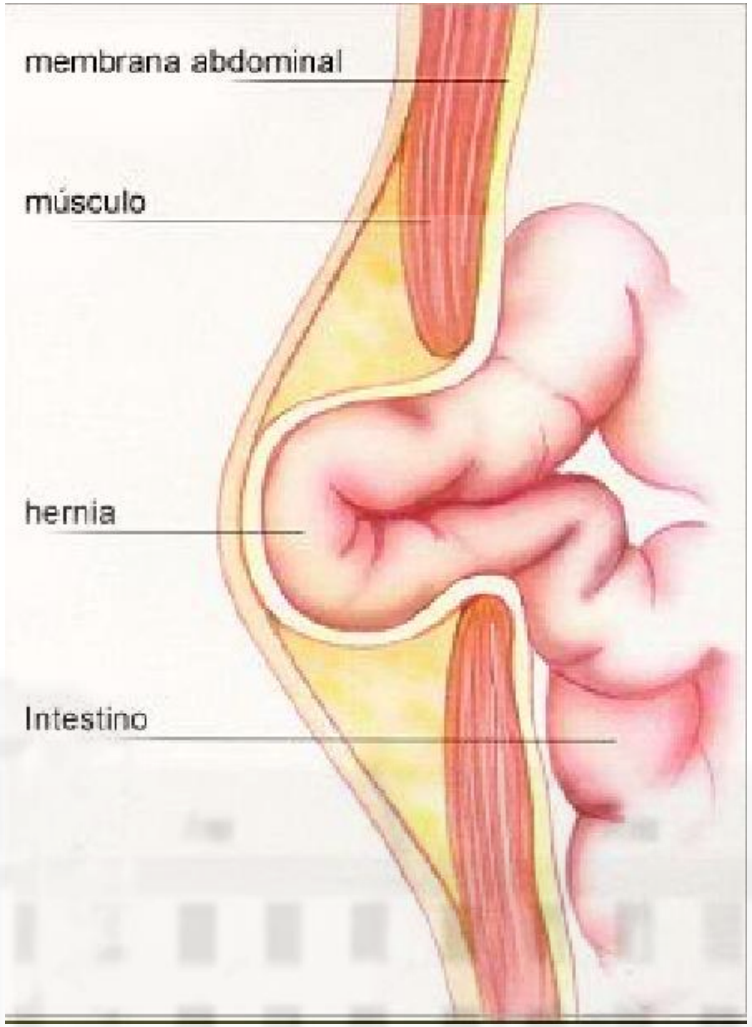
Krasnoyarsk State Medical University named after prof. V.F. Voyno-Yasenetsky of the Ministry of Healthcare of the Russian Federation
Department of Operative Surgery and Topographic Anatomy



Surgical anatomy of the anterior abdominal wall. Abdominal hernias and their treatment.

Lecturer: PhD, associate professor Anna D. Shabokha
The Head of Department: MD, associate professor Andrey N. Russkikh

Lecture Plan:

1. The limits of the region.
2. The anterior abdominal wall as an object of diagnosis of diseases and operative access to the organs of the abdominal cavity.
3. Layered topography of the anterior abdominal wall in various areas.
Blood supply, innervation.
4. Weakness places of the abdominal wall:
a) The white line/linea alba of the abdomen
b) The umbilical ring
c) The inguinal canal
d) Femoral ring
d) Obturator foramen of the pelvis
5. Operative access to the organs of the abdominal cavity.
6. Definition, classification of hernias.
7. Hernia repair operation. Stages of the operation.
8. The surgeon’s tactics for strangulated and non-strangulated hernias.
9. Modern surgical approaches and plastic surgery of inguinal hernias.

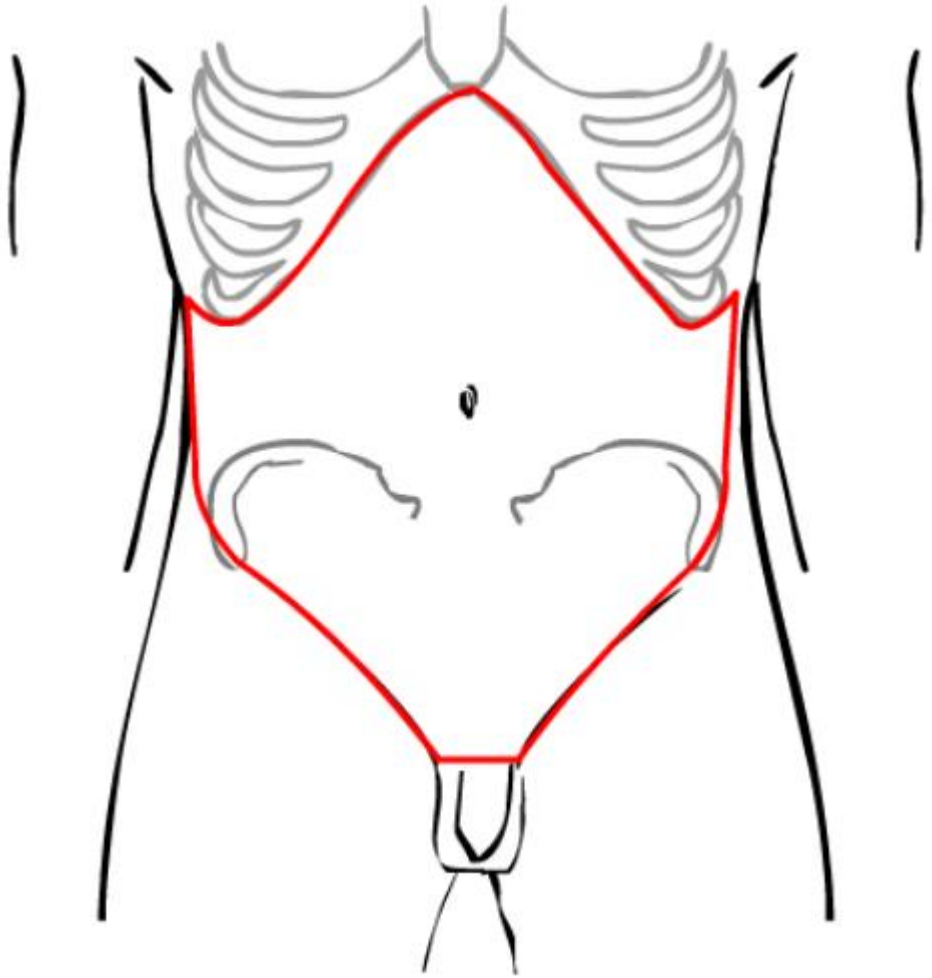
Purpose:

To give a topographic and anatomical justification of the basic principles of surgical interventions on the anterolateral abdominal wall.

Topic relevance:

- The abdomen and anterior abdominal wall take an active part in all vital functions of the body and ensure the constancy of the position, shape and structure of the abdominal organs and retroperitoneal space.
- The anterior abdominal wall is a mirror of the state of the organs not only of the abdominal and thoracic cavities, but also of the entire body, which is of great clinical importance.
- Diagnostics is carried out through the abdominal wall, access to the organs of the abdominal cavity, pelvis and mediastinal organs is carried out, and endoscopic interventions are performed.
- To date, more than 500 surgical incisions are known.

Anterolateral abdominal wall



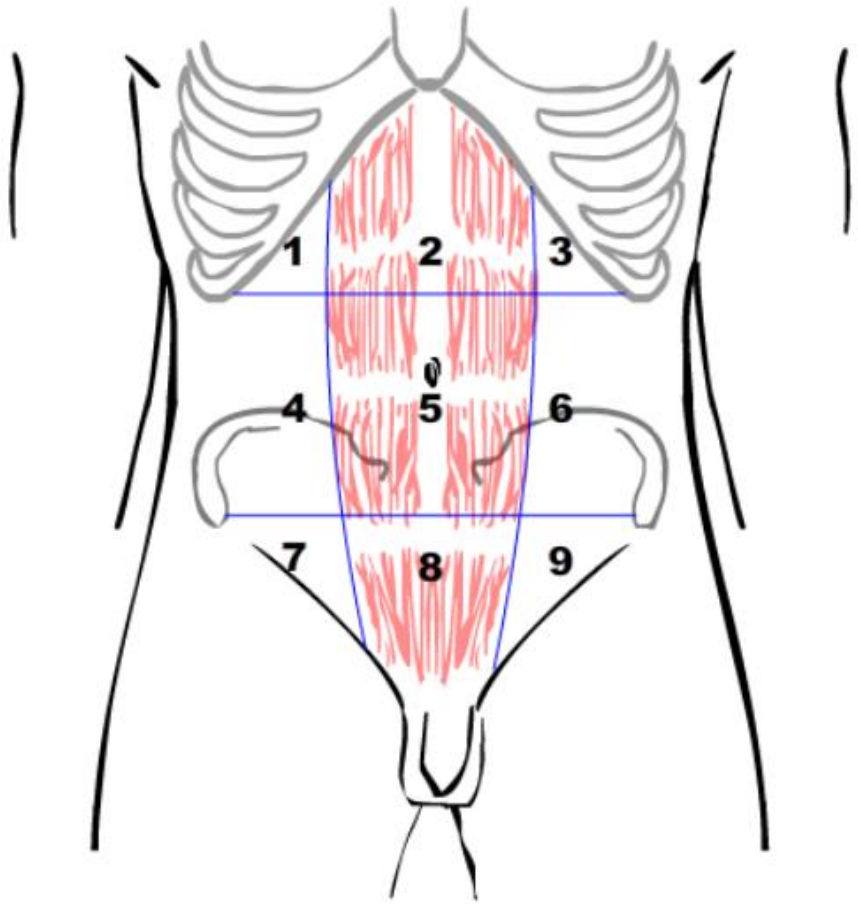
The limits:

From above - the base of the xiphoid process and costal arches;

Bilateral – midaxillary lines;

From below - the iliac crests, inguinal folds (commonly corresponding to inguinal ligaments by projections) and the upper edge of the symphysis.

Areas of the anterior abdominal wall

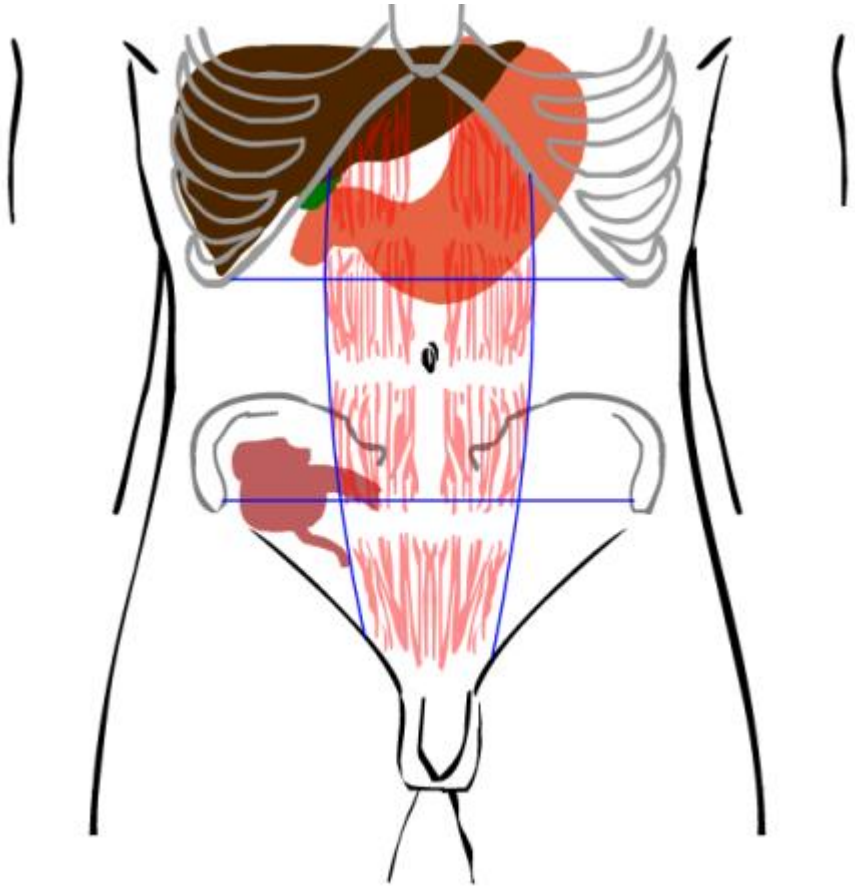


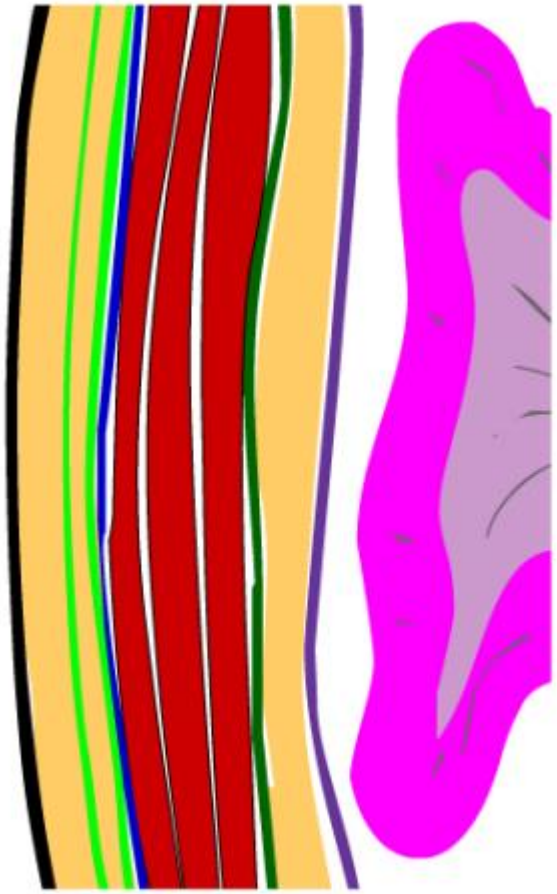
Epigastrium
1) right hypochondrium
2) epigastric region
3) left hypochondrium

Mesogastrium
4) right side area
5) the umbilical region
6) left side area

Hypogastrium
7) right inguinal area
8) pubic area
9) left inguinal area

Anterolateral abdominal wall. Layer structure.

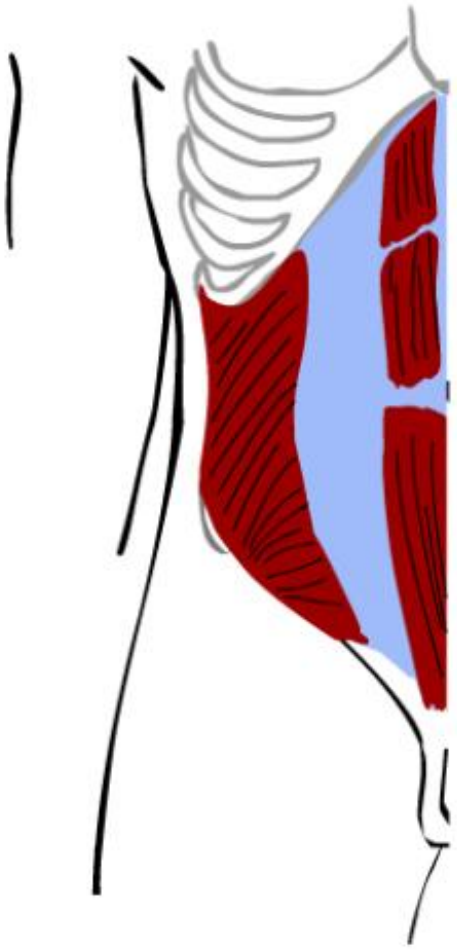




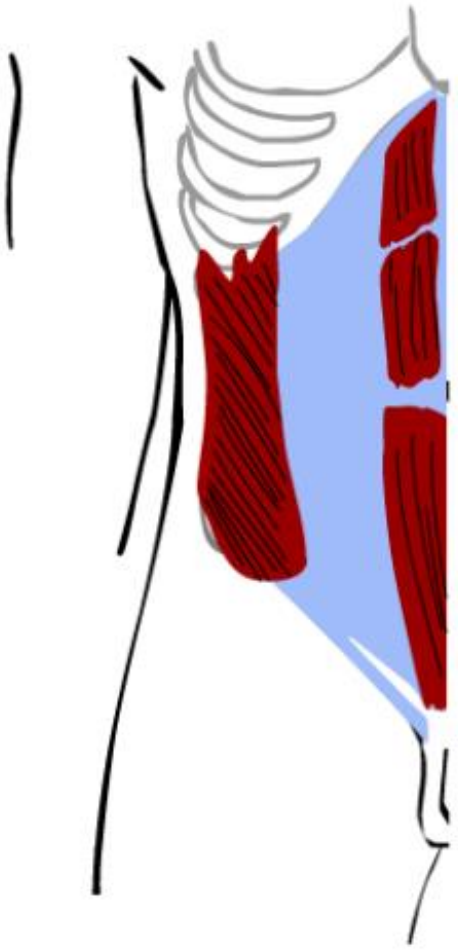
1. Skin
2. Subcutaneous tissue
3. Superficial fascia
a) Superficial leaf
b) Thompson's fascia (deep leaf)
4. Own fascia
5. External oblique abdominal muscle
6. Internal oblique abdominal muscle
7. Transverse abdominal muscle
8. Transverse fascia
9. Preperitoneal fat.
10. parietal layer of peritoneum
11. Abdominal cavity

