КРАСНОЯРСКИЙ МЕДИЦИНСКИЙ УНИВЕРСИТЕТ
1942/2022

Federal State Budgetary Educational Institution of Higher Education "Krasnoyarsk State Medical University named after. prof. V.F. Voino-Yasenetsky" Ministry of Health of the Russian Federation
Department of Operative Surgery with Topographic Anatomy

SURGICAL ANATOMY OF THE LIVER, GALL BLADDER AND BILIARY TRACT

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LECTURE PLAN

1. The history of the development of surgical hepatology
2. Topography of the liver;
3. Liver surgeries;
   - Liver suture,
   - Liver resections,
   - Liver transplantation;
4. Topography of the gallbladder and bile ducts;
5. Operations on the gallbladder and bile ducts.

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PURPOSE

Explain the topographic anatomy of the liver, gallbladder and bile ducts. Indicate the main stages in the development of surgical interventions on the liver, gallbladder and bile ducts. To familiarize students with the technique of a number of surgical interventions on these organs and give their topographic and anatomical justification. To familiarize students with the basic definitions and classifications necessary to master the material.

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HISTORY OF LIVER SURGERY

- *2000-3000 years ago – Assyrian-Babylonian kingdom, first mention of the liver.*
- *334-280 BC. A. Herophilus - the first documentary description of the structure of the liver.*
- *S. Galenus (129-199 AD), described the tubular structures of the liver, identified five lobes in the liver.*
- *1535 Andreas Laguna first showed that the human liver consists of four, more often three, lobes.*
- *1538 Andreas Vesalius described the two lobes of the liver, thereby casting doubt on the then established dogmas regarding the anatomy of the liver.*
- *1640 Walaeus discovered that even the smallest vessels of the liver have their own membrane, which is a continuation of the liver capsule and unites the artery, vein and bile duct.*
- *1654 Francis Glisson - liver capsule, Glisson's triad.*

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HISTORY OF LIVER SURGERY

Carl Joseph
Langenbuch
(Germany, 1829-1918)

1882 The first operation on the gallbladder is antegrade (from the bottom) cholecystectomy
1887first selective liver resection

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HISTORY OF LIVER SURGERY

- *In Russia, the first successful liver resection was performed by N.V. Sklifosovsky in 1889*
- *The first right hemihepatectomy in our country was performed by A.M. Dykhno in 1955*
- *Professors B.V. Petrovsky, E.I. Galperin, V.A. Vishnevsky, A.K. Eramishantsev, Yu.I. Patyutko, V.S. Shapkin et al. made a great contribution to the study of the anatomical structure of the liver, the development of methods for isolating Glissonian pedicles during its resection, improving reconstructive biliary surgery, and surgery for portal hypertension*

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LIVER

- ***a vital unpaired internal human organ located in the upper floor of the abdominal cavity and performing a large number of functions:***

- ***1. neutralization of allergens, poisons, toxins by converting them into less toxic compounds that are easily removed from the body; removal from the body of excess inflammatory mediators, hormones, vitamins, as well as metabolic end products***
- ***2. gluconeogenesis - providing energy needs with glucose;***
- ***3. depot of vitamins (A, D, B12, K) and a number of microelements (iron, copper, cobalt);***
- ***4. synthesis of blood plasma proteins, cholesterol, bile acids, bilirubin, formation of bile, digestive hormones and enzymes;***
- ***5. blood depot.***

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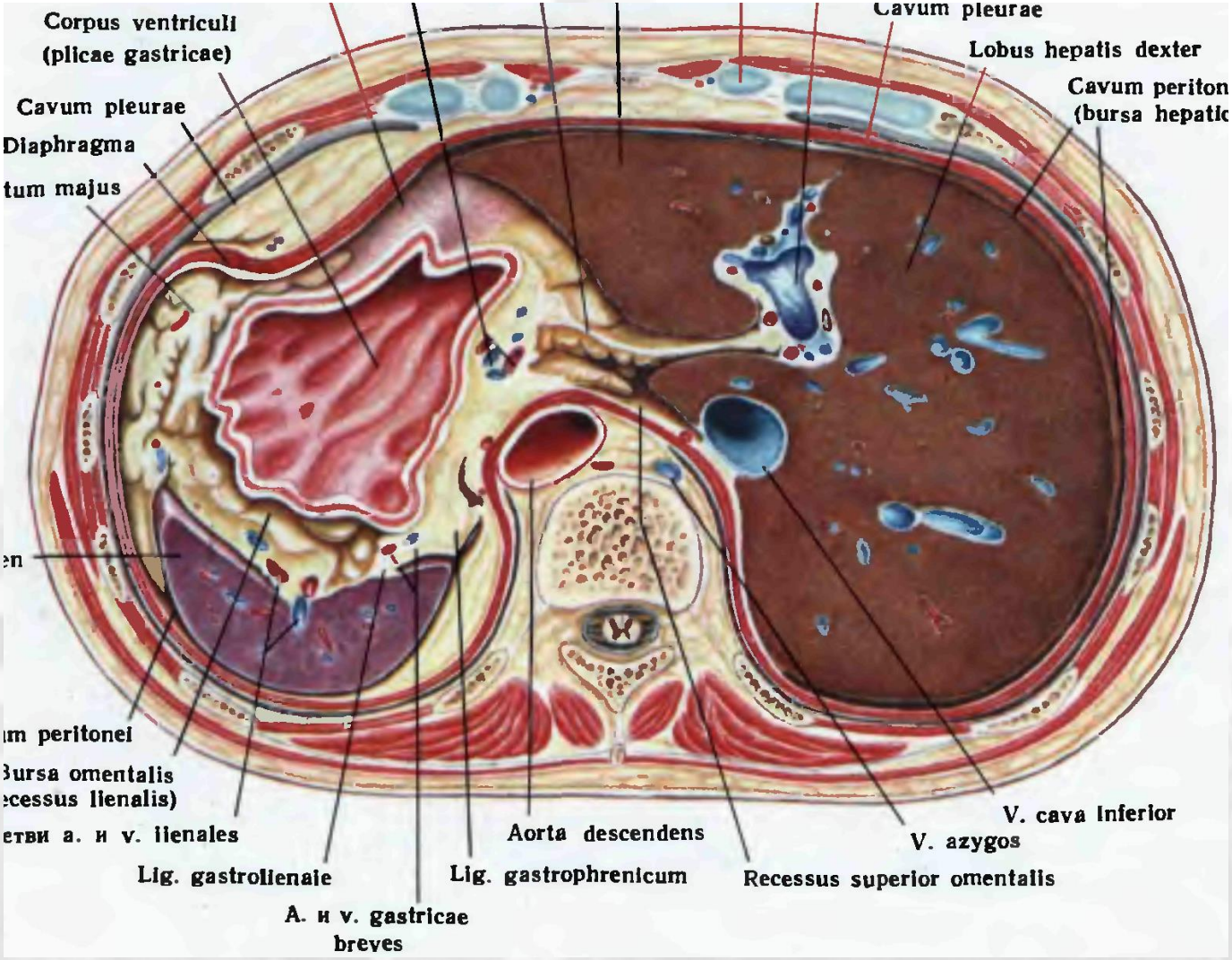
TOPOGRAPHY OF THE UPPER FLOOR OF THE ABDOMINAL CAVITY

located organs in a horizontal section



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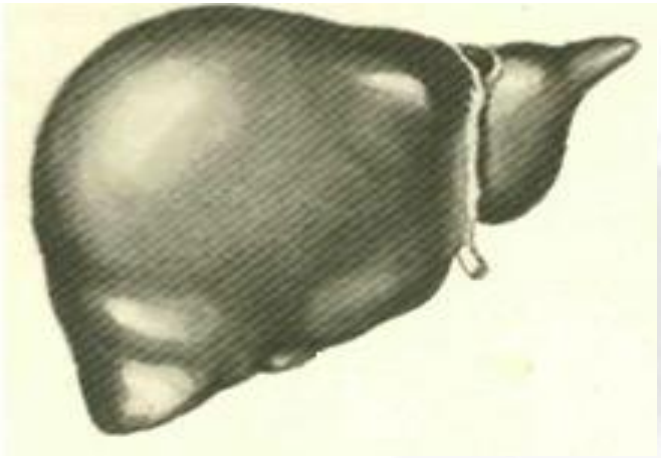
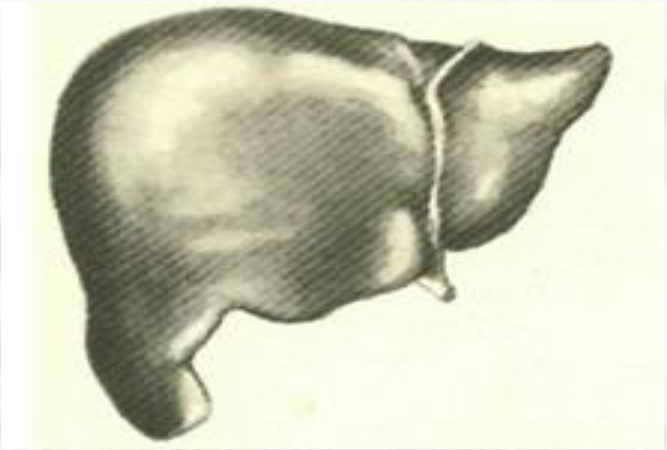
LIVER SHAPES

hypolobar types

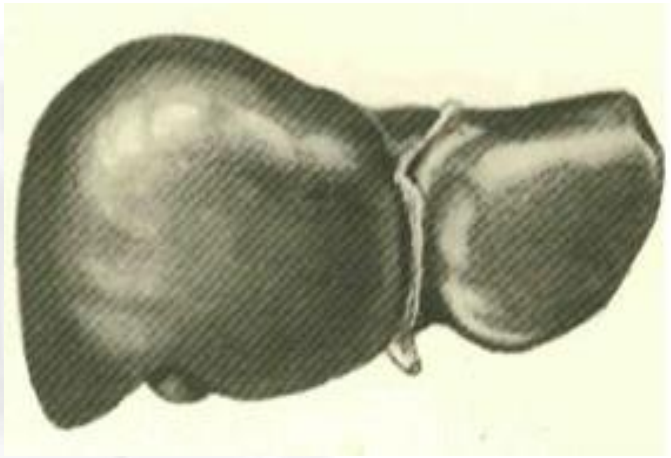


rounded

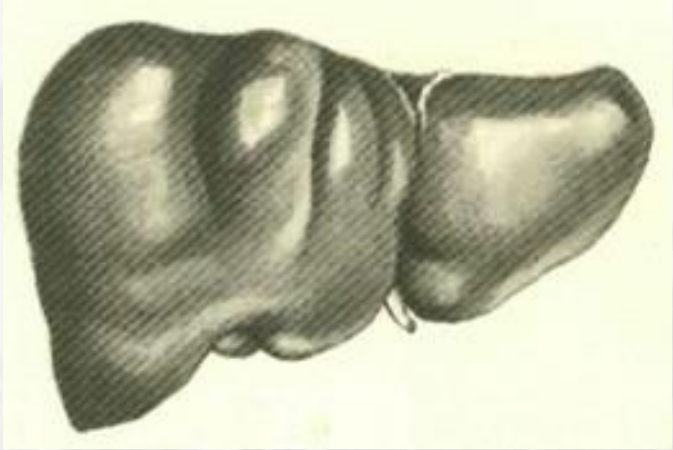


"tongue-like«
Riedel's lobe

hyperlobar types



saddle-shaped



wedge-shaped
"Cough" furrows

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POSITION OF THE LIVER

A. Frontal:

1. **Dorsopetal** *(40%)(diaphragmatic surface of the liver faces posteriorly, visceral surface anteriorly)*
2. **Ventropetal** *(60%)(diaphragmatic surface facing anteriorly, visceral surface posteriorly)*

B. Sagittal position:

1. **Dextropetal** *(almost vertical position, developed right lobe of the liver)*
2. **2. Sinistropetal** *(position is more horizontal, the left lobe of the liver is more developed)*

In relation to the costal arch:

Retrocostal *(liver edge above the costal arch)*

Extracostal *(liver edge below the costal arch)*

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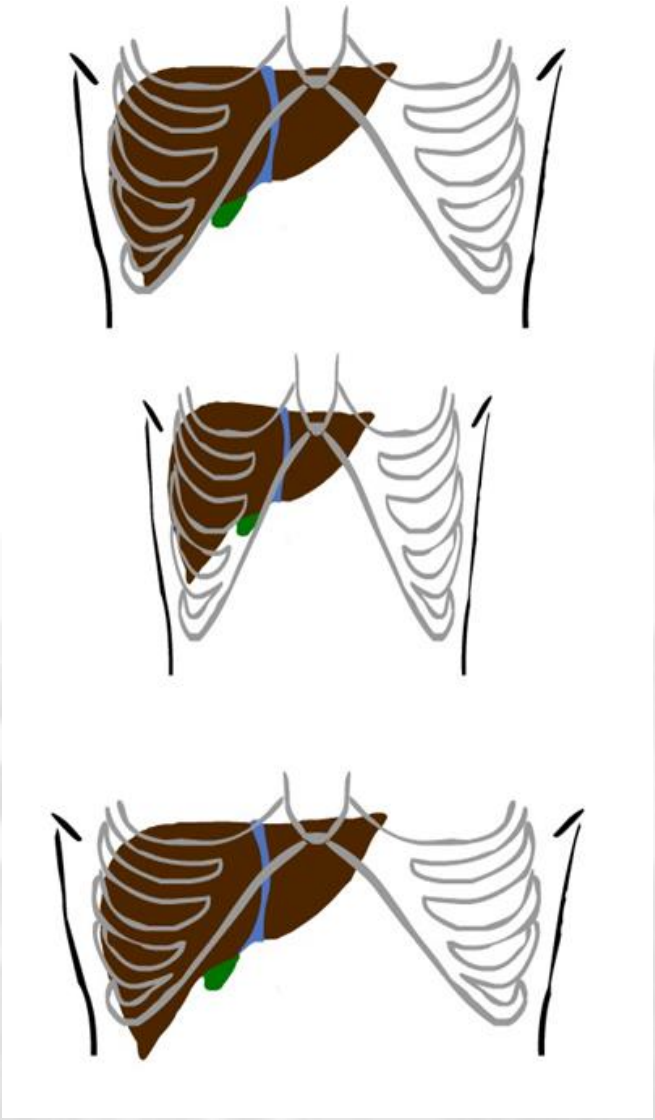
OPTIONS FOR LOCATION OF THE LIVER EDGE in relation to the costal arch



- in normosthenics, the liver occupies the right hypochondrium and epigastric region

- in asthenics, the lower edge of the liver can be located 4-5 cm above the costal arch

- in hypersthenics, the edge of the liver may protrude 2-3 cm from under the costal arch

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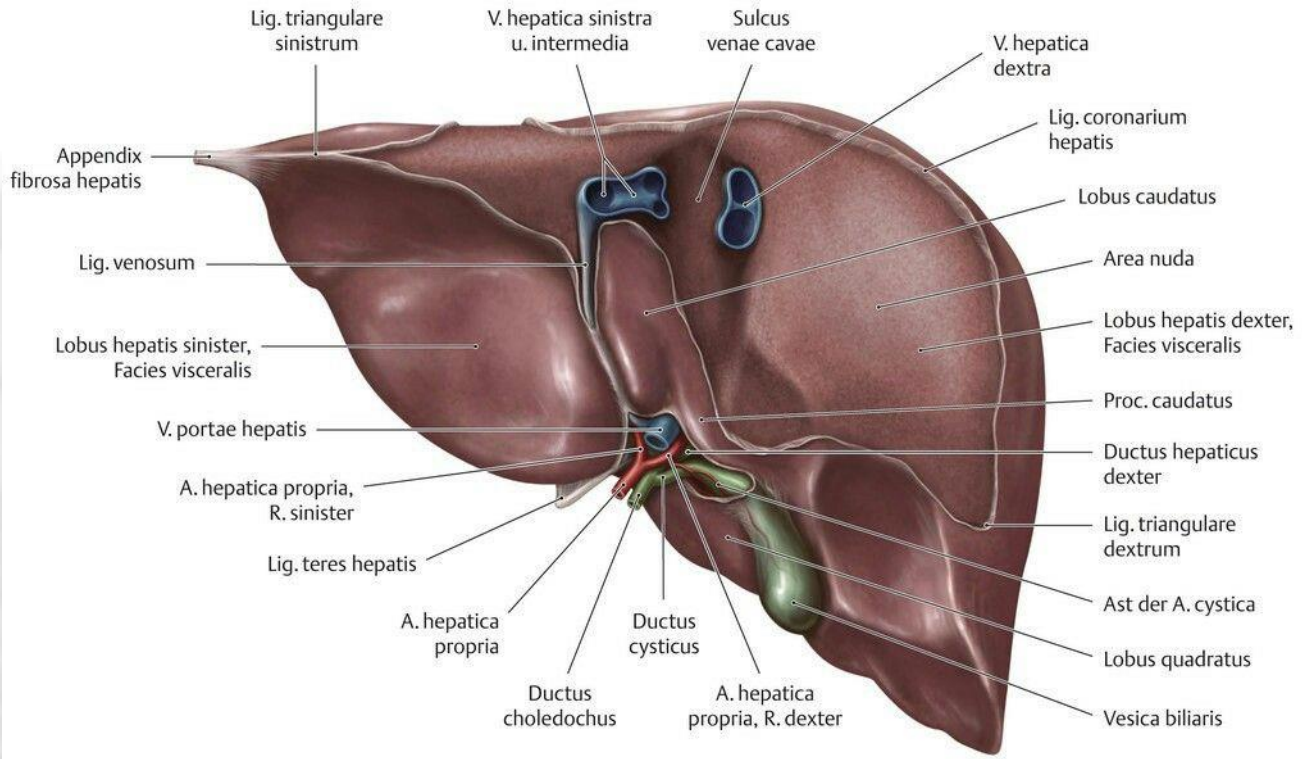
LIVER FIXATION FACTORS:

