Department of faculty surgery named after professor Yu.M. Lubensky

Topic: Complications of acute appendicitis

lecture No.6 for 4th grade students
in speciality 31.05.01 General Medicine

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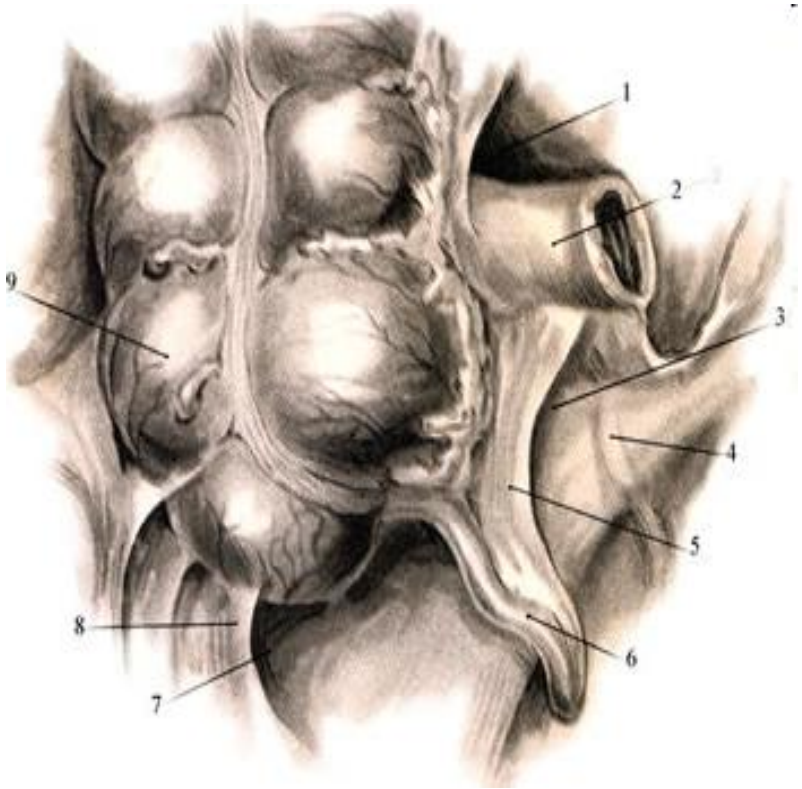
Lecture plan

1. Classification of complications
2. Clinical picture, diagnosis, surgical tactics for the following main complications of acute appendicitis:

- appendicular infiltration
- abscess of appendicular infiltration
- periappendicular abscess
- peritonitis
- pylephlebitis, sepsis

Anatomical and physiological data



- Peritoneal pockets in the area of caecum.
  - 1 — recessus ileocaecalis superior;
  - 2 — ileum (dissected);
  - 3 — recessus ileocaecalis inferior;
  - 4 — ureter dexter;
  - 5 — mesenteriolum appendicis vermiformis;
  - 6 — appendix vermiformis;
  - 7 — recessus retrocaecalis;
  - 8 — plica retrocaecalis;
  - 9 — caecum.

Classification of acute appendicitis complications (V.I. Kolesov, 1972)

- Preoperative complications
- Postoperative complications

Classification of acute appendicitis complications (V.I. Kolesov, 1972)

- Preoperative complications:
  - appendicular infiltration
  - abscess of appendicular infiltration
  - periappendicular abscess
  - peritonitis (local, diffuse, generalised)
  - peritoneal (abdominal) sepsis

Classification of acute appendicitis complications (V.I. Kolesov, 1972)

- Postoperative complications:
  - early, late
  - local, general
  - associated with:
    - tactical errors (difficulties in diagnosis, late surgery, inadequate drainage, etc.)
    - technical errors (excessive traumatisation of tissues during the surgery, suture failure, mesenteric vessel ligation leakage, etc.)

Classification of acute appendicitis complications (V.I. Kolesov, 1972)

- Postoperative complications
  - Surgical wound complications
    - infiltration in the anterior abdominal wall
    - wound abscess
    - haemorrhage from the abdominal wall wound
    - haematoma in the wound
    - wound dehiscence (with eventration, without eventration)
    - suture sinuses
    - postoperative hernia

Classification of acute appendicitis complications (V.I. Kolesov, 1972)

- Postoperative complications
  - Complications in the abdominal cavity
    - intraabdominal haemorrhage, abscess of the haematoma in the appendectomy area, abscess of the haematoma in the Douglas space
    - infiltrations and abscesses in the ileocaecal region, peristump abscess
    - interloop infiltrations and abscesses, infiltrations and abscesses of the lesser pelvis cavity

Classification of acute appendicitis complications (V.I. Kolesov, 1972)

- Postoperative complications
  - Complications in the abdominal cavity
    - acute intestinal obstruction (dynamic, mechanical)
    - intestinal fistulae
    - progressive peritonitis

Classification of acute appendicitis complications (V.I. Kolesov, 1972)

- General complications after appendectomy:
  - thrombophlebitis and thrombosis of the lower limbs
  - thromboembolism of the pulmonary artery
  - thrombosis and embolism of mesenteric vessels
  - pylephlebitis, sepsis

Appendicular infiltration

- A conglomeration consisting of inflammatorily changed loops of the bowels and greater omentum that adhere to each other and parietal peritoneum, that separates the inflamed vermiform process and the exudate accumulated around it from the free abdominal cavity
- complicates the course of acute appendicitis in 1-3% of the cases

Stages of appendicular infiltration development
(N.S. Uteshev, 1975; A.I. Krakovsky, 1986)

1. Loose infiltrate (early stage).
2. Dense infiltrate (late stage).
3. Periappendicular abscess in the loose infiltrate and abscess of the dense infiltrate.

Appendicular infiltration. Clinical picture.

- Develops on days 3-5 from the disease onset,
- abdominal pain almost disappears,
- general condition of the patients improves,
- body temperature remains subfebrile,

Appendicular infiltration. Clinical picture.

- Objective assessment of the abdomen:
  - impossible to reveal muscle tension or other symptoms of peritoneal irritation,
  - in the right iliac area, it is possible to palpate quite a dense, minimally painful and minimally mobile tumour-like formation,
  - the dimensions of the infiltrate may differ, sometimes it occupies the whole right iliac area,
  - oftentimes, positive Rovsing's and Sitkovsky's signs are present.

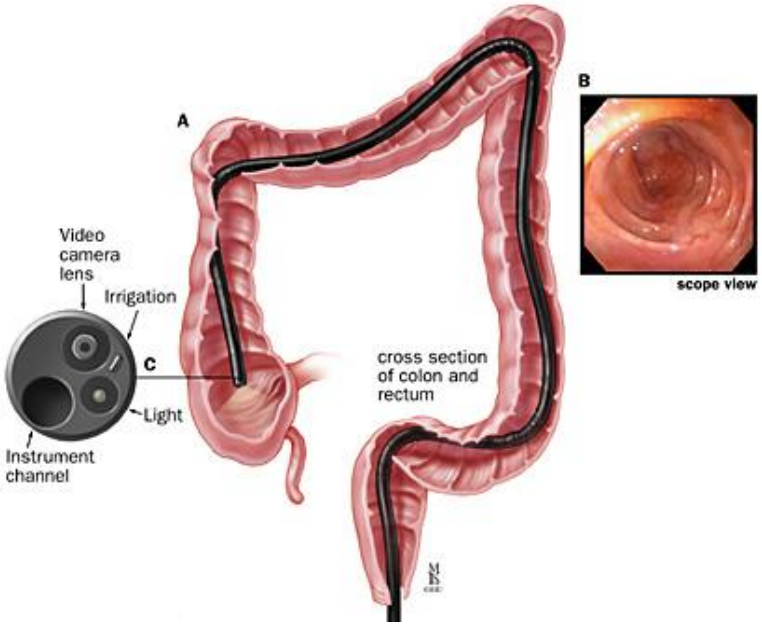
Appendicular infiltration. Diagnosis.

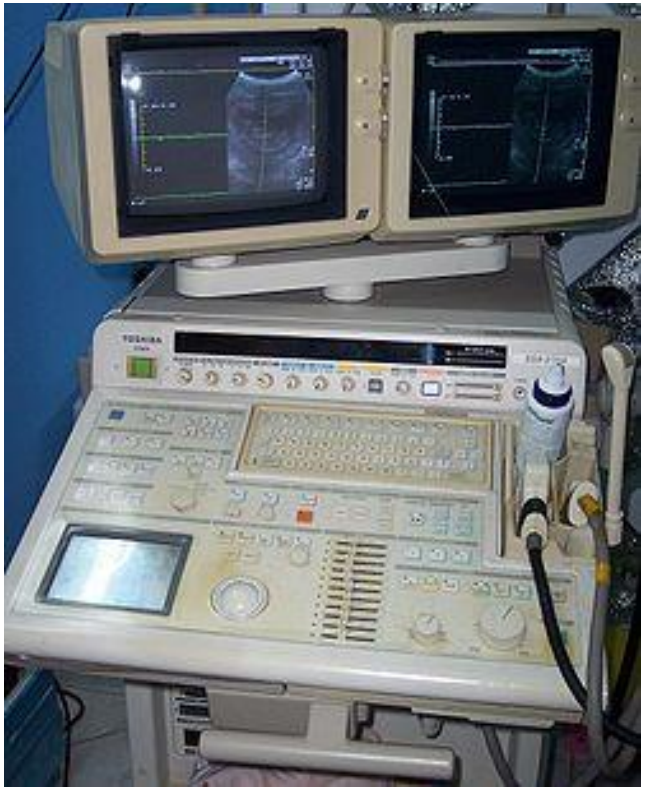
- medical history,
- clinical picture,
- rectal and vaginal examination,
- moderate leukocytosis with presence of neutrophilic inflammatory shift,
- ultrasound examination (it is possible to determine the internal structure of the formation, dynamics of inflammatory changes over time and under the influence of the treatment performed).
- MSCT of the abdominal cavity.

