

Lecture # 5

Operative surgery of organs of the peritoneal cavity

Plan of lecture

1. Intestinal sutures
2. Intestinal anastomoses
3. Operations on the stomach
4. Operations on the small intestine
5. Operations on the large intestine
6. Operations on the liver, pancreas, spleen

Intestinal sutures

- ***Intestinal suturing*** is an operative method for restoring integrity of the intestinal tube. This notion is integrative and includes all types of sutures placed on the wall of a hollow organ, which has its peritoneal coat.

Layers of the hollow organ wall

Structurally, the wall of any hollow organ consists of following layers:

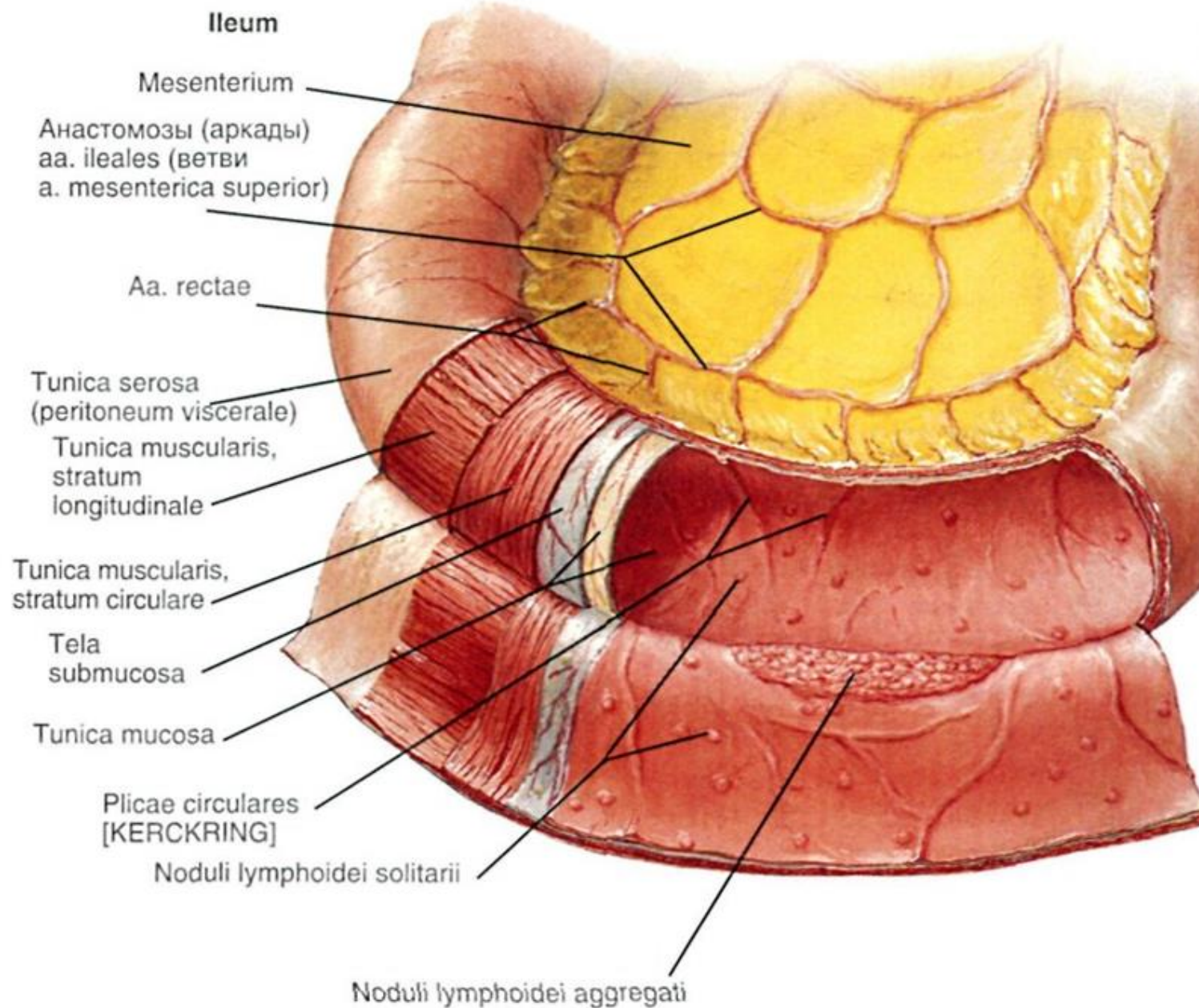
Serous membrane of intestine wall (the adventitia of the oesophagus) is peritoneum. It provides peristaltic function of the gut. Cells of peritoneum produce serous fluid, and therefore one of the most important abilities of the peritoneum - the adhesion.

Muscular layer of a gut includes longitudinal, circular and oblique fibers.

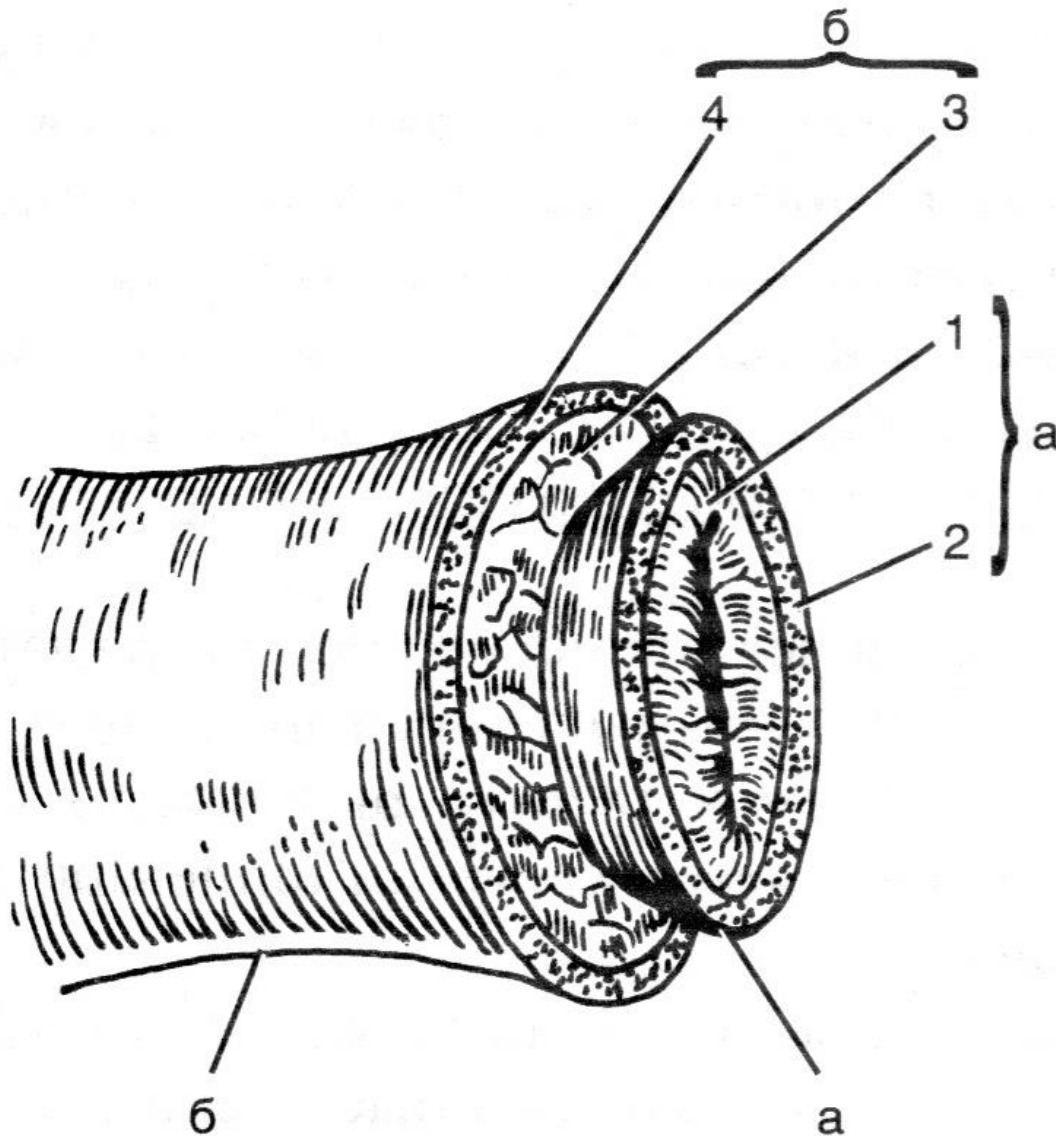
Submucous base contains all vessels, nerves and elastic fibers of gut wall. The most strong layer.

Mucous membrane is differentiated in organs.