1.Increment of the liver to the lumbar diaphragm (posterior extra peritoneal field);

2.Increment to the inferior vena cava;

3.Intra-abdominal pressure;

4.Strengthening the liver with hepatic veins;



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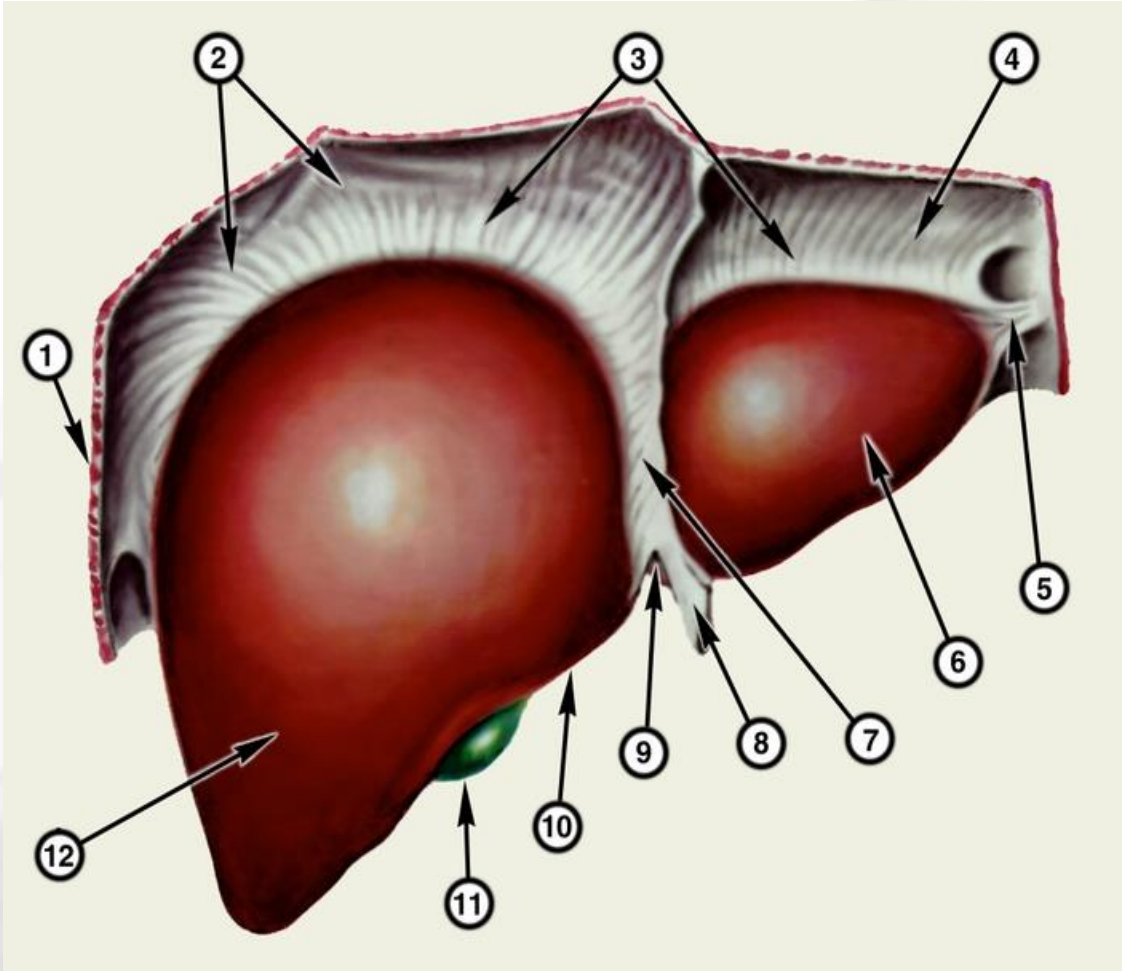
LIVER FIXATION FACTORS:

5. Liver ligaments:
A- connective tissue



1 - right triangular ligament;
2 - diaphragm;
3 - coronary ligament of the liver;
4 - left triangular ligament;
5 - fibrous process of the liver;
6 - left lobe of the liver;
7 - falciform ligament of the liver;
8 - round ligament of the liver;
9 - cutting of the round ligament;
10 - lower edge of the liver;1
1 - bottom of the gallbladder;
12 - right lobe of the liver.

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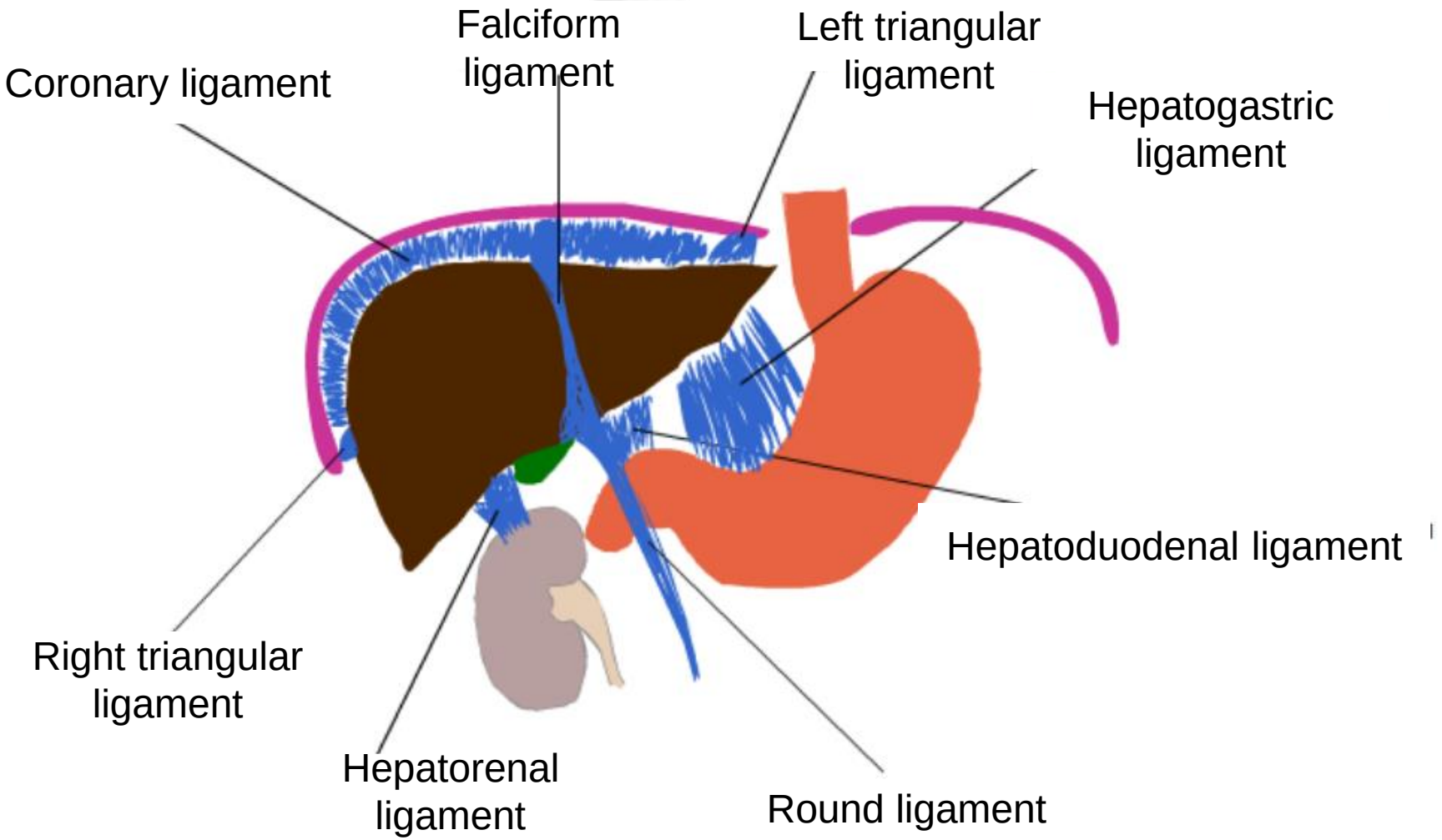
LIVER FIXATION FACTORS:

5. Liver ligaments: *B-peritoneal*



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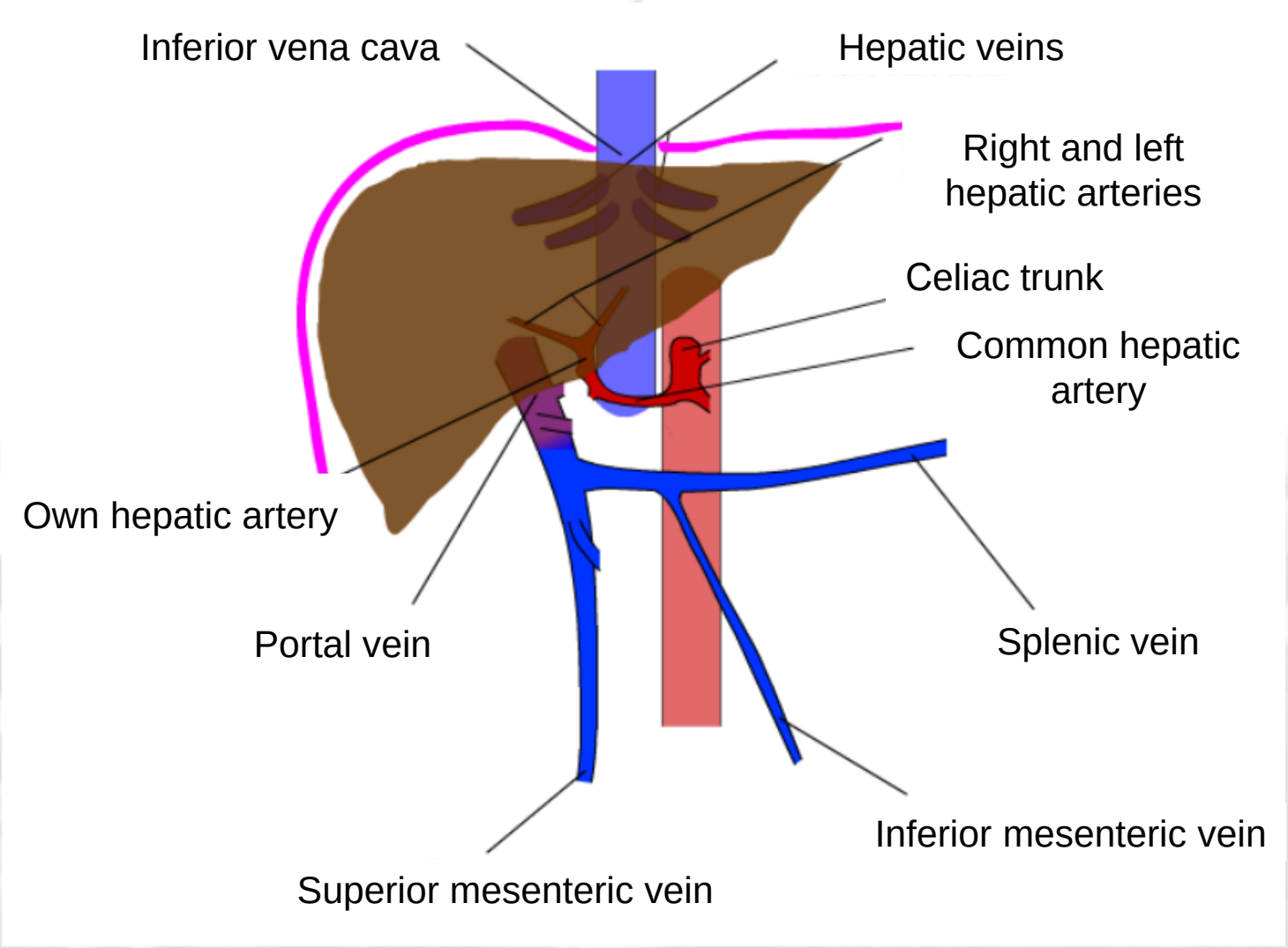
LIVER VASCULAR SYSTEMS:



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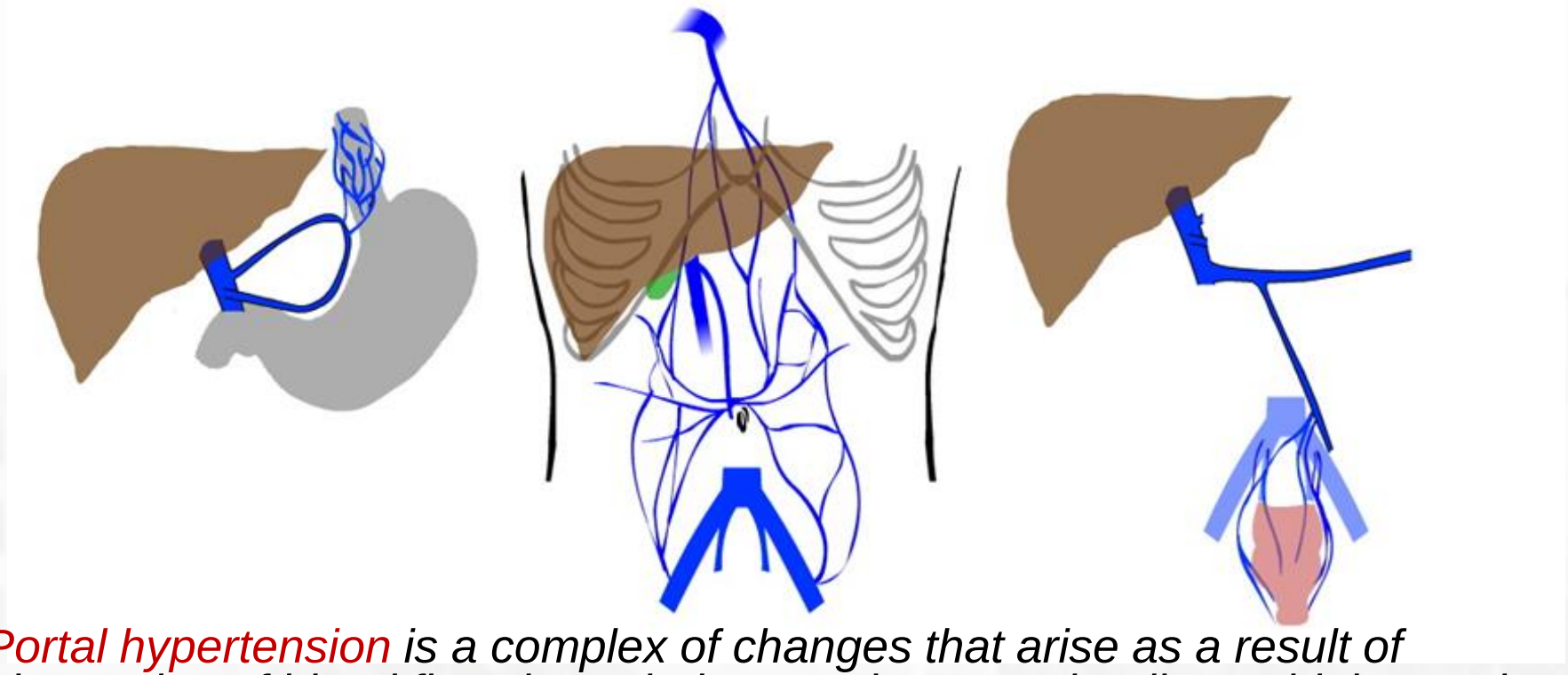
PORTOCAVAL ANASTOMOSES
main groups

Coronary vein of the stomach and vein of the esophagus

Veins of the anterior abdominal wall and umbilical vein

Inferior mesenteric vein and rectal venous plexus



Portal hypertension is a complex of changes that arise as a result of obstruction of blood flow through the portal system, leading to high portal pressure, splenomegaly, variceal bleeding from the veins of the esophagus, stomach and rectum, the development of ascites, liver failure and encephalopathy