Appendicular infiltration. Differential diagnosis.

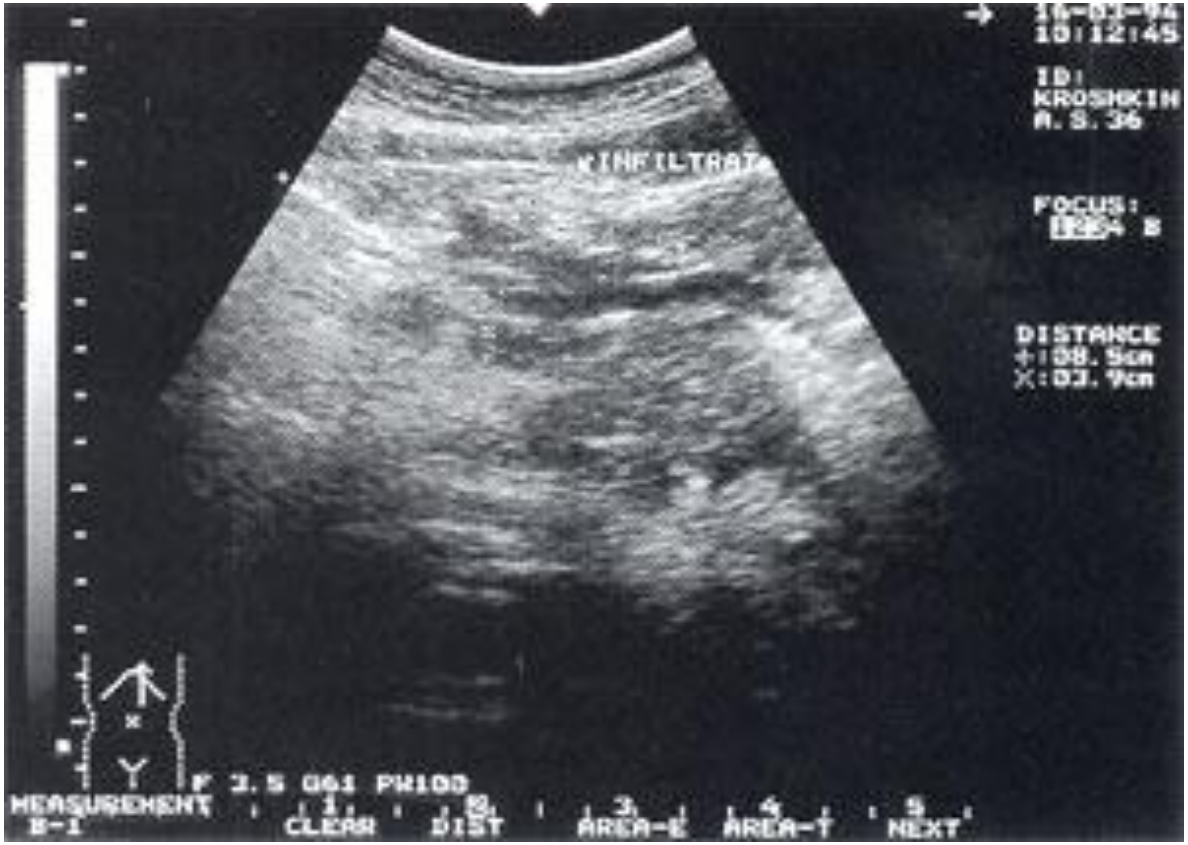
- differentiation between appendicular infiltration and caecal tumour:
  - in elderly subjects,
  - medical history: in acute appendicitis, it is short, the pain is acute and accompanied by increased body temperature, whereas the tumour is characterised by long-term medical history with gradual development of pain syndrome without significant elevation of body temperature,
  - tumour of the caecum is frequently complemented by anaemia, oftentimes leads to intestinal obstruction phenomena, which is almost never observed in case of appendicular infiltration,
  - dynamic observation of appendicular infiltration makes it possible to note that the tumour-like formation becomes smaller while there is no shrinkage for a true tumour.

Appendicular infiltration. Diagnosis.





Appendicular infiltration. Diagnosis.



Conservative treatment of appendicular infiltration

1) bedrest
2) general antibacterial therapy
3) physiotherapy (warmth, warm microenemas, diathermy, UHF)
4) ***surgery is contraindicated***

Clinical signs of resorption of appendicular infiltrate

- persistent normalisation of body temperature,
- good general condition
- normalisation of the white blood picture and ESR
- painless palpation of the abdomen
- absence of infiltrate both upon palpation through the anterior abdominal wall and rectal examination, according to ultrasound data
- normalisation of motor and evacuation function of the bowel

Symptoms of abscess of appendicular infiltration

- high body temperature
- acute local pain upon palpation, fluctuation
- local symptoms of peritoneal irritation
- high leucocytosis with distinct left shift of the leucocyte formula
- fluid cavern identifiable with ultrasound

Abscess of appendicular infiltration

- Upon revealing appendicular abscess at the preoperative stage without signs of peritonitis. it is recommended to perform drainage of the abscess through percutaneous approach with ultrasound or CT-guidance
- In the postoperative period, regular sanitation is required (2-3 times per day) as well as ultrasound monitoring of the drained area.

Abscess of appendicular infiltration

- In absence of ultrasound and CT-navigation for percutaneous drainage, it is necessary to perform appendicular abscess drainage through open approach (the Pirogov's extraperitoneal approach).
- ***upon opening of abscessed appendicular infiltrate, one should under no circumstances seek simultaneous appendectomy,***
- it is only removed in case when it is not accompanied by technicalities (the process lies freely in the abscess cavity),
- in the postoperative period, the patients prescribed detoxification therapy and broad-spectrum antibiotics.

Example of diagnosis wording

- Appendicular infiltration
- Abscess of appendicular infiltration
- Abscess of appendicular infiltration with breakthrough into the abdominal cavity. Generalised purulent peritonitis

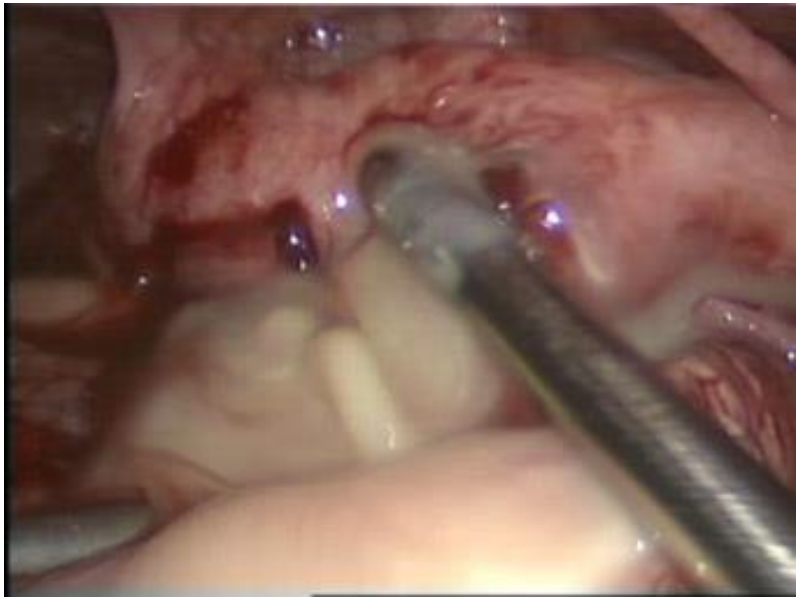
Periappendicular abscess

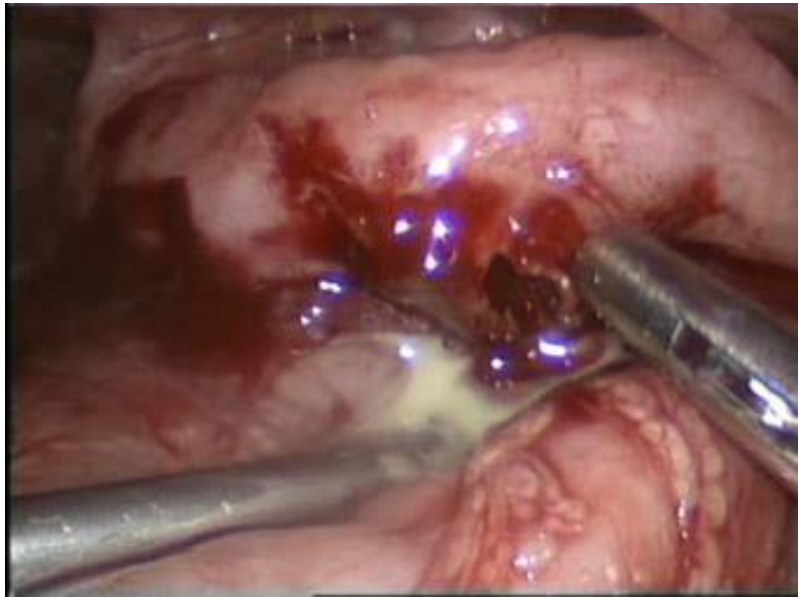
- An abscess around the destructively changed vermiform process, that is separated by intestinal loops, greater omentum and parietal peritoneum that loosely adhere to each other.
- Occurs in 11.4% of destructive peritonitis cases.