Intestinal wall



Intestinal wall



a – Internal sheath:

1 – Mucous membrane

2 – Submucous base

b – External sheath:

3 – Muscular layer

4 – Serous membrane

Requirements for intestinal sutures

- They must be aseptical (clean).
- They must be hermetical (waterproof).
- They must be haemostatic.
- They must be strong. This is ensured by stitching of submucous base.
- They must connect margins of the wound layer-by-layer.
- They must minimally decrease the diameter of intestinal tube.

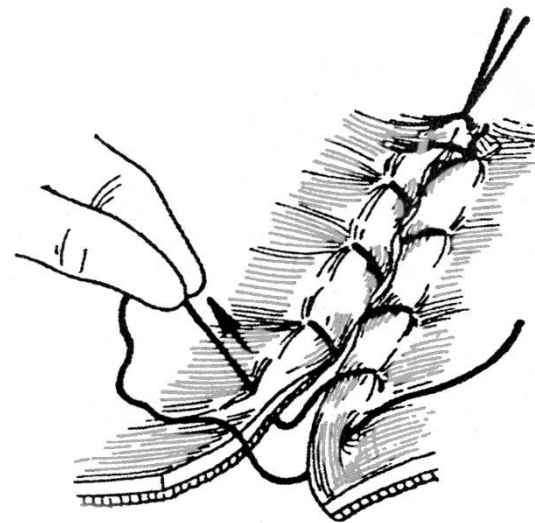
Classification of intestinal sutures

- An intestinal suture may pass through the both sheaths at once (*through-and-through, nonaseptic, penetrated or the 1-st row sutures*) or involve only some of them (*serous-muscular, unpenetrated, aseptic or the 2-nd row sutures - thread is not present inside*).
- According to technique:
 - ***Continuous;***
 - ***Interrupted***

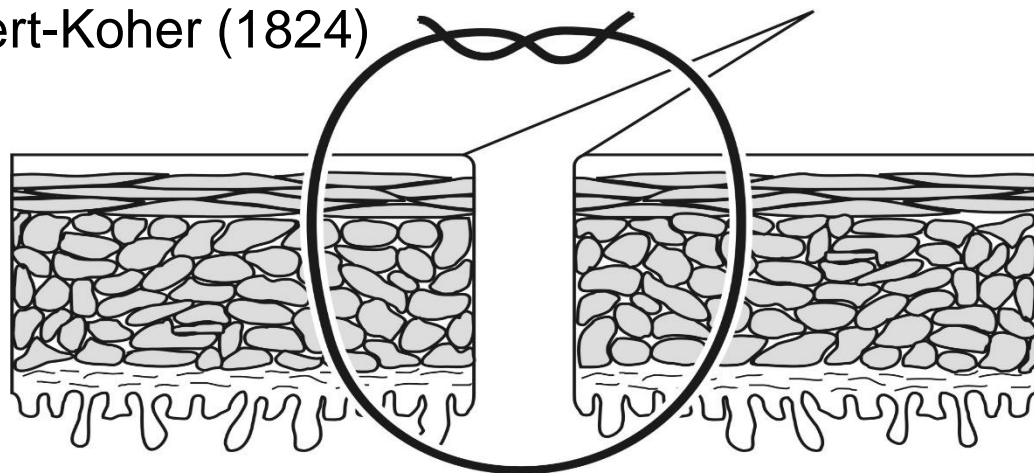
Classification of intestinal sutures

Marginal, through-and-through, penetrated, serous-mucous, "1-st row", nonaseptic or "dirty" sutures

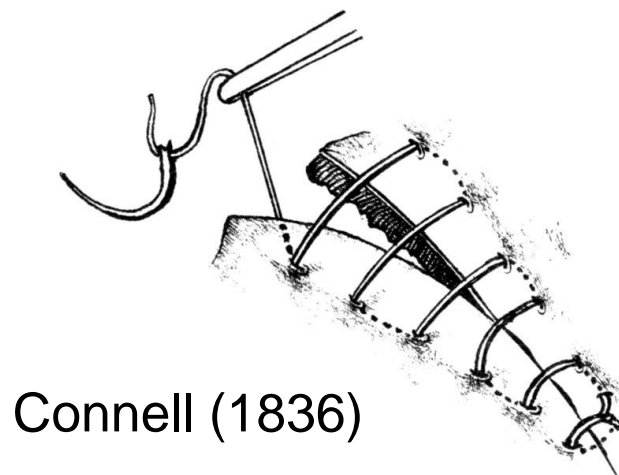
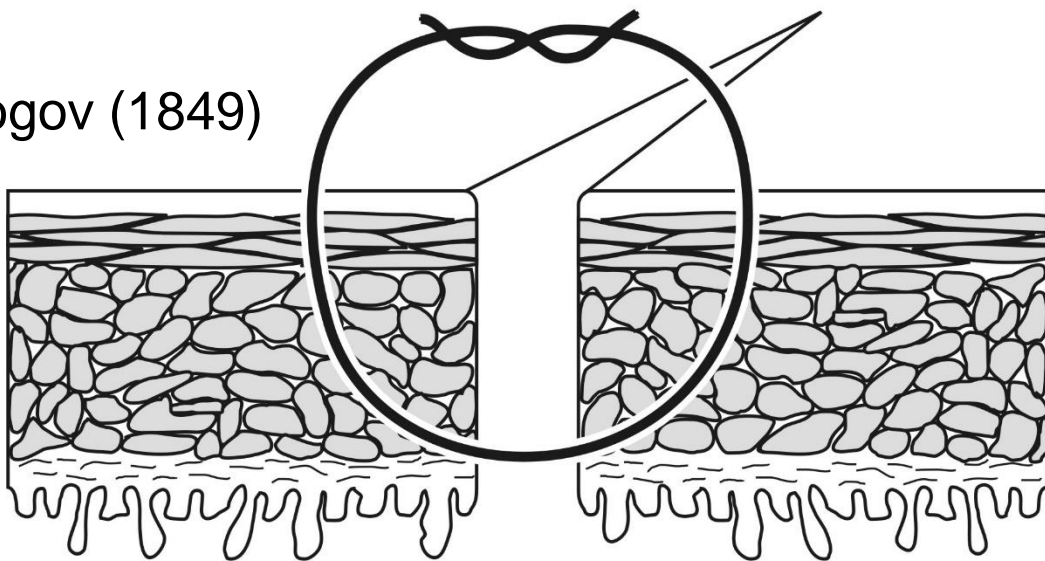
Schmiden (1911)



Albert-Koher (1824)



Pirogov (1849)

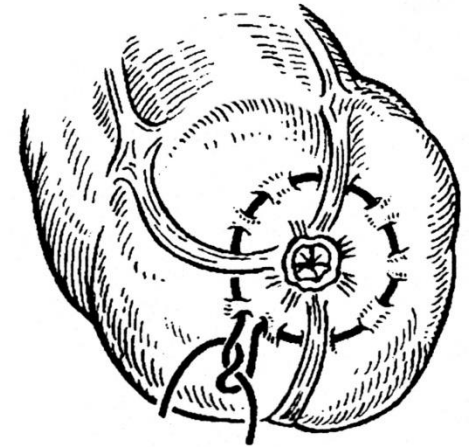


Connell (1836)