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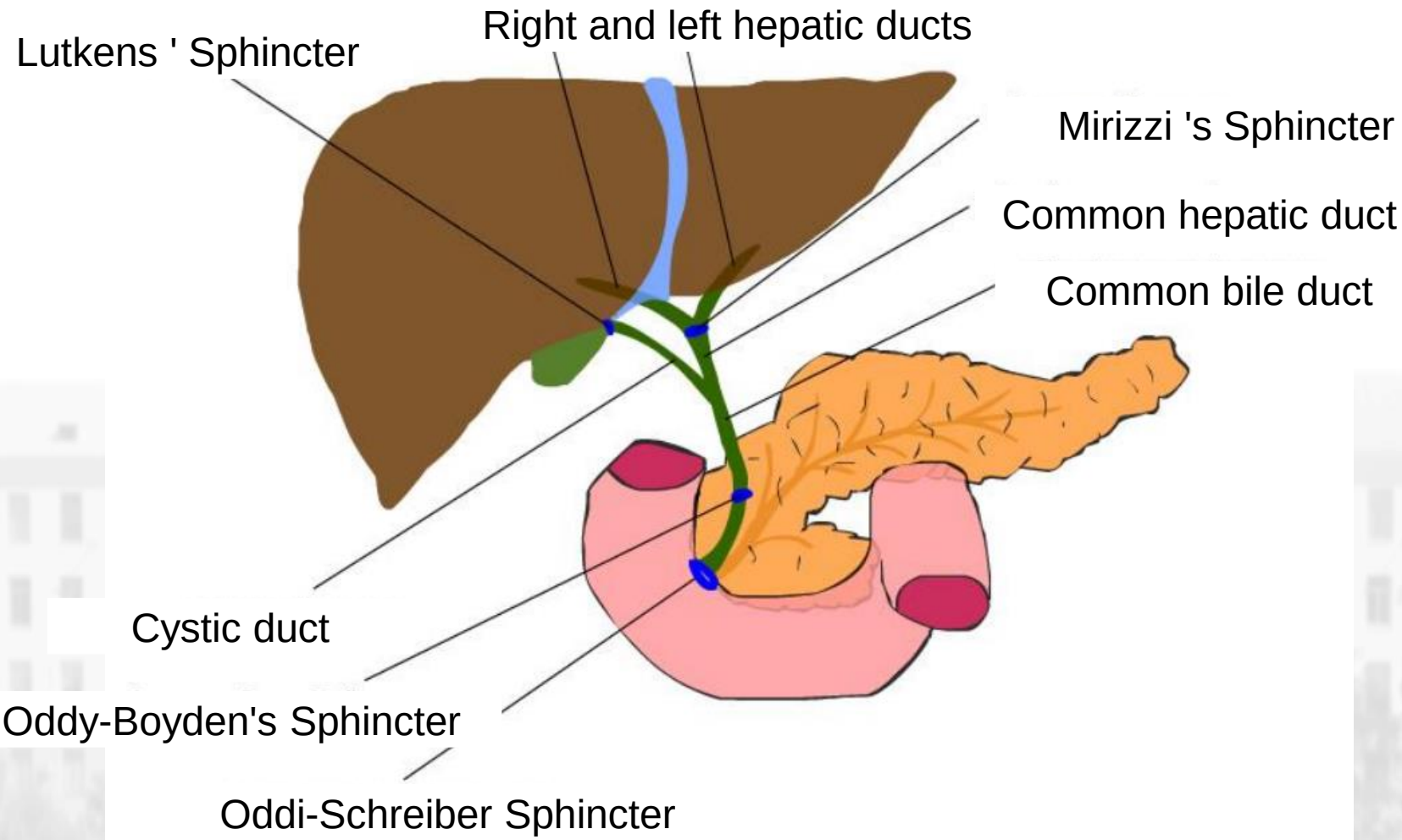
LIVER VASCULAR SYSTEMS:

Biliary tract



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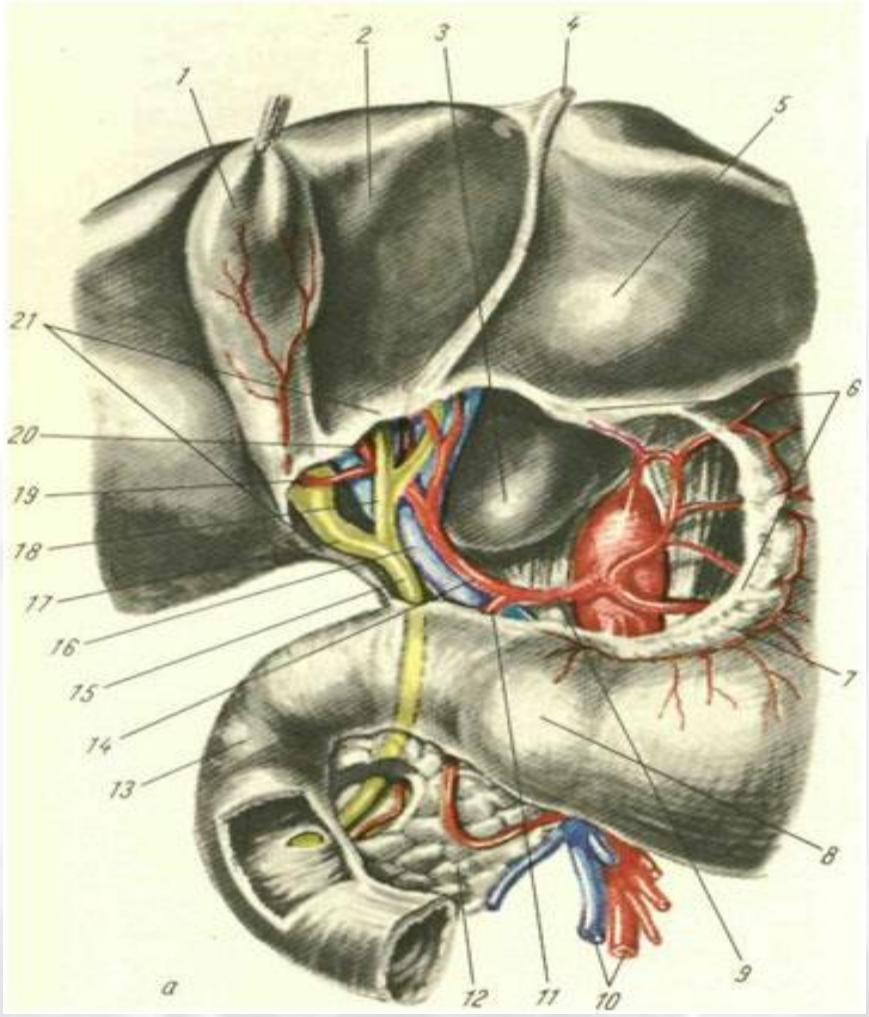
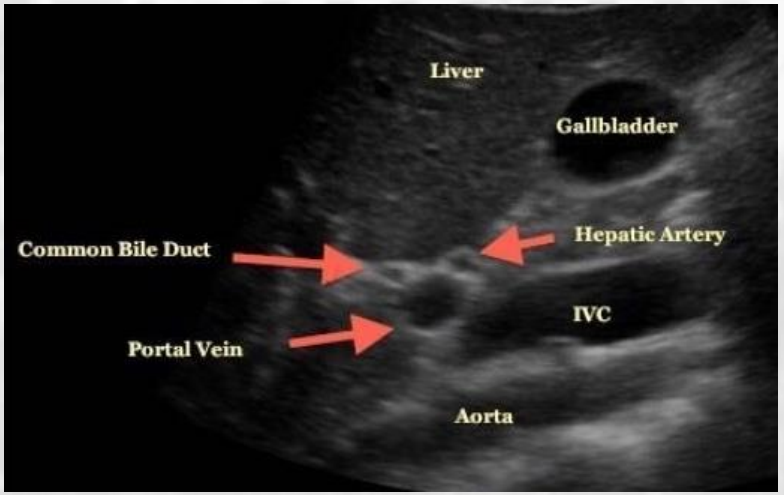
PORTA HEPATIS

transverse groove covered on all sides by leaves of the hepatoduodenal ligament



between the sheets pass:

- *duct,* **D**
- *vein,* **V**
- *artery* **A**



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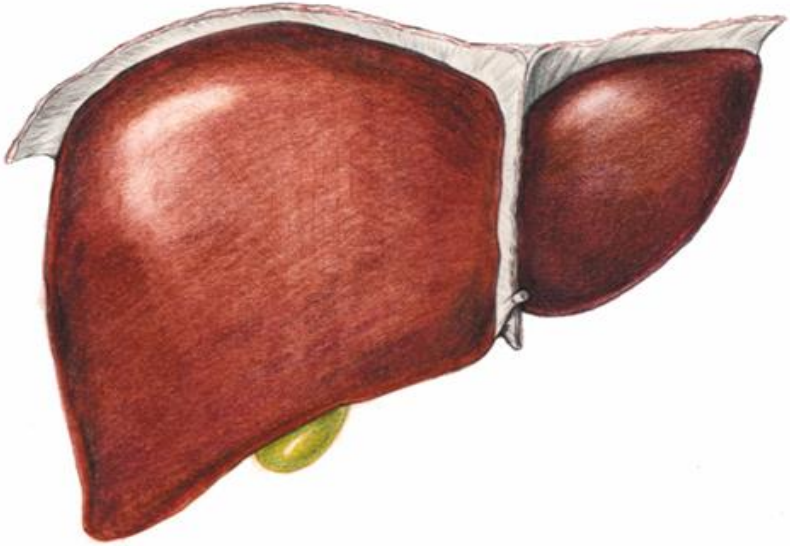
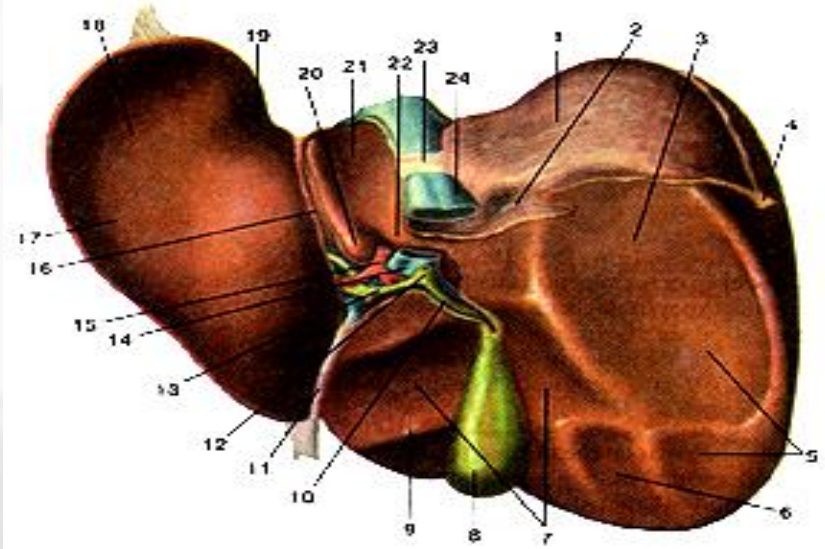
SEGMENTAL STRUCTURE OF THE LIVER





by external signs the liver divides into two unequal lobes (right, left)

boundaries on the diaphragmatic surface – falciform ligament;

on the visceral surface – left longitudinal fissure

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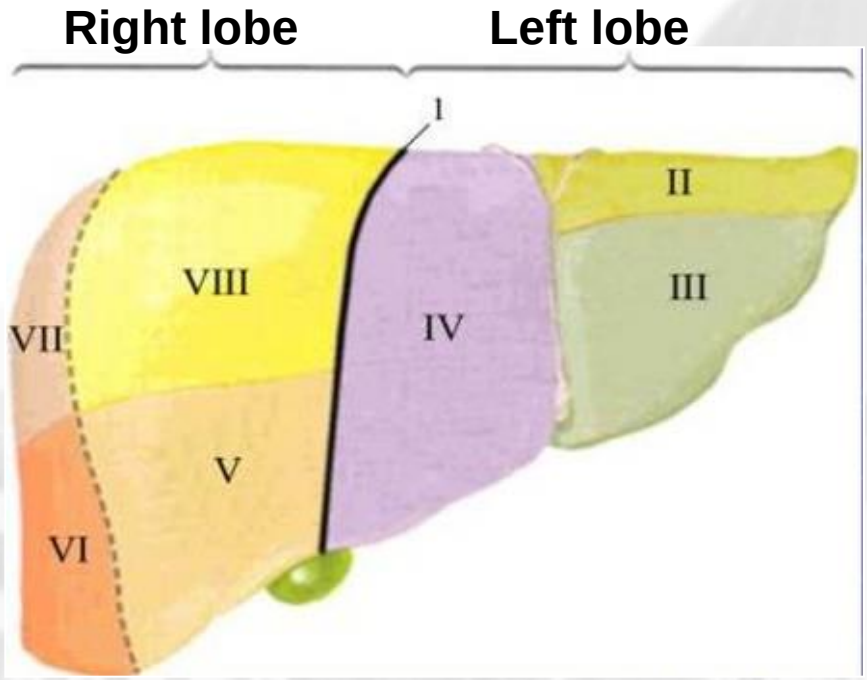
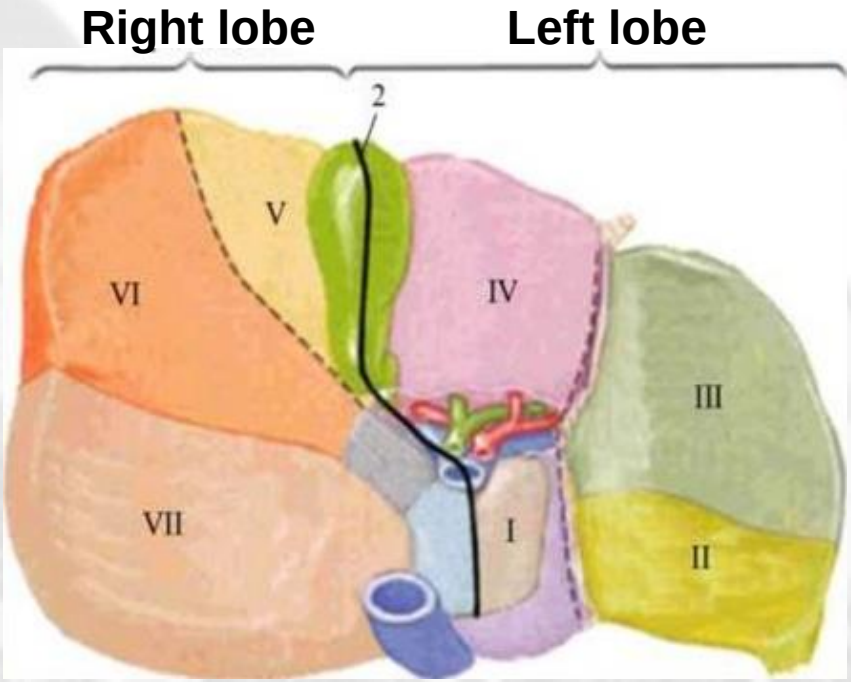
SEGMENTAL STRUCTURE OF THE LIVER

BUT, research by Melnikov A.V. (1928), Quino (1954), Reifferscheid et al. showed that the internal structure of the circulatory and biliary tracts does not correspond to the external signs of division of the liver into lobes.





Rex-Cantle Line (1898)

on the posterior surface of the liver is the suprahepatic section of the inferior vena cava;

on the anterior side is the bed of the gallbladder.

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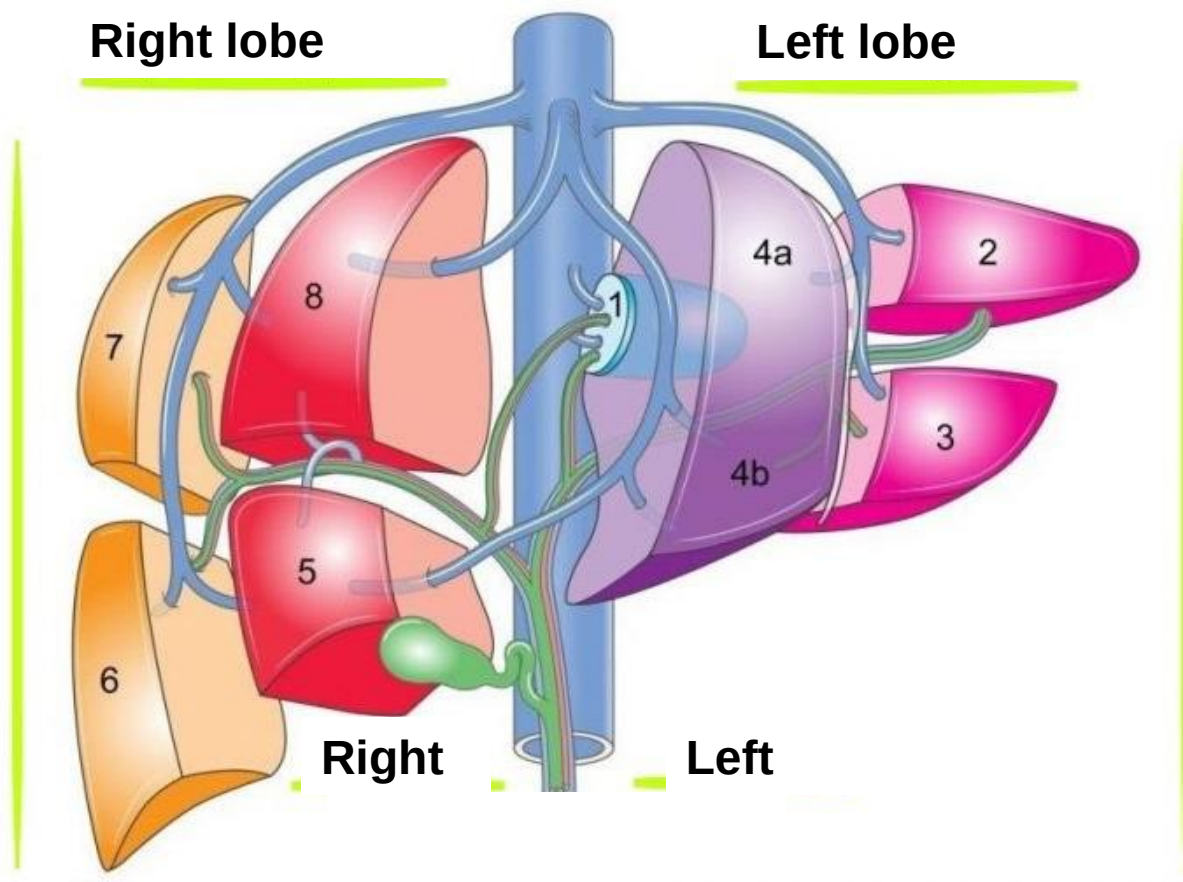
SEGMENTAL STRUCTURE OF THE LIVER

according to Couinaud (1954)

(basis – division of Gleason's triad – art.hepatica, v.portae, hepatic ducts)



The liver consists of 5 sectors and 8 segments.

Each segment includes: segmental portal vein,segmental artery and segmental hepatic duct.

The segments, grouped along radii around the gate of the liver, enter larger areas (sectors).