Periappendicular abscess

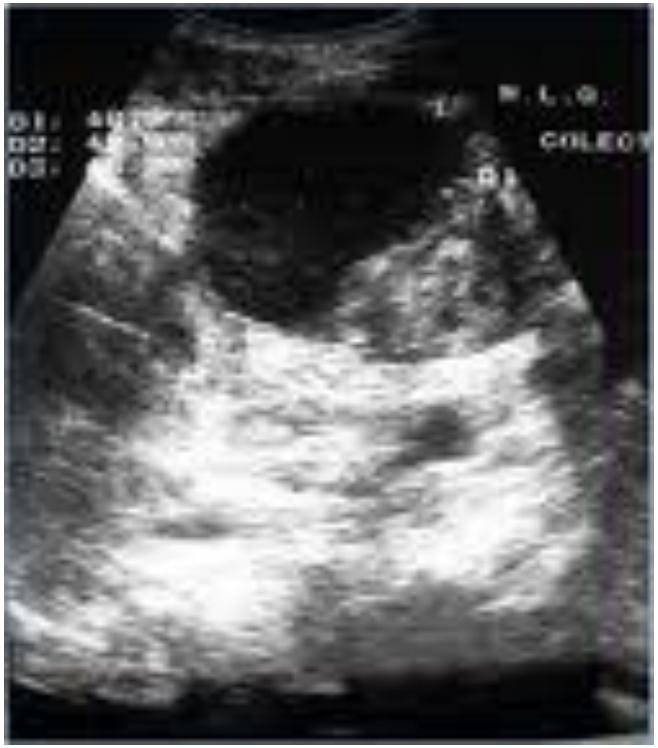
- It is possible to perform appendectomy in 70% of the cases, the abscess cavity is drained using a rubber tube and micro-irrigator device for antibiotics
- In 30% of the cases, it is impossible to perform appendectomy due to pronounced infiltration and purulent fusion of the process
- The wound is closed using rare coaptation stitches up to the drainages

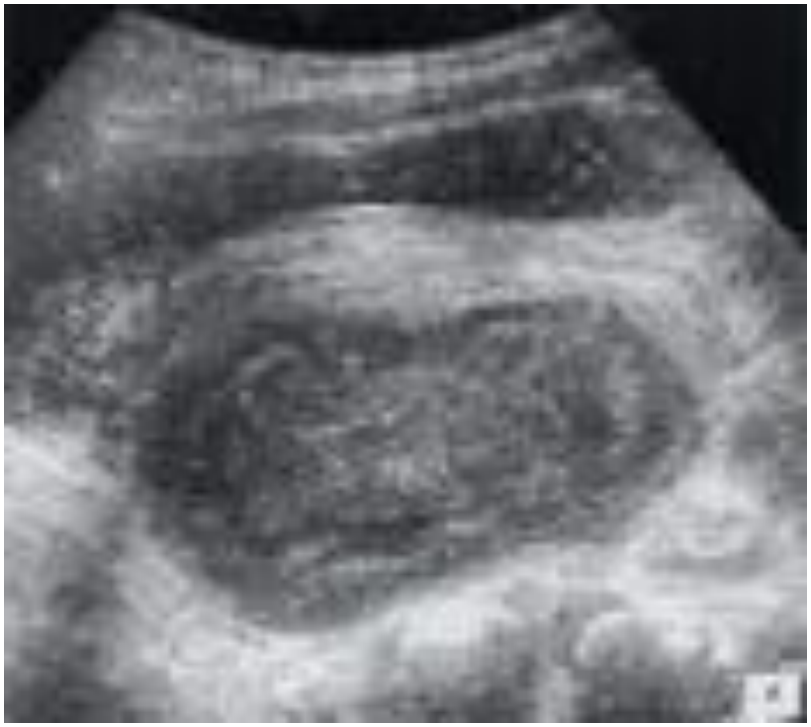
Periappendicular abscess





Periappendicular abscess





Example of diagnosis wording

- Acute gangrenous perforating appendicitis. Periappendicular abscess.

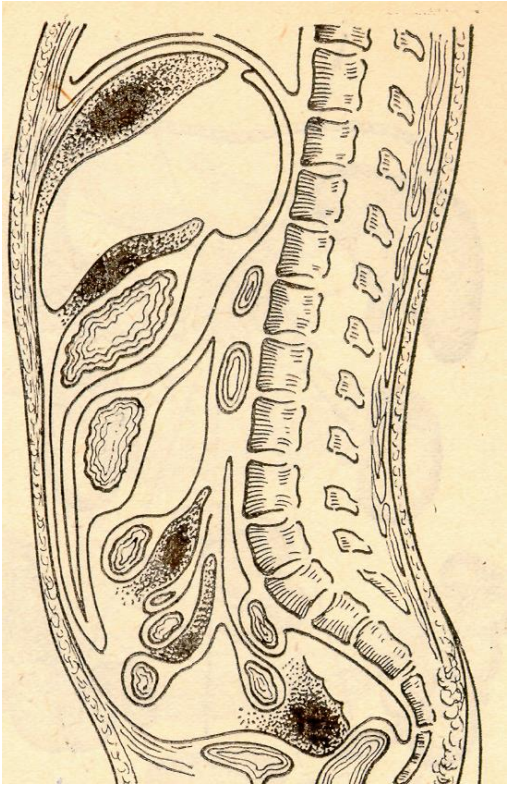
Scheme of localisation of circumscribed abscesses of the abdominal cavity in acute appendicitis