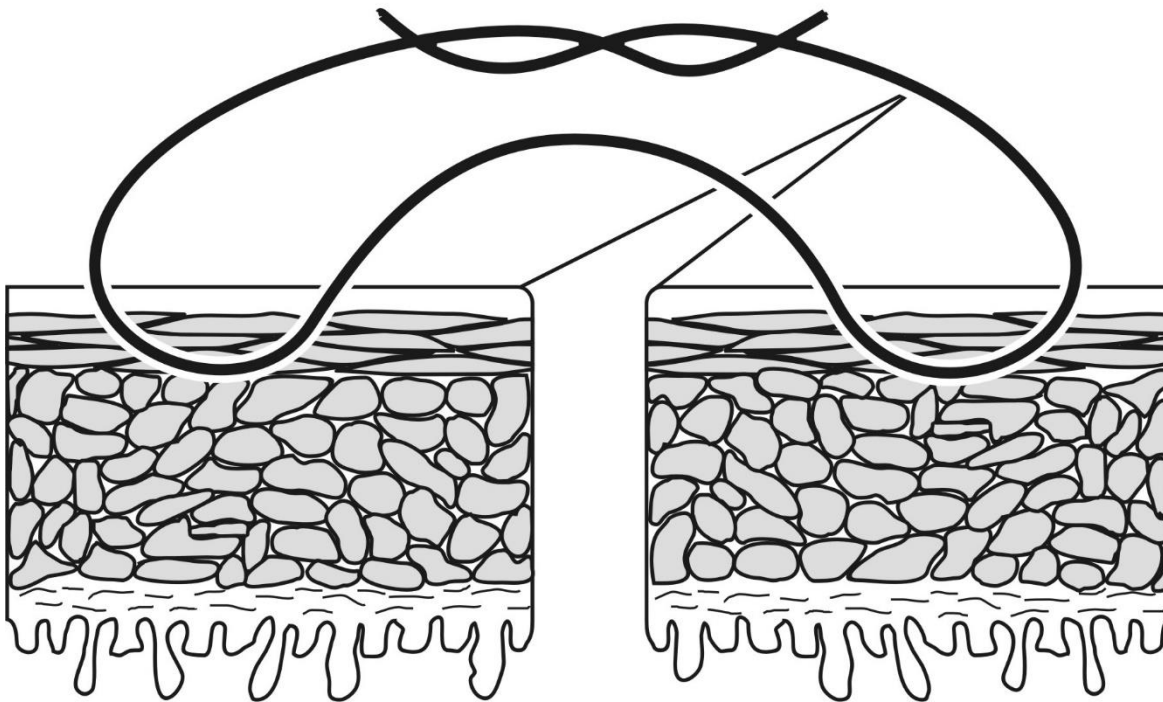
Classification of intestinal sutures

Serous-muscular, unpenetrated, invaginate, aseptic or “2-nd row” sutures

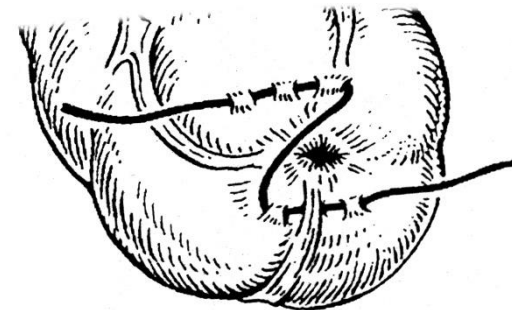
Purse-string (Doyen)



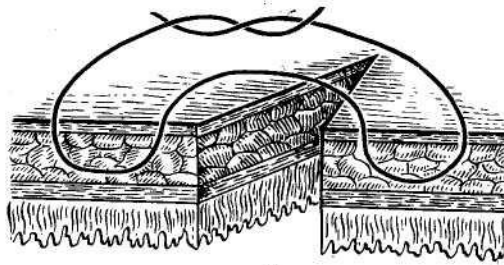
Lambert (1825)



Z-suture

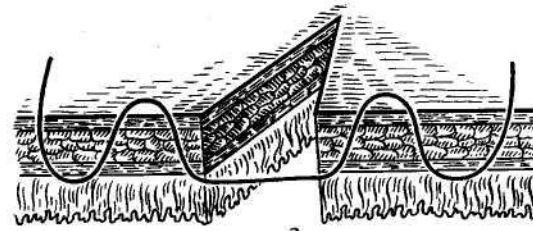


Lambert



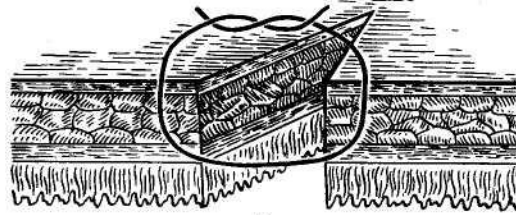
Ламберта (направной,
для призматической массы
и ва)

Mulenburg



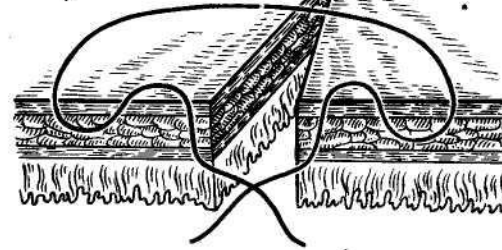
Мюленбург - совсем. край
рамы и широкой их соприкосн.
срвзкими отслоениями

Pirogov



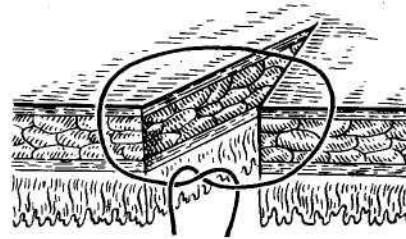
Пирогова

Hlopov



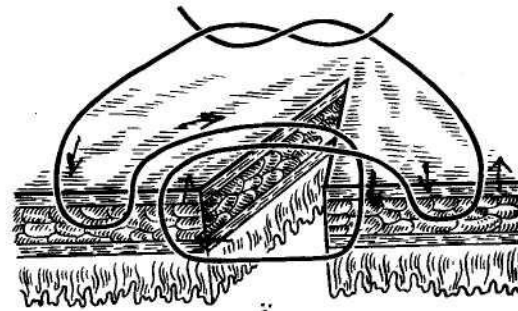
Хлопова

Pirogov-Mateschuk



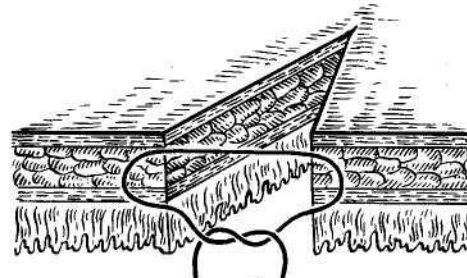
Пирогова - Матешук

Zhuchenko



Жуhenko

Myshkin

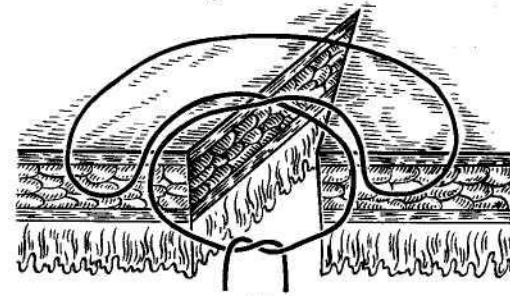


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Мышкин - Демидкина

Bondarchuk



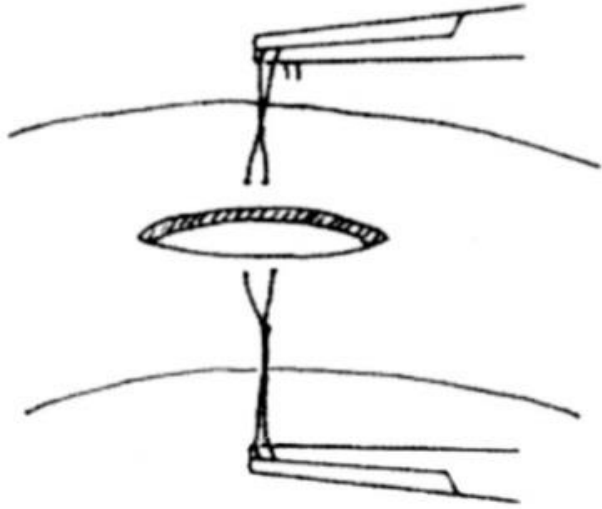
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Боднарчука

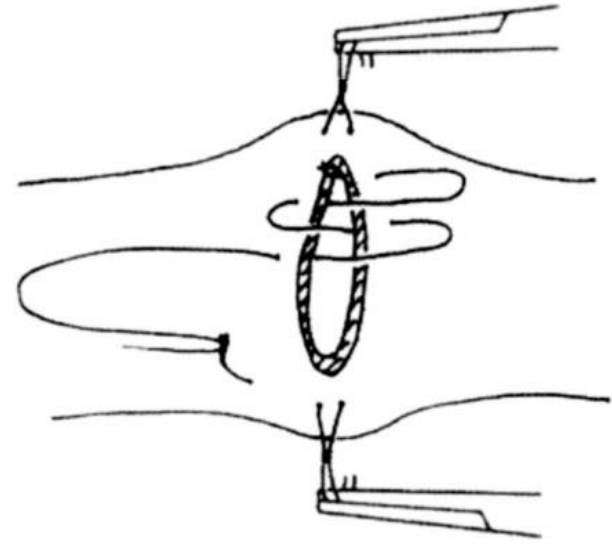
Rules of suturing of a gut wound

- The wound of the small intestine sutured with 2 lines of sutures.
- The wound of the large intestine needs 3 lines of sutures.
- The gut wound sutured in the transverse direction.
- The wound with diameter less than 0,5 sm sutured by purse-string suture.