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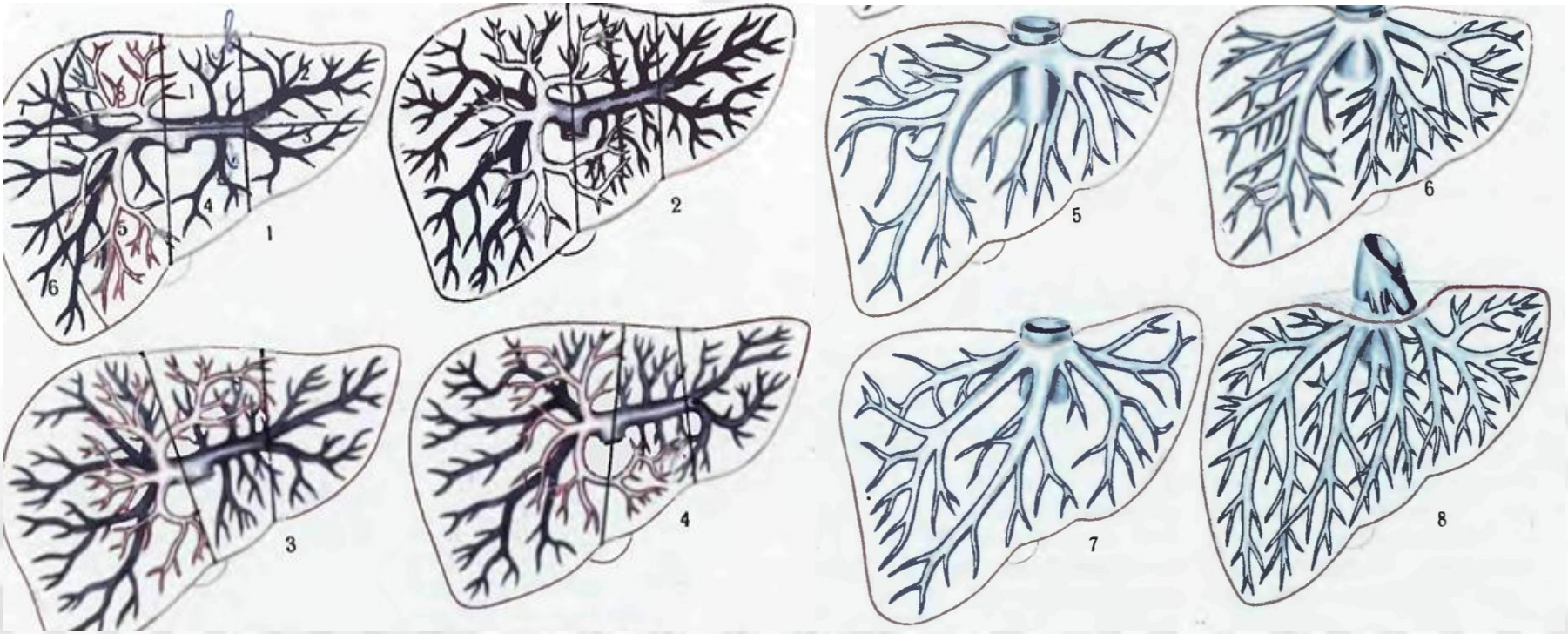
SEGMENTAL STRUCTURE OF THE LIVER according to Borovkov S.A.

(based on the division of the liver veins)



The liver has 4 lobes and 6 segments. Branching options v. portae and the location of the sagittal grooves of the liver (1, 2, 3, 4).

Differences in the branching of the hepatic veins (5, 6,7) (schemes according to S.A. Borovkov)

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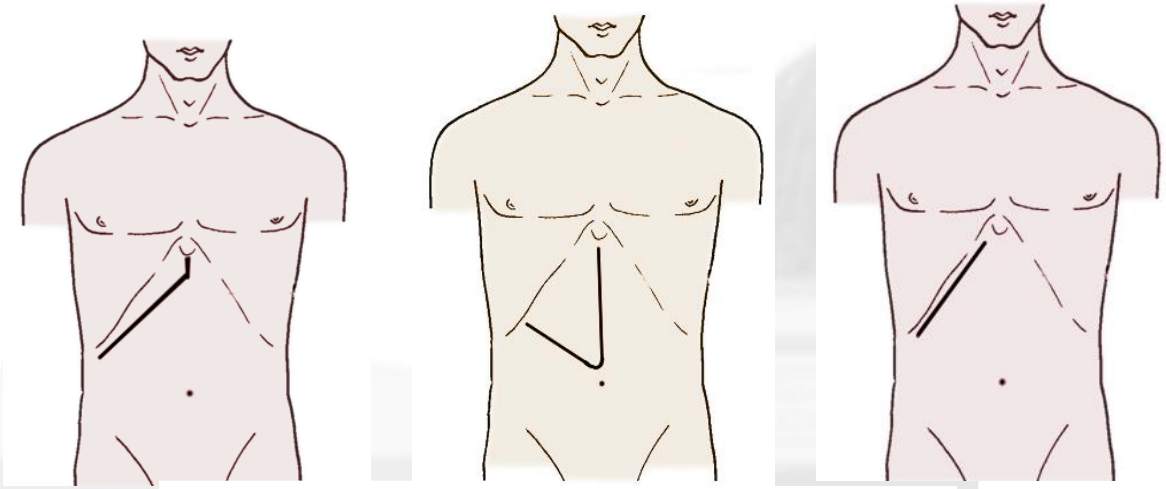
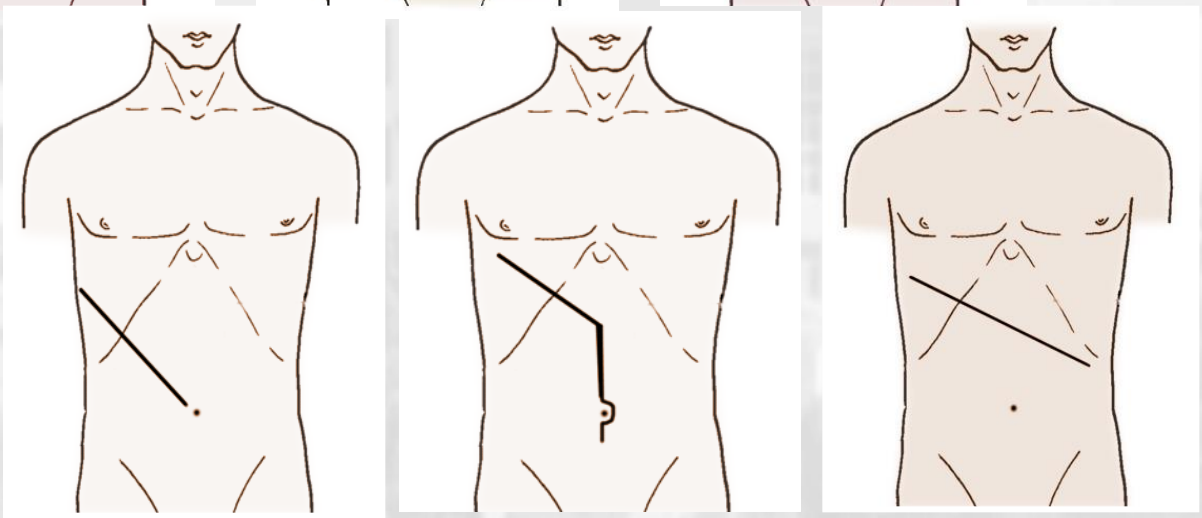
OPERATIVE ACCESS TO THE LIVER

1. Laparotomy, 2. Laparothorocotomy (Quino),

3. Toroko-pleuro-diaphragmo-laparotomy (Petrovsky-Pochechuev, Longmeier-Bregadze)



By form:
Oblique
Transverse
Vertical
Angular
Wave-shaped



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OPERATIVE ACCESS TO THE LIVER

Anatomically justified surgical access to the liver must meet the following requirements:

1. *Complete examination of the liver and its surrounding organs.*
2. *Compliance with the volume and nature of the surgical intervention.*

Classic transabdominal approaches at the right costal arch allow performing operations only on the gallbladder and bile ducts. These incisions do not provide anatomical resection and do not provide access to the caval gate of the liver.

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BASIC RULES FOR LIVER OPERATIONS

1. *Careful preoperative preparation for liver surgery;*
2. *Reasonable, thoughtful choice of pain relief method;*
3. *Maximum tissue sparing, high technicality of the operation;*
4. *Consider the segmental structure of the liver;*
5. *Inspection of bile duct patency (cholangiography on the operating table);*
6. *Thorough retonation of all desulfurized areas;*
7. *Reasonable drainage of the abdominal cavity.*

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HEMOSTASIS METHODS

Temporary:

Clamping of the main vessels passing through the lig.hepatoduodenale (1908, J.J. Pringle);

Compression of the liver tissue manually or using special elastic clamps (1939, T.T. Tung);

Use of neuroplegic drugs or hypothermia.

The final methods of hemostasis are:

Mechanical (liver sutures);

Physical;

Chemical;

Biological.

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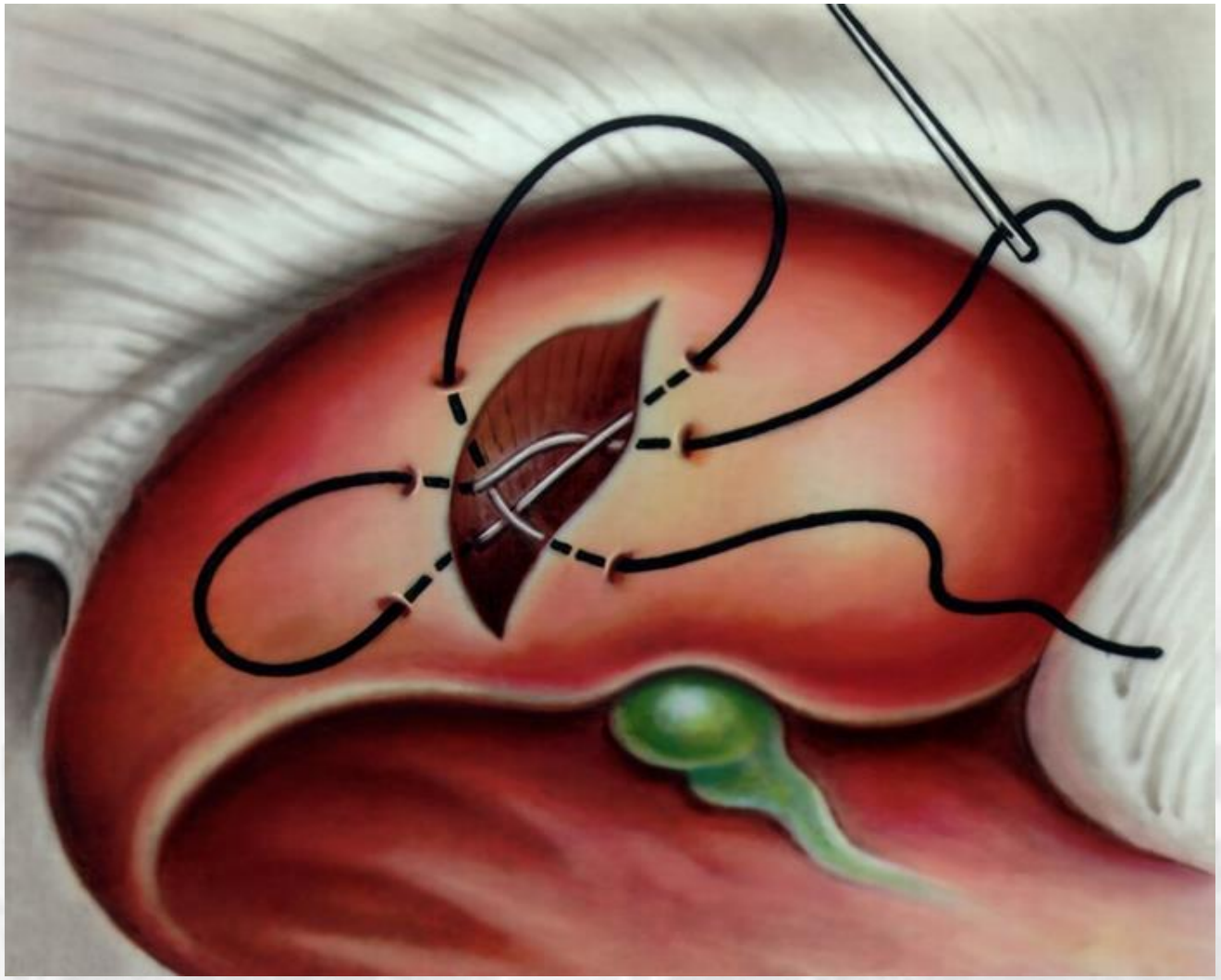
LIVER SUTURES



interrupted hepatic suture according to Telkov

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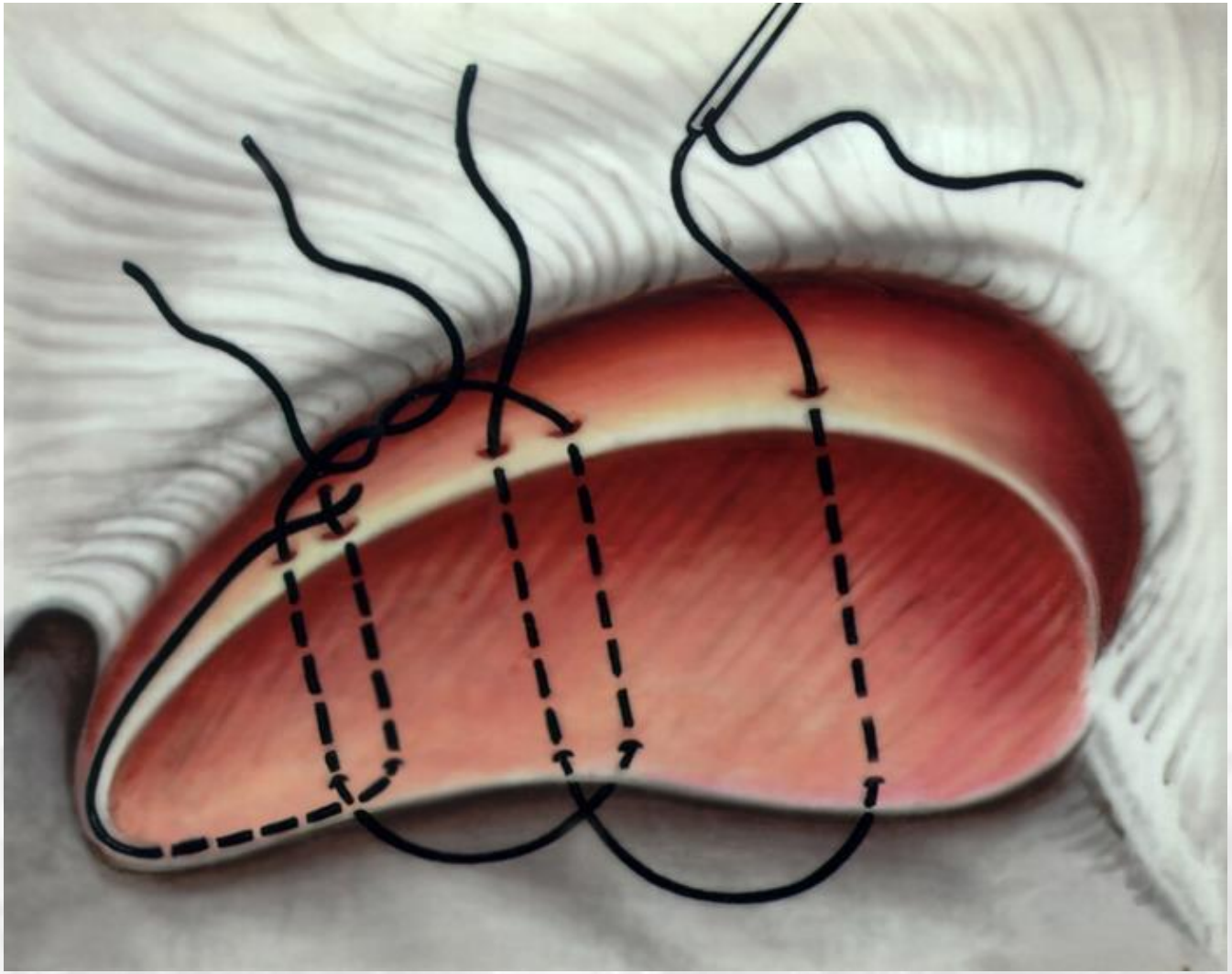
LIVER SUTURES



interrupted hepatic suture according to Oppel

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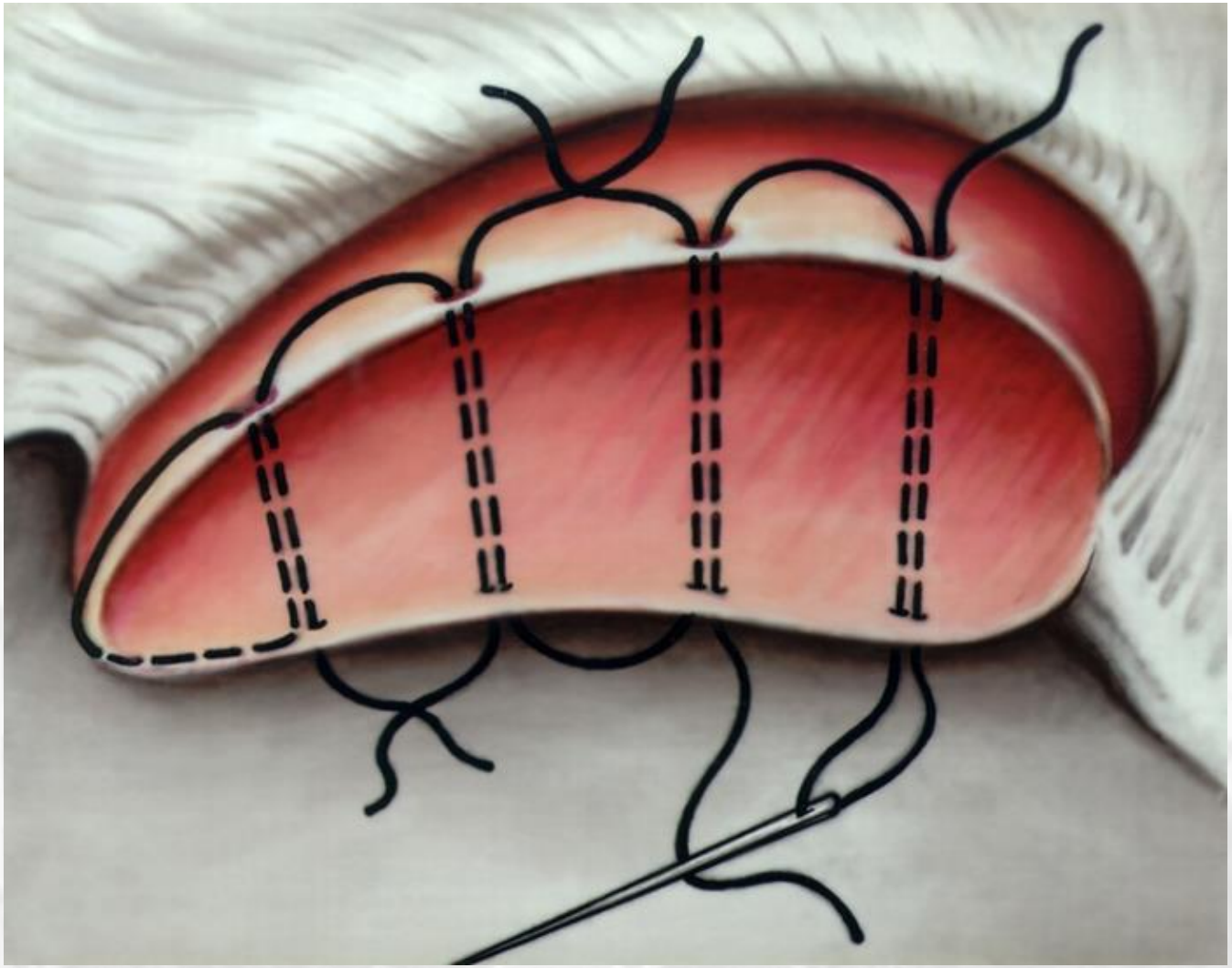
LIVER SUTURES



interrupted hepatic suture according to Kuznetsov-Pensky (1894)