Anterolateral abdominal wall

Transverse abdominal muscle

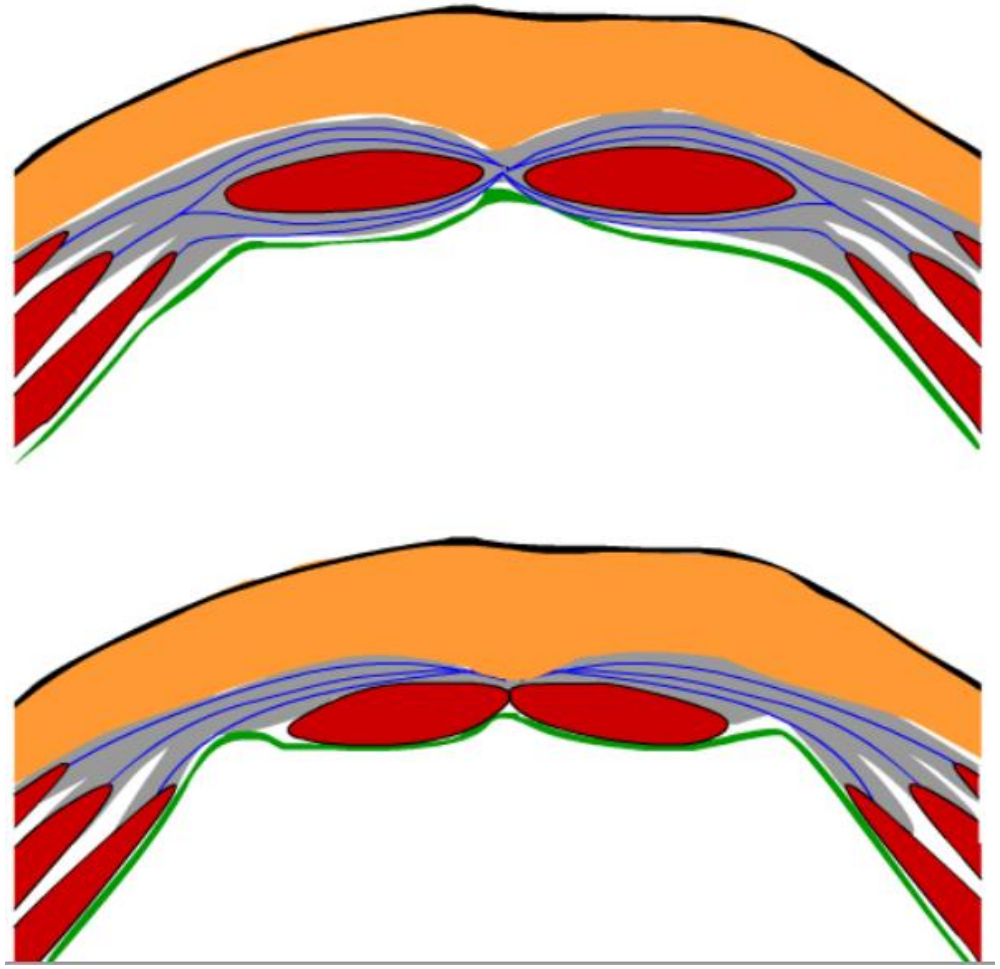


Internal oblique abdominal muscle



External oblique abdominal muscle

Anterolateral abdominal wall



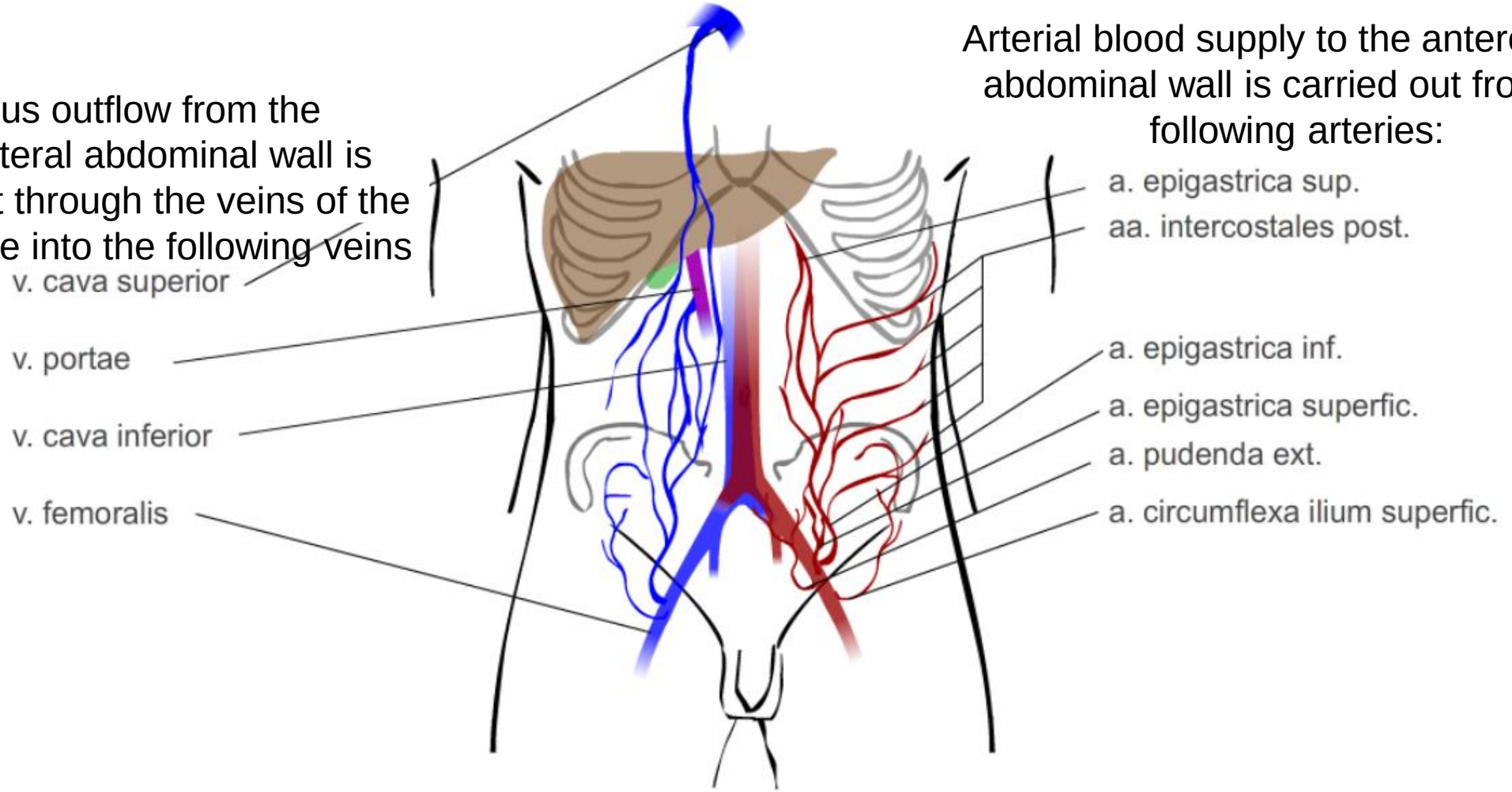
The rectus sheath, vagina m. recti abdominis is formed due to the wide abdominal muscles.

In the upper 2/3 of the anterior abdominal wall (above the navel): the external and internal oblique muscles with their aponeuroses form the anterior vaginal wall of the rectus abdominis muscle, the internal oblique and transverse muscles form the posterior vaginal wall.

In the lower 1/3 of the anterior abdominal wall (below the navel): the tendons of all abdominal muscles are part of the anterior vaginal wall of the rectus abdominis muscle.
The transverse fascia covers the muscle behind.

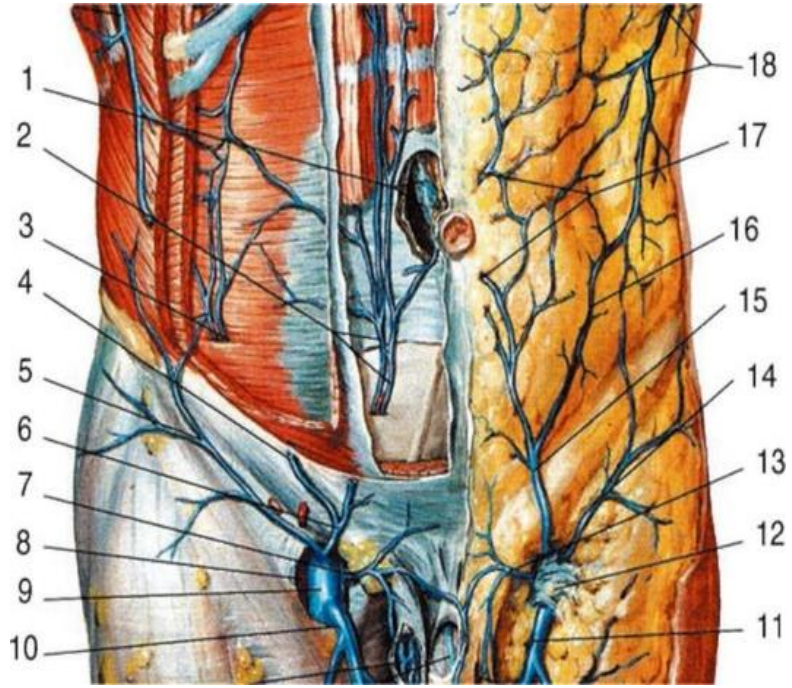
Anterolateral abdominal wall. Blood supply

Venous outflow from the anterolateral abdominal wall is carried out through the veins of the same name into the following veins

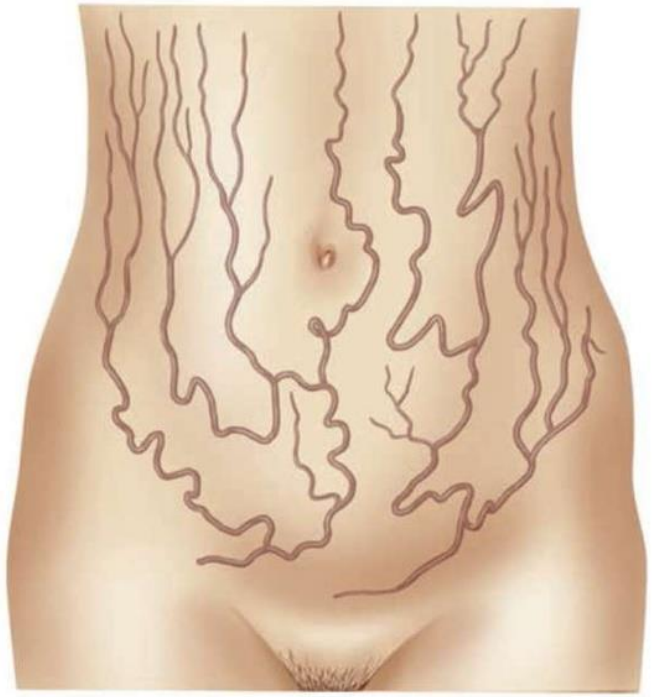


Arterial blood supply to the anterolateral abdominal wall is carried out from the following arteries:

Anterolateral abdominal wall. Blood supply



Subcutaneous abdominal veins. 1 - vv. paraumbilicales within the round ligament of liver; 2 - vv. epigastricae inferiores; 3 - tributaries of v. circumflexa ilium profunda; 4 - an anastomotic branch of v. thoracoepigastrica; 5 - v. circumflexa ilium superficialis; 6 - v. epigastrica superficialis; 7 - vv. pudendae externae; 8 - hiatus saphenus; 9 - v. femoralis; 10 - v. saphena magna; 11 - v. saphena magna; 12 - hiatus saphenus coated by fascia cribrosa; 13 - vv. pudendae externae; 14 - v. circumflexa ilium superficialis; 15 - v. epigastrica superficialis; 16 - an anastomotic branch of v. thoracoepigastrica; 17 - tributaries of vv. paraumbilicales; 18 - v. thoracoepigastrica

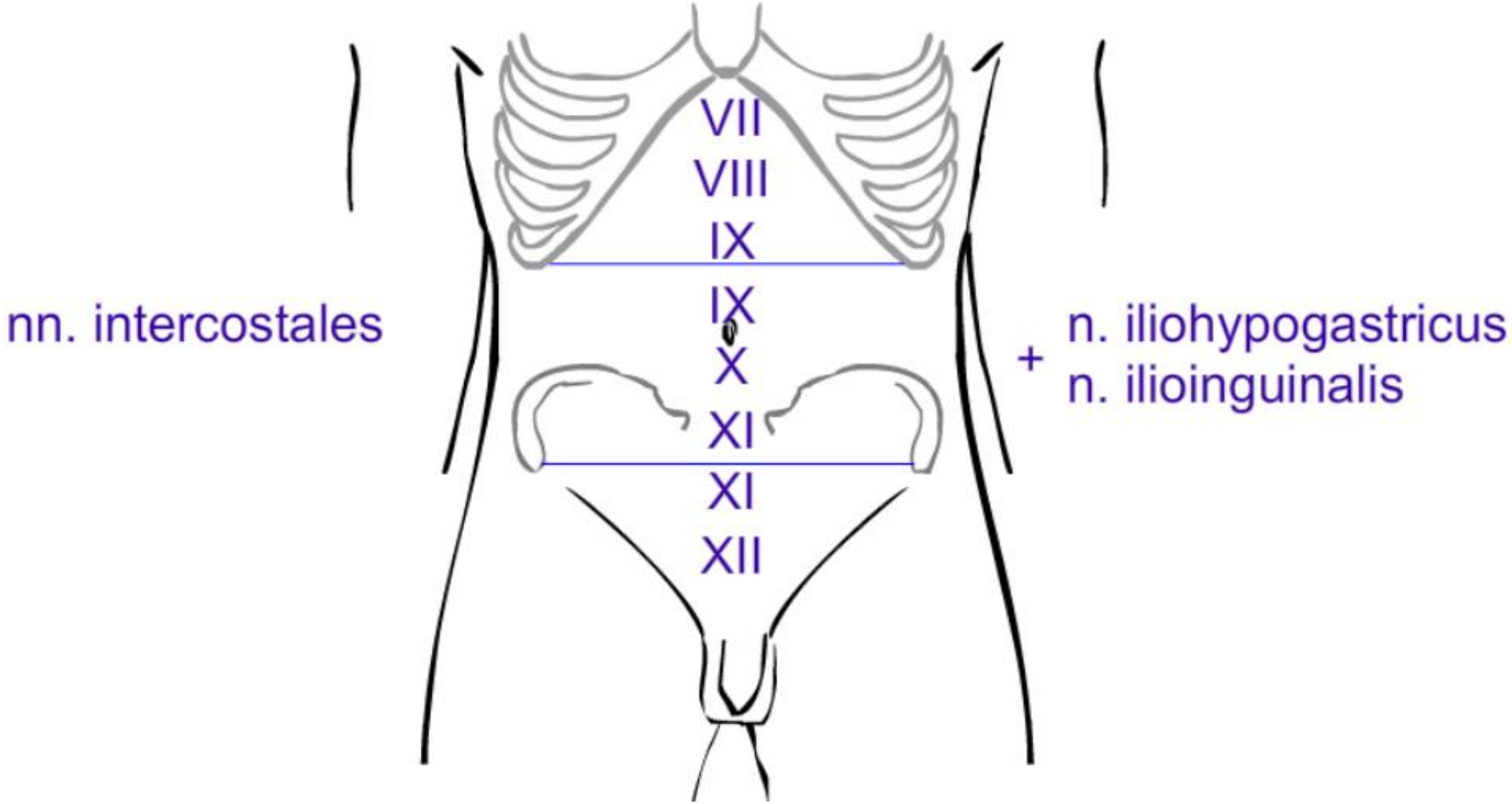


Varicose veins of the anterior abdominal wall - «Medusa head».

In patients with liver cirrhosis and decompensated portal hypertension, varicose veins may develop when the pressure in the portal vein system increases

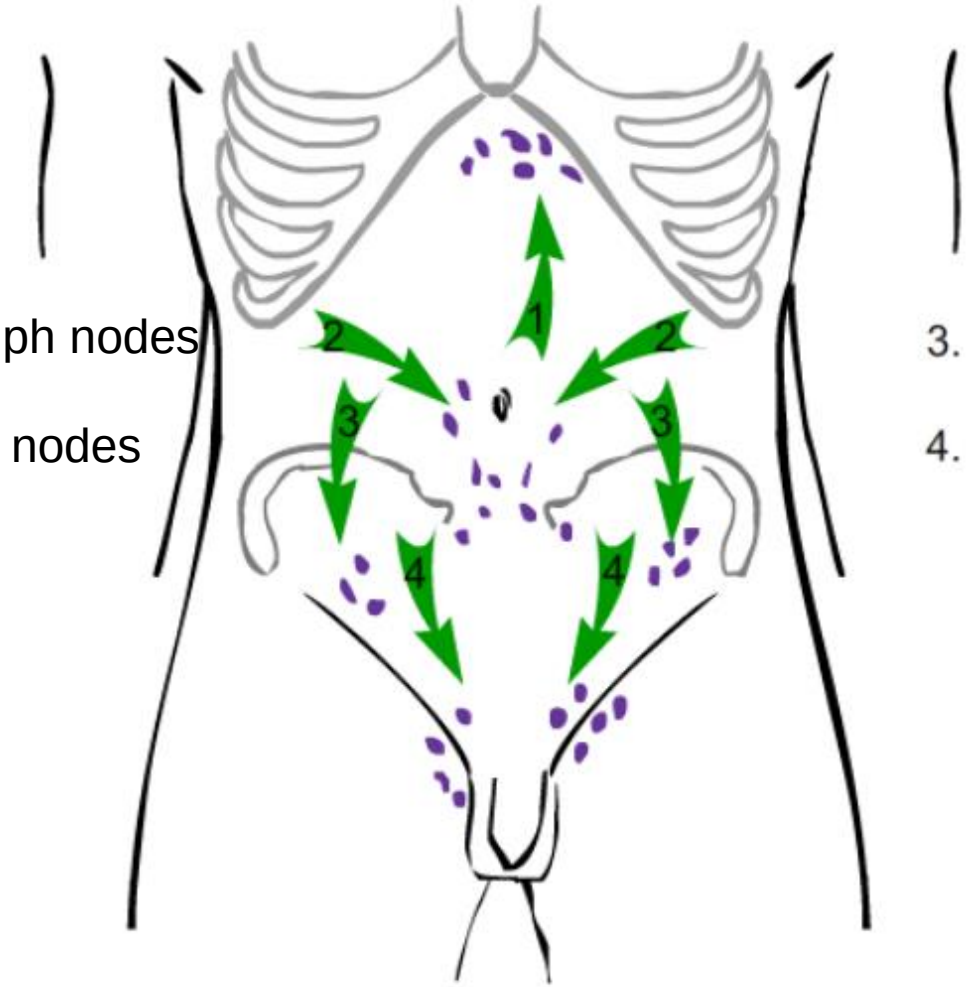
Anterolateral abdominal wall. Innervation