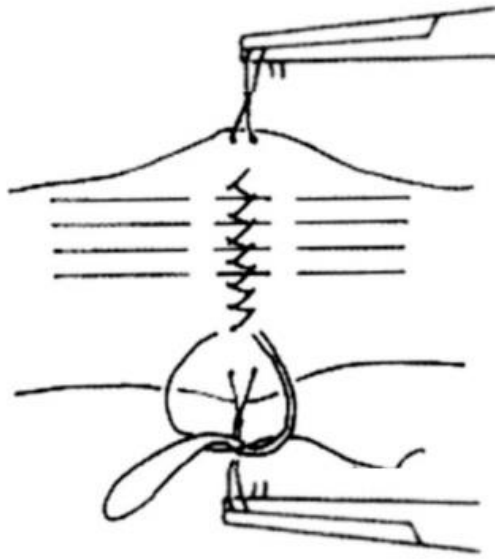
Wound of small intestine



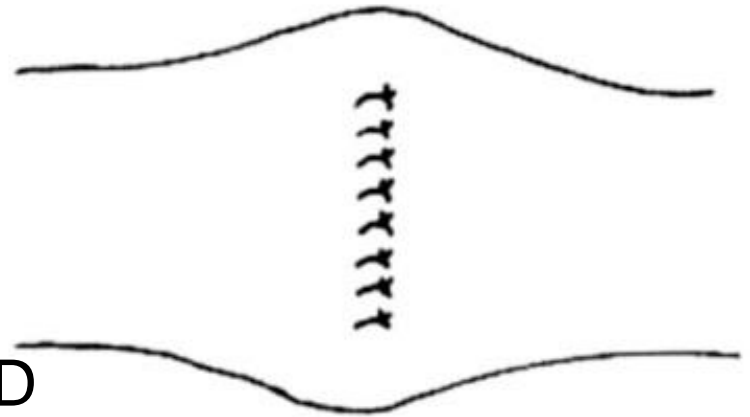
A



B

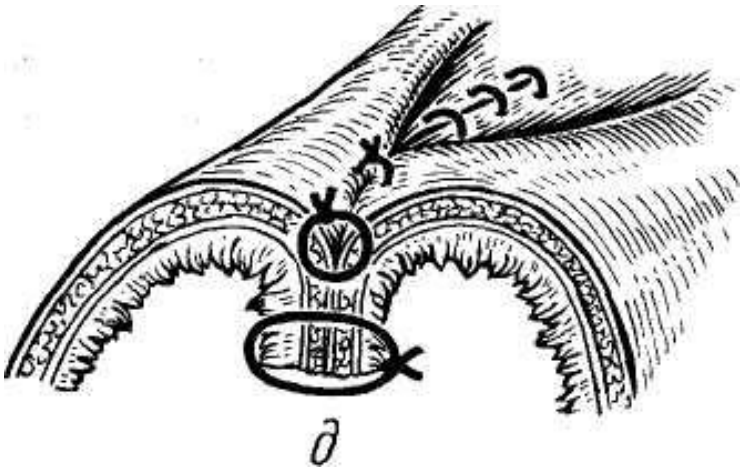


C

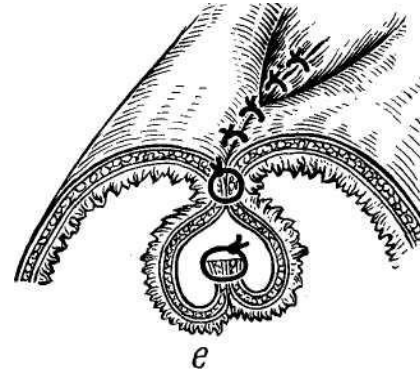


D

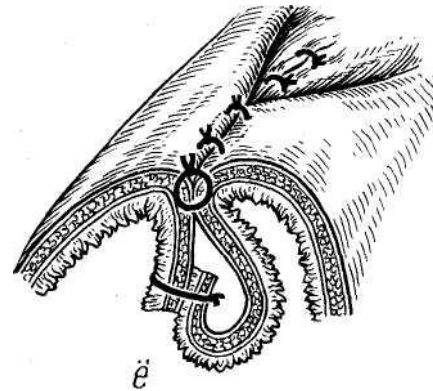
Correct imposed suture



Incorrect imposed suture



Space



Different tissues (mucous –serous)

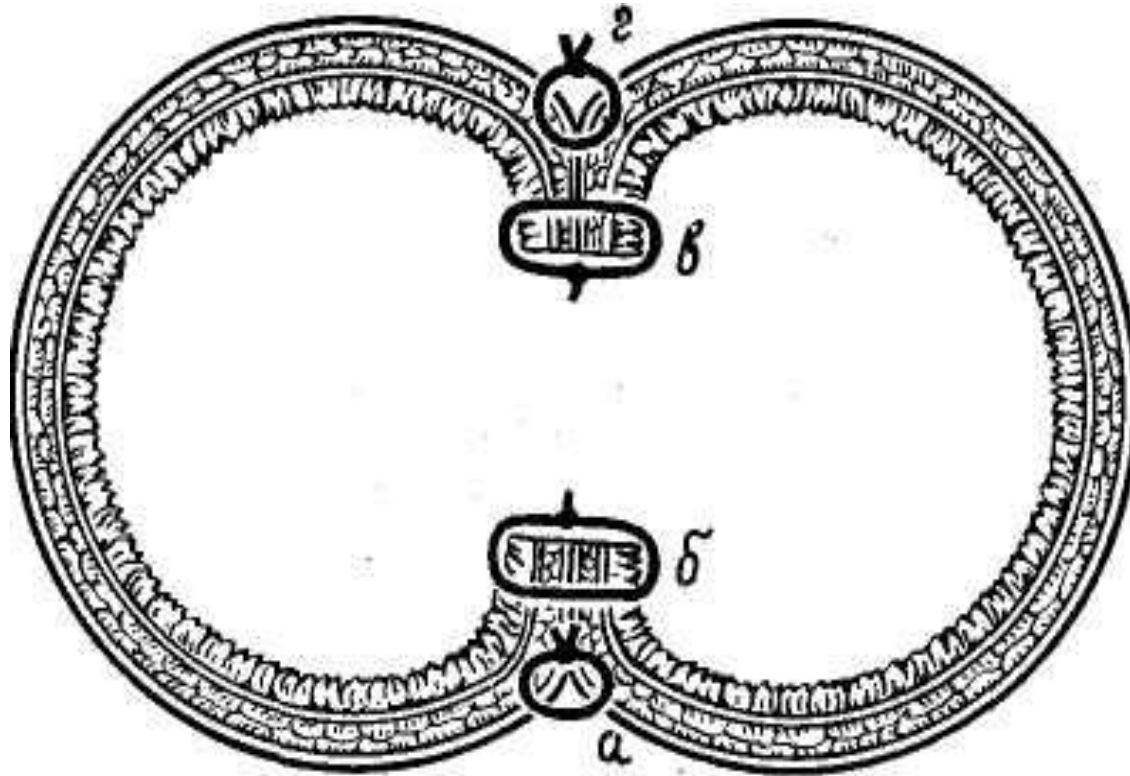
Intesto-intestinal anastomosis

Types:

- end-to-end;
- side-to-side (lateral);
- end-to-side.

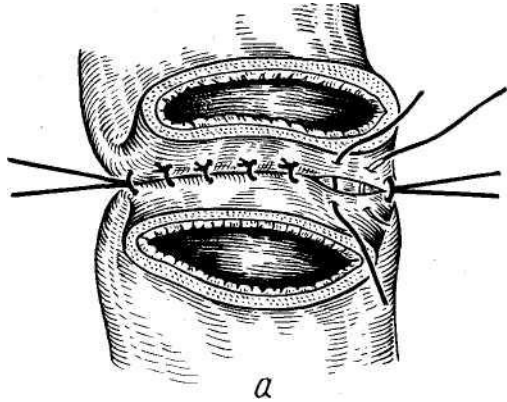
Any anastomosis should be isoperistaltic (it must keep the direction of peristaltic wave).

General scheme of intestinal anastomosis

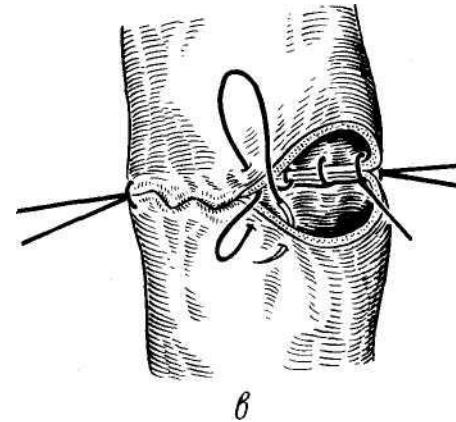


- a — Posterior serous suture (Lambert);
- б — Posterior through-and-through suture (Moultanovsky-Reverden);
- в — Anterior through-and-through suture (Schmiden);
- г — Anterior serous suture (Lambert).