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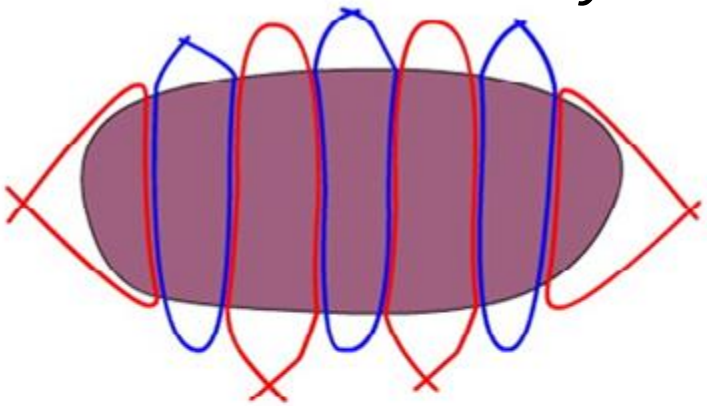
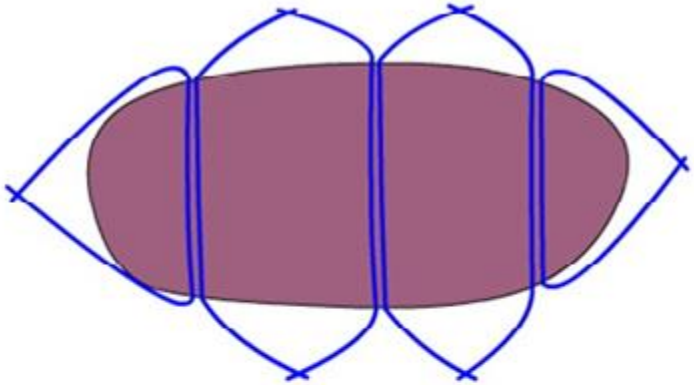
LIVER SUTURES

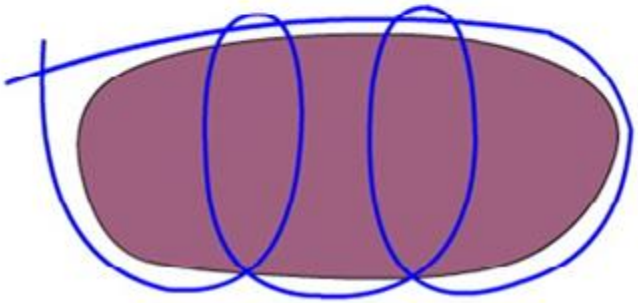
Kuznetsov-Pensky



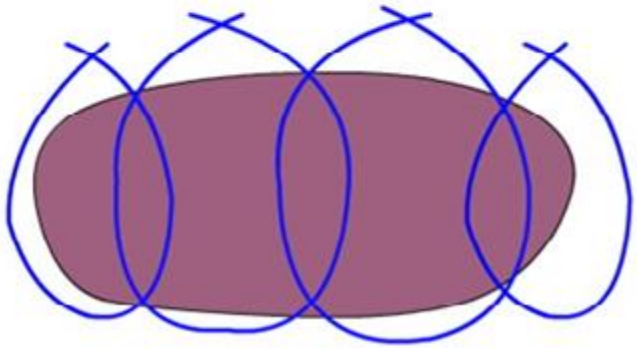
Jordano



Ovre



Oppel



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TYPES OF LIVER RESECTIONS

1.Atypical resection;

Removal of part of the liver within healthy tissue(wedge-shaped, planar, marginal, transverse);

2. Typical resections:

Hemihepatectomy (1/2 liver);

Lobectomy;

Segmentectomy.

The main points of a typical liver resection are:

1. *Isolation and ligation of elements of Gleason's triad;*
2. *Ligation of the hepatic veins;*
3. *Dissection of the liver along the interlobar fissures;*
4. *Isolation and removal of the resected part;*
5. *Covering the wound surface of the liver.*

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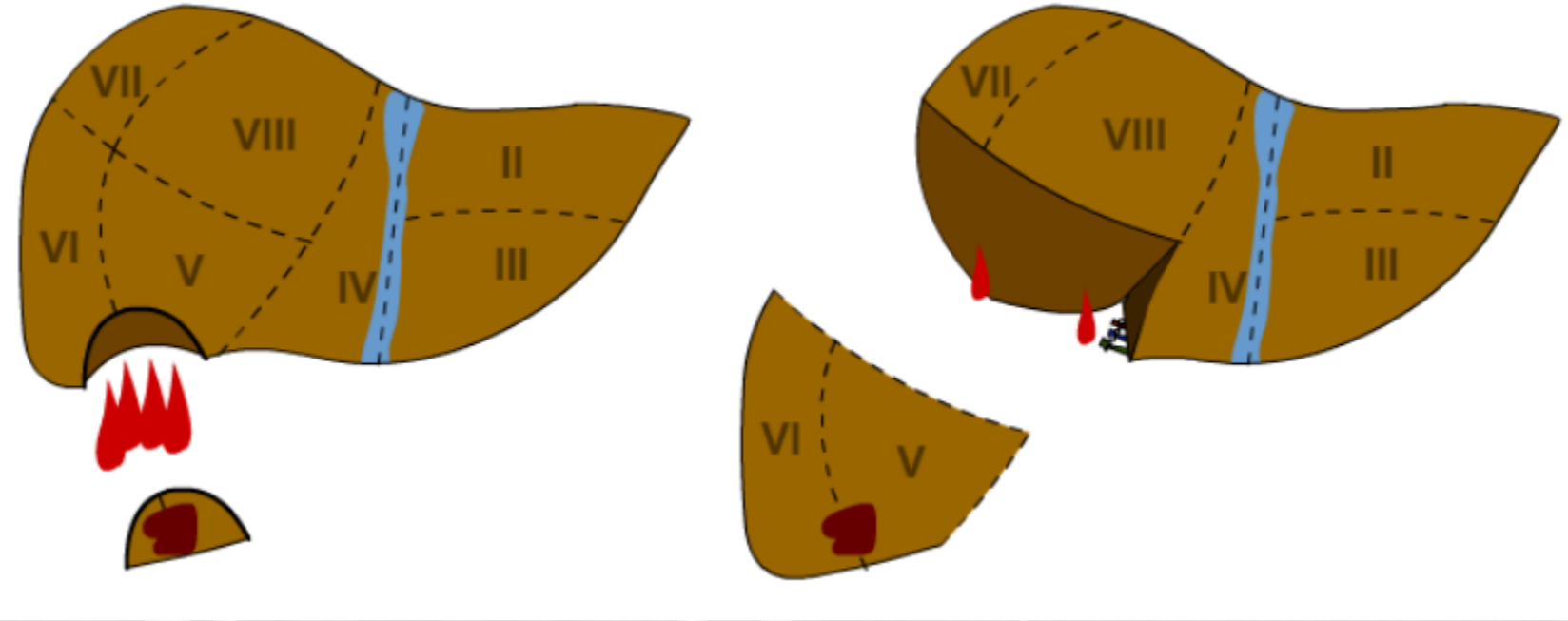
TYPES OF LIVER RESECTIONS

Atypical removal of a part of an organ within healthy tissue.
Advantages: it is easier, faster, and more economical.
Disadvantages: uncontrolled bleeding (loss of 7-11 liters)

Anatomical is performed along the line of low-vascular gaps.
Advantages: no severe bleeding (loss of 2-3 liters).
Disadvantages: less economical, because the whole segment, the share is removed.



КРАСНОЯРСКИЙ МЕДИЦИНСКИЙ УНИВЕРСИТЕТ
1942/2022

OPERATIONS FOR PORTAL HYPERTENSION

1. *Organ anastomoses;*
2. *Creation of drainages (windows in the parietal peritoneum);*
3. *Splenectomy;*
4. *Vascular anastomoses;*
5. *Endovascular minimally invasive technologies of porto-systemic shunting (PSS), TIPS - Transjugularis Intrahepatic Porto-systemic Shunt.*

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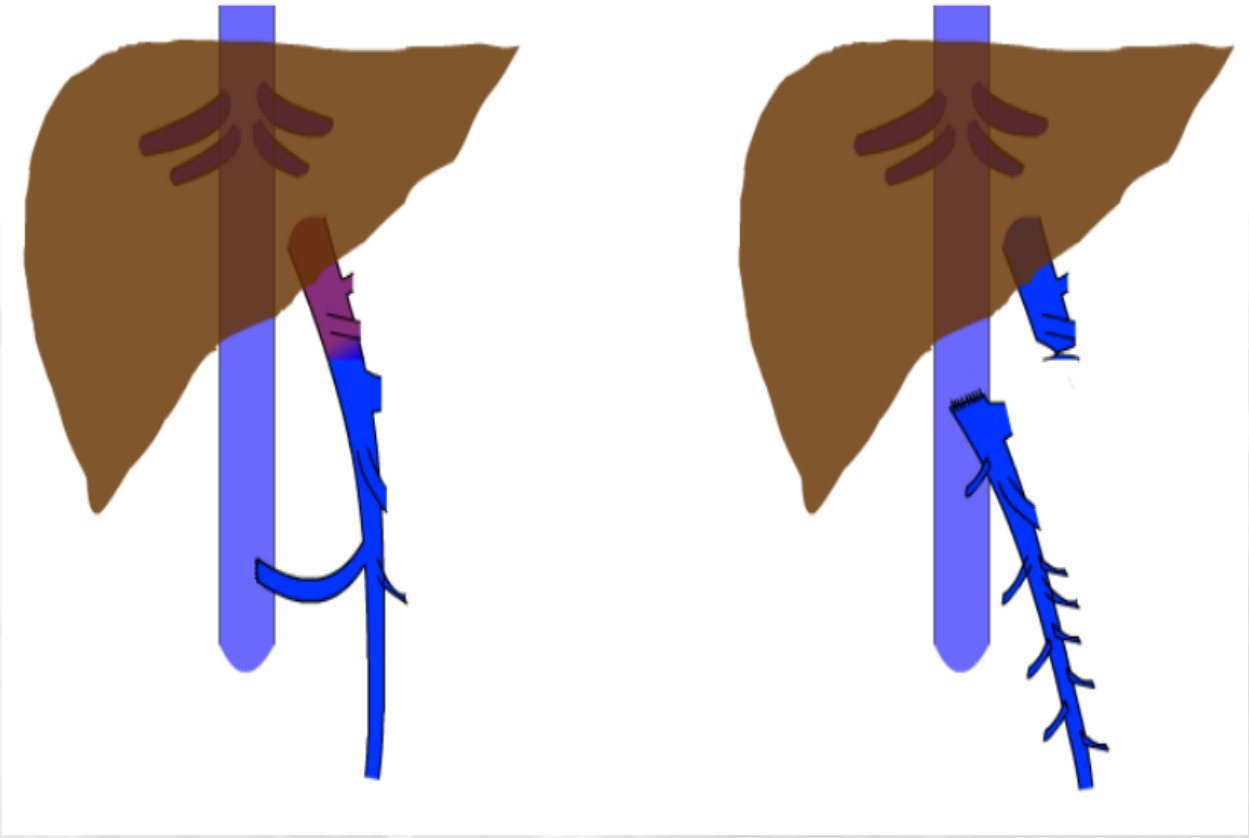
MESENTERICOCAVAL ANASTOMOSES

The method of N. A. Bogoraz (1912). Anastomosis of one of the large branches of the superior mesenteric vein with the inferior vena Cava of the "end-to-side" type.

The method of V. V. Krestovsky (1926). The intersection of the superior mesenteric vein at the root of the mesentery, because all the blood from this pool is directed to the inferior vena Cava.



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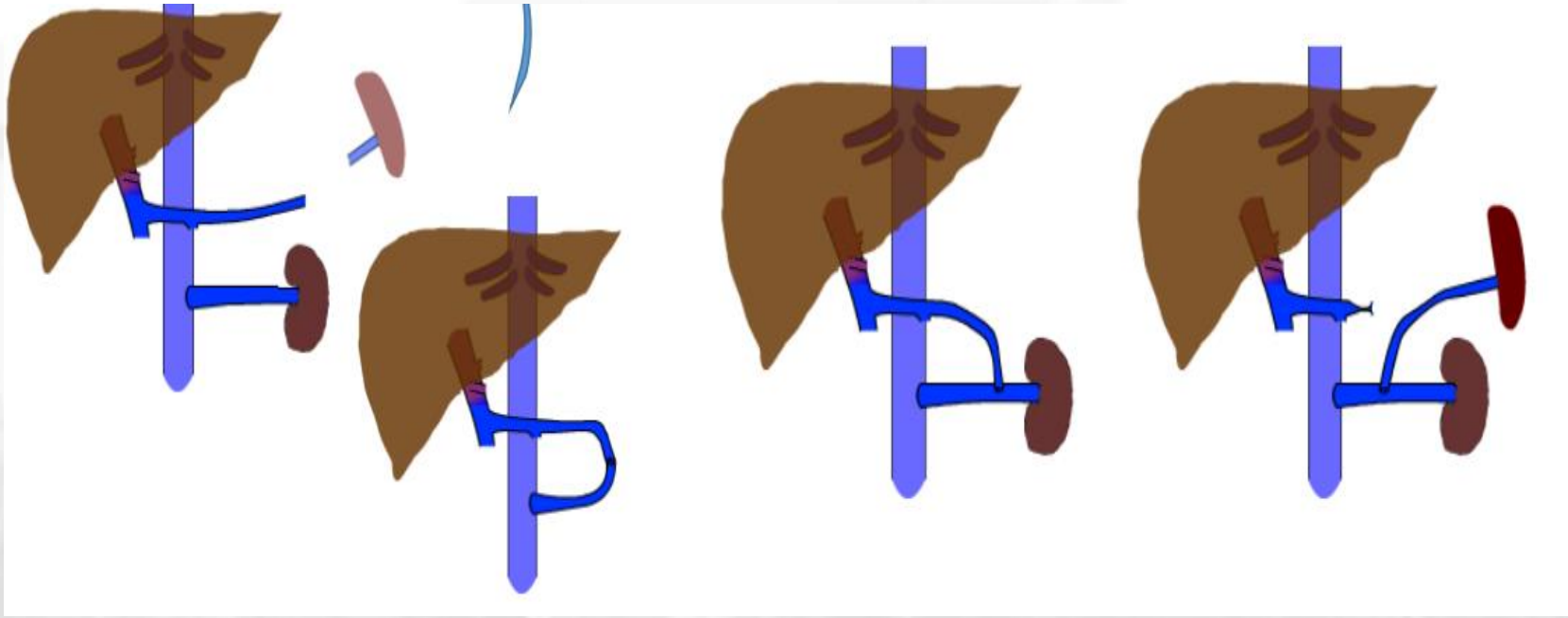
SPLENORENAL ANASTOMOSES

The Blackmore Method (1945)
-Splenectomy
-Nephrectomy
-Spleen-renal anastomosis "end-to-end"

The Linton Method (1947). Proximal splenorenal anastomosis
-Splenectomy
-Splenorenal anastomosis "end-to-side"

The Warren Method (1967)
Distal splenic-renal anastomosis
-Ligation of the proximal end of the splenic vein,
-Splenic-renal anastomosis "end-to-side".