Subphrenic abscess

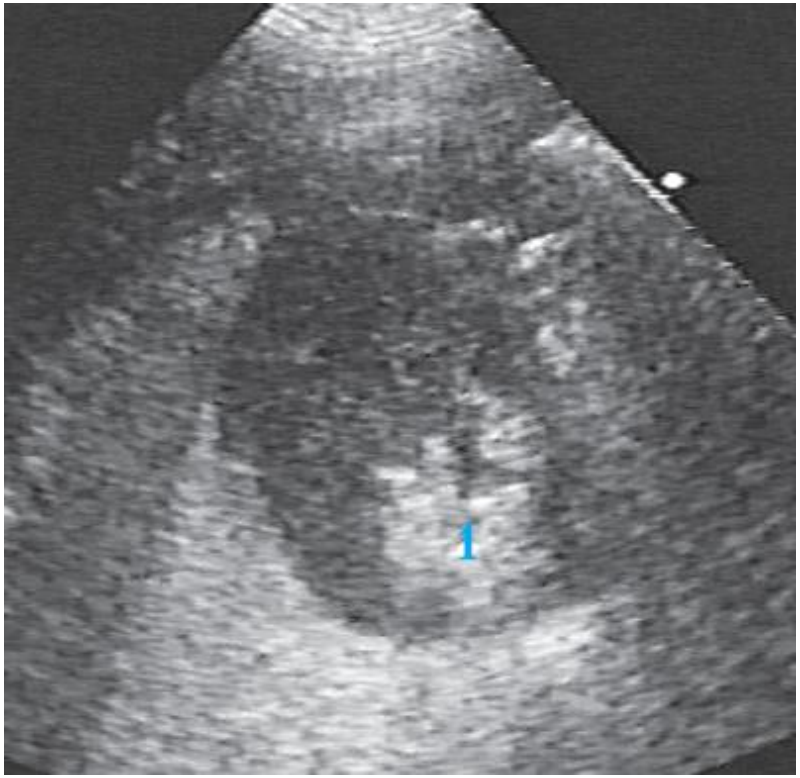
Subhepatic abscess

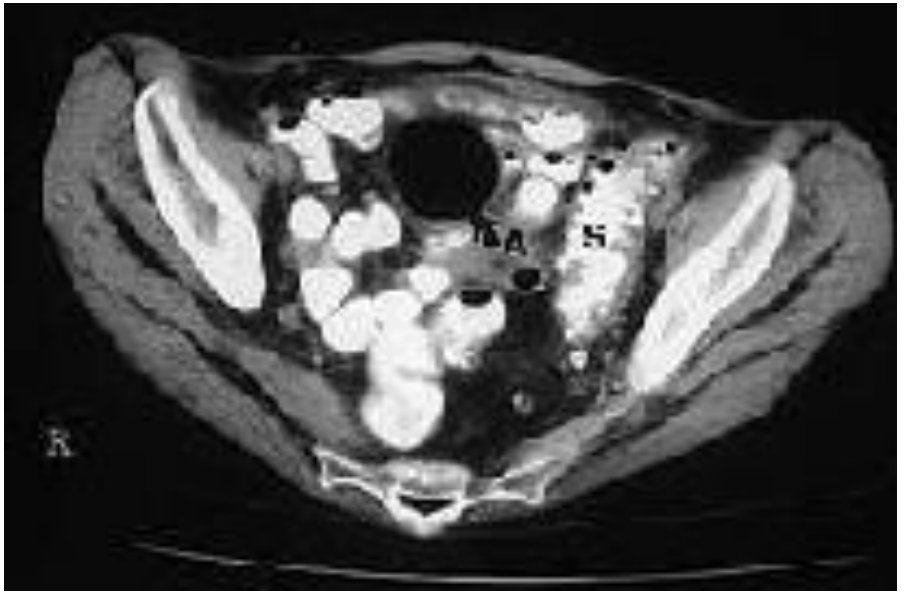
Interintestinal abscess

Douglas space abscess



Diagnosis of abdominal cavity abscess

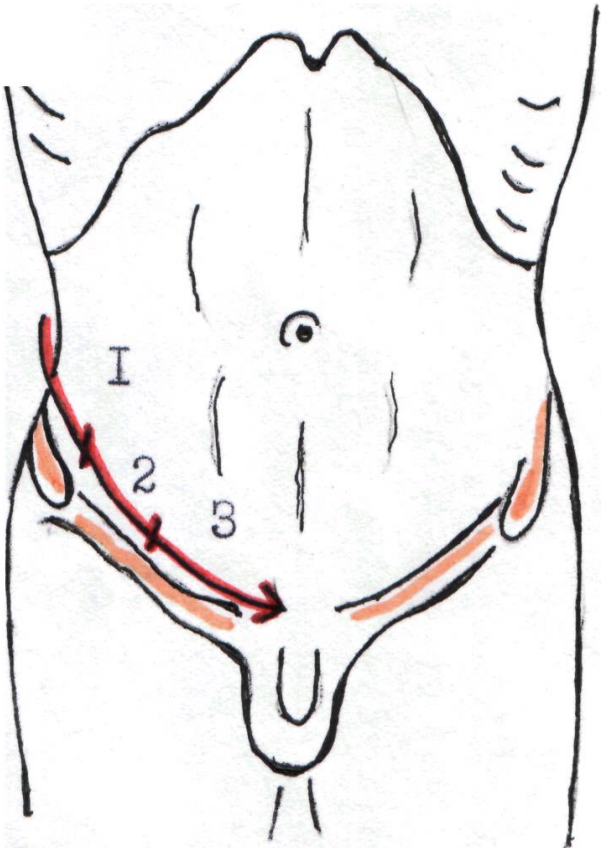




Surgical treatment of local peritonitis in acute appendicitis

- In local purulent peritonitis (up to two anatomical areas), it is recommended to perform evacuation of exudate and drainage of the abdominal cavity (with bacteriological analysis of the peritoneal liquid)
- In case of technicalities and prolonged duration of operative intervention increasing the risk of adverse outcome of the surgery, it is recommended to consider the question of conversion

Scheme of incisions for opening and drainage of appendicular abscess



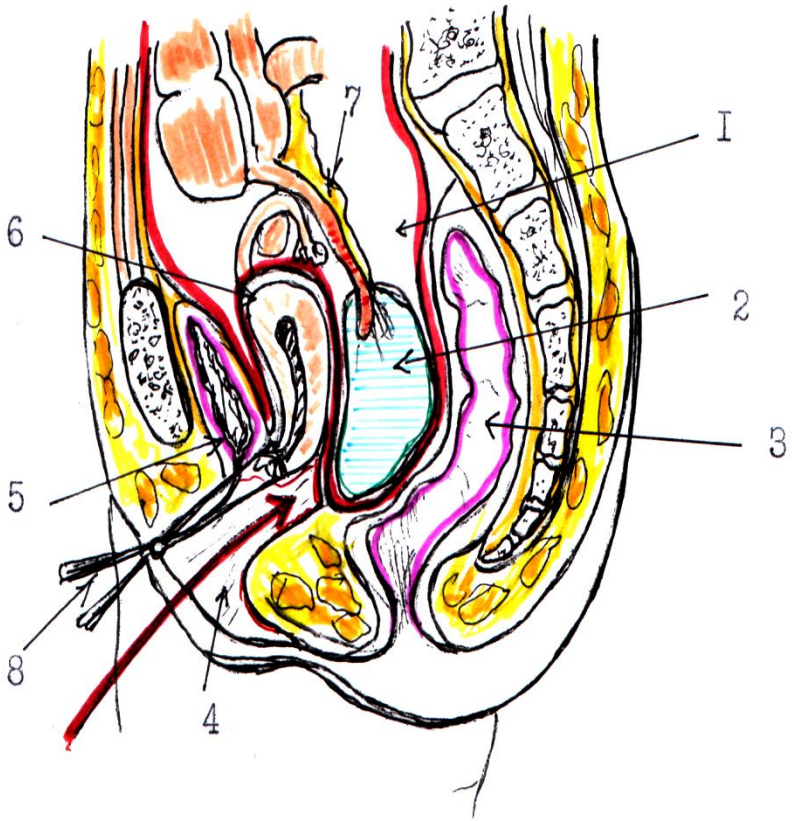
I - incision in the upper third of this line allows extraperitoneal approach to the retrocecal abscess

2 - incision in the middle third matching the iliac spine and Poupart's ligament is appropriate for opening of iliac abscess

3 - incision above the mons pubis allows access to the median celiac abscess.

When the abscess is at the bottom of the Douglas pouch, the approach to it is gained through colpotomy or rectotomy и

Transvaginal approach for drainage of the pelvic abscess in the Douglas space

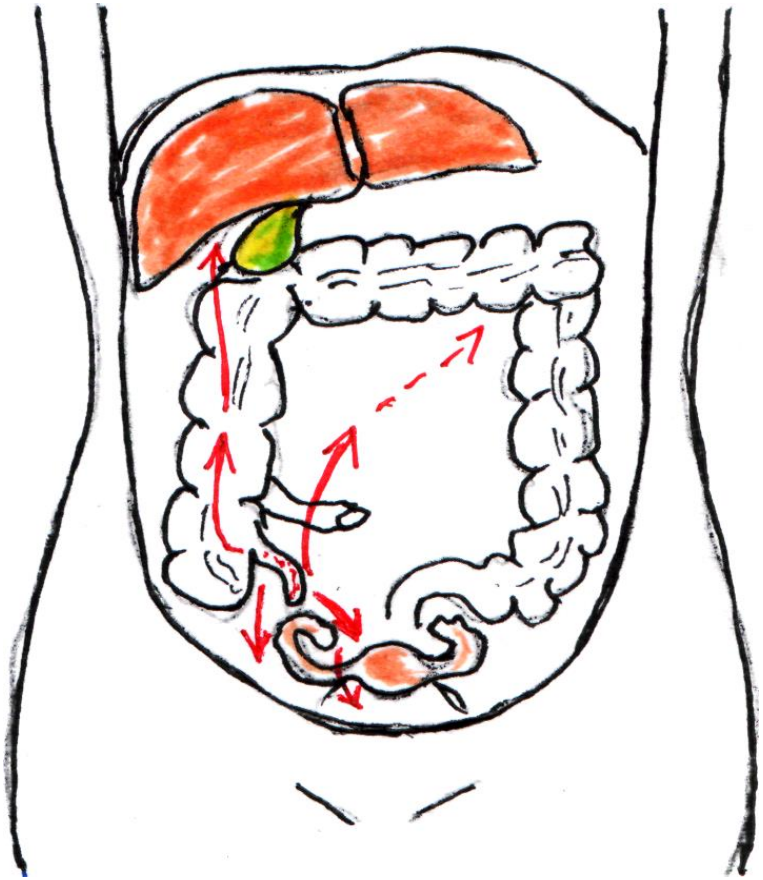


I - Douglas space /excavatio rectouterina/
2 - abscess of the Douglas pouch
3 - rectal ampulla /ampulla recti/
4 – vagina /vagina/
5 - urinary bladder /vesica urinaria/
6 – uterus /uterus/
7 – vermiform process /appendix vermiformis/
8 - bullet forceps on the cervix

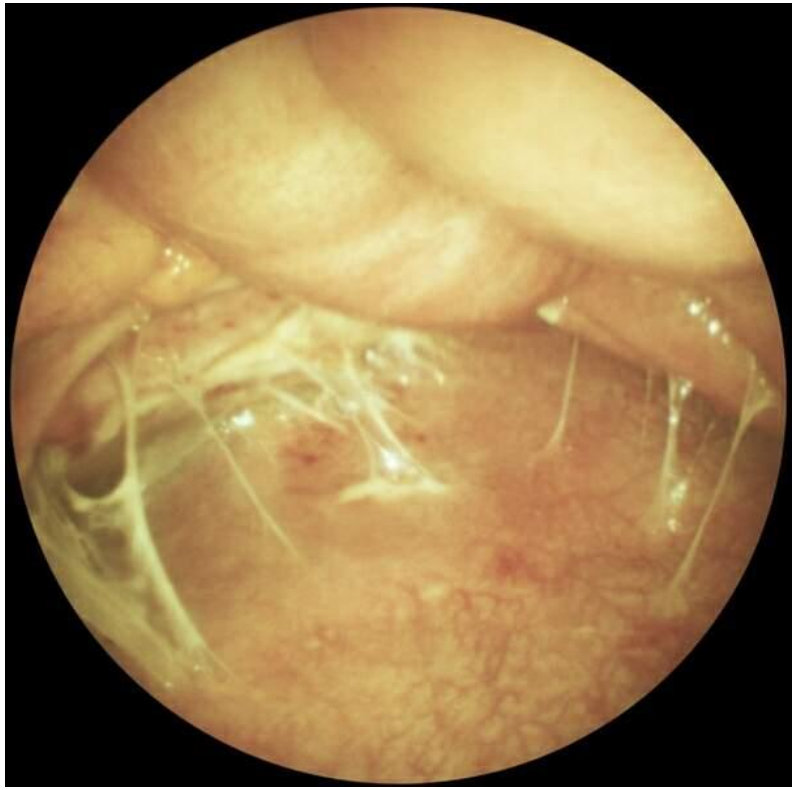
Example of diagnosis wording

- Acute gangrenous appendicitis. Abscess of the lesser pelvis.
- Acute gangrenous appendicitis. Subhepatic abscess.