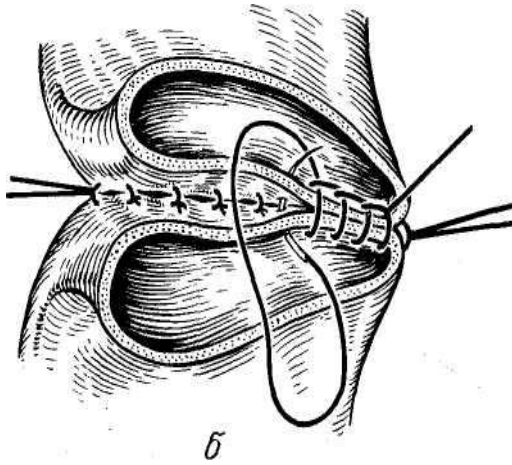
End-to-end anastomosis



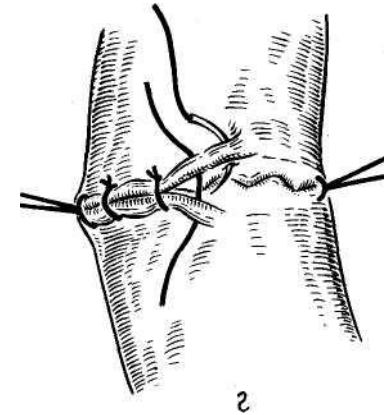
Serous-muscular Lambert's suture



Invaginated suture
(Schmiden, Connell)