Innervation of the anterolateral abdominal wall is carried out due to:



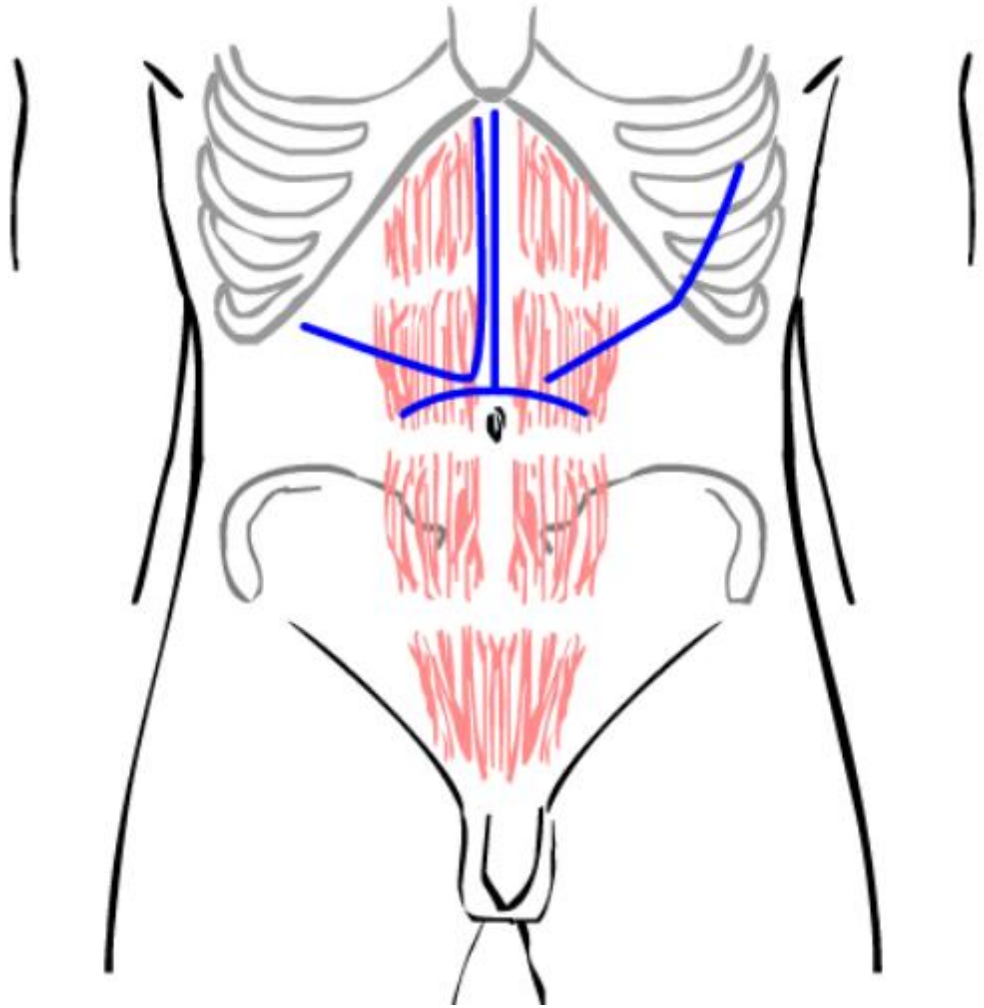
Anterolateral abdominal wall. Lymph outflow

Lymphatic outflow from the anterolateral abdominal wall is carried out to the following lymph nodes



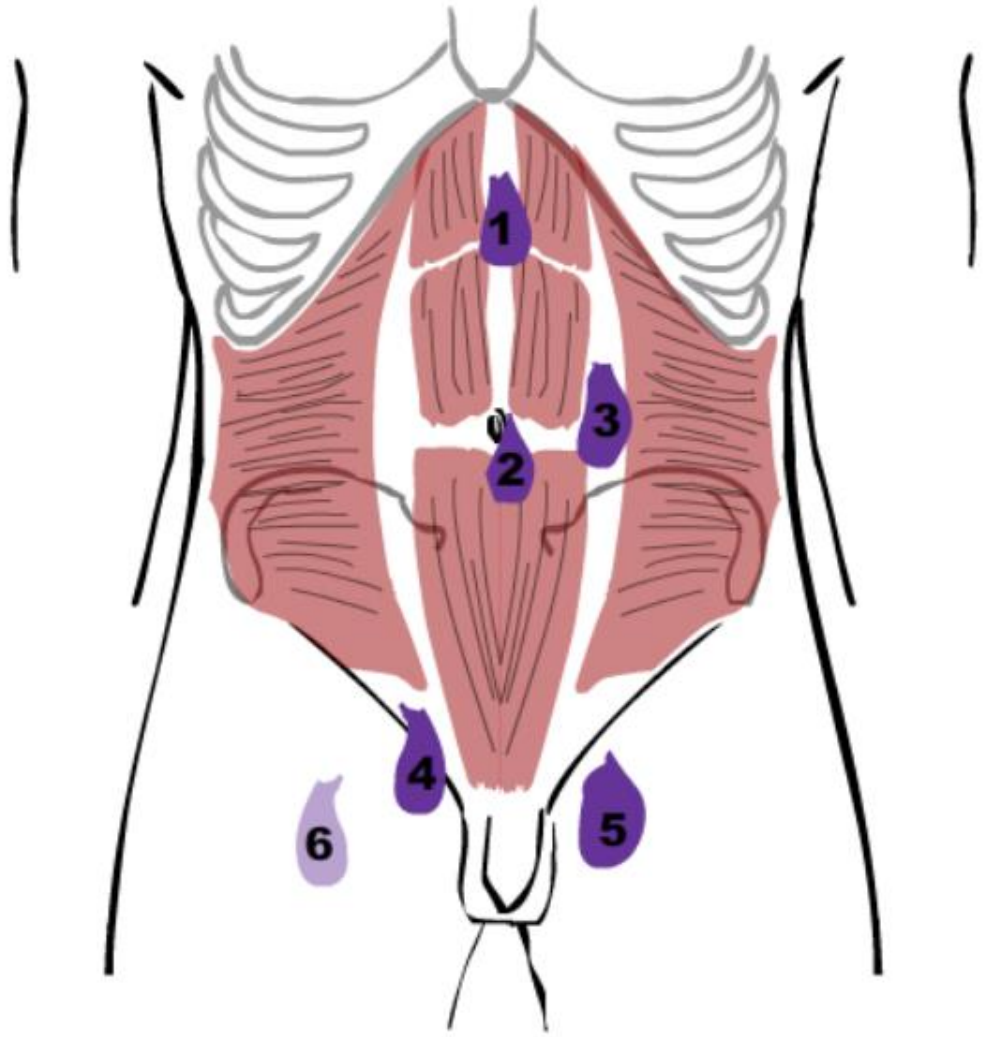
1. Into the epigastric lymph nodes
2. Into the lumbar lymph nodes
3. Into the iliac lymph nodes
4. Into the deep inguinal lymph nodes

Operative access to the organs of the abdominal and thoracic cavities



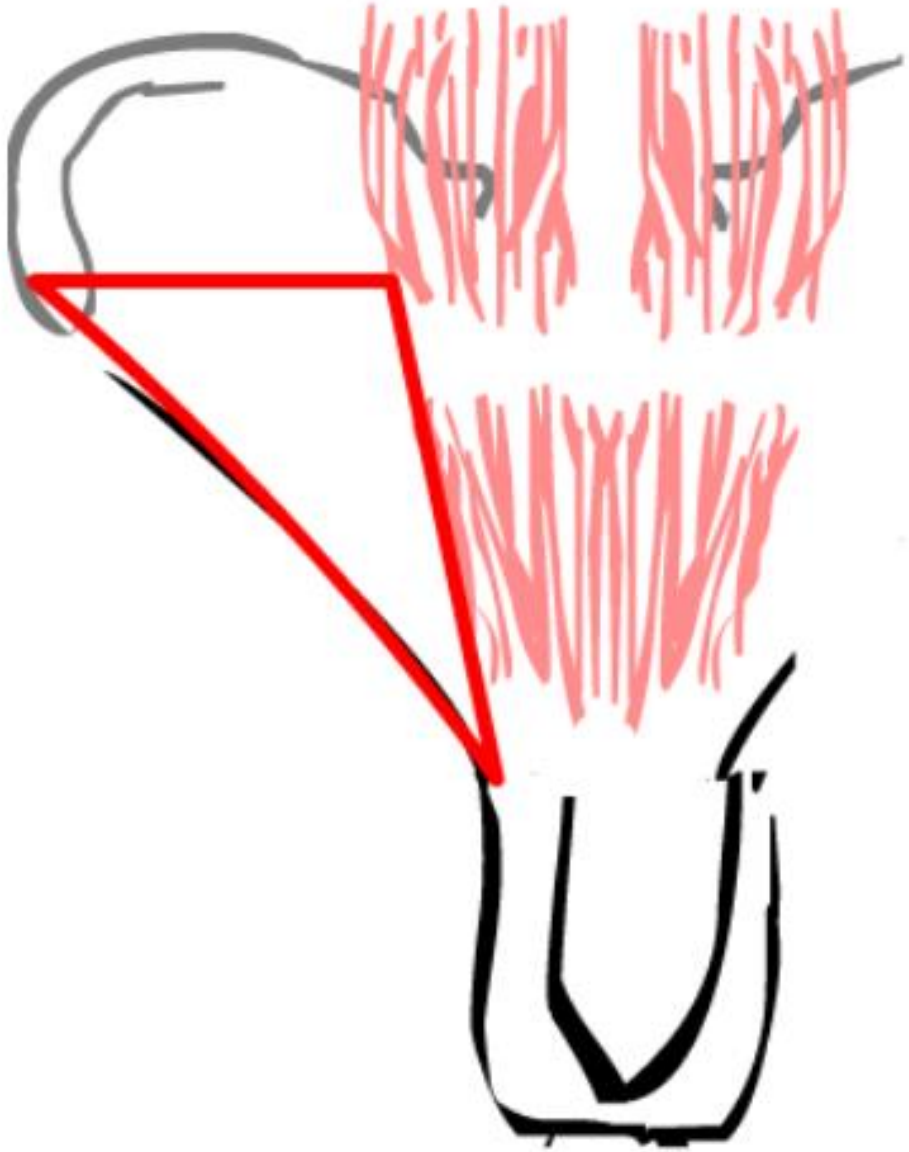
1. Longitudinal (vertical)
2. Transverse
3. Oblique
4. Combined

Anterolateral abdominal wall. Weakness places



1. The white line/linea alba of the abdomen
2. The umbilical ring
3. The Spigelian line
4. Inguinal canal
5. Femoral ring
6. Obturator foramen of the pelvis

Inguinal area



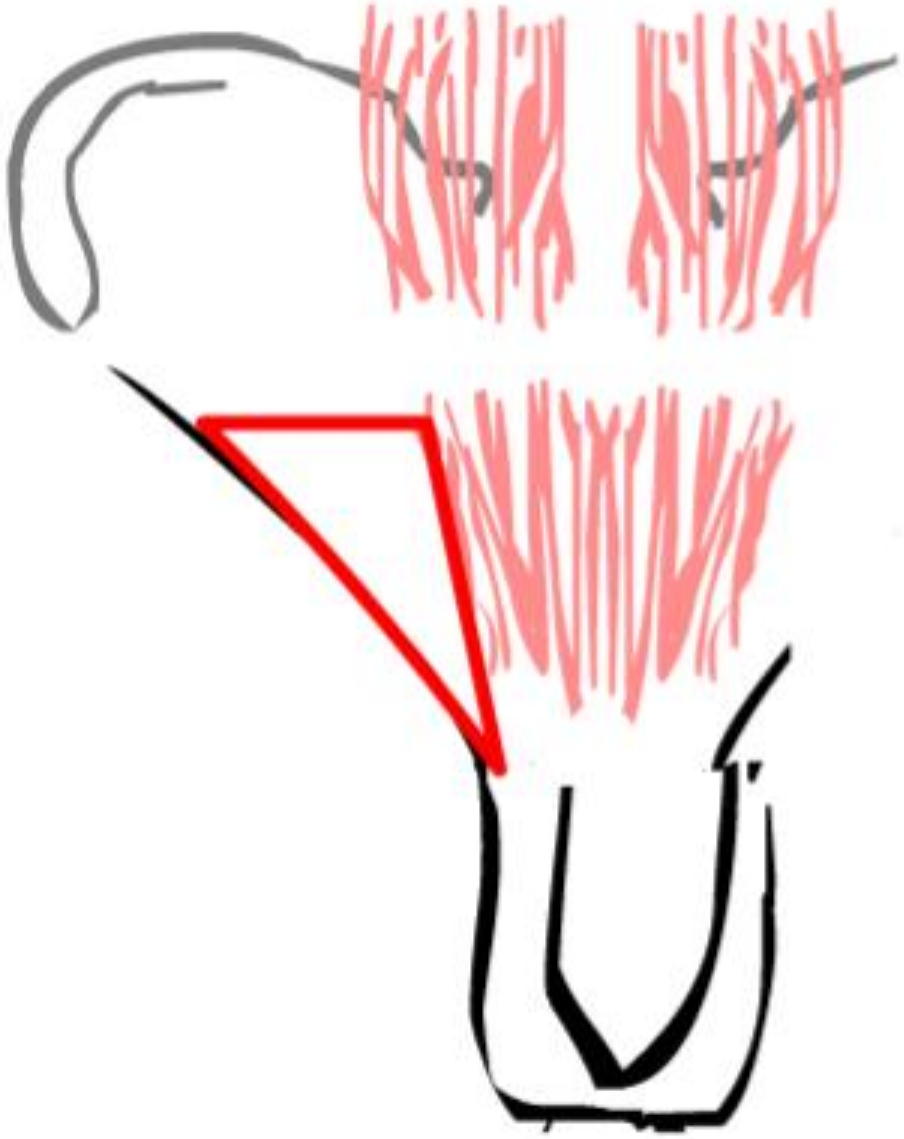
The borders:

From above – the interspine line;

From below and laterally – projection of the inguinal ligament;

Medial – lateral edge of the rectus abdominis muscle.

Inguinal triangle



The borders:

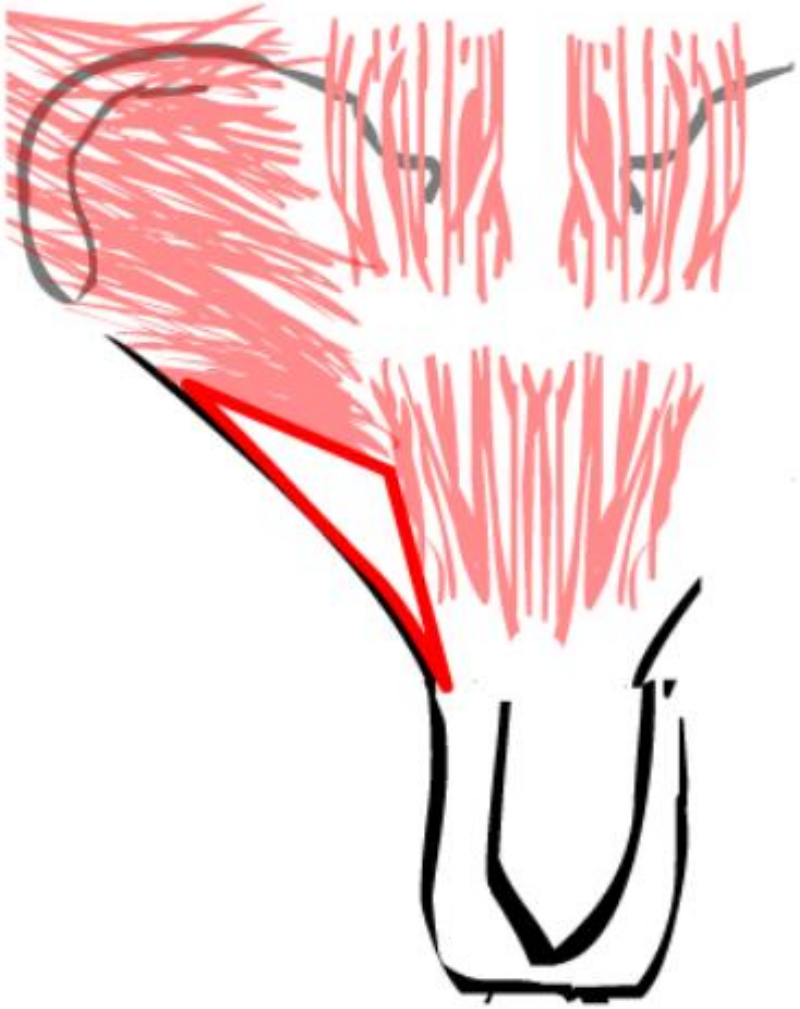
From above is a horizontal line drawn from the border between the outer and middle third of the inguinal ligament to the intersection with the lateral edge of the rectus abdominis muscle.

Lower lateral - inguinal ligament.

Medial - lateral edge of the rectus abdominis muscle.

The inguinal triangle, the inguinal height and the inguinal canal are located in this area.