Scheme of spread of purulent infection in destructive appendicitis



Laparoscopic picture of peritonitis



Surgical treatment of local peritonitis in acute appendicitis

- In widespread and diffuse peritonitis complicated by pronounces GIT paresis, compartment syndrome and septic shock, it is recommended to perform the surgery via open approach through midline laparotomy and a corresponding programme of postoperative management in the resuscitation and intensive care unit

Treatment of widespread peritonitis of appendicular origin

1. infection control – elimination of the source of infection in the abdominal cavity through an early surgery, effective sanitation of the abdominal cavity and drainage of the abdominal cavity, massive antibacterial therapy
2. liquidation of paralytic ileus
3. detoxication of the organism

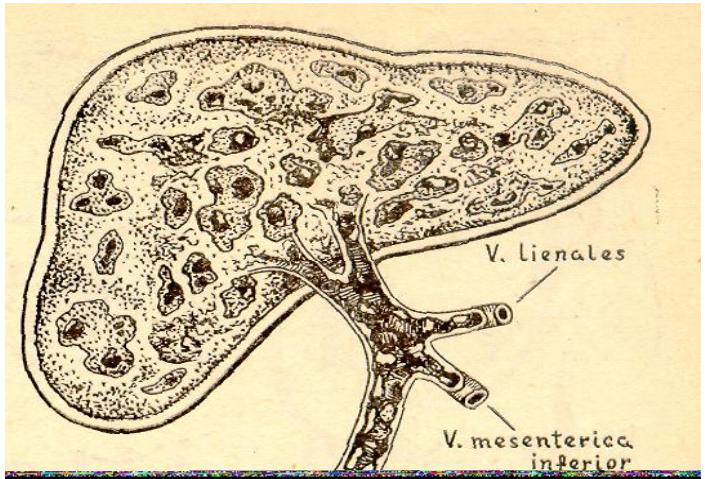
Treatment of widespread peritonitis of appendicular origin

4. correction of disorders in water and electrolyte exchange, acid-base status, protein exchange using massive infusion-transfusion therapy
5. correction of disfunction in cardiovascular system, lungs, liver and kidneys

Example of diagnosis wording

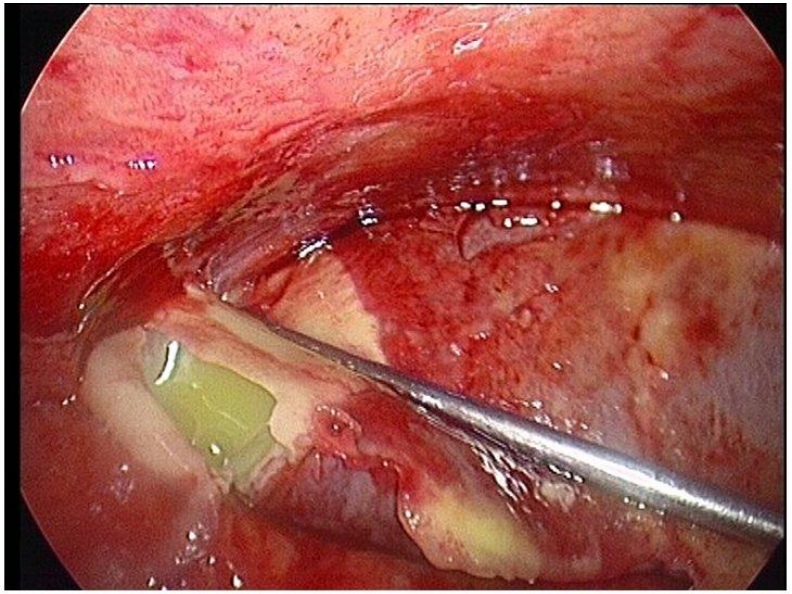
- Acute phlegmonous appendicitis.
  Local serous peritonitis.
- Acute gangrenous appendicitis.
  Diffuse purulent peritonitis.
- Acute gangrenous perforating appendicitis.
  Generalised purulent peritonitis.

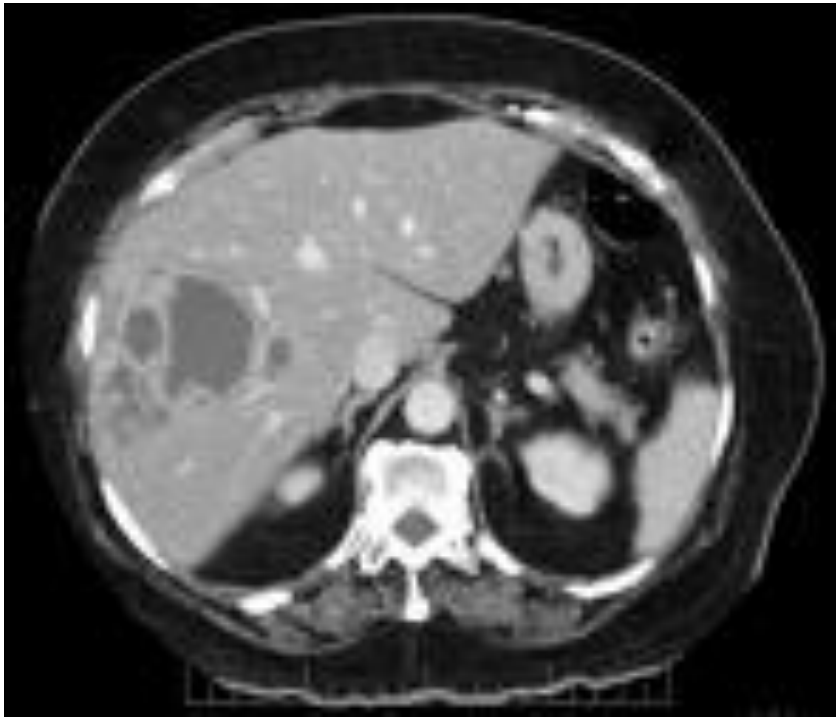
Pylephlebitis



- Purulent thrombophlebitis of the portal vein.
- Develops on days 2-4 after the surgery.
- Characterised by:
  - pronounced intoxication
  - yellowing of the skin
  - hectic fever
  - pronounced leukocytosis with a left shift
  - enlarged liver

Pylephlebitis





Example of diagnosis wording

- Acute gangrenous perforating appendicitis. Local purulent peritonitis. Pylephlebitis. Hepatic apostematosis. Abdominal sepsis.

Postoperative complications. Main aetiological factors.

1. Developed acute appendicitis due to late presentation of the patients or due to diagnostic errors of the physicians at the prehospital and hospital stages of treatment.
2. Defects of surgical technique and tactical errors during the appendectomy.
3. Unforeseen situations associate with exacerbation of comorbidities.

Postoperative complications

- Surgical wound complications:
  - infiltration in the anterior abdominal wall
  - wound abscess
  - haemorrhage from the abdominal wall wound
  - haematoma in the wound
  - wound dehiscence (with eventration, without eventration)
  - suture sinuses
  - postoperative hernia

Infiltration in the anterior abdominal wall

- Develops gradually by days 4-6 after the surgery.
- Aggravation of pain in the wound area, especially while moving.
- Upon examination:
  - significant oedema of wound edges,
  - hyperaemic skin around the wound, elevated local temperature,
  - infiltrate 4-6cm from the wound edges,
  - body temperature of 37.5-38.0°C,
  - moderate leukocytosis in blood.

Infiltration in the anterior abdominal wall

- Physiatry (UHF, UV).
- Antibiotic therapy.
- Antiplatelet medications.
- Semi-spirituous dressings.