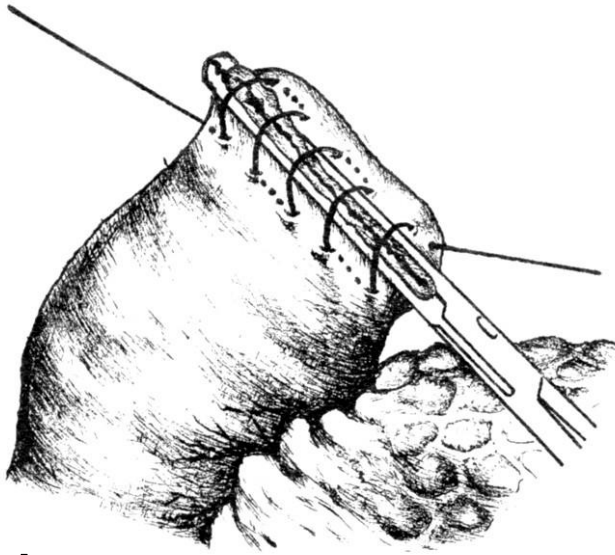


Haemostatic Reverden-Moultanovsky's suture

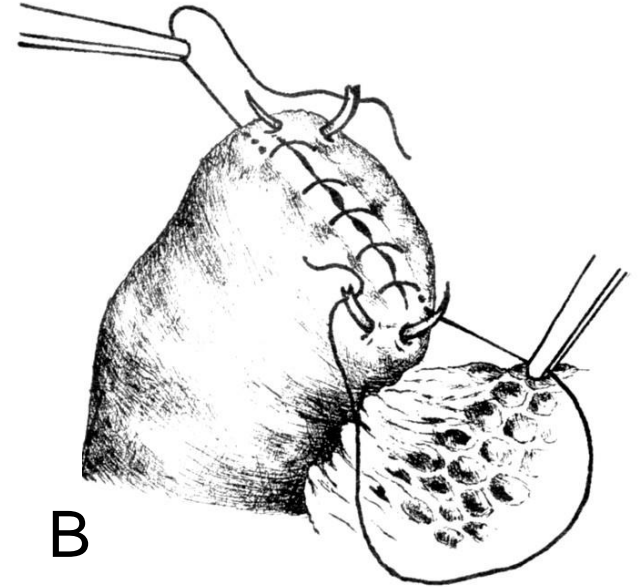


Serous-muscular Lambert's suture

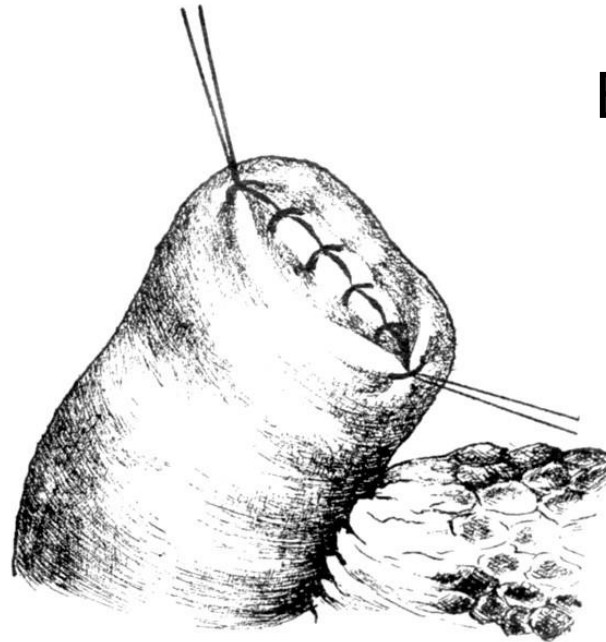
Side-to-side anastomosis



A

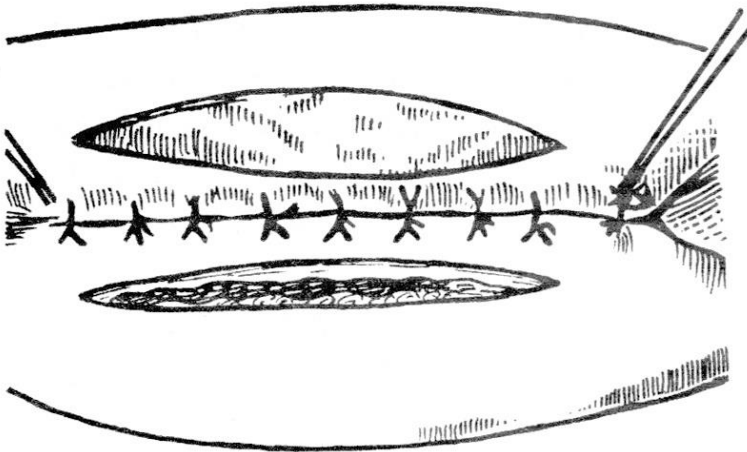


B

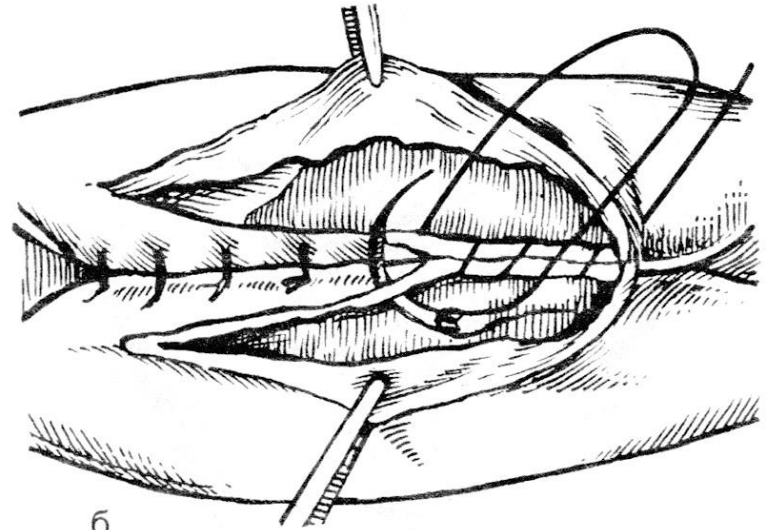


C

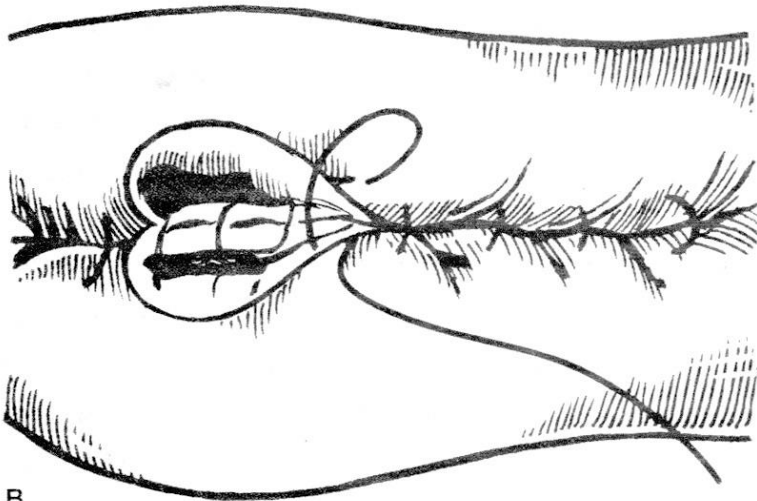
Side-to-side anastomosis



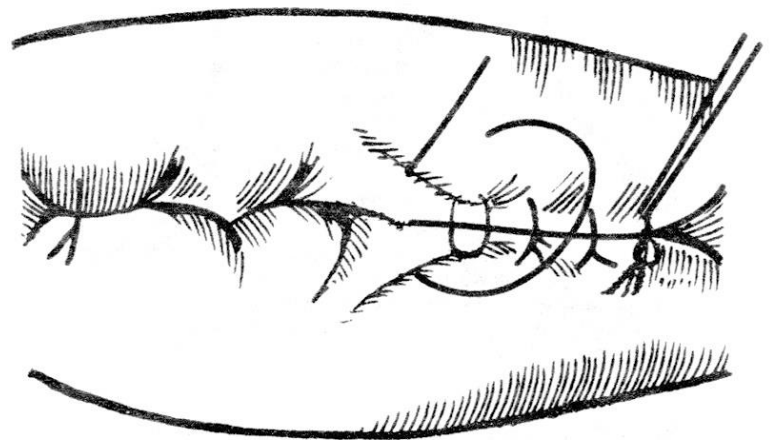
a



б



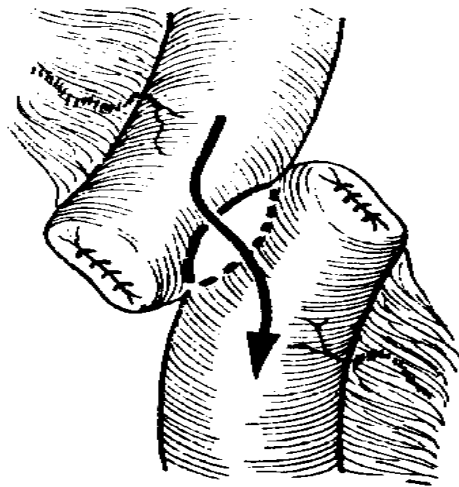
B



Г