Inguinal height



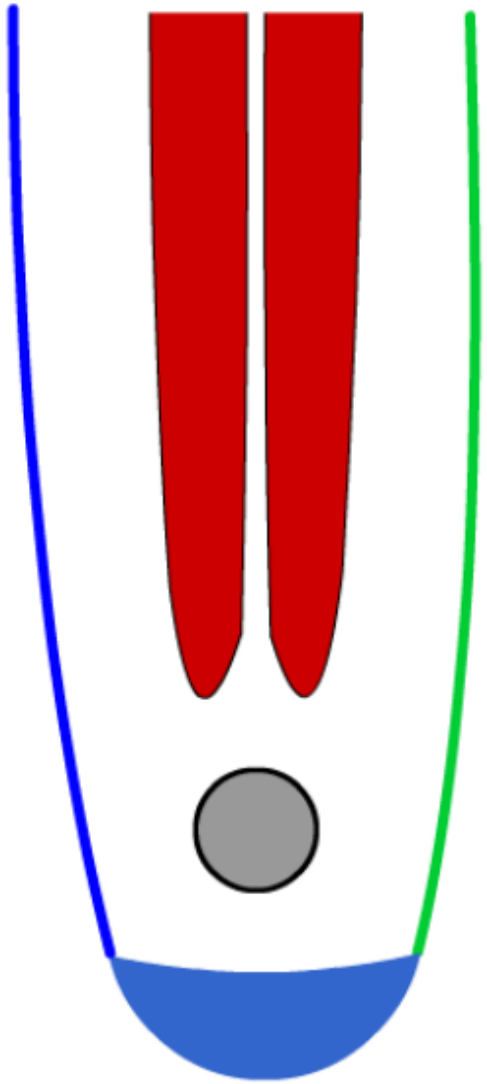
Natural defect of the muscles layer of the abdominal wall in the lower medial part of the inguinal region are limited by:

From above - the free lower edges of the internal oblique and transverse abdominal muscles,

From below and the lateral – medial part of the inguinal ligament,

Medial - lateral edge of the vagina m. recti abdominis

Inguinal canal



It has four walls:

Anterior - aponeurosis of the external oblique abdominal muscle,
Posterior - transverse fascia of the abdomen,
Lower - inguinal ligament,
Upper - free edges of the internal oblique and transverse abdominal muscles.

The contents of the inguinal canal in males are: the spermatic cord, funiculus spermaticus, the ilioinguinal nerve, n. ilioinguinalis, going along the anterior surface of the cord, and the genital ramus of the genitofemoral nerve, r. genitalis n. genitofemoralis. In females, the same two nerves and the round ligament of uterus, lig. teres uteri, pass through the canal.

It has two holes:
The internal is the deep inguinal ring, and
The external is the superficial inguinal ring.

Inguinal canal

The deep inguinal ring, *annulus inguinalis profundus,* is formed by a funnel-shaped protrusion of the transverse fascia of the abdomen and its transition into the spermatic cord (round ligament of the uterus).

The superficial inguinal ring, *annulus inguinalis superficialis,* is formed by the divergence of the fibers of the aponeurosis of the external oblique muscle into two legs, lateral and medial.

Hernias. History of the study.

- The first mention of an inguinal hernia is found in ancient Egyptian papyri dating back to 1500 BC.
- Hippocrates (4th century BC) names direct abdominal trauma as the main causes of inguinal and umbilical hernias.
- Celsus gave the classical definition of a hernia as a protrusion of the viscera through an acquired or congenital “gate” and was the first to use the term “hernios”.
- The first anatomical studies of the inguinal area were carried out by Galen (1st century AD).
- At the end of the 17th century J.L. Petit came up with the concept of a hernia as the loss of internal organs from their location in the abdominal cavity.
- A. Littre (1770) described Meckel's diverticulum in the hernial sac (true Littre's hernia), despite the fact that Meckel's diverticulum itself was not considered an independent pathology until 1809.
- Parietal strangulation (incomplete hernia) was first described by A. G. Richter (1788).
- The modern history of hernia surgery begins only in the second half of the 19th century, thanks to the advent of general anesthesia (1846) and the introduction of the principles of asepsis and antisepsis developed by J. Lister (1865), W.S. Halsted (1896).
- A historical breakthrough in herniology is associated with the name of the Italian surgeon E. Bassini, who created a unified concept in the surgical treatment of inguinal hernia.
- The first operation was performed by E. Bassini in 1884, and he reported his experience in publications of 1887, where the most valuable provisions of his operation were presented. Over the next few years, many modifications of the E. Bassini operation were proposed. The movement of the spermatic cord into the subcutaneous tissue was introduced by Postemsky (1887), W.S. Halsted (1899).
- A proposal for excision of cremaster muscle fibers was made by W.S. Halsted (1893), which led to better isolation and visualization of the internal inguinal ring.

Definition.

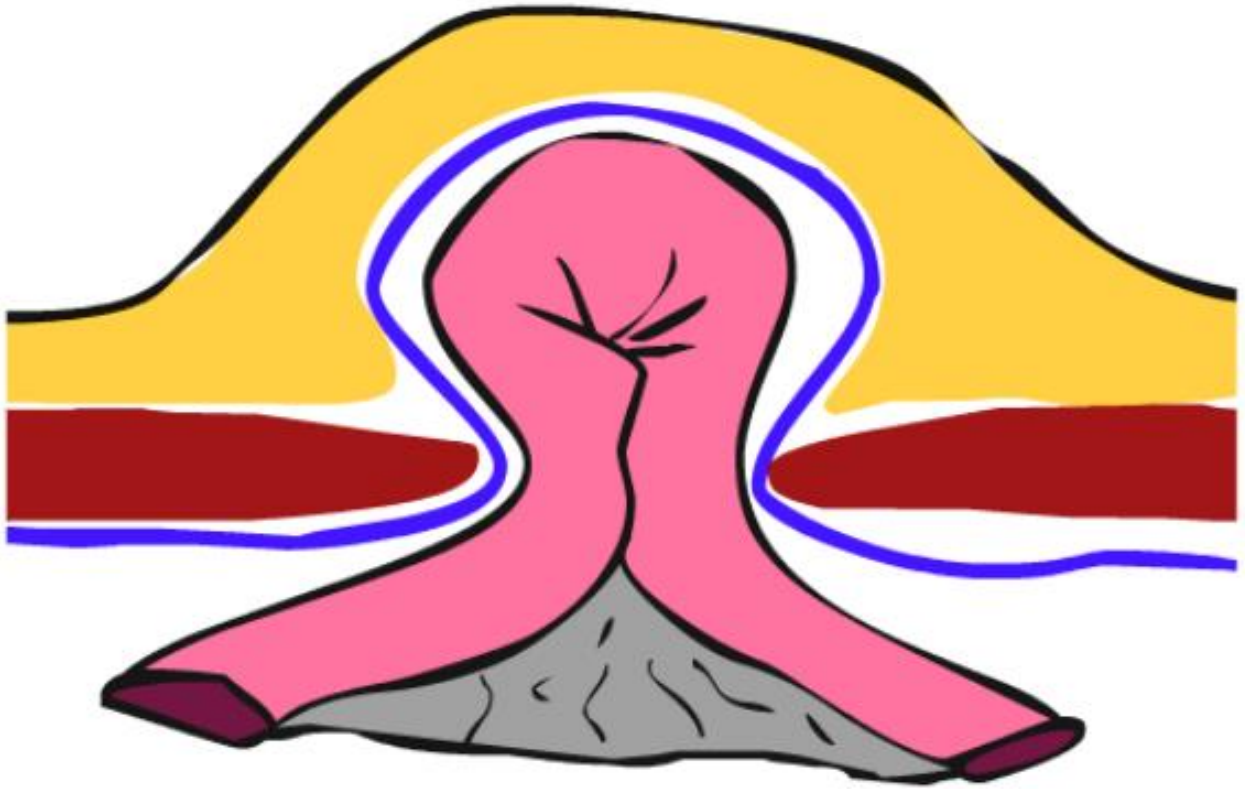
An external abdominal hernia is the protrusion of abdominal organs into the layers of the abdominal wall through natural, but enlarged or newly formed openings while maintaining the integrity of the parietal layer of the peritoneum.

Eventration is the exit of the abdominal organs into the layers of the abdominal wall through natural, but enlarged or newly formed openings with a violation of the integrity of the parietal layer of the peritoneum.

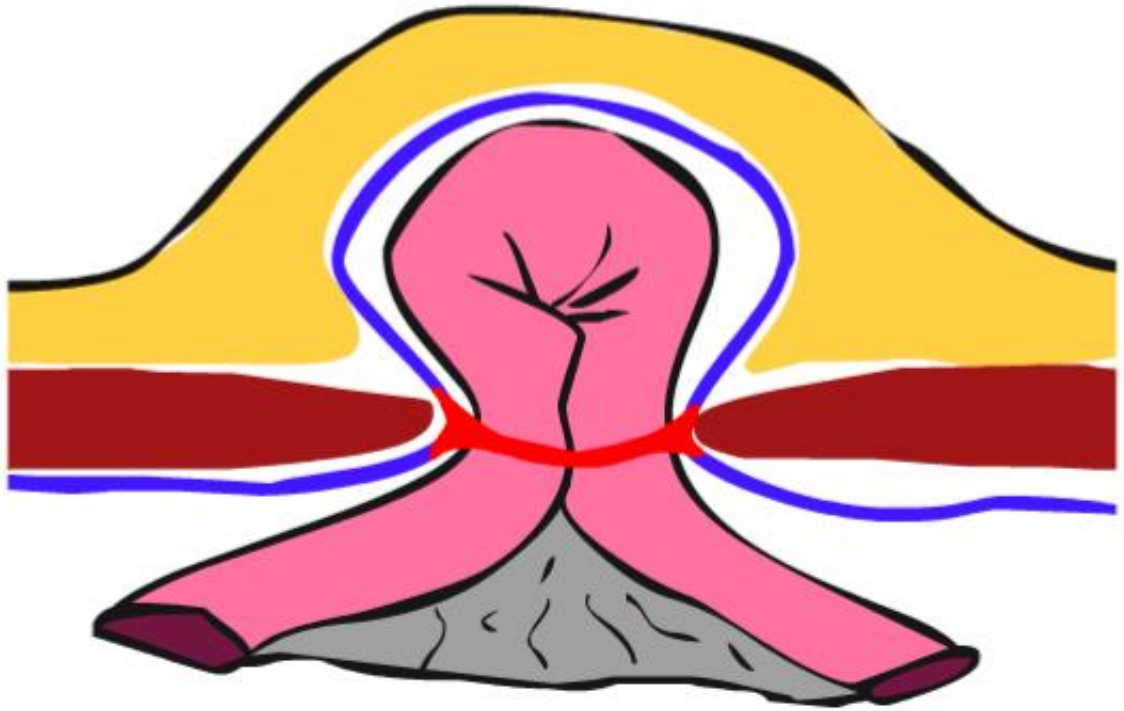
Prolapse is the protrusion of an organ or part of it not covered by peritoneum through natural openings (for example, prolapse of the uterus through the vagina or prolapse of the rectum through the anus).

Components of a hernia:

- hernial orifice;
- hernial sac;
- hernial contents.



Hernial orifices are weakness places in the abdominal wall through which hernias emerge (inguinal fossae, umbilical ring, linea alba, holes in the diaphragm, etc.). Normally, certain anatomical formations pass through these openings (spermatic cord, round ligament of the uterus, neurovascular bundles, etc.). In case of traumatic and postoperative hernias, the hernial orifices can be holes formed as a result of rupture of muscles and aponeuroses during abdominal trauma, or as a result of surgical intervention.

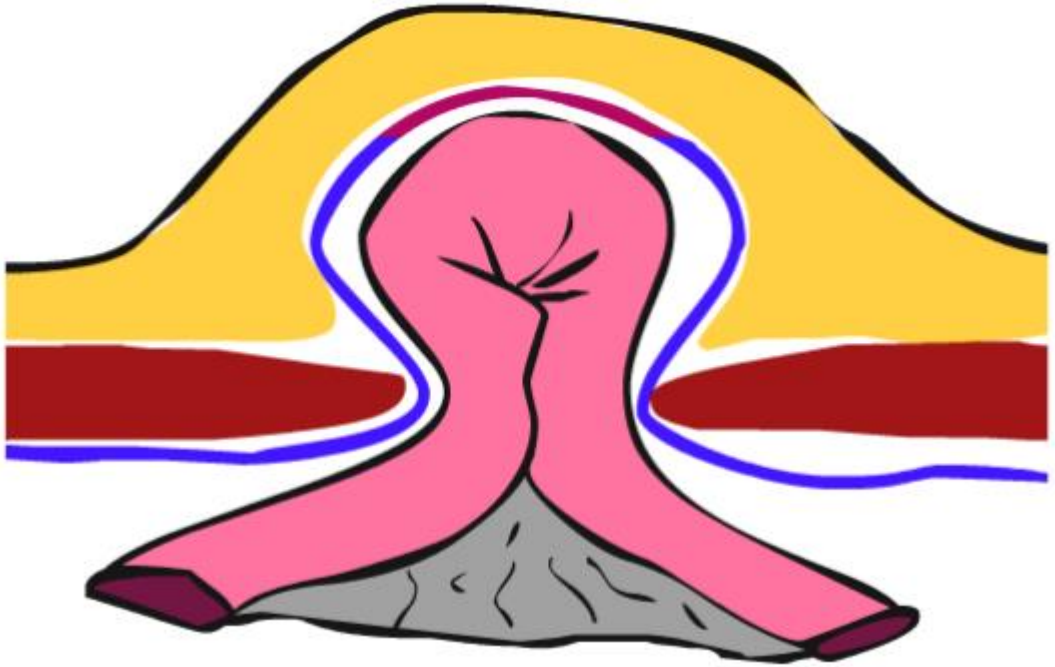


The hernial sac is a parietal layer of the peritoneum containing the viscera that exits through the hernial orifice.

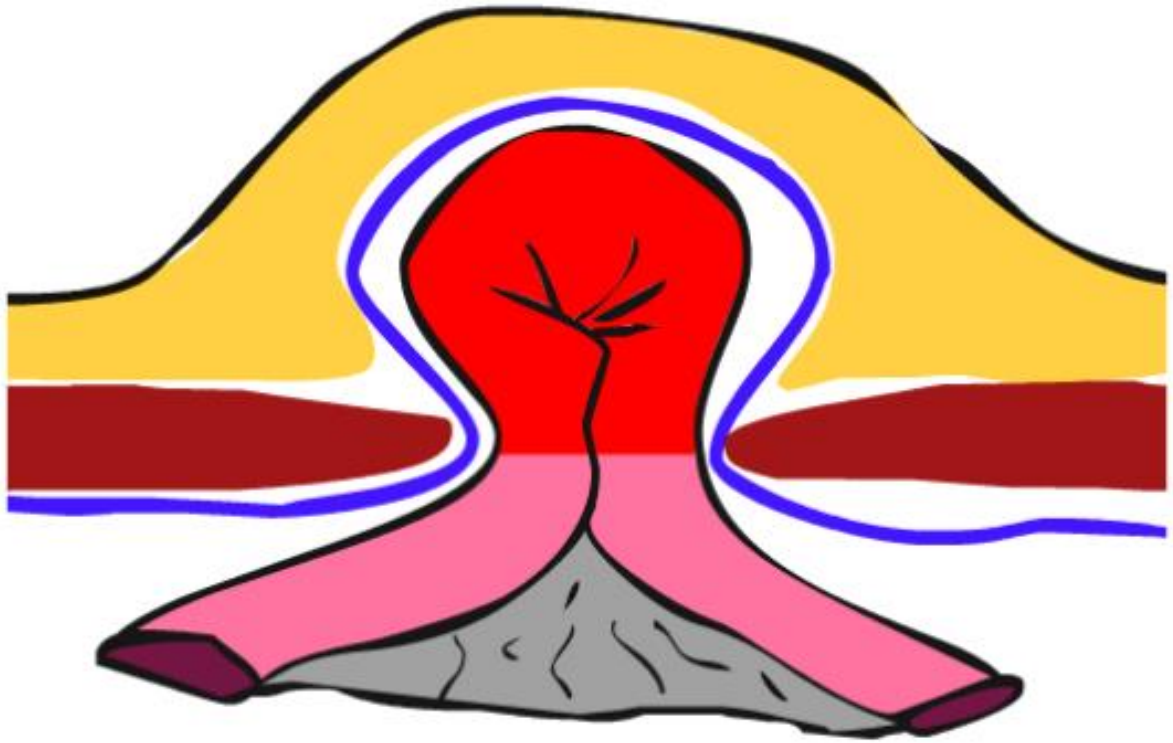
The shape of the hernial sac can be *cylindrical, spherical, or pear-shaped.*

In the hernial sac there are:

- «mouth»;
- neck;
- body;
- bottom.



The contents of the hernial sac can be any of the abdominal organs - the small intestine, omentum, sigmoid and caecum with a vermiform appendix, etc.



CLASSIFICATION OF HERNIA

By origin:

- Congenital.
- Acquired:

a) Traumatic.
b) Pathological.
c) Artificial.

CLASSIFICATION OF HERNIAS

According to clinical signs:

1. Hernias not pinched, set, free (hernia Liberia, hernia reponibilis):

a) Adjusting freely in the horizontal position of the patient, the hernial gates are palpable well;

6) Hernial protrusion is corrected independently, but it takes some time for complete correction, as well as a special position during the examination (with a raised pelvis); hernial gates are feeling well.

2. Hernia irrevocable (hernia irreponibilis):

a) Hernias are partially correctable when the hernial ring is not fully determined;

b) Hernias are completely unrecoverable when the hernial ring is not defined or is defined indistinctly.