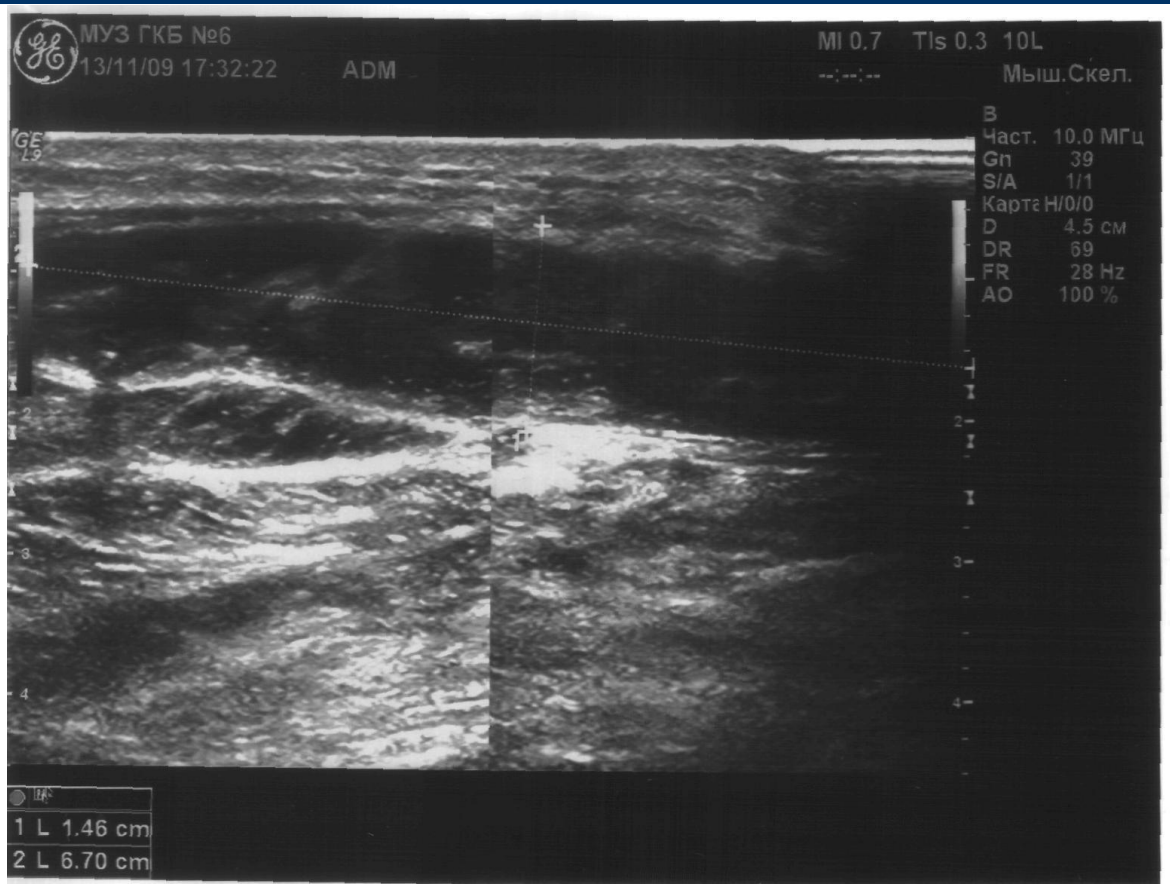
Wound abscess

- rough traumatisation of the wound by the surgeon’s hands and tools,
- inability of the surgeon to preserve the wound from infection by peritoneal exudate,
- bad haemostasis,
- usage of low-quality suturing materials,
- bad postoperative treatment.

Wound abscess

- aggravation of pain,
- elevation of body temperature, especially in the evening,
- deterioration of the general condition,
- acute pain in infiltrate around the wound, hyperaemia of its edges, local hyperthermia, leakage of pus between the stitches.

Abscess of the postoperative scar of the anterior abdominal wall. Ultrasound diagnosis.



Wound abscess

- Remove a necessary number of stitches, open the wound wide, perform revision, sanitation and drainage.
- Antibacterial therapy.
- Physiatry.
- Dressings with ointments based on polyethylene glycol, vinyl, solcoseryl.

Example of diagnosis wording

- Acute phlegmonous appendicitis. Postoperative complication: infiltration in the surgical wound, abscess of the postoperative scar, abscess of the surgical wound

Haemorrhage from the abdominal wall wound

- Permanent haemostasis through ligation or suturing of the bleeding vessel.
- The developed haematoma is to be emptied.
- In case of abscess, the haematoma is to be open wide and manage according to the principles of infected wound treatment.

Example of diagnosis wording

- Acute phlegmonous appendicitis. Postoperative complication:
  - haemorrhage from the anterior abdominal wall wound,
  - haematoma of the surgical wound

Wound dehiscence

- In weakened patients with profound impairments of reactivity.
- Continuing peritonitis.
- Abscess of the surgical wound with dehiscence of the aponeurotic sutures.
- More often develops on days 6-8 after the surgery.

Postoperative complications

- Complications in the abdominal cavity
  - abscess of the haematoma in the appendectomy area, abscess of the haematoma in the Douglas space
  - infiltrates and abscesses in the ileocaecal region, peristump abscess
  - interloop infiltrations and abscesses, infiltrations and abscesses of the lesser pelvis cavity

Postoperative complications

- Complications in the abdominal cavity
  - acute intestinal obstruction (dynamic, mechanical)
  - intestinal fistulae
  - progressive peritonitis

Intraabdominal haemorrhage

- Source:
  - mesenteric vessels of the vermiform process,
  - dissected adhesions and fusions.
- Causes:
  - incomplete ligation of mesenteric vessels,
  - slipping of the ligation after reduction of the mesenteric oedema,
  - insufficiently reliable haemostasis in the adhesions,
  - increased bleeding tendency due to general diseases.

Intraabdominal haemorrhage

- Diagnosis:
  - Clinical picture (the discharge obtained through drainage, anaemia, shock)
  - Ultrasound of the abdominal cavity (free liquid, haematoma)
- Treatment:
  - In case of bleeding, reoperation is indicated (relaparoscopy, relaparotomy, sanitation, drainage of the abdominal cavity).

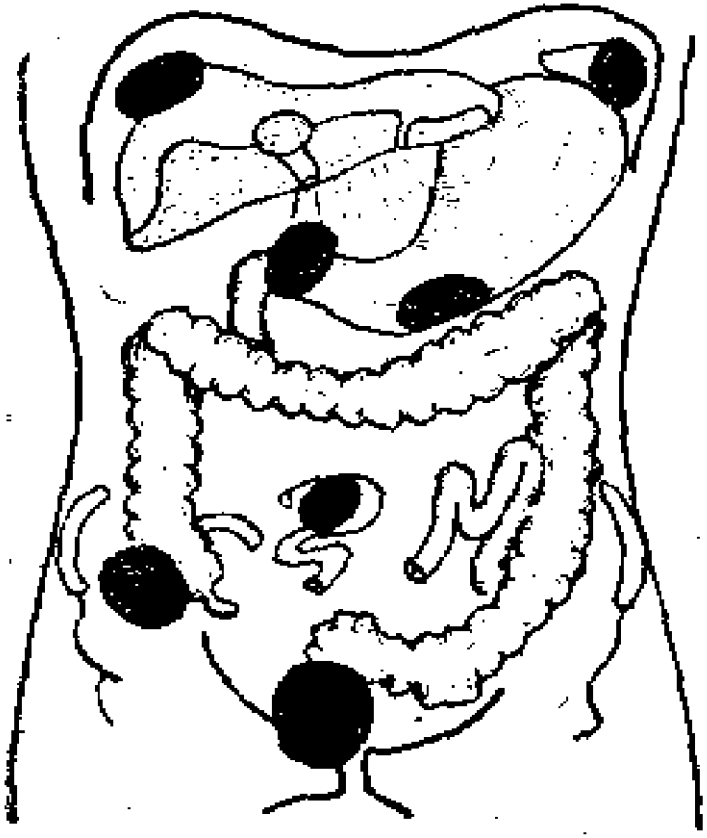
Example of diagnosis wording

- Acute phlegmonous appendicitis. Postoperative complication:
  - intraabdominal haemorrhage,
  - haemoperitoneum

Infiltrations and abscesses of the abdominal cavity

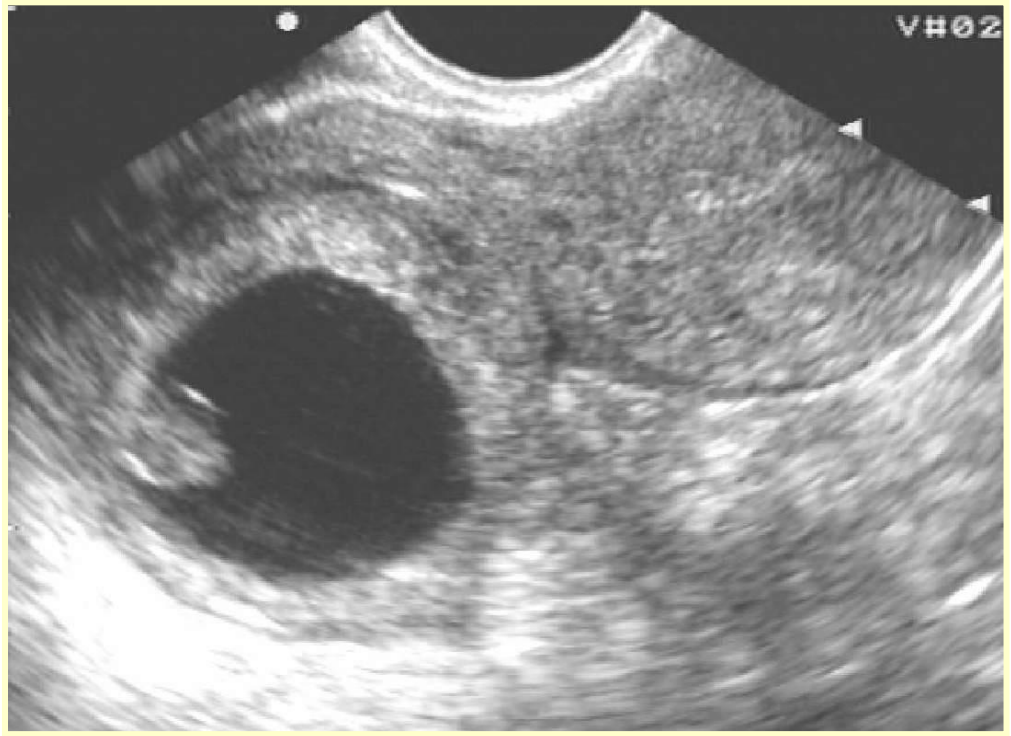
- Risk factors for postoperative abscess:
  - obesity,
  - perforation of the appendix,
  - generalised fibrinous purulent peritonitis,
  - duration of the surgery no longer than 90 minutes,
  - unnecessary irrigation of the abdominal cavity.

