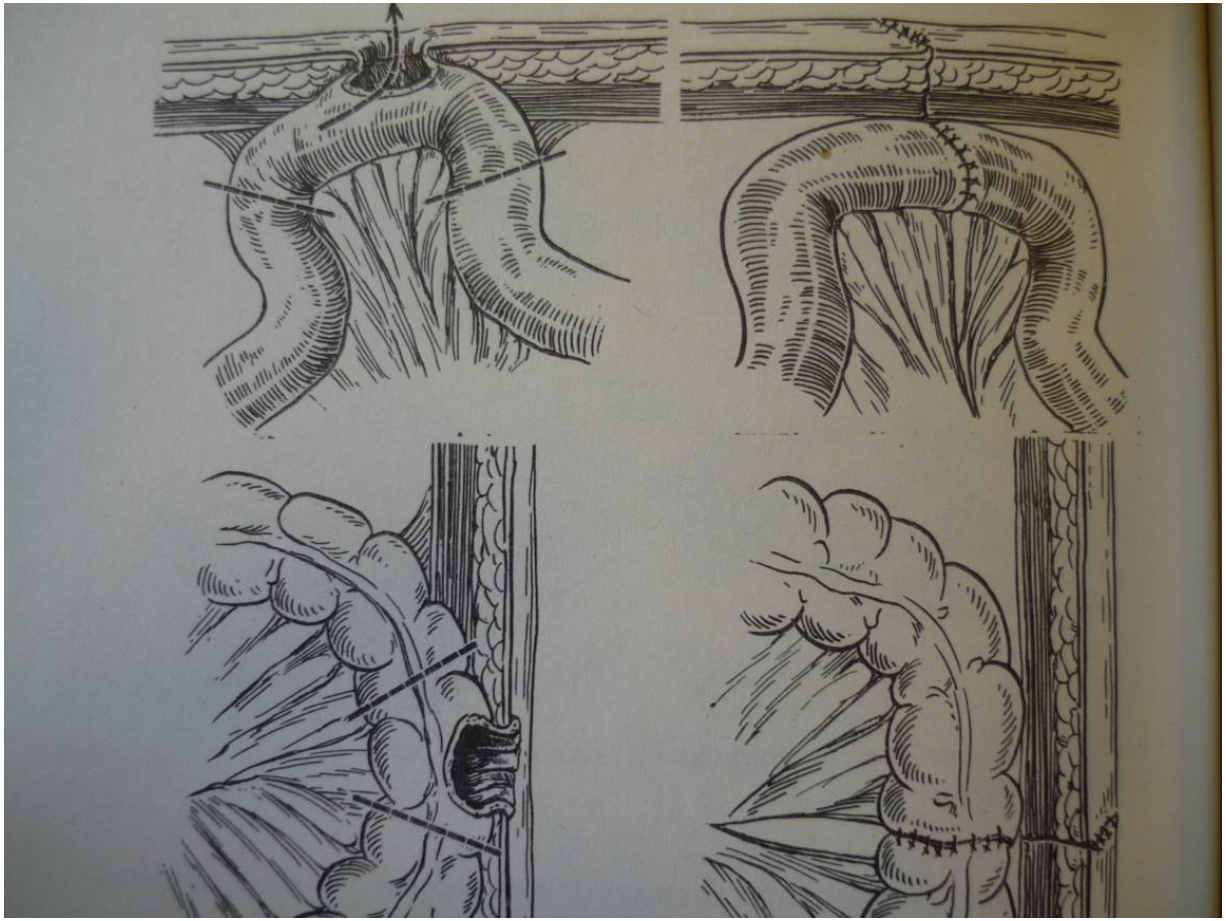
Surgical treatment: Parietal resection of the intestine with a fistula.

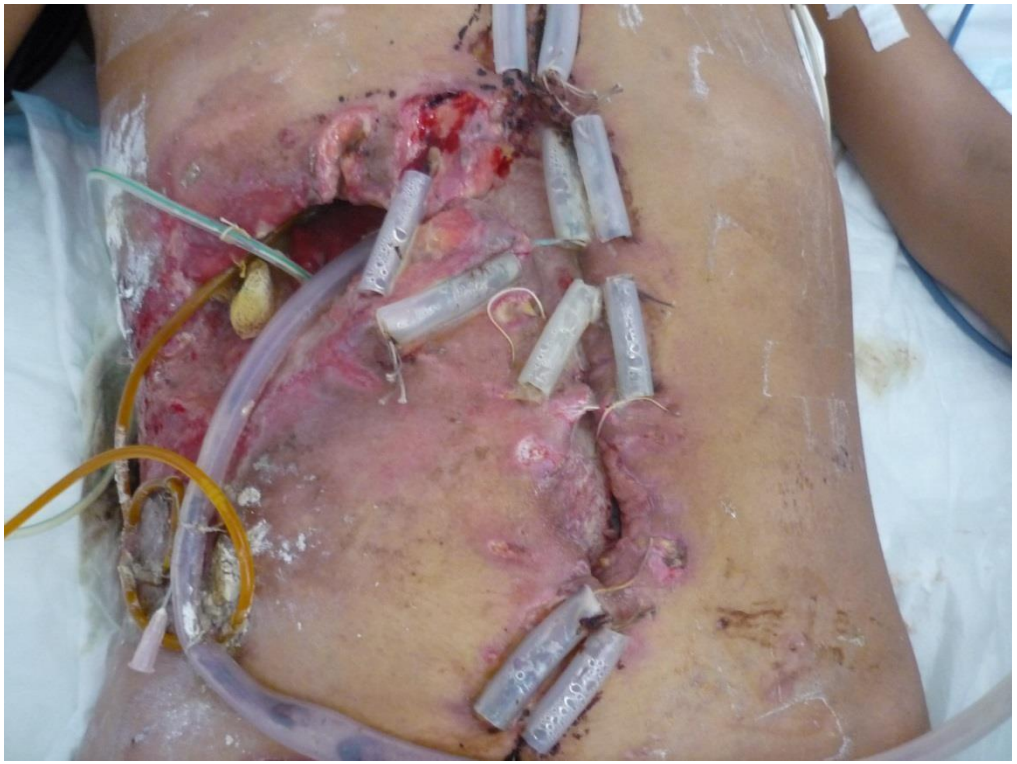


Surgical treatment: Parietal resection of the intestine with a fistula.



Surgical treatment: Parietal resection of the intestine with a fistula.





Patient A., aged 23 years. Больная А., 23 года.

Diagnosis: Complete unformed biliary fistula, incomplete duodenal fistula opening into a purulent wound, maceration of skin, fixed subcutaneous eventration.

Thank you for your attention!