3. Strangulated hernias (hernia incarcerated):

a) The affected organs are viable;

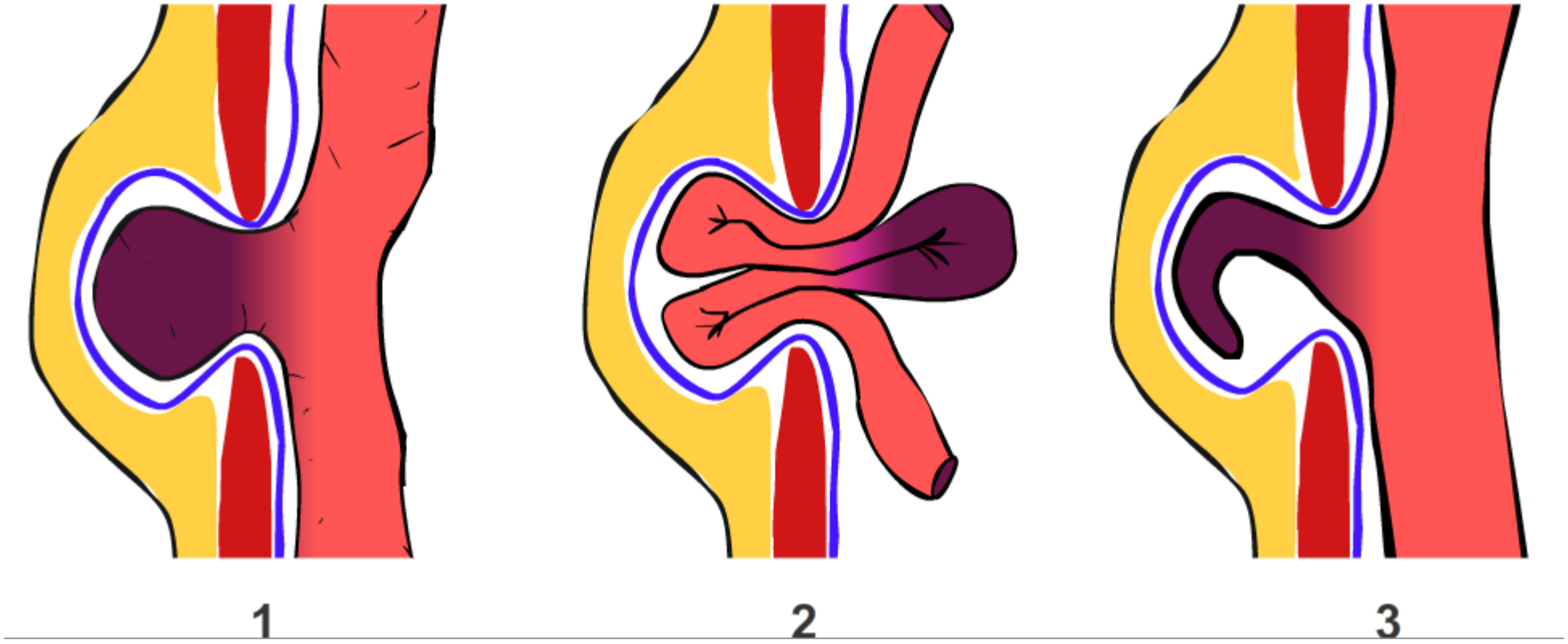
b) Infringed organs with irreversible pathological changes;

c) Strangulated hernias with a phlegmonous process in the area of hernial protrusion.

CLASSIFICATION OF HERNIAS

Special types of strangulations:

1. Parietal strangulation of Richter;
2. Retrograde W-shaped strangulation;
3. Littre-Meckel hernia (hernia in which the strangulated hernial contents are Littre-Meckel diverticulum)



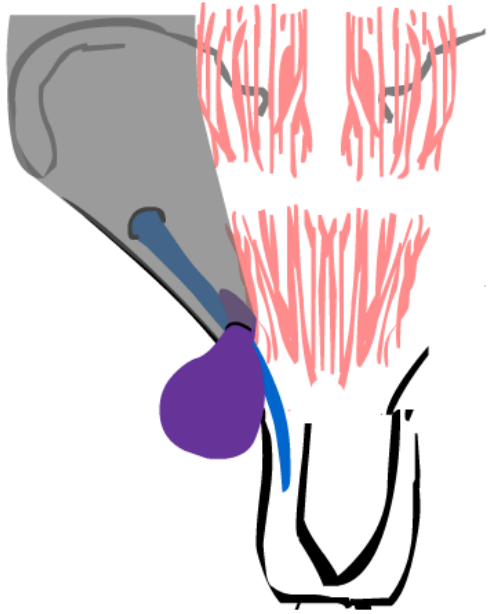
Inguinal hernia

Indirect

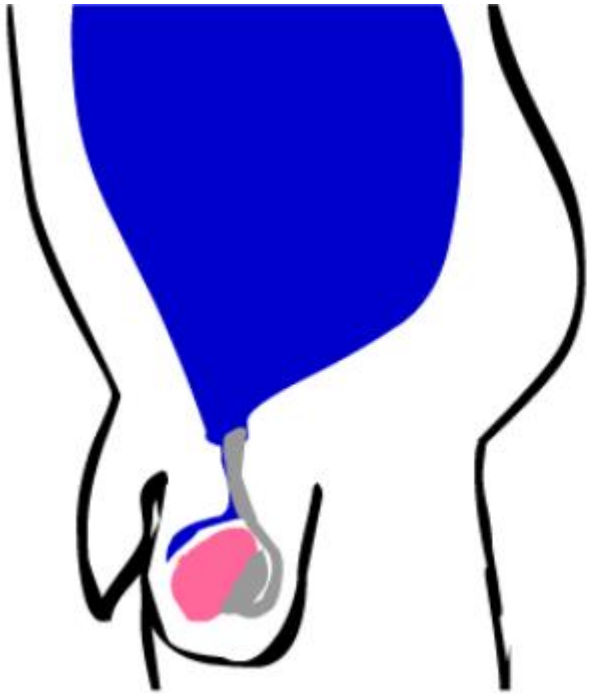
An inguinal hernia is called indirect when its hernial sac enters the inguinal canal through the deep inguinal ring, passes through the entire canal and exits through the superficial inguinal ring.

Direct

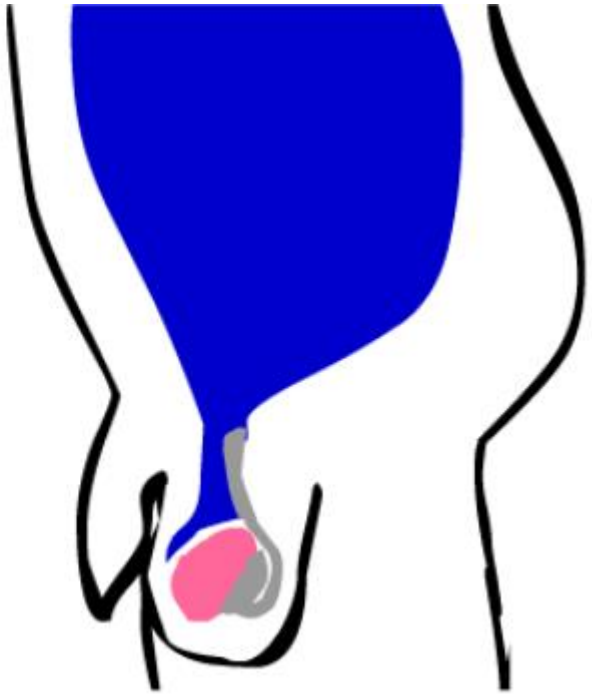
A direct inguinal hernia is a protrusion of the peritoneum in the area of the superficial inguinal ring and its penetration into the inguinal canal outside the spermatic cord, through the inguinal height. This hernia is always acquired.



The process of the testicle descending into the scrotum

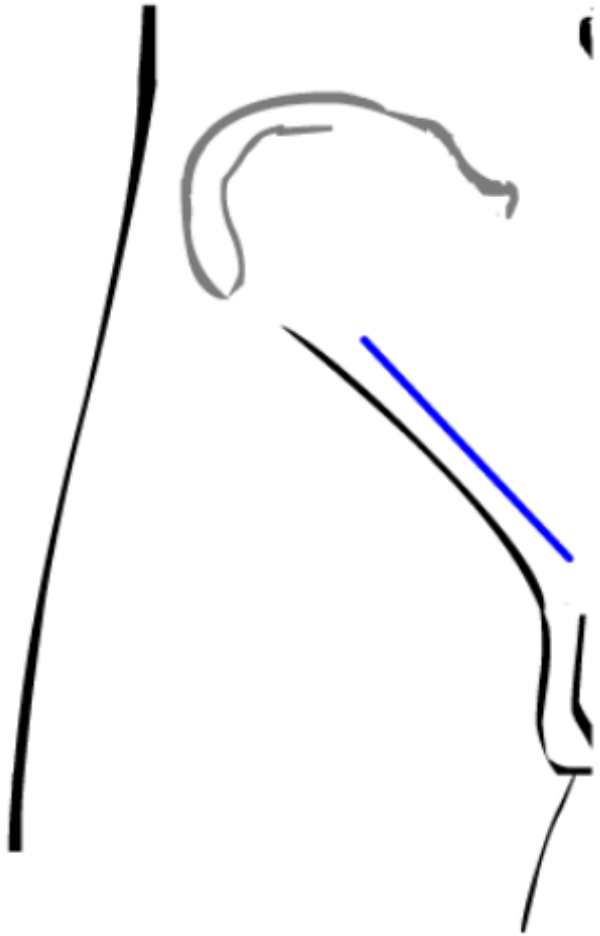


The vaginal leaf of the peritoneum has closed (norm)



Open vaginal leaf of the peritoneum

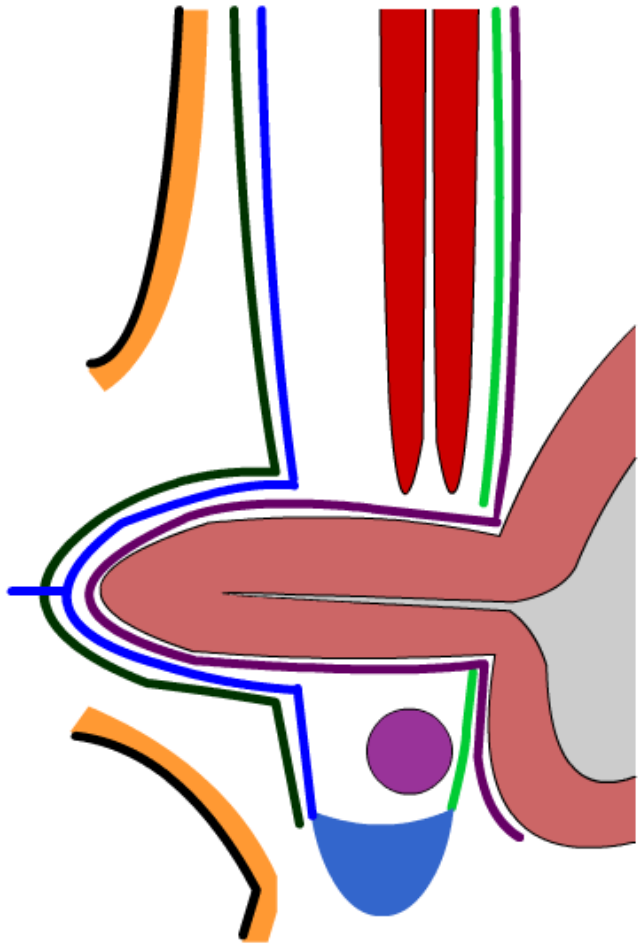
Stages of herniotomy in case of non-strangulated hernia



1. OPERATIONAL ACCESS

A 5 - 6 cm long incision parallel to and above The inguinal fold by 1 - 1.5 cm with access to the root of the scrotum (boys)

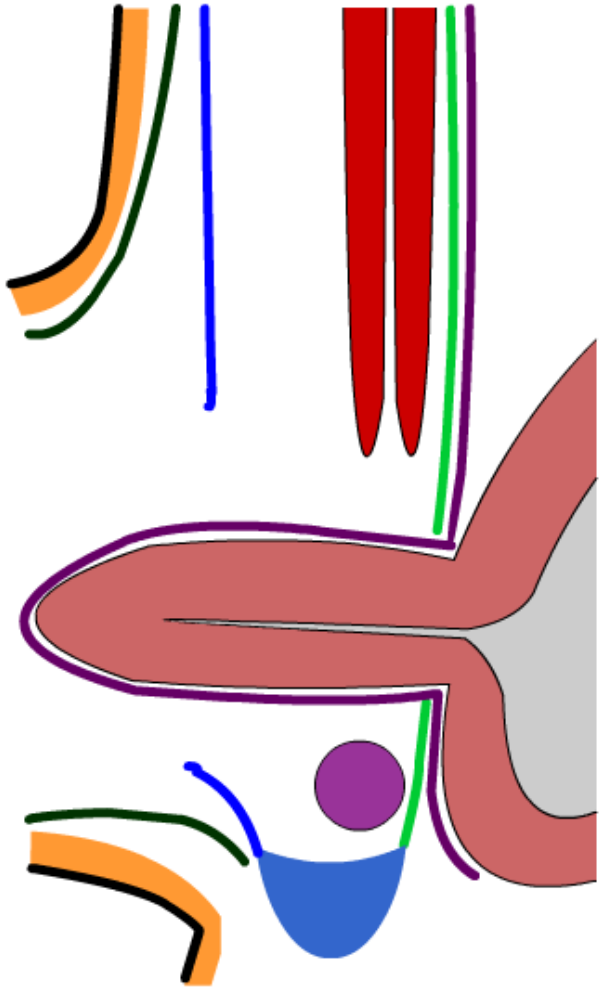
Stages of herniotomy in case of non-strangulated hernia



1. OPERATIONAL ACCESS

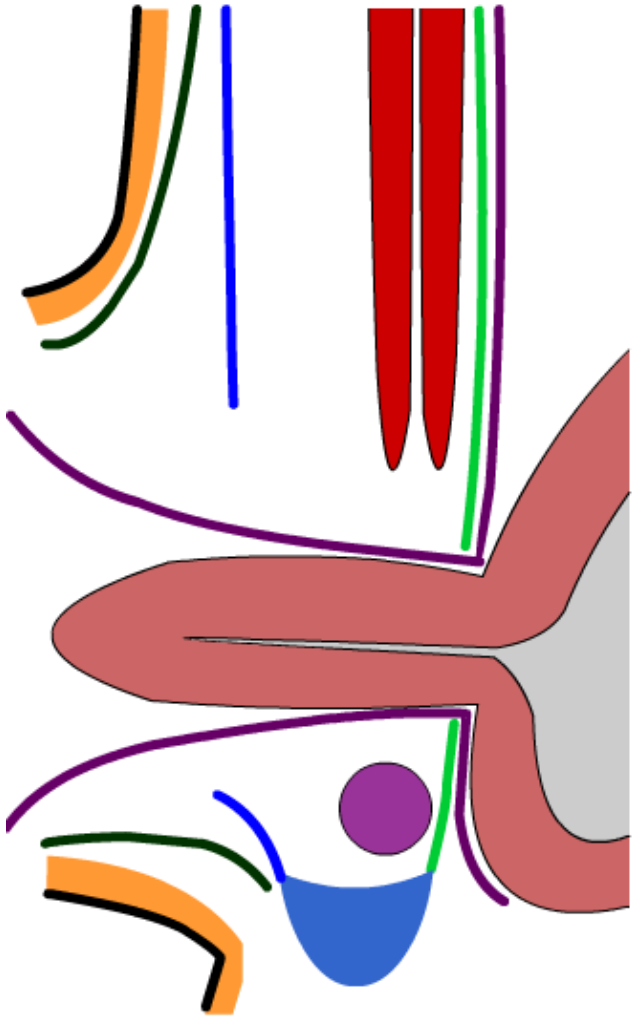
Dissect a deep leaf of the superficial fascia, expose the aponeurosis of the external oblique abdominal muscle