Infiltrations and abscesses of the abdominal cavity



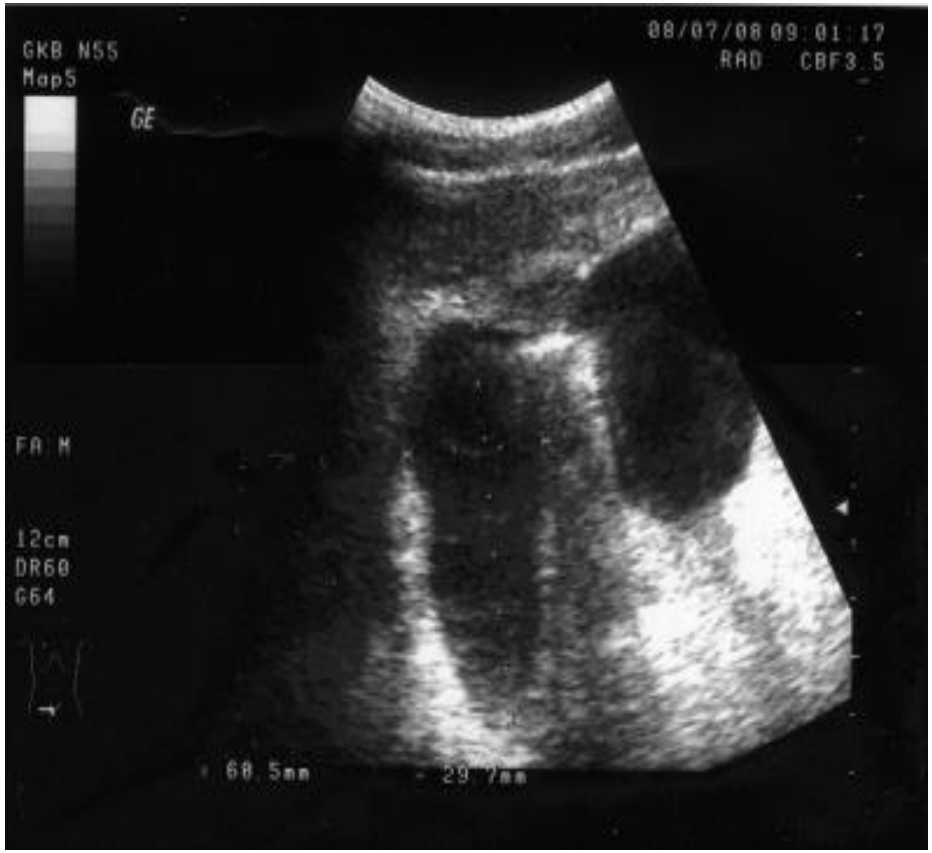
- of the ileocaecal region,
- interintestinal,
- of the lesser pelvis cavity,
- of the subphrenic space,
- of the subhepatic space.

Infiltrations and abscesses of the abdominal cavity



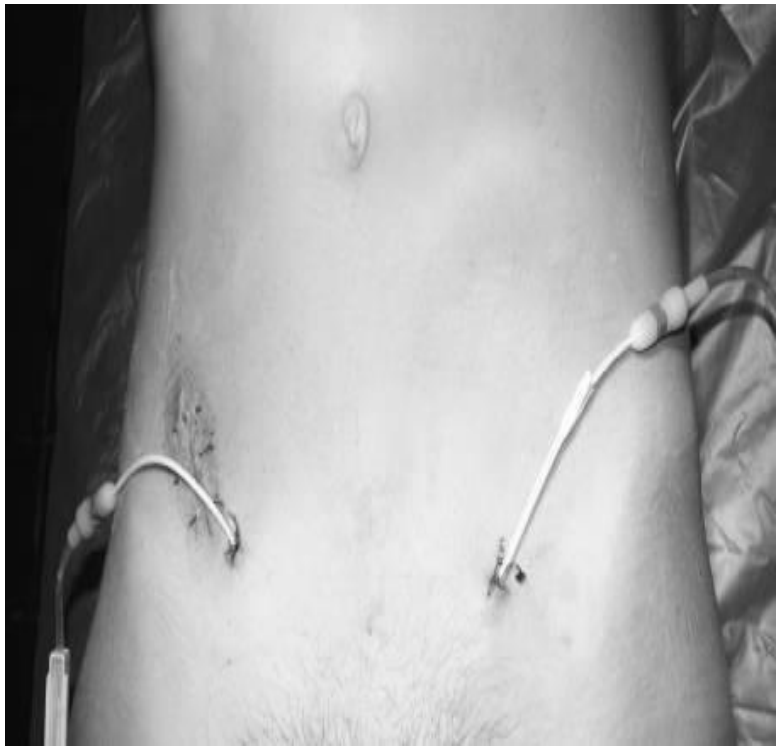
- Ultrasound
- CT

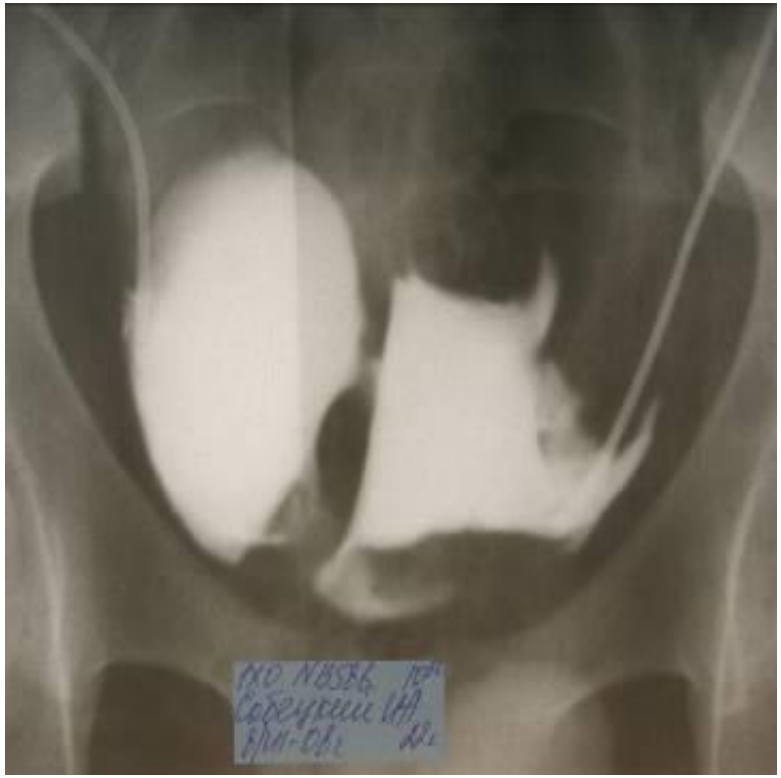
Infiltrations and abscesses of the abdominal cavity



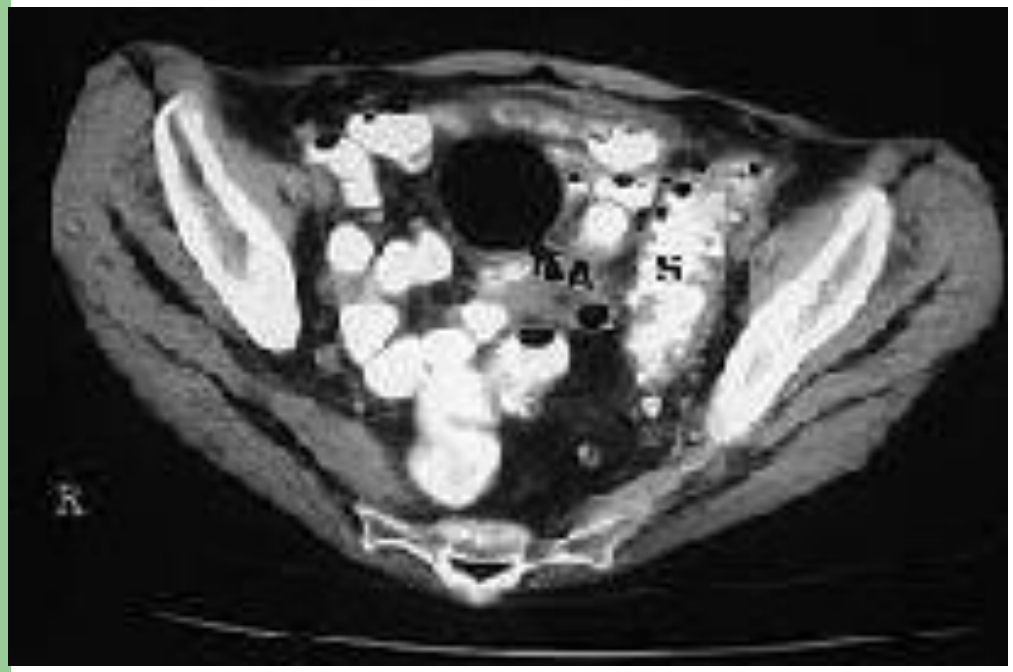
- Intraabdominal abscess after appendectomy in the “hourglass” shape

Infiltrations and abscesses of the abdominal cavity





Infiltrations and abscesses of the abdominal cavity



- Abscess of the abdominal cavity (CT)

Example of diagnosis wording

- Acute phlegmonous appendicitis. Postoperative complication:
  - Infiltration of the abdominal cavity,
- Acute gangrenous appendicitis. Local purulent peritonitis. Postoperative complication:
  - interintestinal abscess,