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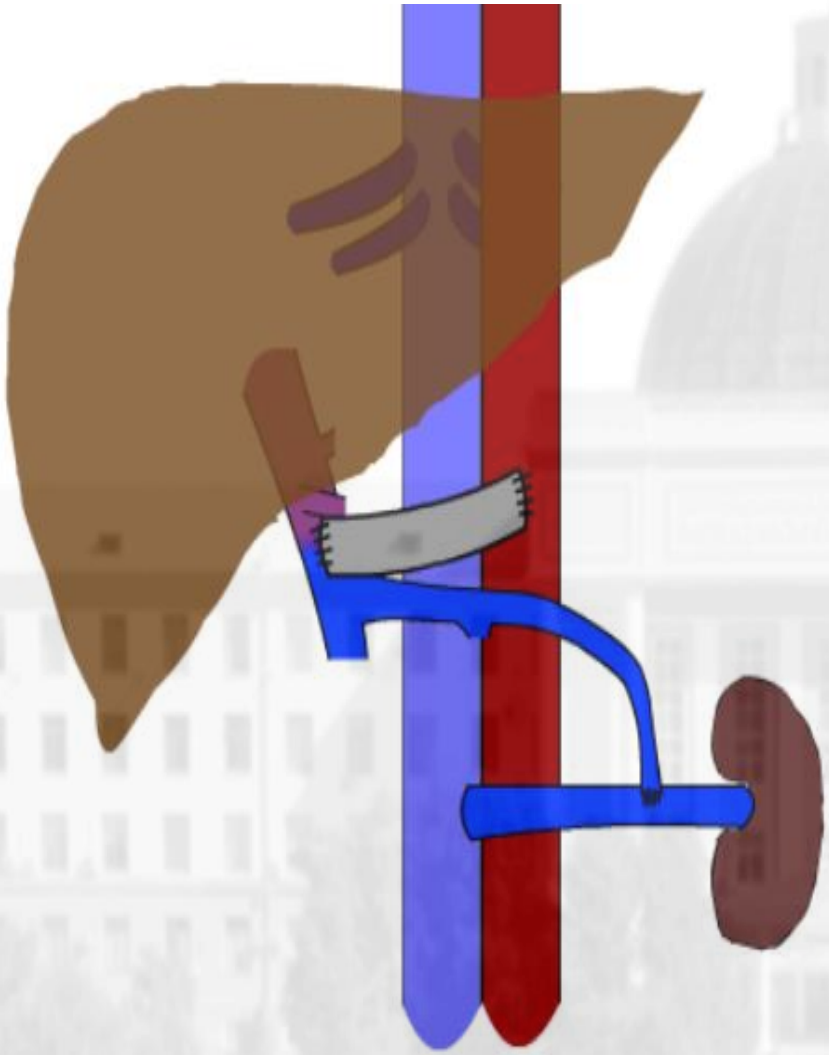

If it is not possible to impose splenic-renal anastomosis, mesenteric-renal and mesenteric-caval anastomoses are used.

Since there is a violation of portal and arterial blood flow, arterialization of the liver is recommended simultaneously with unloading (Noel, 1970)

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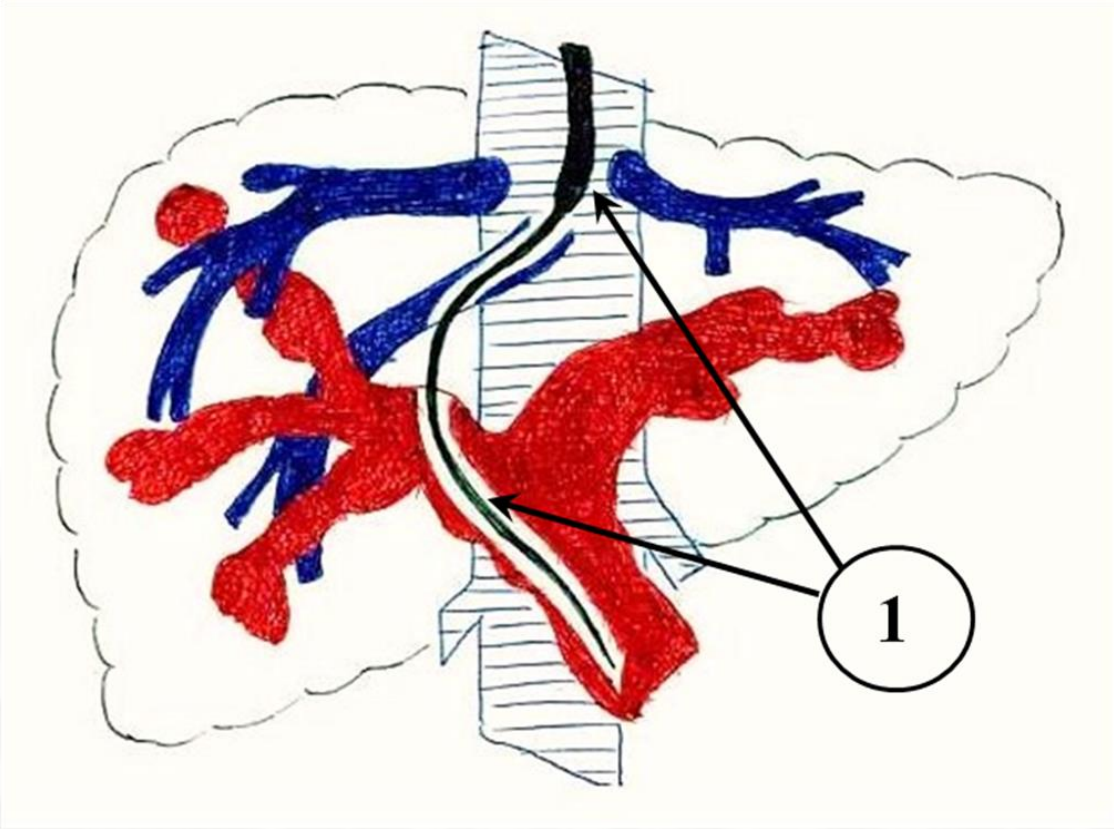
TRANSJUGULAR INTRAHEPATIC PORTOSYSTEMIC BYPASS



1) The stage of creating an anastomosis between the intermediate hepatic vein and the right branch of the portal vein

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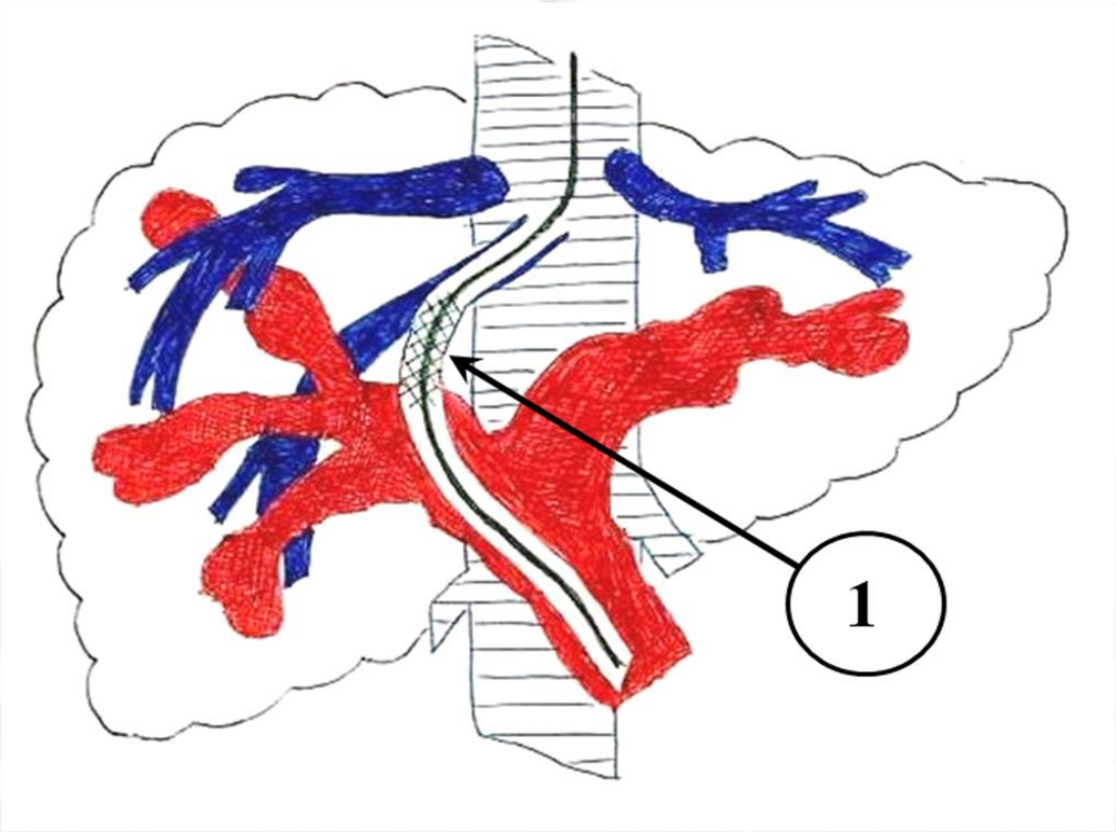
TRANSJUGULAR INTRAHEPATIC PORTOSYSTEMIC BYPASS



2) Balloon dilatation stage

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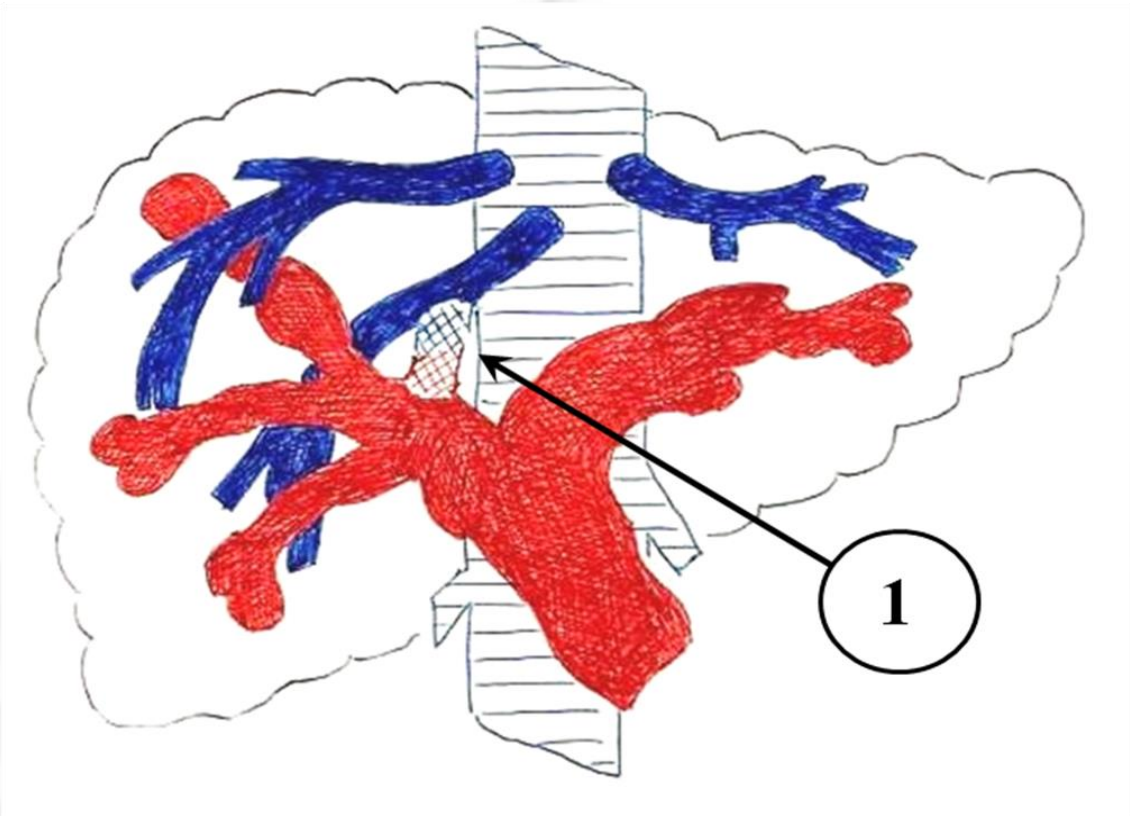
TRANSJUGULAR INTRAHEPATIC PORTOSYSTEMIC BYPASS



3) Metal stent installation stage

КРАСНОЯРСКИЙ МЕДИЦИНСКИЙ УНИВЕРСИТЕТ
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LIVER TRANSPLANTION

Purpose:

Temporary connection of the liver in order to cleanse the body of harmful metabolic products;

Complete liver transplantation.

Types:

Orthotopic (replacement of the entire liver);

Heterotopic (replanting).

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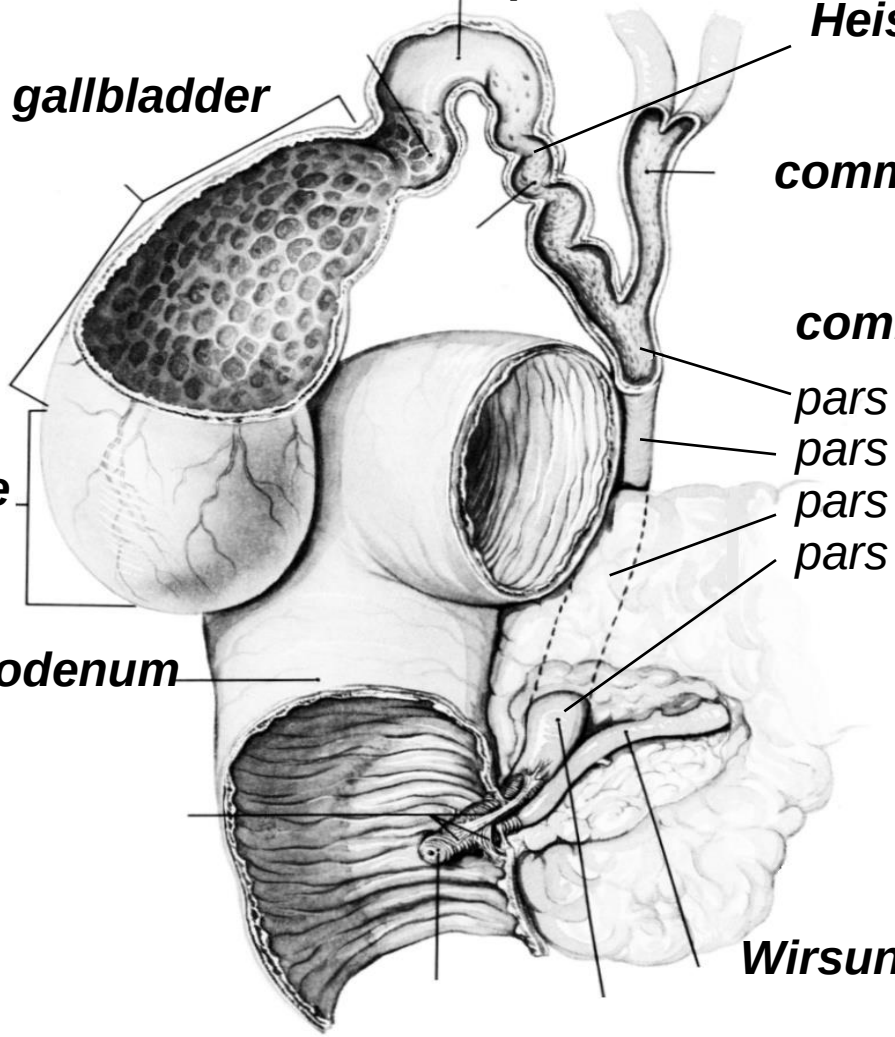
GALL BLADDER AND EXTRAHEPATIC BILY DUCT



Hartmann's pocket
Heisner spiral valve
body of the gallbladder
common hepatic duct
common bile duct
pars supraduodenalis,
pars retroduodenalis,
pars pancreatica,
pars duodenalis
bottom of the gallbladder
duodenum
Wirsung duct
major duodenal papilla (Vaterov)

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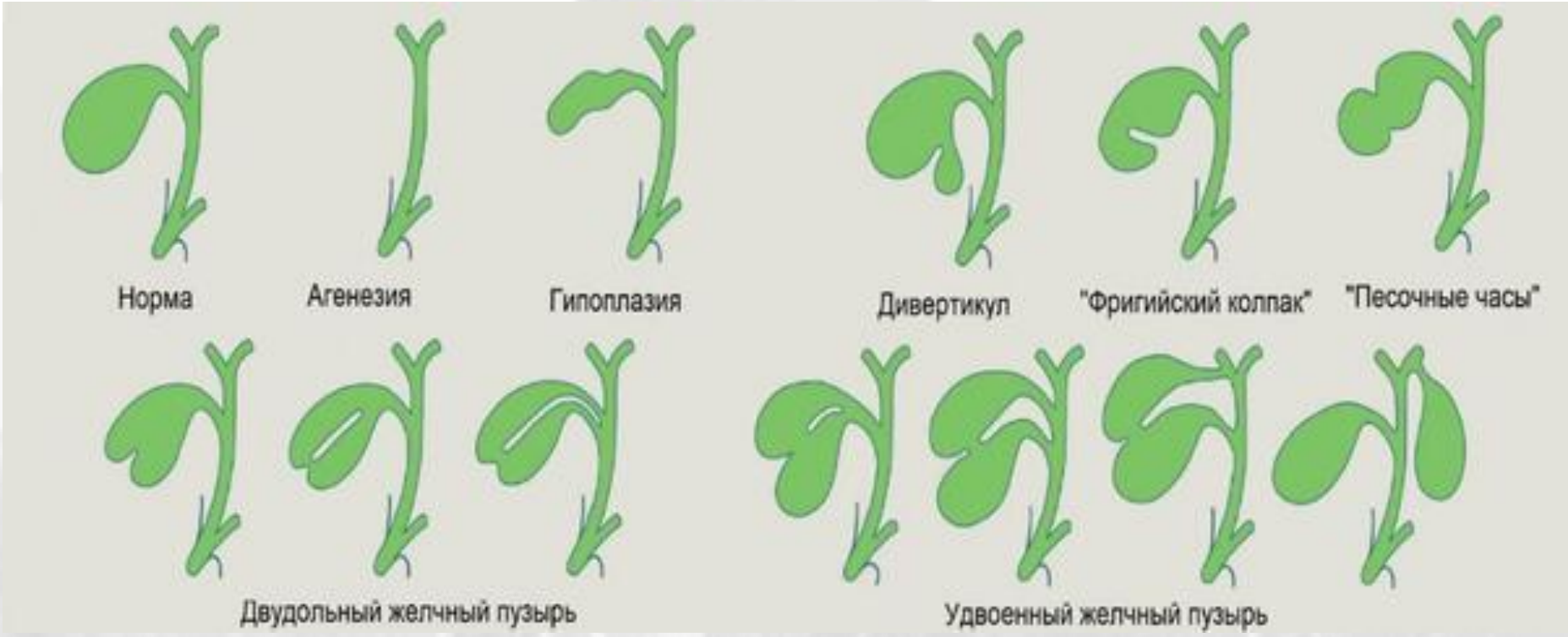
GALL BLADDER AND EXTRAHEPATIC BILY DUCT

Anomalies in the shape/development of the gallbladder
Hook-shaped.
S-shaped.
"Phrygian cap.
"Bull's Horn«
Presence of kinks and partitions.