Stages of herniotomy in case of non-strangulated hernia



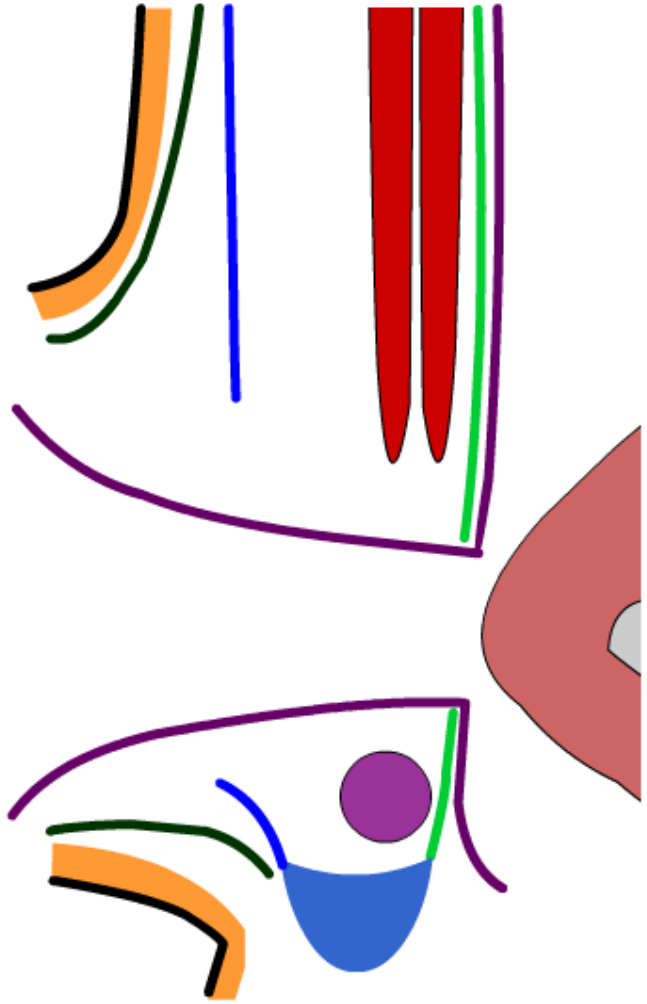
2. ISOLATION OF THE HERNIAL SAC

Stages of herniotomy in case of non-strangulated hernia



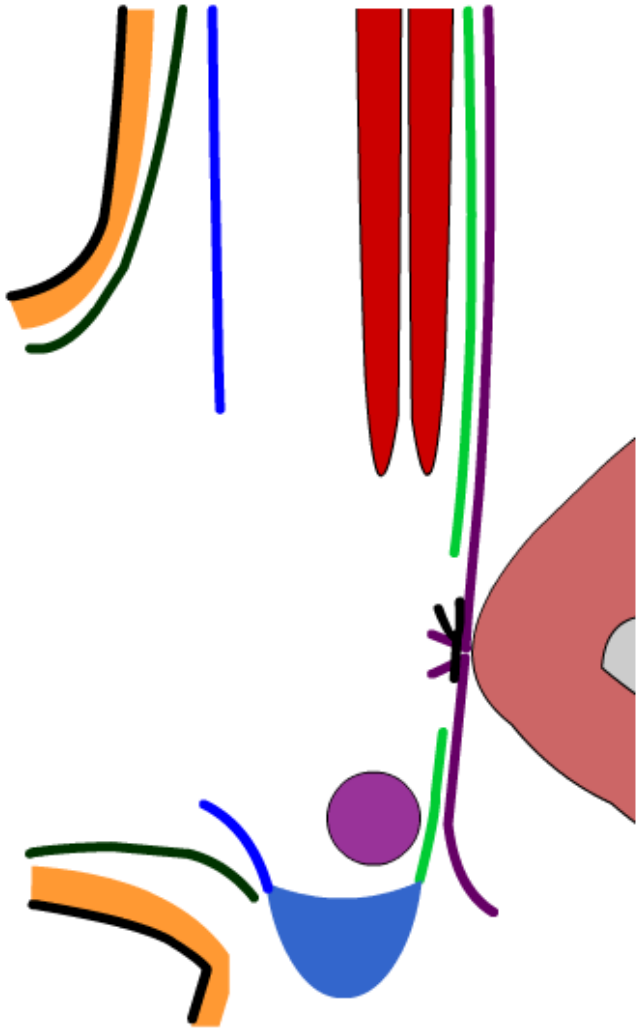
3. OPENING OF THE HERNIAL SAC

Stages of herniotomy in case of non-strangulated hernia



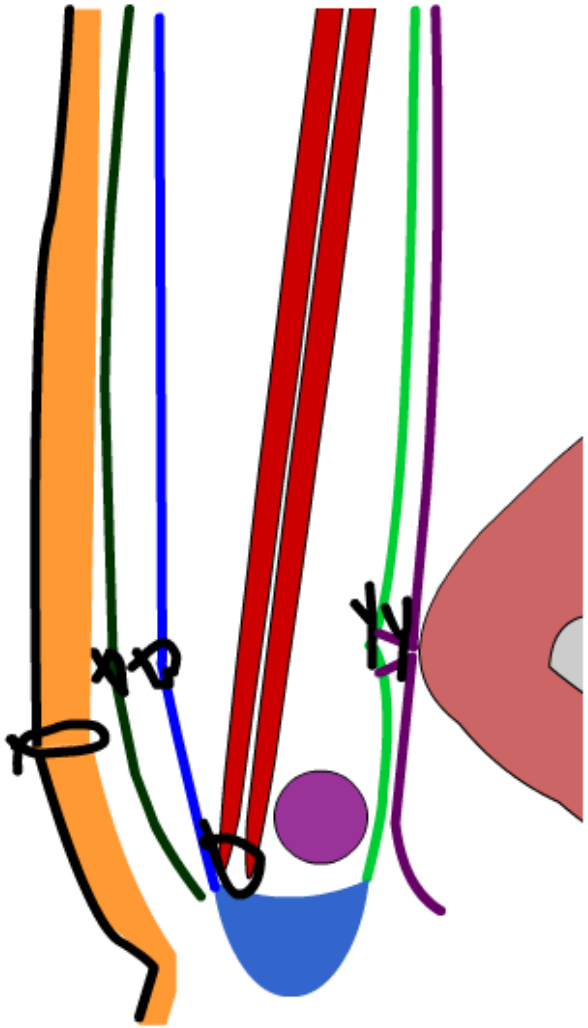
4. EXAMINATION AND REDUCTION OF THE CONTENTS INTO THE ABDOMINAL CAVITY

Stages of herniotomy in case of non-strangulated hernia



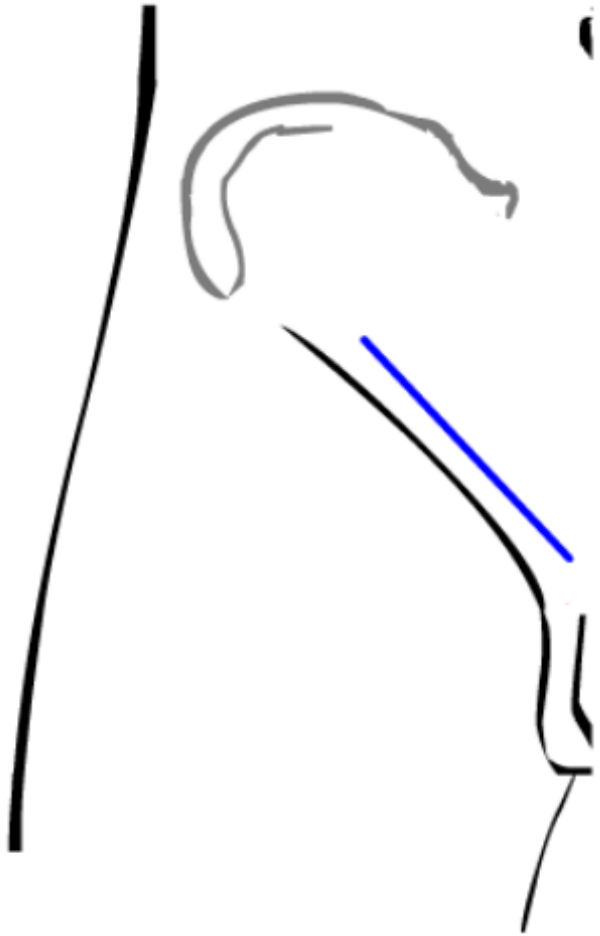
5. STITCHING THE SAC AT THE NECK, DRESSING, CUTTING OFF

Stages of herniotomy in case of non-strangulated hernia



6. HERNIA ORIFICE PLASTIC SURGERY

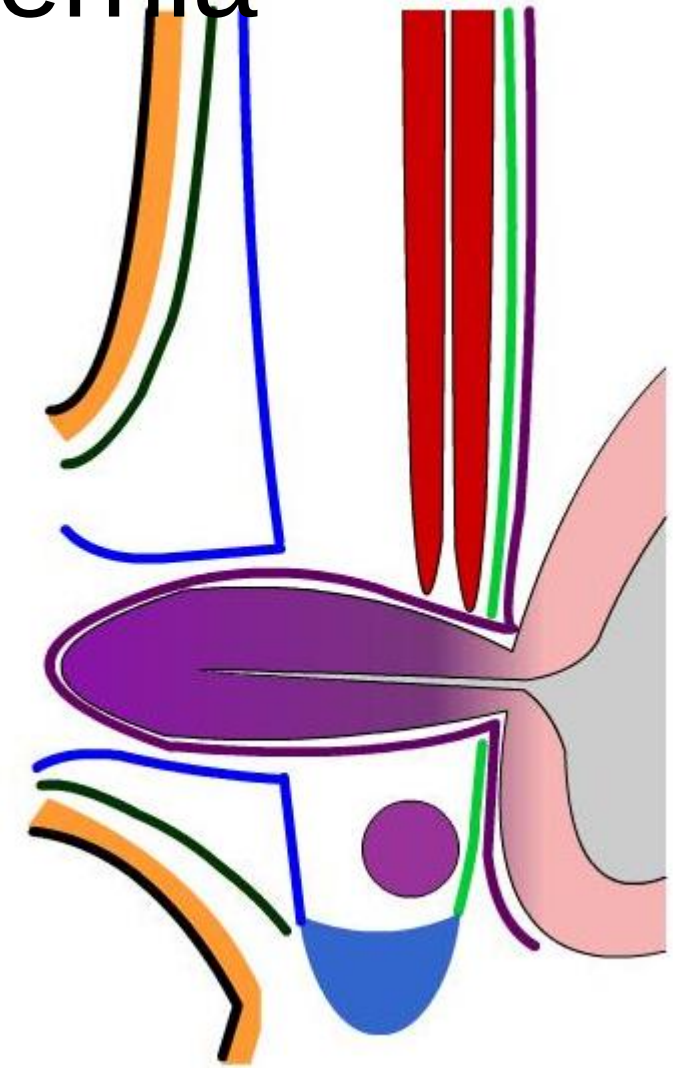
Stages of herniotomy with a strangulated hernia



1. OPERATIONAL ACCESS

A 5 - 6 cm long incision parallel to and above The inguinal fold by 1 - 1.5 cm with access to the root of the scrotum (boys)

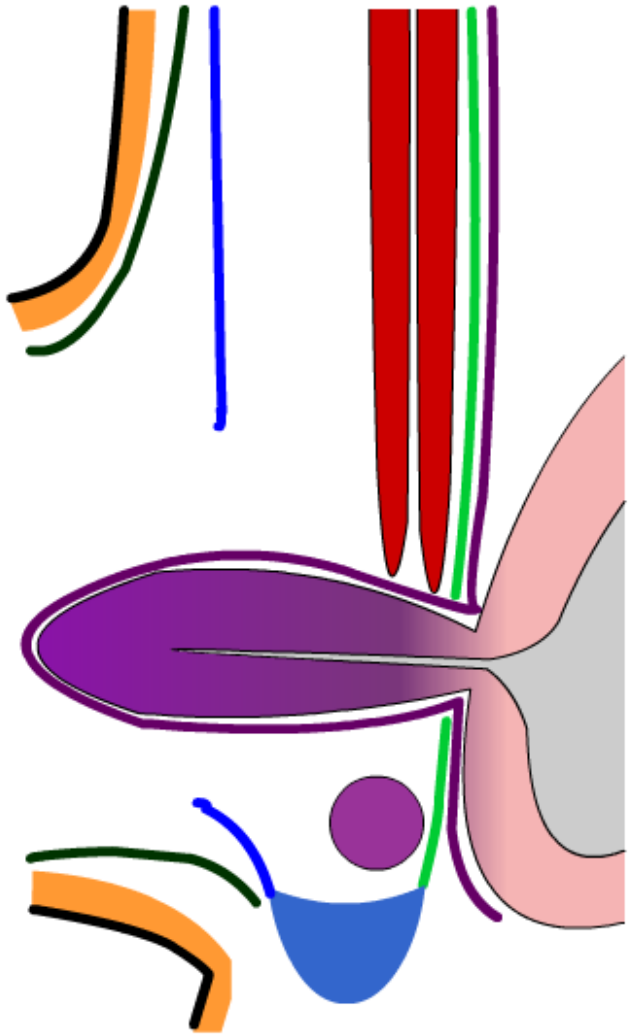
Stages of herniotomy with a strangulated hernia



1. OPERATIONAL ACCESS

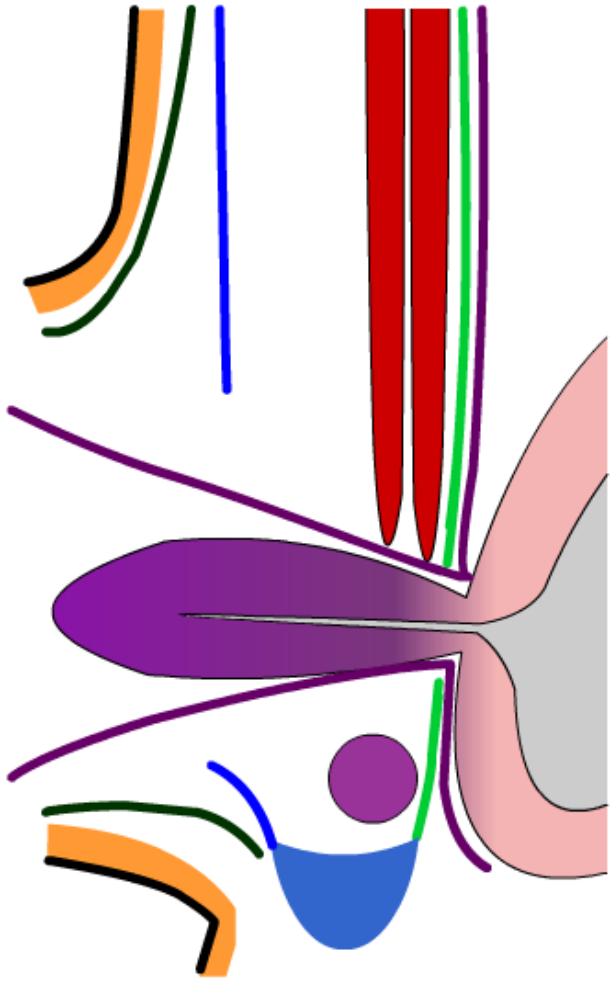
Dissect a deep leaf of the superficial fascia, expose the aponeurosis of the external oblique abdominal muscle

Stages of herniotomy with a strangulated hernia



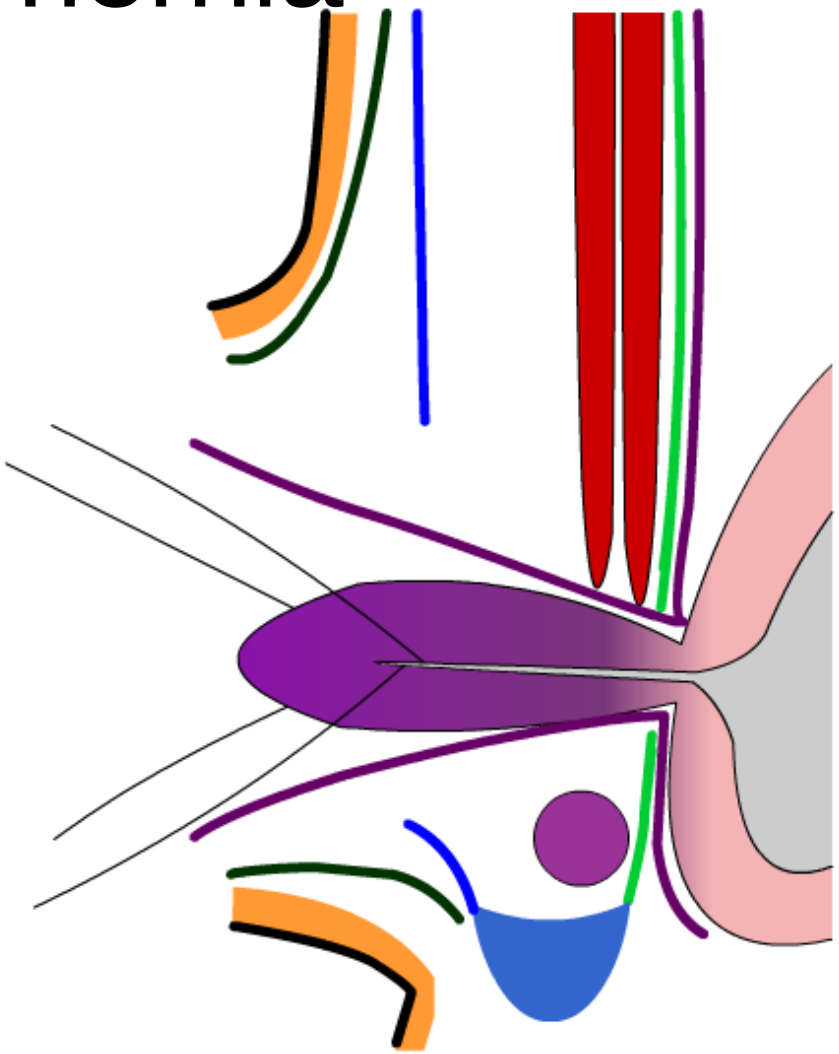
2. ISOLATION OF THE HERNIAL SAC

Stages of herniotomy with a strangulated hernia



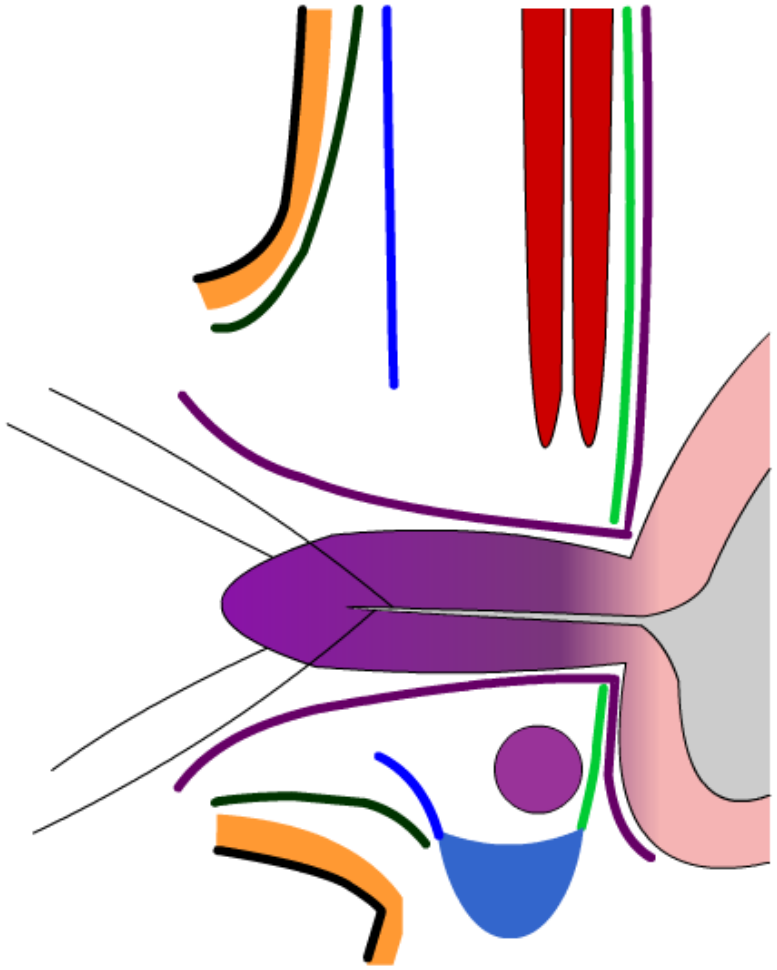
3. OPENING OF THE HERNIAL SAC

Stages of herniotomy with a strangulated hernia



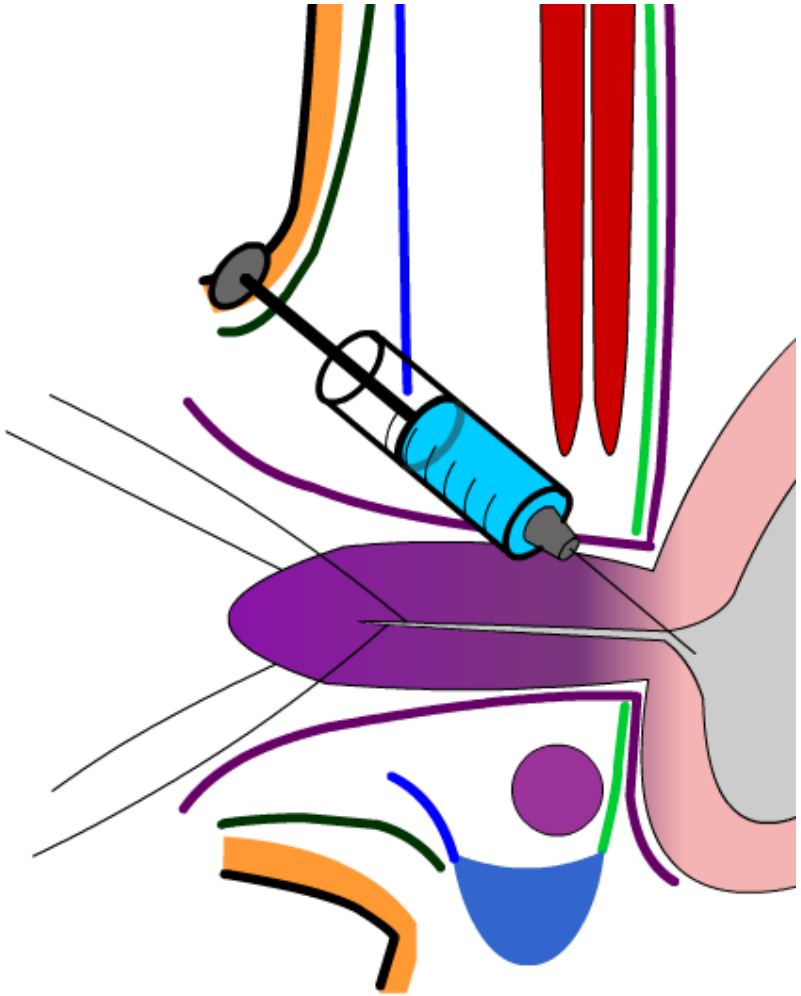
4. EXAMINATION AND FIXATION OF HERNIAL CONTENTS