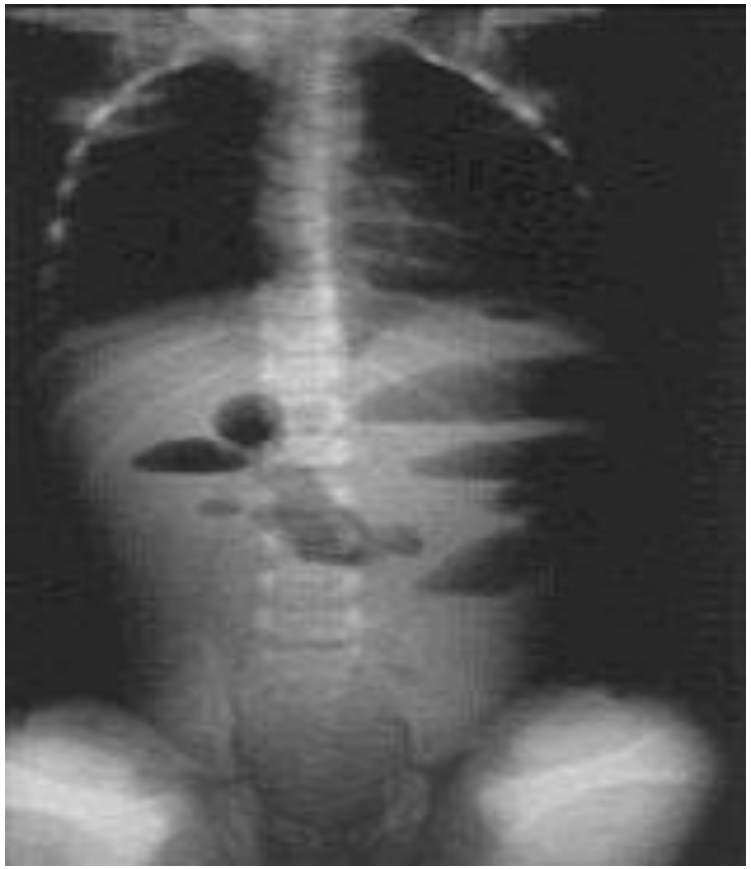
Early postoperative intestinal obstruction

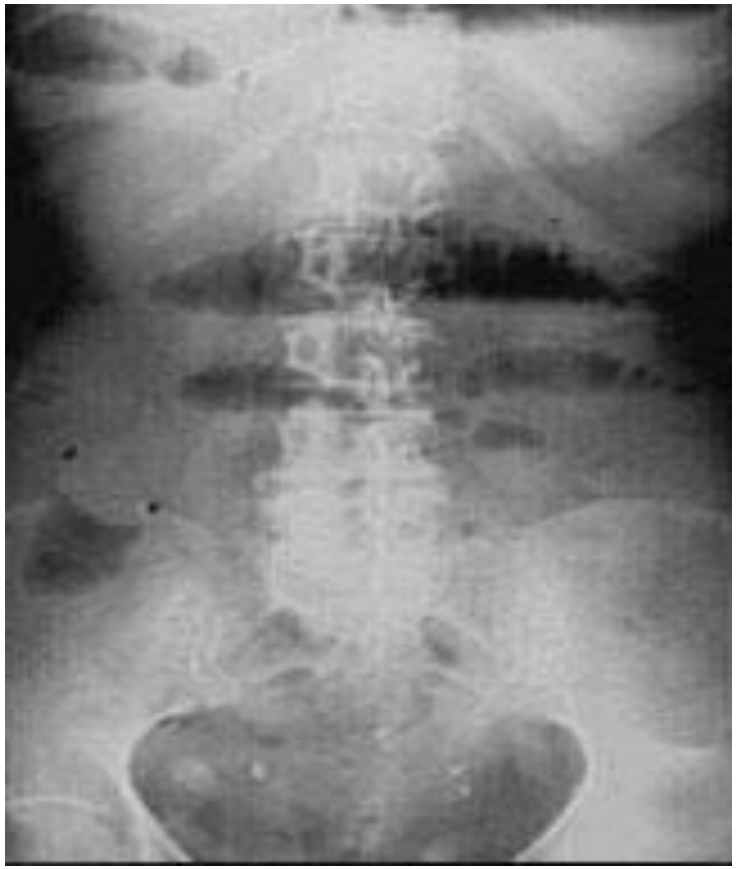
- Before 4 weeks after the surgery, characterised by the presence of a mechanical obstacle in the way of the intestinal contents.
- Most frequent causes – formation of adhesions and strangulation of the intestine (in the trocar wound).
- Clinical manifestations of the intestinal paresis and obstruction are largely similar and require differentiation due to different approaches to their treatment.

Early postoperative intestinal obstruction

- Conservative treatment of early adhesive intestinal obstruction usually must last for no longer than 24-48 hours in all cases
- Laparoscopic adhesiolysis (separation of intestinal adhesions through laparoscopic approach) is preferable.
- Surgical intervention in case of strangulation of an intestine in the wound is to be done immediately.

Early postoperative intestinal obstruction

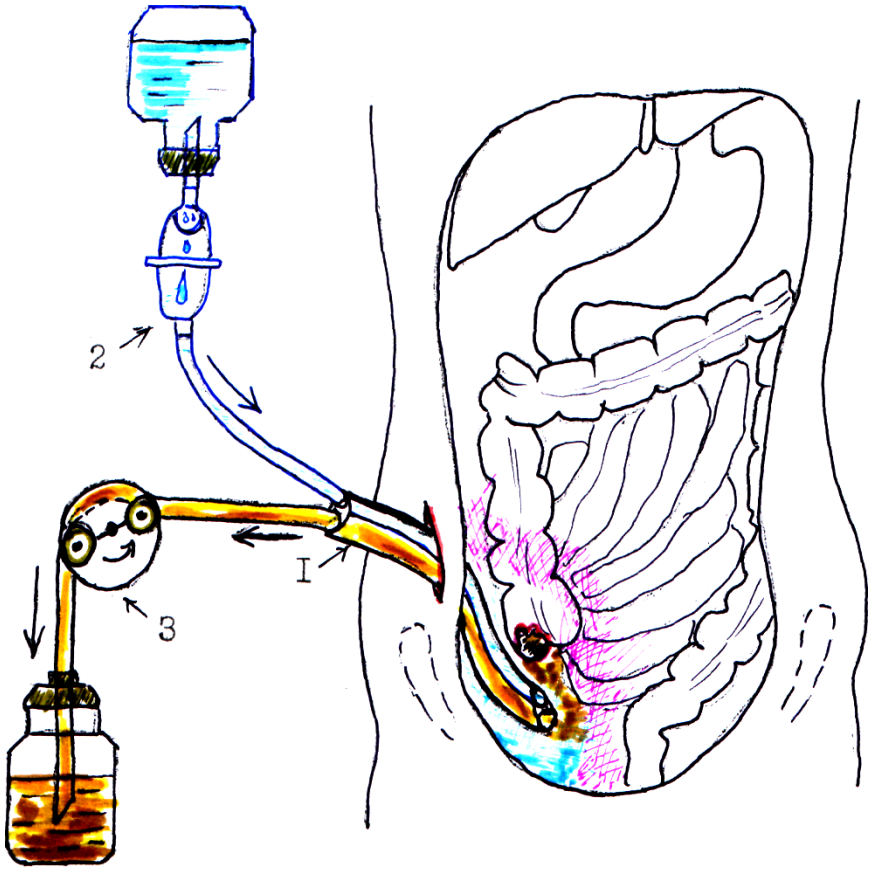




Example of diagnosis wording

- Acute phlegmonous appendicitis. Postoperative complication:
  - Acute early adhesive intestinal obstruction.

Intestinal fistulae



1 - double-barreled drain tube installed into the purulent fecal cavity in the area of fistula

2 – an antiseptic solution is administered drip-wise into the area of fistula for sanitation

3 - through the 2nd lumen of the drain tube, active vacuum aspiration of the rinsing solution with the discharge of the caecal fistula is performed

Example of diagnosis wording

- Acute gangrenous perforating appendicitis. Typhlitis. Local purulent peritonitis. Postoperative complication:
  - Incompetence of the vermiform process stump, incomplete caecal fistula.
- Condition after appendectomy. Tubular fistula of the cecum.

Postoperative peritonitis

- infection of the abdominal cavity with the contents of the vermiform process,
- escape of the pus into the free abdominal cavity upon separation of the appendicular abscess,
- bad sanitation of the abdominal cavity from purulent exudate,
- inadequate drainage of the abdominal cavity,
- technical errors during the surgery.

Example of diagnosis wording

- Acute gangrenous appendicitis. Postoperative complication:
  - Continuing generalised purulent peritonitis,
  - Perforation of the ascending colon. Generalised purulent peritonitis.

Postoperative complications

- General complications after appendectomy:
  - thrombophlebitis and thrombosis of the lower limbs
  - thromboembolism of the pulmonary artery
  - thrombosis and embolism of mesenteric vessels
  - pylephlebitis, sepsis

Thrombophlebitis and thrombosis

- Specifics of pharmaceutical prevention of thrombi:
  - Heparin sodium is prescribed at the daily dosage of 15,000 units, for body mass below 50kg, the daily dosage of heparin is reduced to 10,000 units. The interval between injections is 8h.
  - Low molecular weight heparins. In urgent surgery, onset of prevention with heparin after the surgery is possible, but no later than 12h after the end of the operation.

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Thank you for your attention