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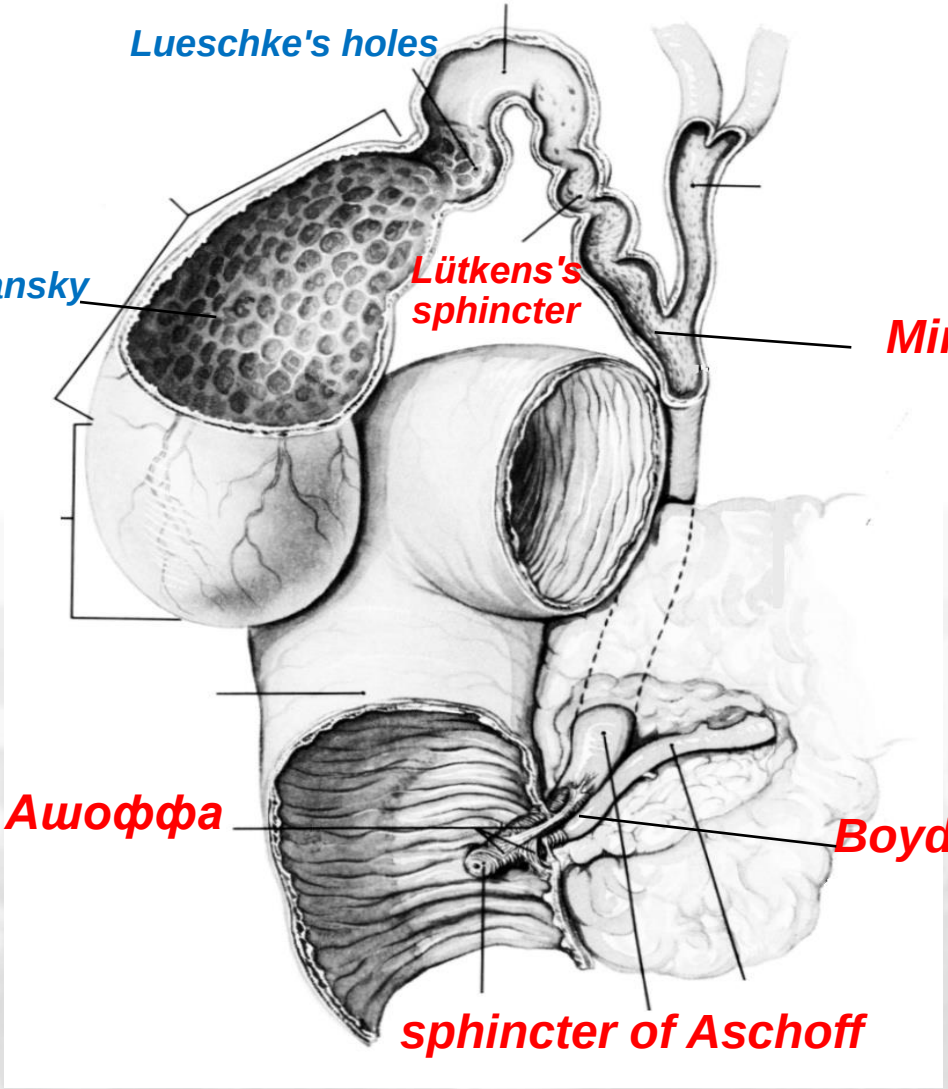
GALL BLADDER AND EXTRAHEPATIC BILY DUCT



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GALL BLADDER AND EXTRAHEPATIC BILY DUCT

Variants of gallbladder location
Typical (in the right hypochondrium);
Atypical:

a) subhepatic left side,
b) b) intrahepatic,
c) c) vagus gallbladder.

There is no gallbladder in a horse, an elephant, a donkey, a rhinoceros, a deer, a camel, and a cat has two.

Absent in humans in 1 case per 7500 observations

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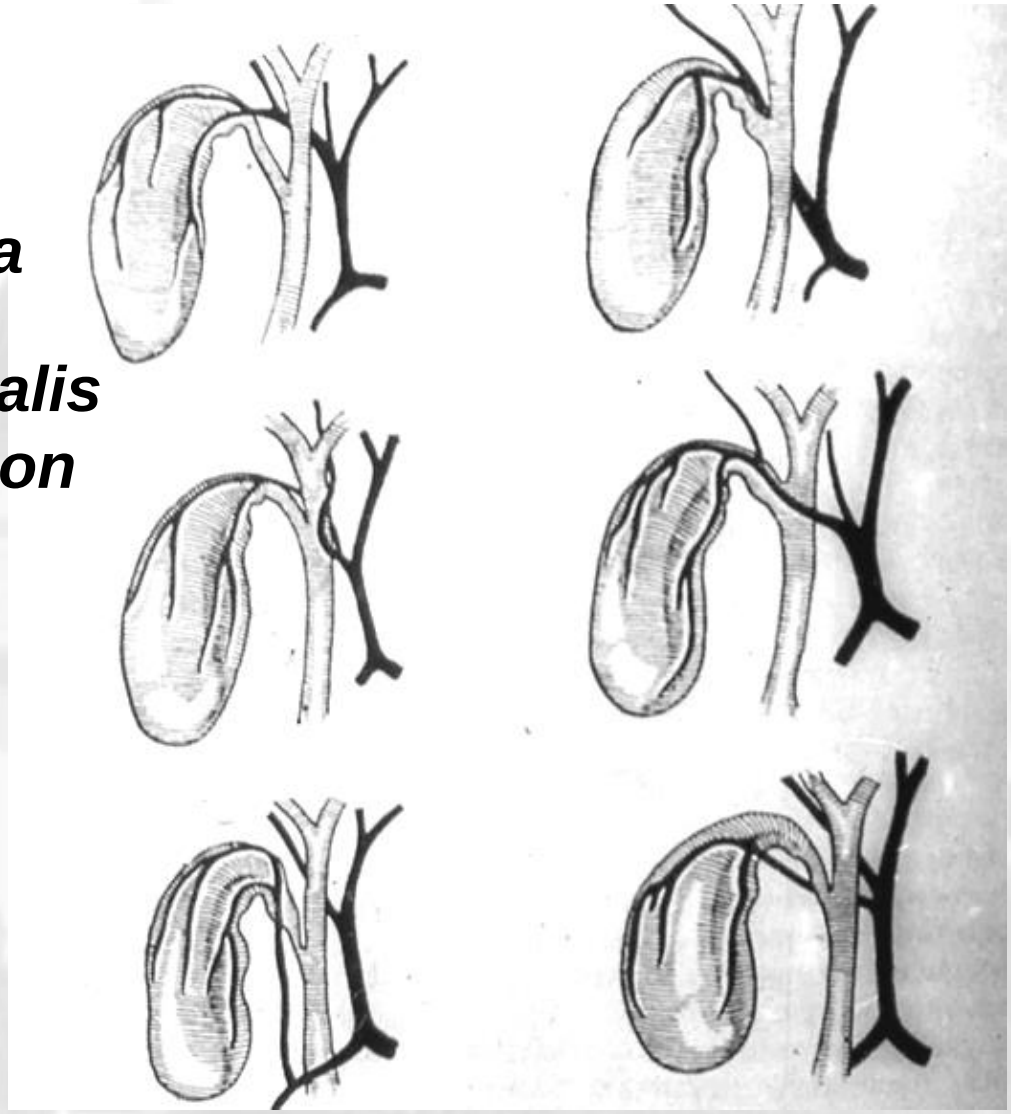
BLOOD SUPPLY TO THE GALLBLADDER
options for discharge art.cystica

1. *from artery art. hepatica dextra*
2. *from art. gastroduodenalis*
3. *from the left and common hepatic artery (double)*



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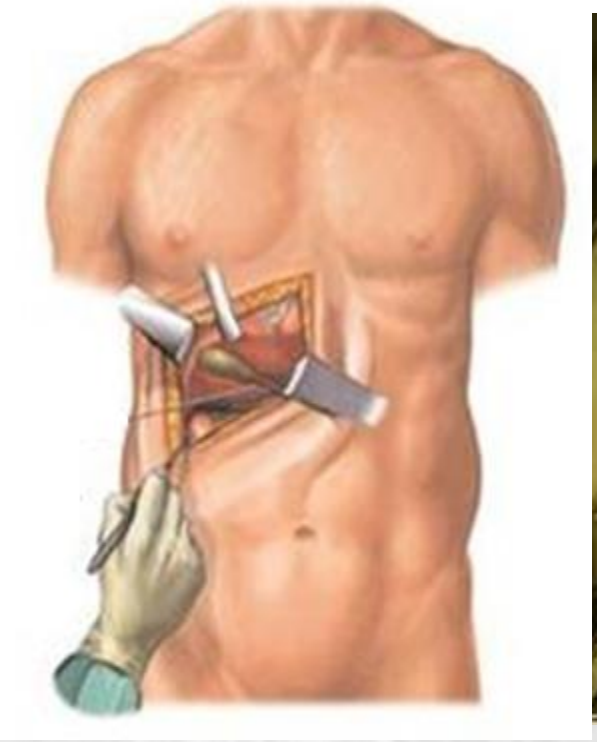
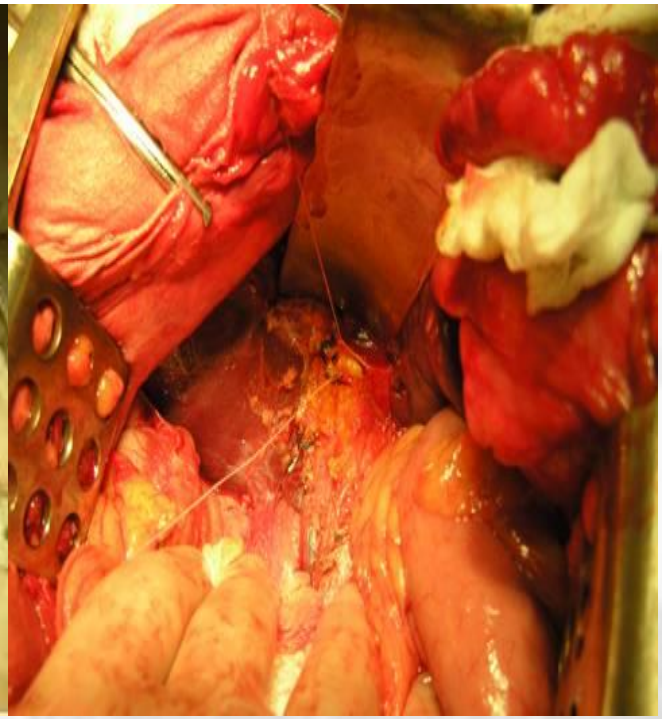
METHODS OF CHOLECYSTECTOMY

1. Open

through midline laparotomy;

minimally invasive method (using a set of “mini-assistant” instruments)





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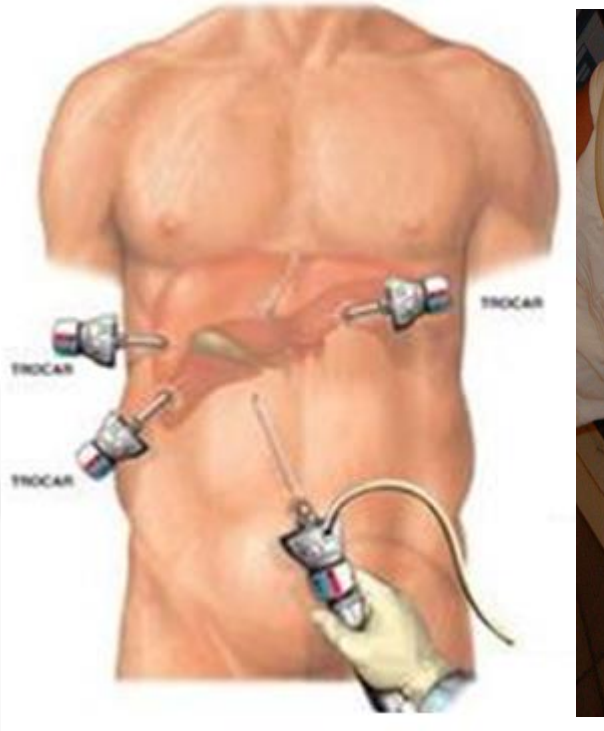
METHODS OF CHOLECYSTECTOMY

2. laparoscopic



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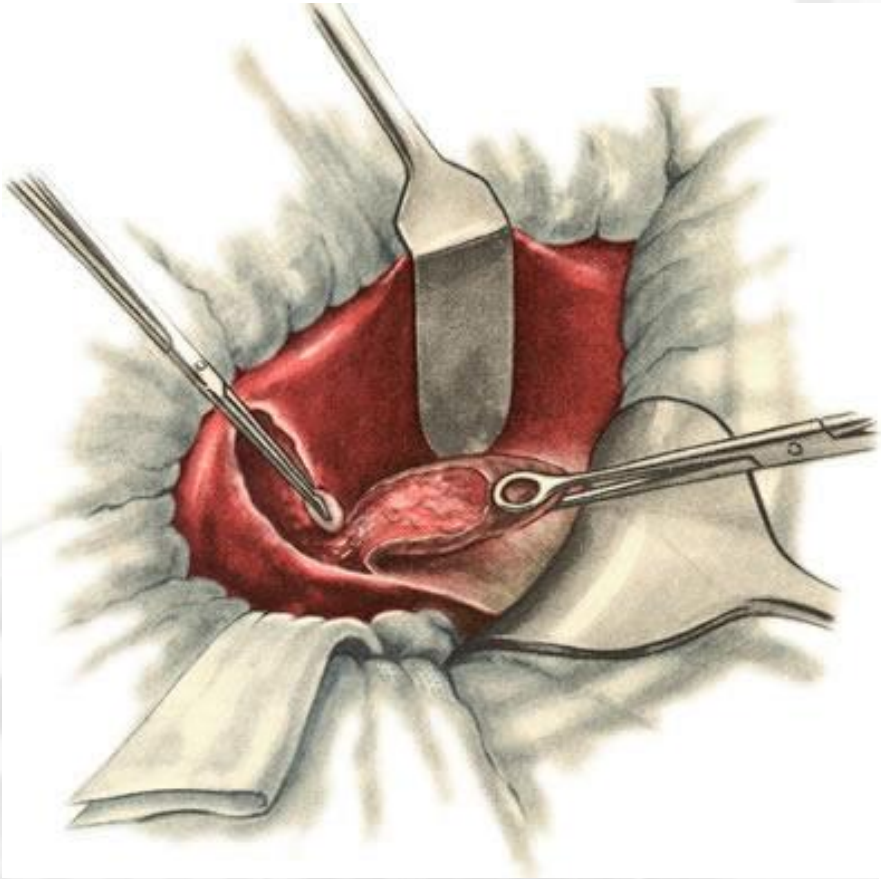
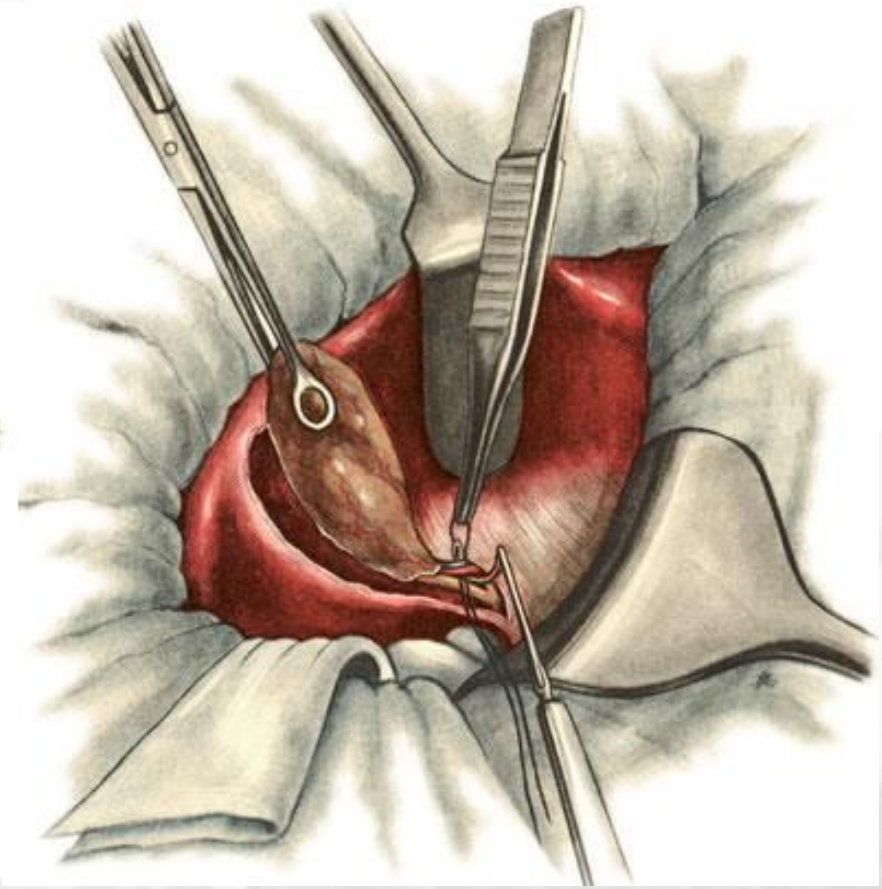
CHOLECYSTECTOMY VARIANTS