Stages of herniotomy with a strangulated hernia



5. DISSECTION OF THE INFRINGING RING

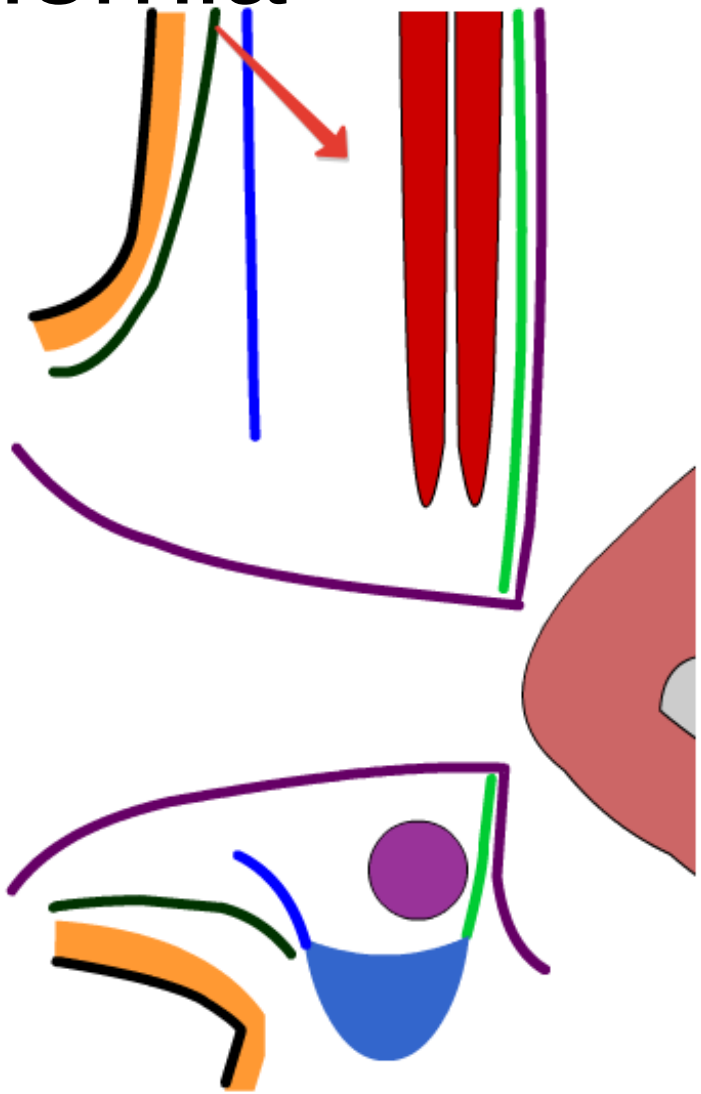
Stages of herniotomy with a strangulated hernia



6. REANIMATION OF THE INFRINGEED CONTENT.

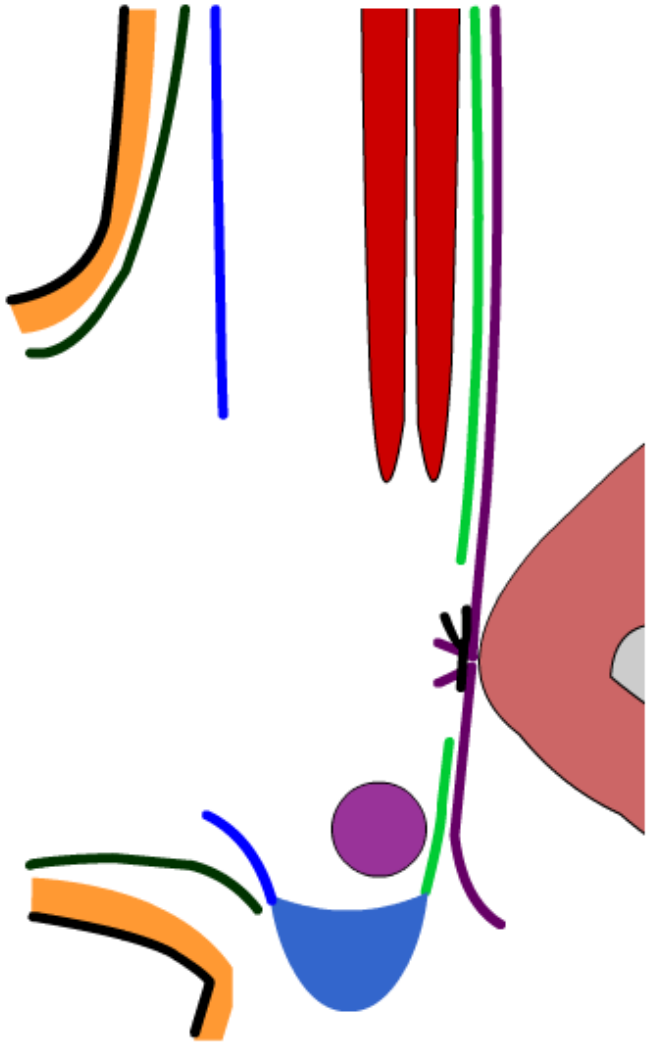
To resuscitate the hernial contents, the intestine is warmed and a 0.25 - 0.5% novocaine solution is injected into the tissue (intestinal mesentery). If these manipulations are ineffective, resection of the strangulated tissues is performed (in case of necrosis)

Stages of herniotomy with a strangulated hernia



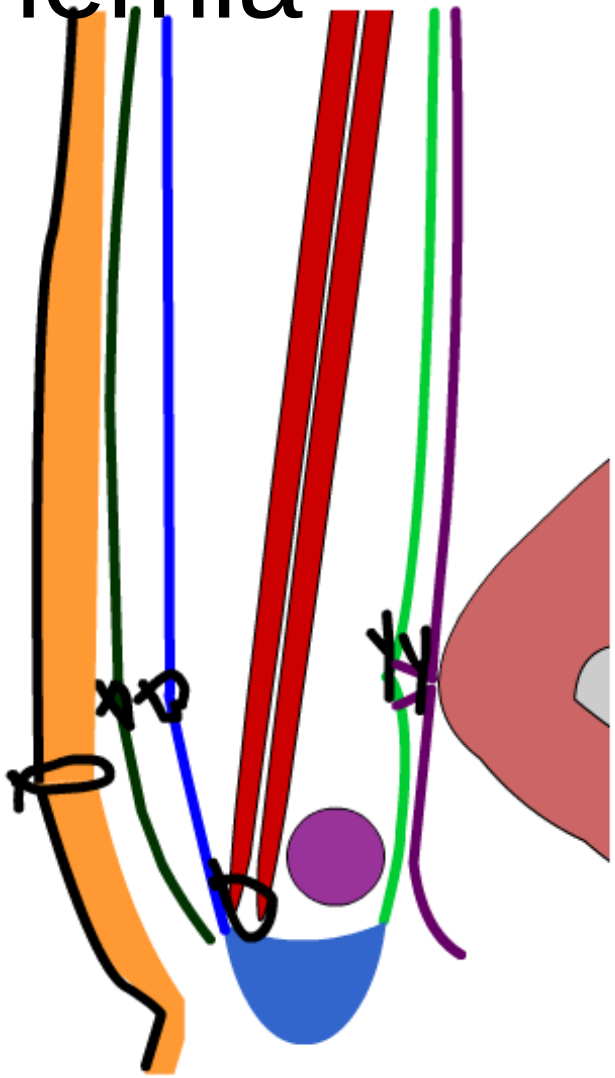
7. REDUCTION OF THE CONTENTS INTO THE ABDOMINAL CAVITY

Stages of herniotomy with a strangulated hernia



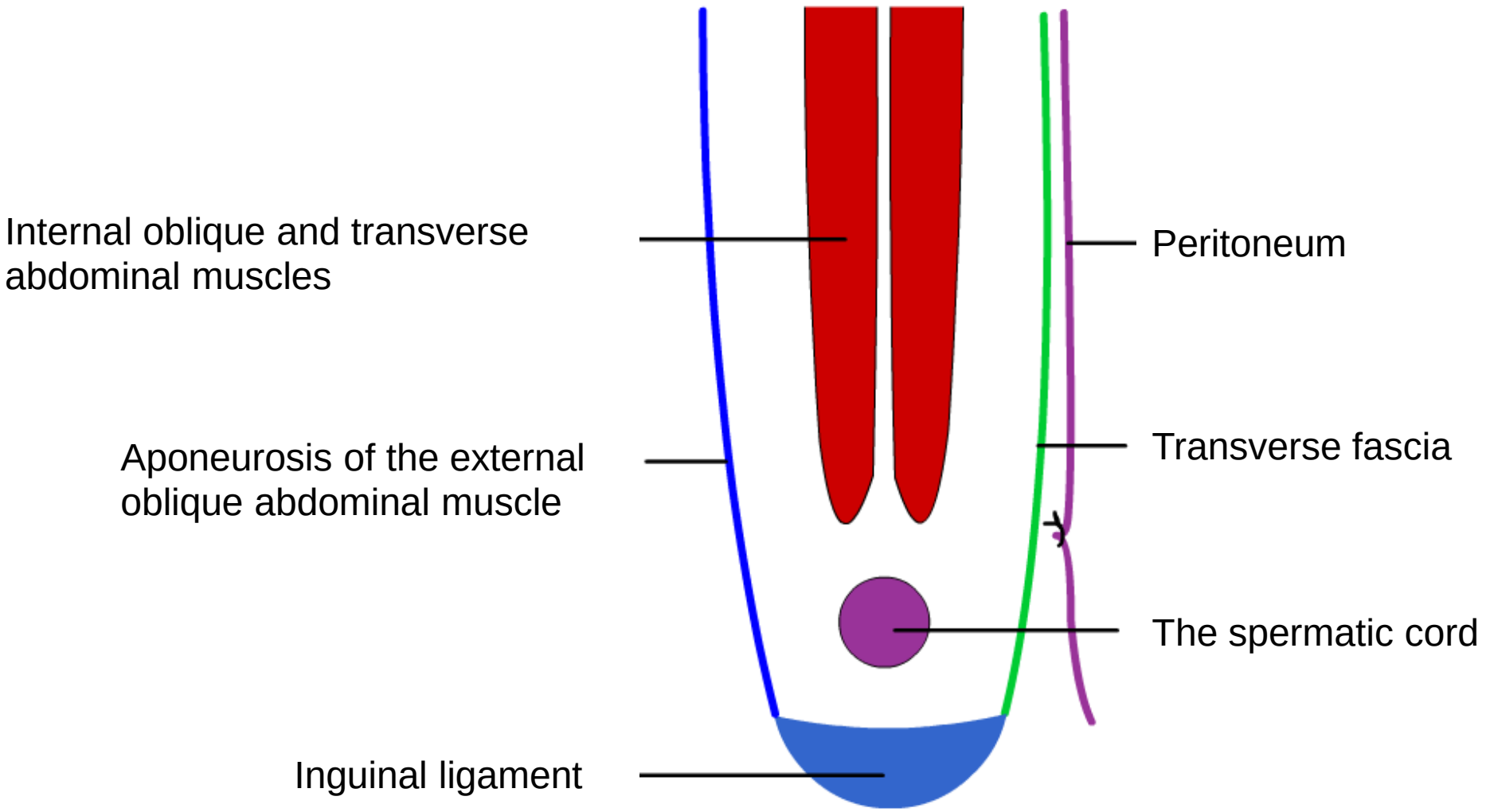
8. STITCHING THE SAC AT THE NECK, DRESSING, CUTTING OFF

Stages of herniotomy with a strangulated hernia



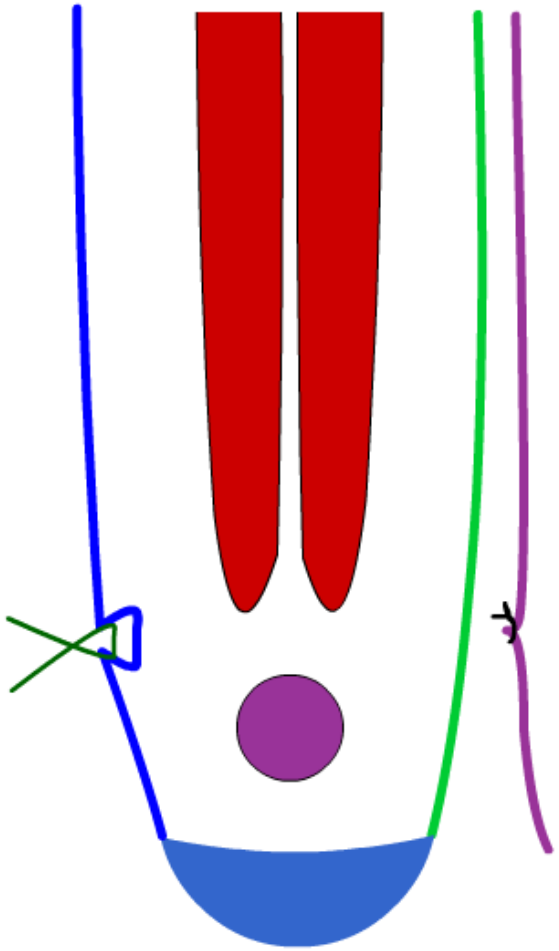
9. HERNIA ORIFICE PLASTIC SURGERY

Plastic surgery of the inguinal canal



Plastic surgery of the inguinal canal

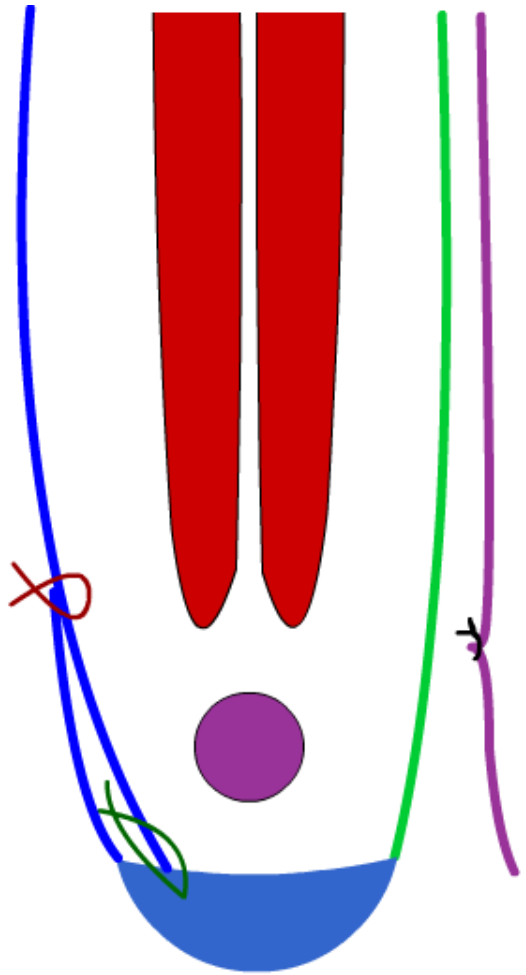
Strengthening of the anterior wall of the inguinal canal



Krasnobaev 's method

Plastic surgery of the inguinal canal

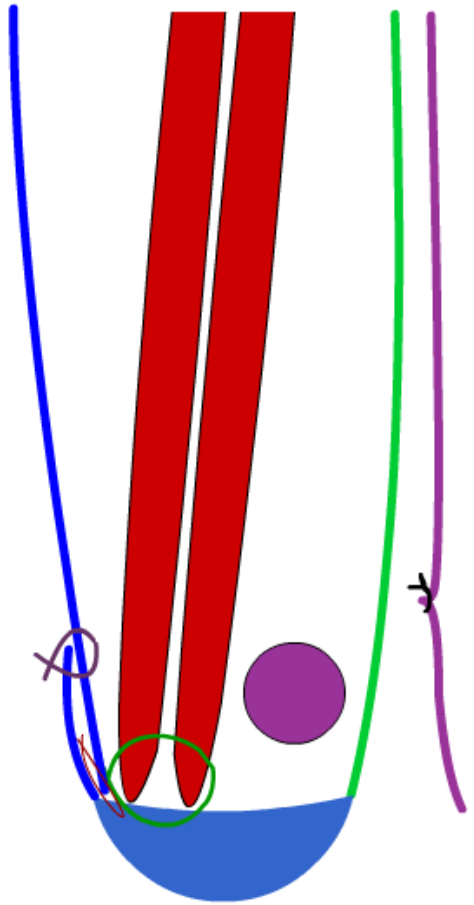
Strengthening of the anterior wall of the inguinal canal