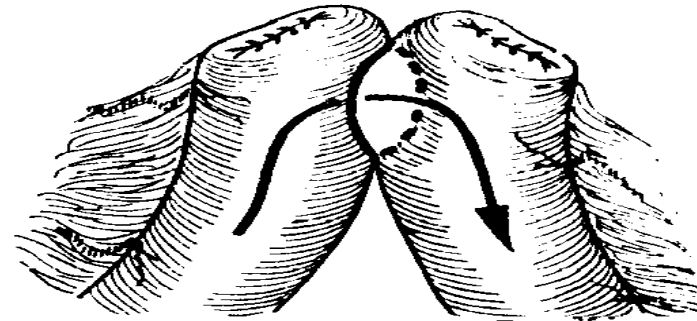
Side-to-side anastomosis

Isoperistaltic

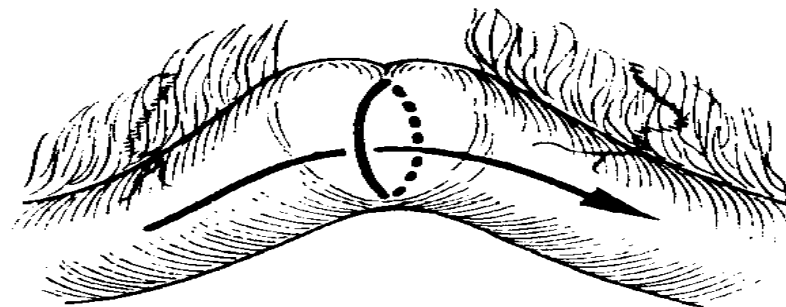


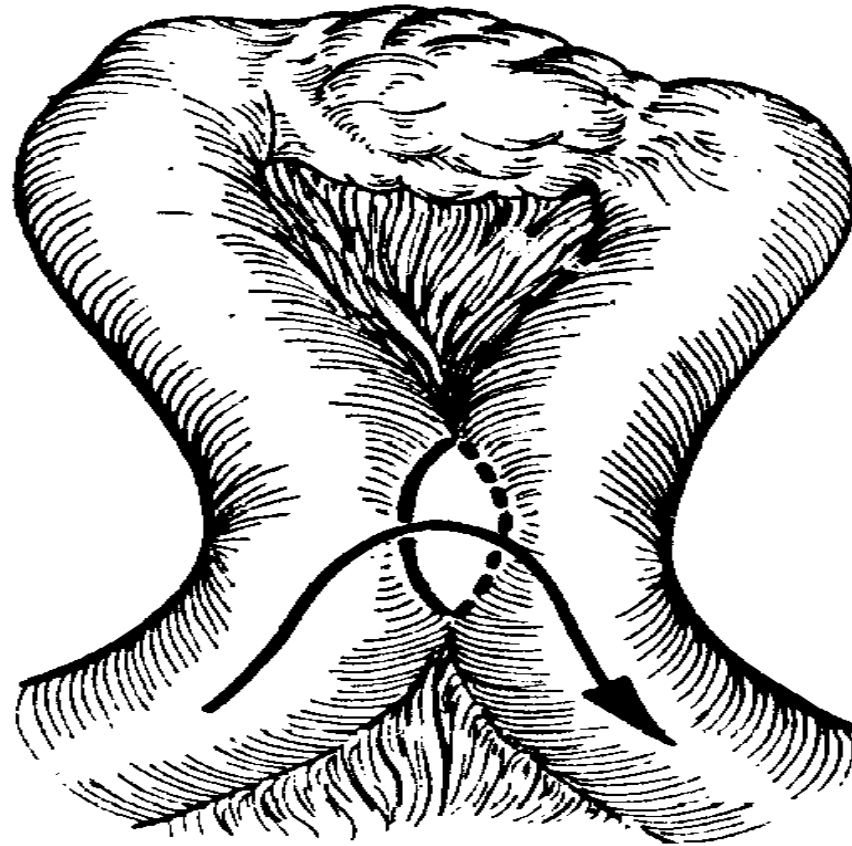
a

Antiperistaltic



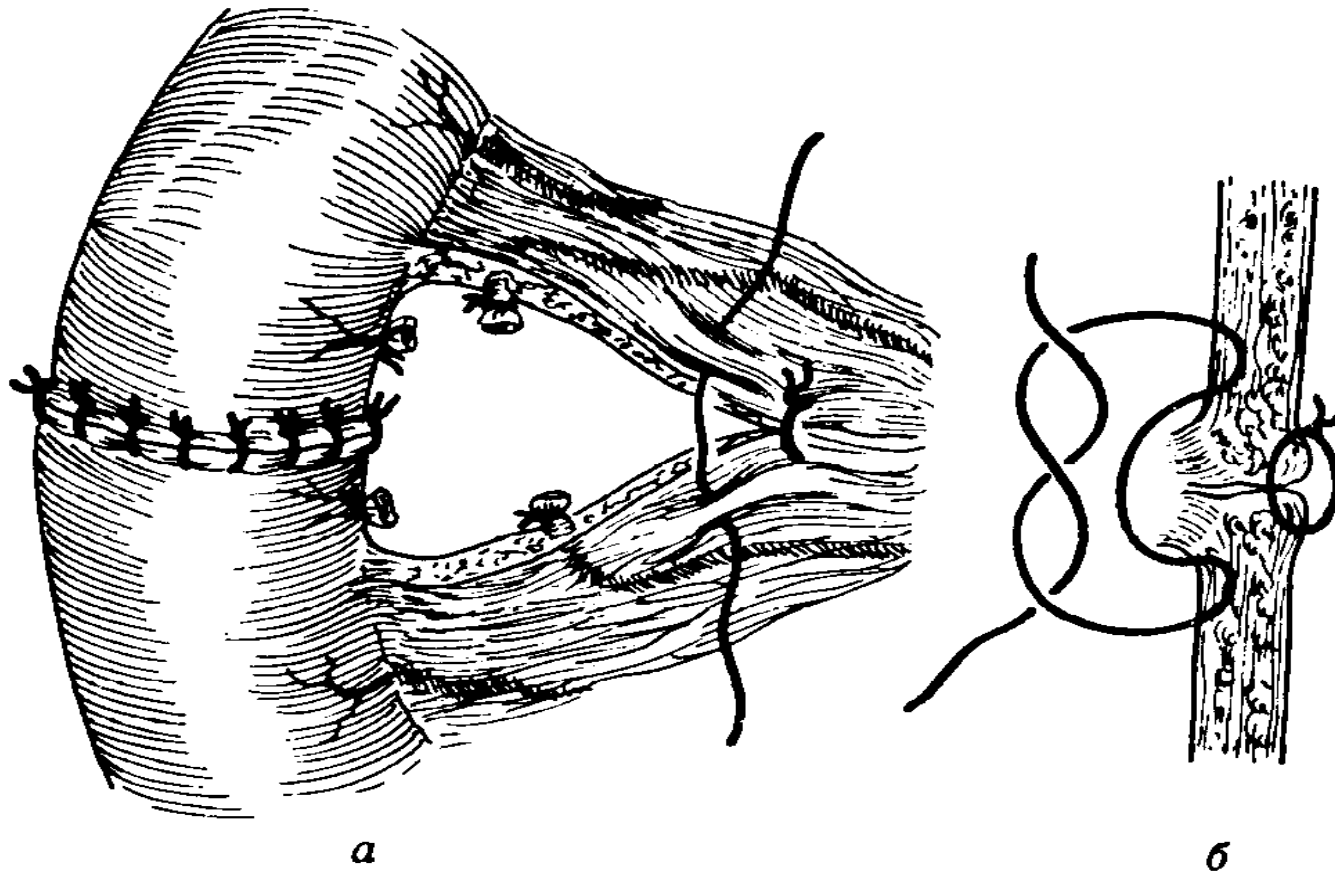
b





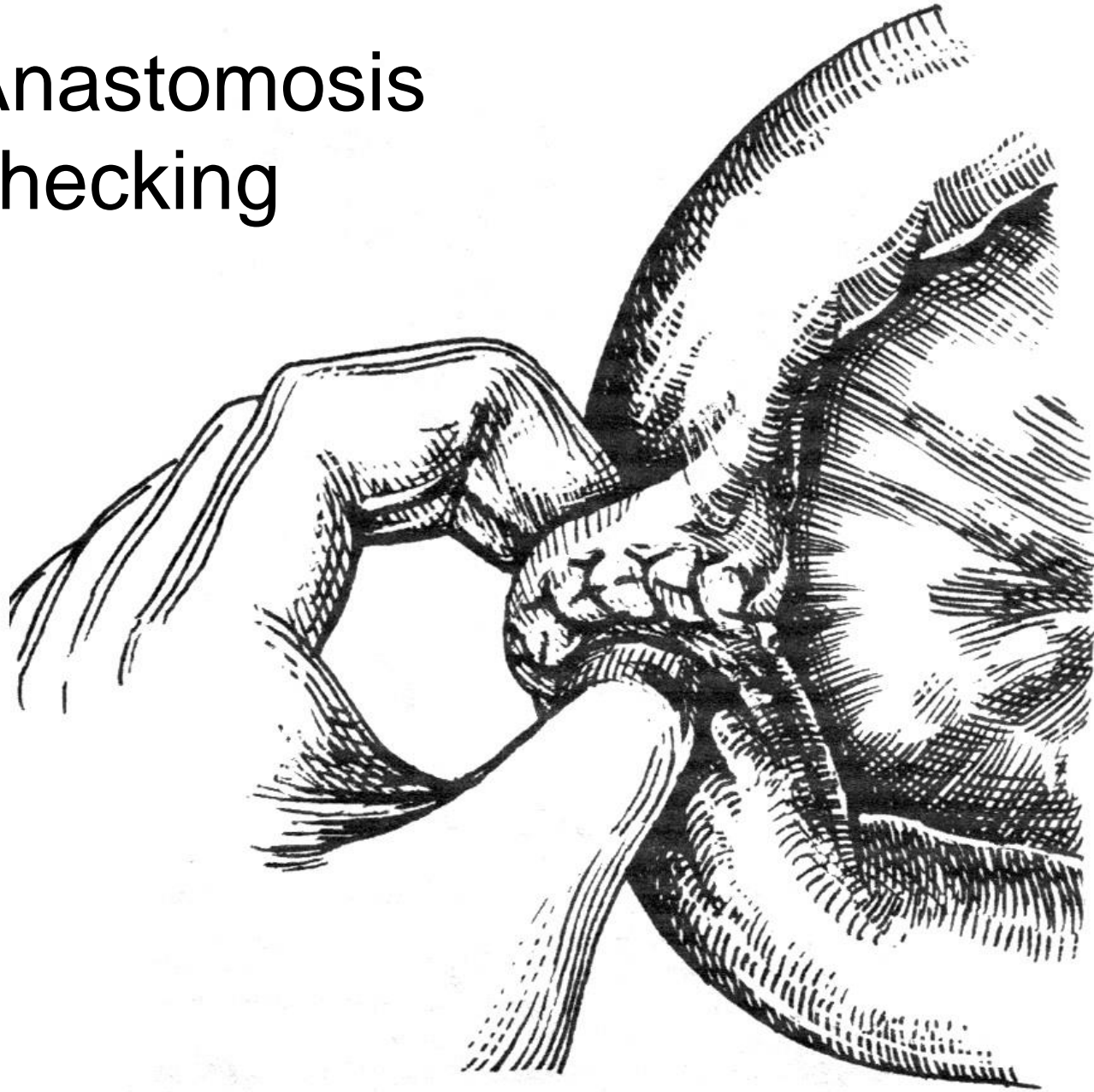
Bypass anastomosis

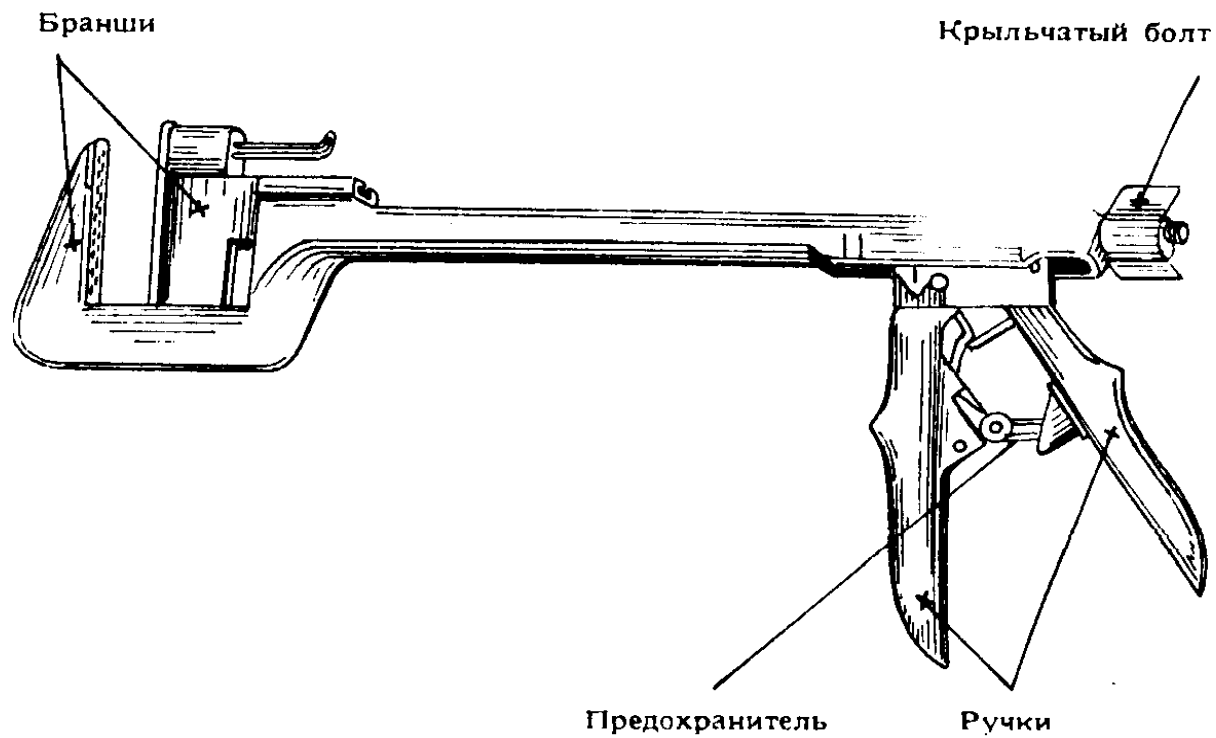
End-to-end anastomosis



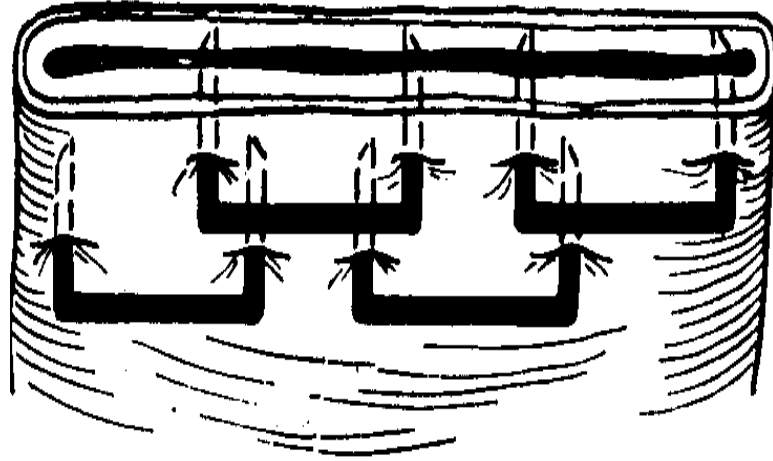
Anastomosis is completed. Serous-serous sutures on the mesentericum (a), cross section of the intestinal wall (b)