1. from the bottom





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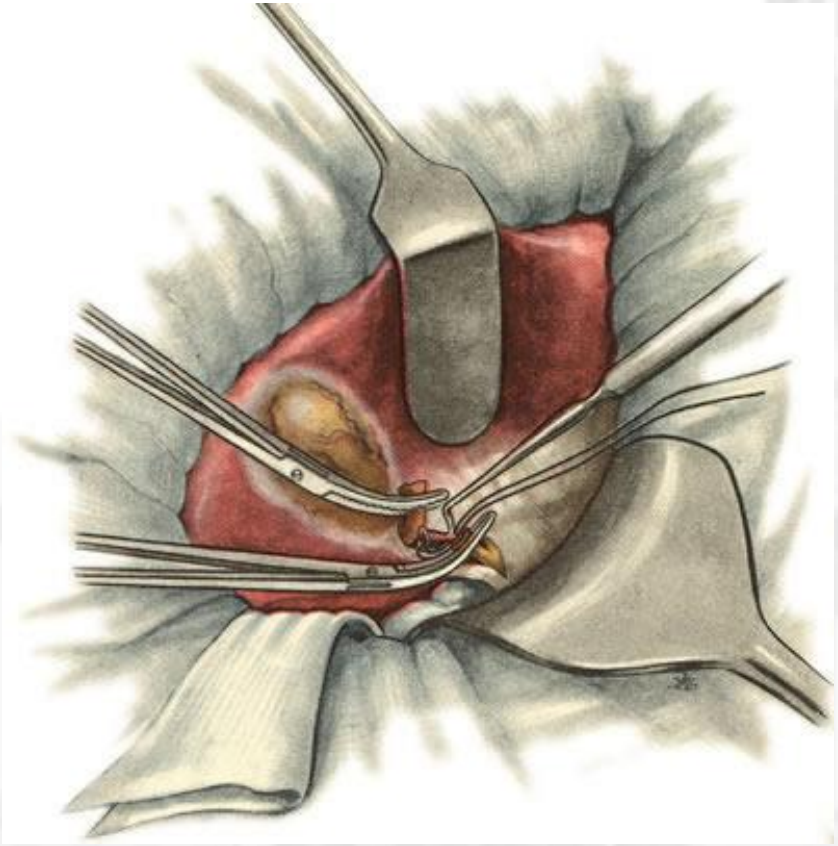
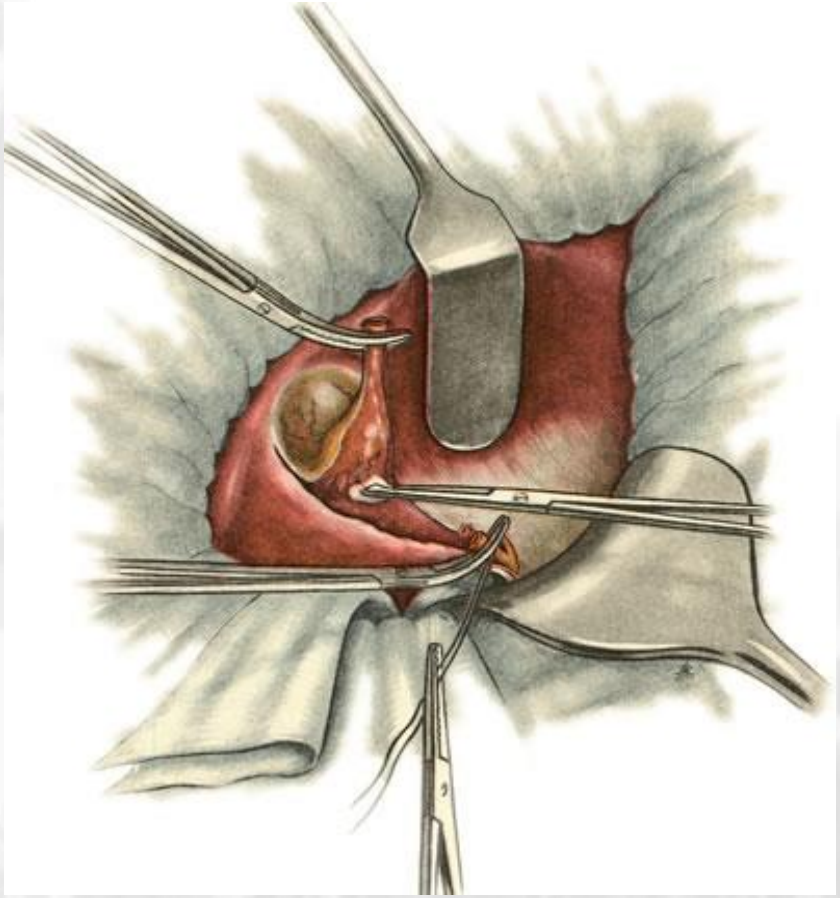
CHOLECYSTECTOMY VARIANTS

2. from the cervix





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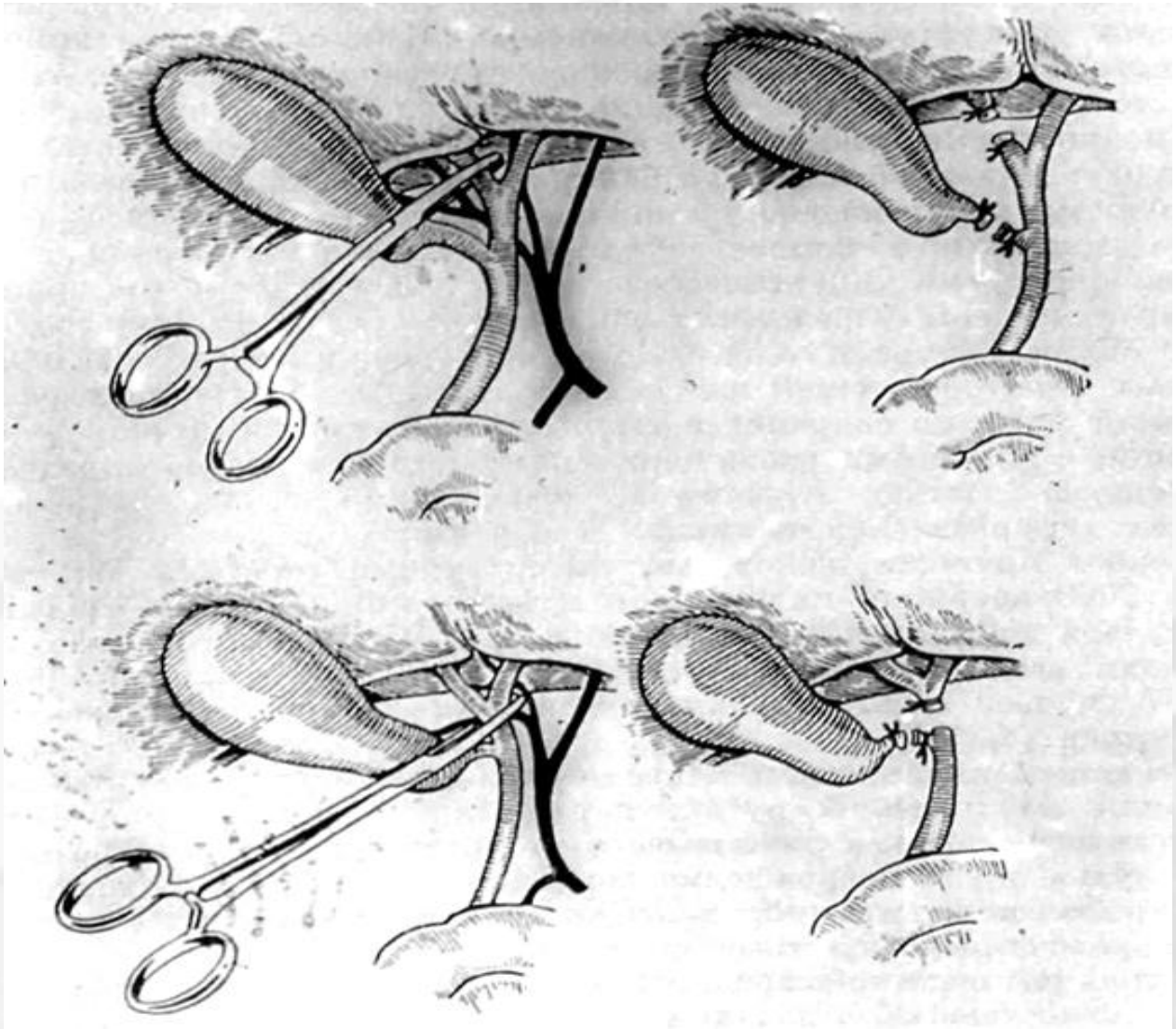
CHOLECYSTECTOMY
Iatrogenic damage to vascular systems



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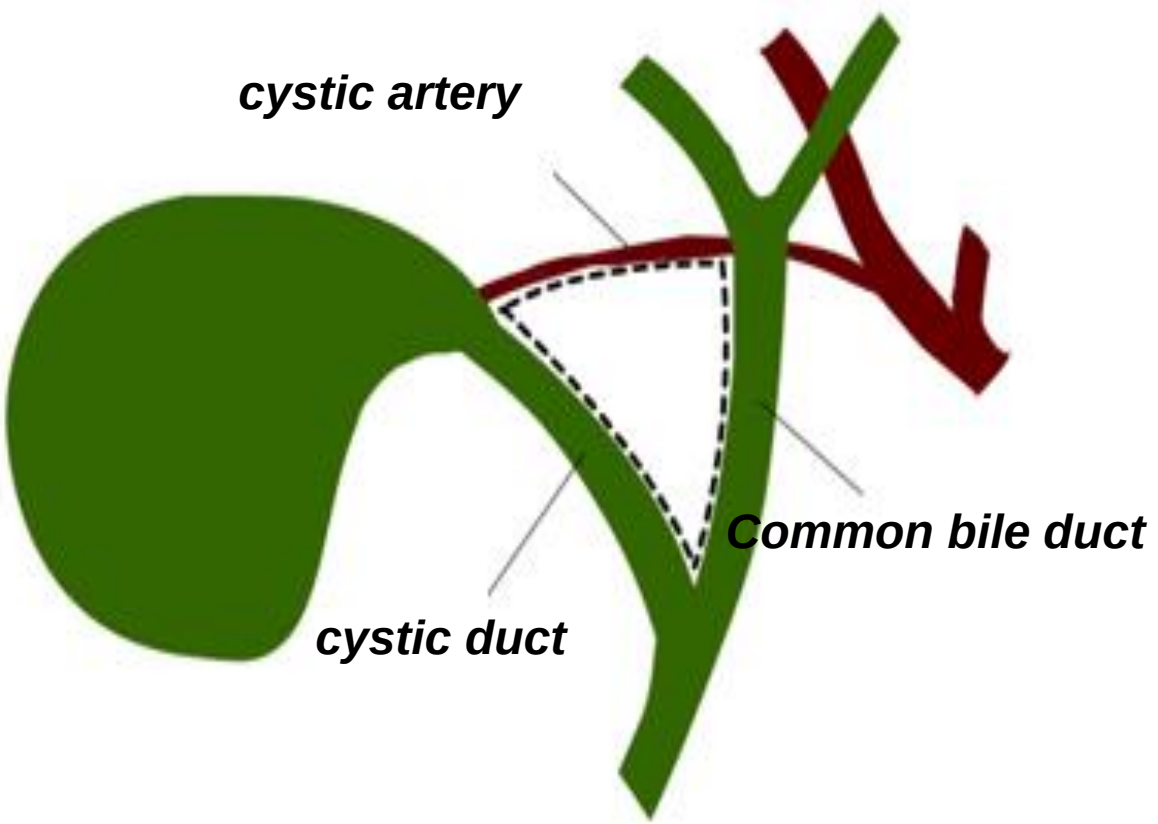
KALO TRIANGLE

Jean-François
Calot
(Франция, 1861-1944)



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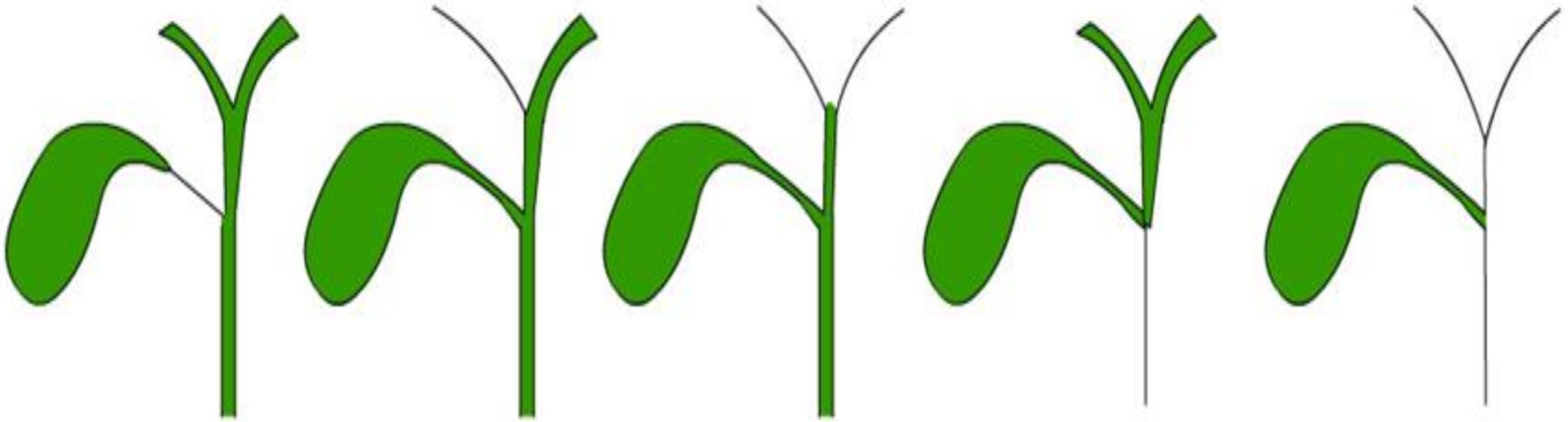
ATRESIA OF THE BILIARY TRACT



the cystic duct

one hepatic duct

hepatic ducts

common bile duct

hepatic ducts and common bile

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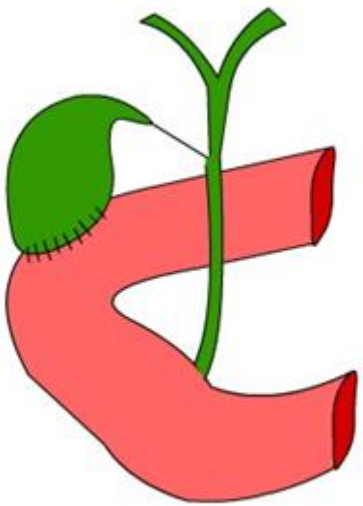
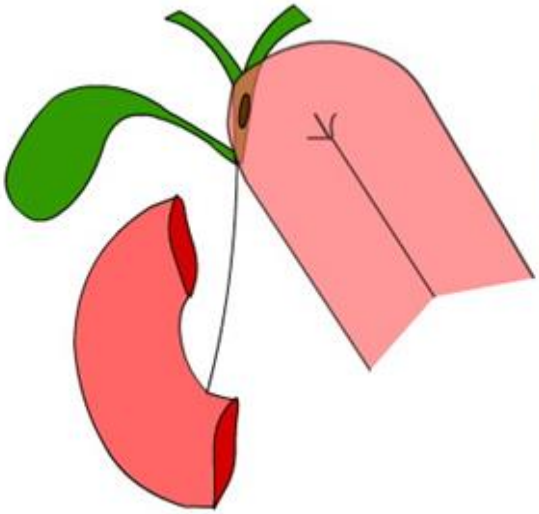
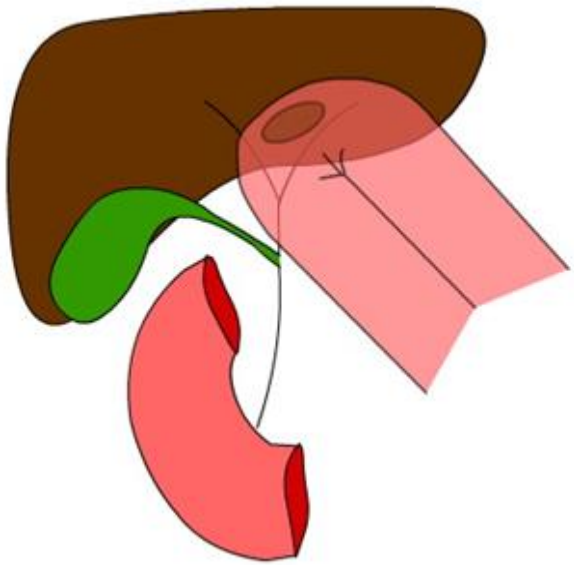
BILIODIGESTIVE ANASTOMOSES



cholecystoduodenoanastomosis



hepaticoejunoanastomosis



hepatojunoanastomosis

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