The Martynov Method (1926)

Plastic surgery of the inguinal canal

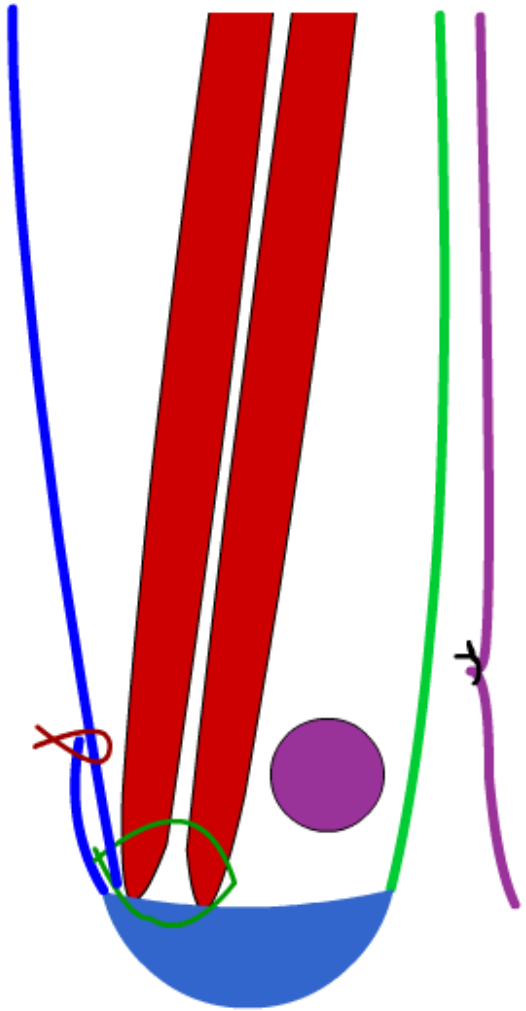
Strengthening of the anterior wall of the inguinal canal



Girard's Method (1894)

Plastic surgery of the inguinal canal

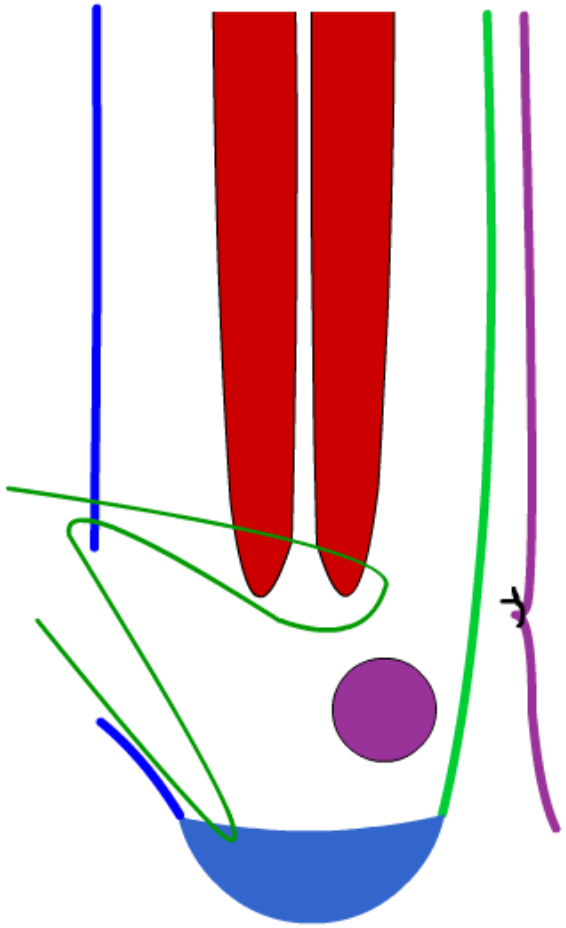
Strengthening of the anterior wall of the inguinal canal



The Spasokukotsky Method (1902)

Plastic surgery of the inguinal canal

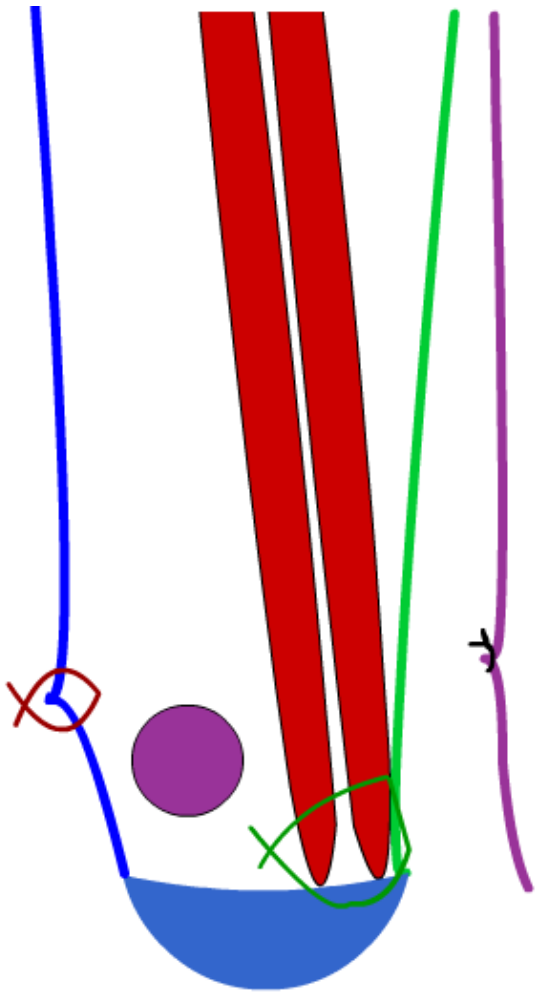
Strengthening of the anterior wall of the inguinal canal



The Kimbarovsky Method (1922)

Plastic surgery of the inguinal canal

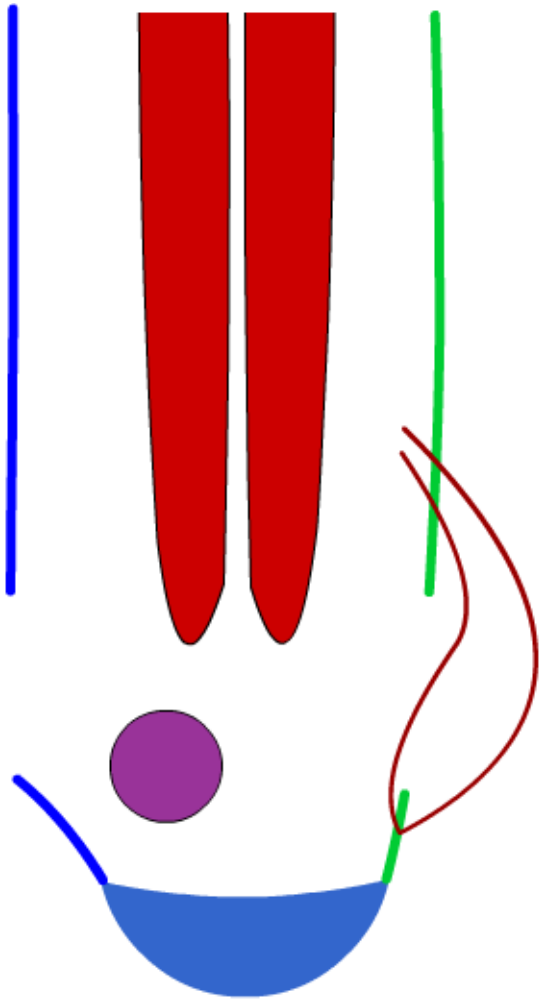
Strengthening of the posterior wall of the inguinal canal



The Bassini Method (1884)

Plastic surgery of the inguinal canal

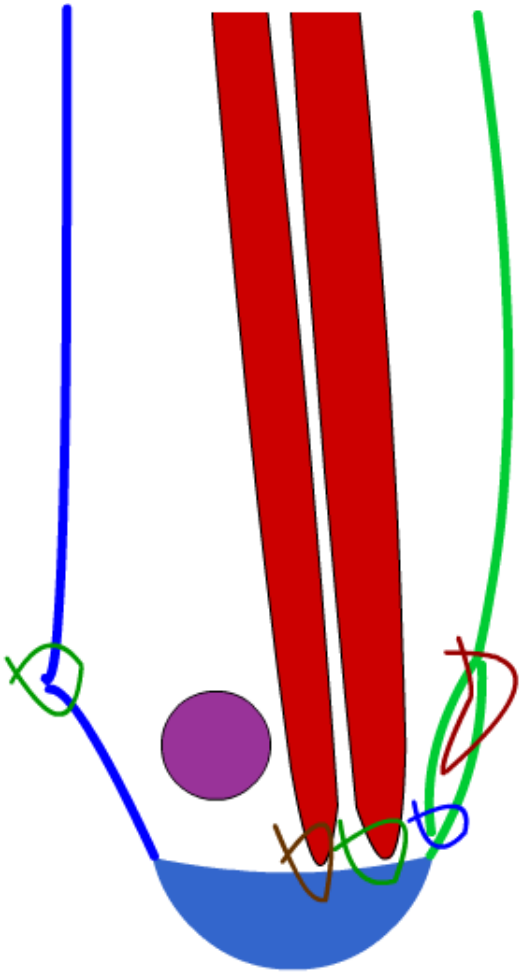
Strengthening of the anterior and posterior walls of the inguinal canal



The "gold standard" of inguinal hernioplasty - the Shuldays method (1944)

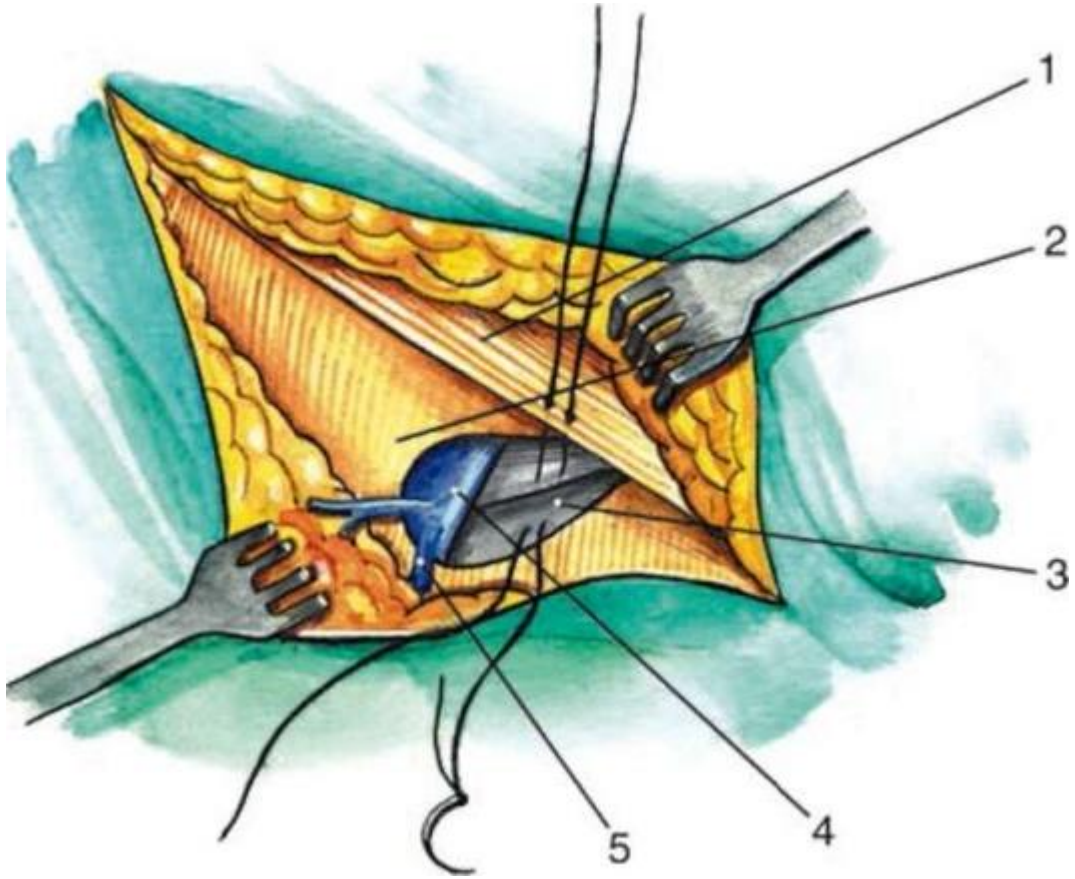
Plastic surgery of the inguinal canal

Strengthening of the anterior and posterior walls of the inguinal canal



The "gold standard" of inguinal hernioplasty - the Shuldays method (1944)

Operations for femoral hernias
The Bassini’s method

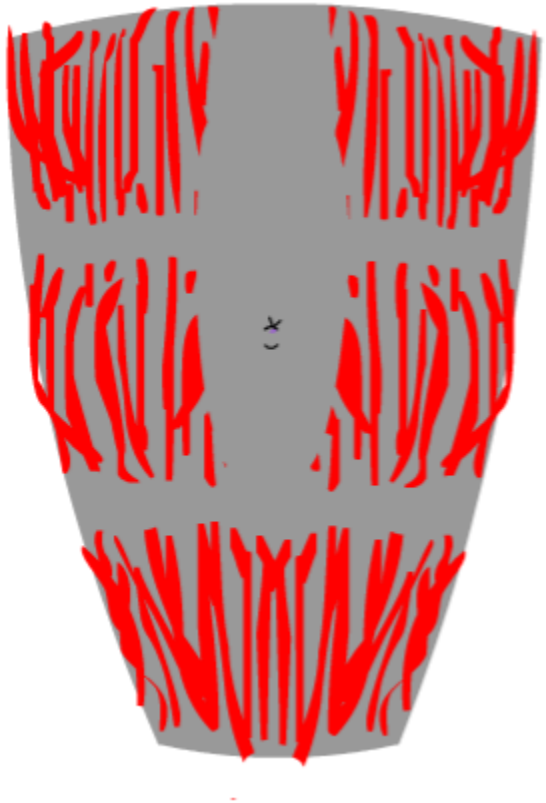


Bassini's plasty of the deep femoral ring by the femoral approach:
1 - the inguinal ligament;
2 - the fascia lata and its falciform edge;
3 - the pectineal ligament;
4 - the femoral vein;
5 - the vena saphena magna

Stitching of the medial section of the inguinal ligament to the pubic ligament with two silk sutures.

Operations for umbilical hernias. Lexer Method

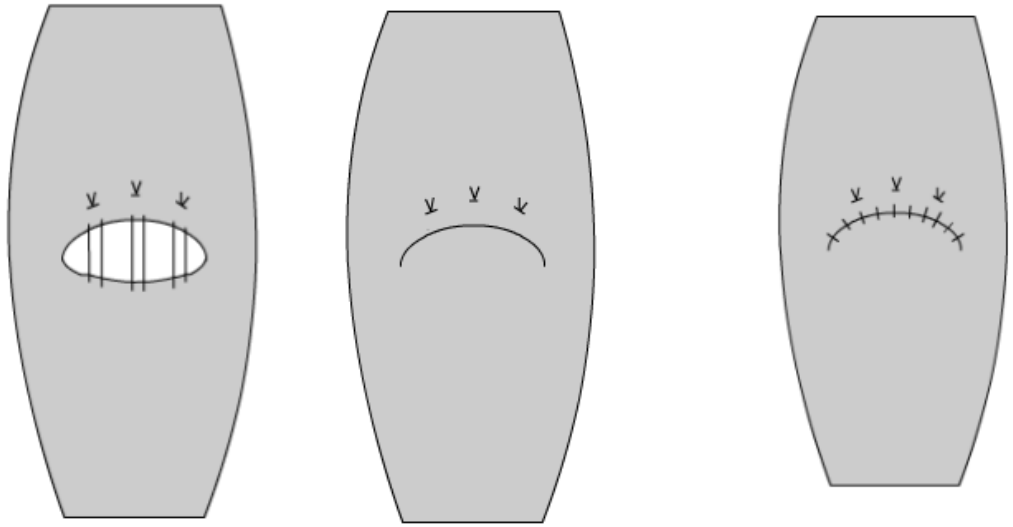
The defect of the umbilical ring is sutured with a pouch seam



Operations for umbilical hernias. The Mayo method

U-shaped seams are applied to the defect in such a way that the upper edge of the aponeurosis lies on the lower one in the form of a duplication

The free edge of the aponeurosis
is sewn with nodular seams



Thanks for your attention!

What walls does the inguinal canal have? Name them.

List of literature sources for preparation for practical classes

1. Nikolaev, A. V. Topographic Anatomy and Operative Surgery = [Топографическая анатомия и оперативная хирургия] : textbook / A. V. Nikolaev. - Moscow : GEOTAR-Media, 2021. - 672 p. - Текст : электронный.
https://www.studentlibrary.ru/book/ISBN9785970460955.html
2. Kagan, I. I. Topographic and clinical anatomy of the human body : the teaching aid for foreign students = [Топографическая и клиническая анатомия тела человека : учебное пособие для иностранных студентов] / I. I. Kagan, S. N. Lyashchenko, A. O. Mironchev. - Moscow : GEOTAR-Media, 2022. - 256 p. : il. - Текст : электронный.
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3. Topographic Anatomy and Operative Surgery. Workbook = [Топографическая анатомия и оперативная хирургия. Рабочая тетрадь] : In 2 parts / ed. S. S. Dydykin. - Moscow : GEOTAR-Media, 2022. - Part I, II. - 120 p. : il. - Текст : электронный.
https://www.studentlibrary.ru/book/ISBN9785970464519.html
4. Video bank of practical skills of the Krasnoyarsk State Medical University, Colibris.
https://krasgmu.ru/sys/files/colibris/122687.mp4
http://krasgmu.ru/index.php?page[common]=elib&cat=catalog&res_id=122688
5. Collection of multiple choice test questions, https://krasgmu.ru/index.php?page[common]=content&id=240256
6. Collection of case problems, https://krasgmu.ru/index.php?page[common]=content&id=240255