Anastomosis checking

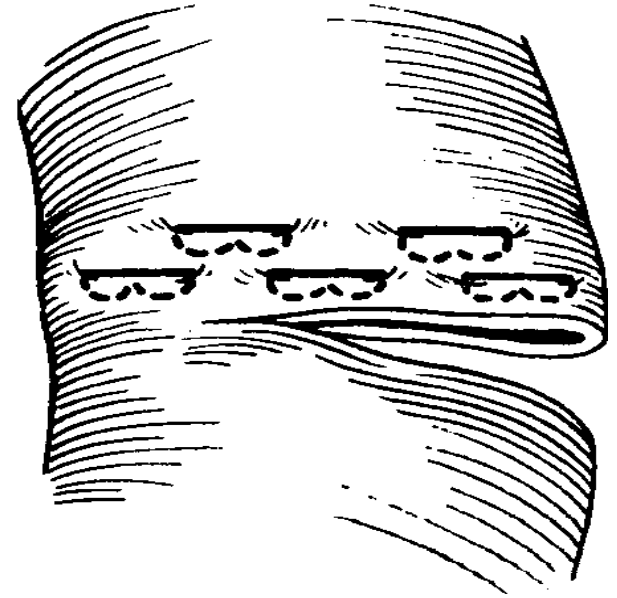




Mechanical stapler UKL for stitching of the duodenum, intestine, hileum of lung

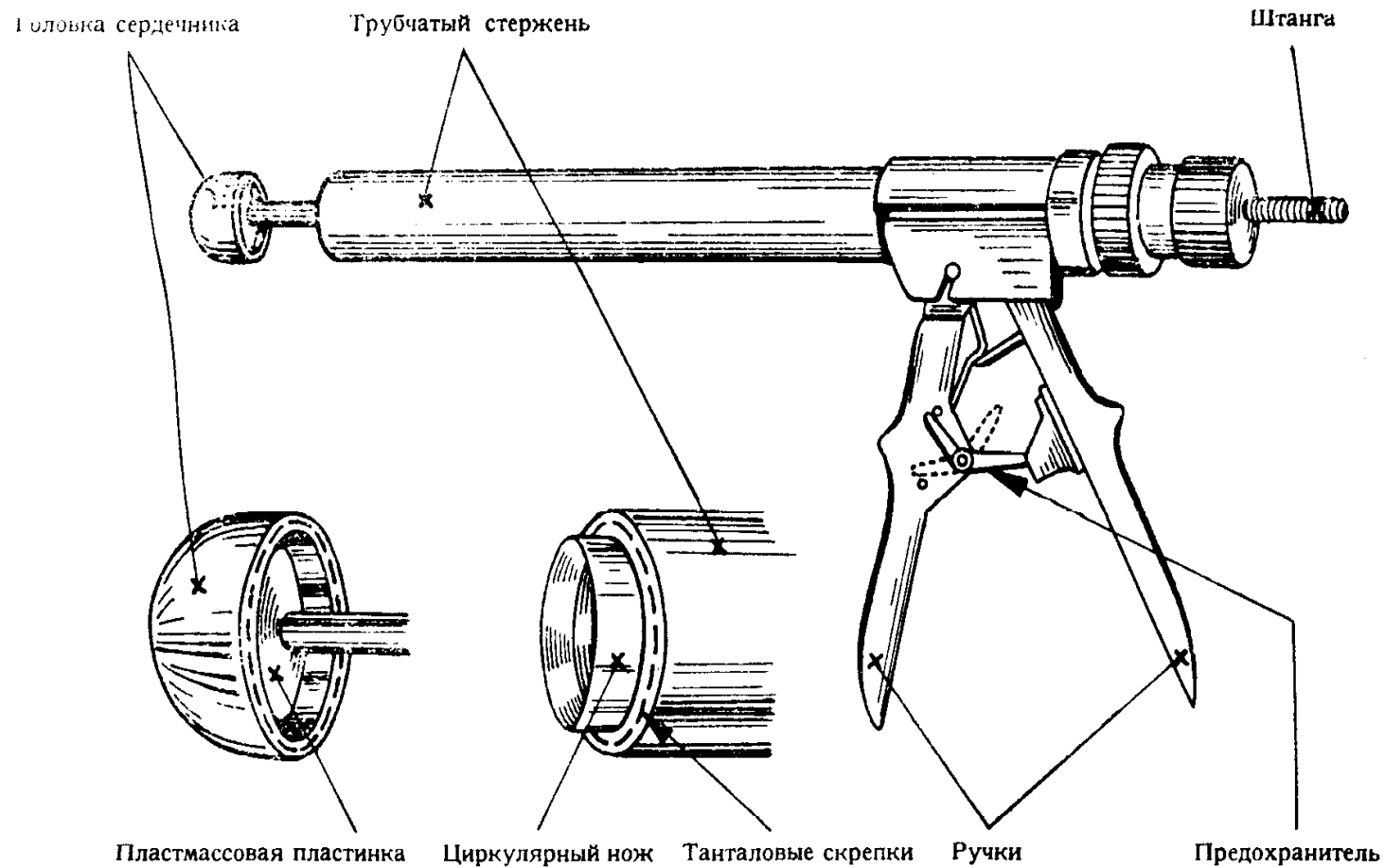


a

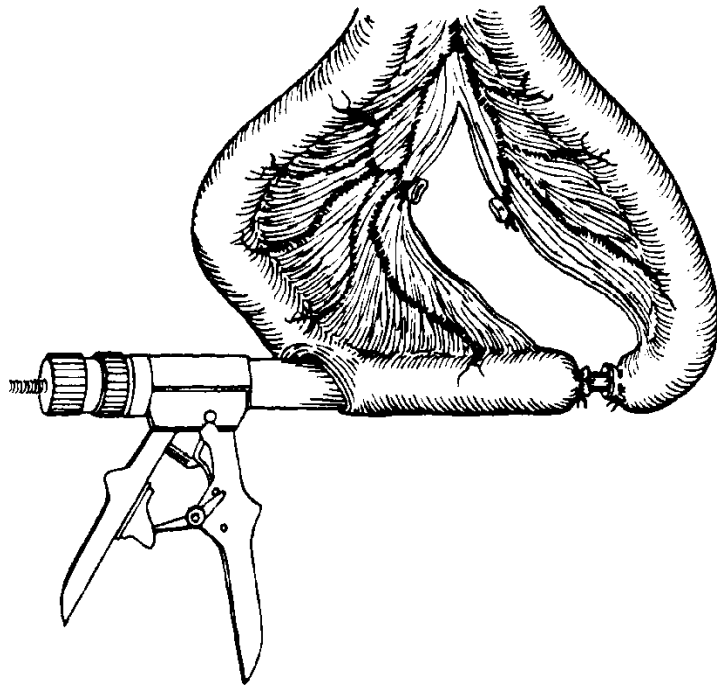


b

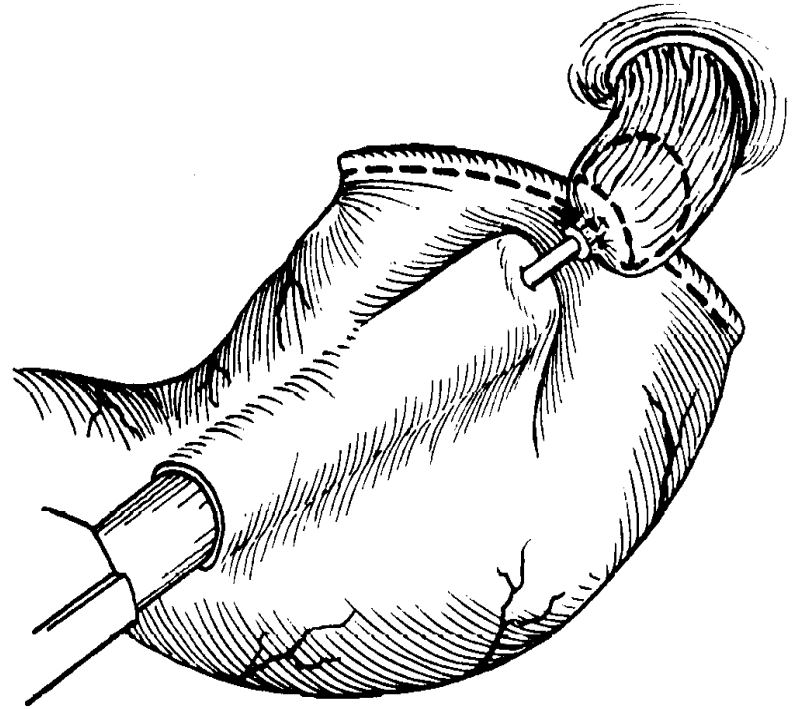
Clips before (a) and after (b) close



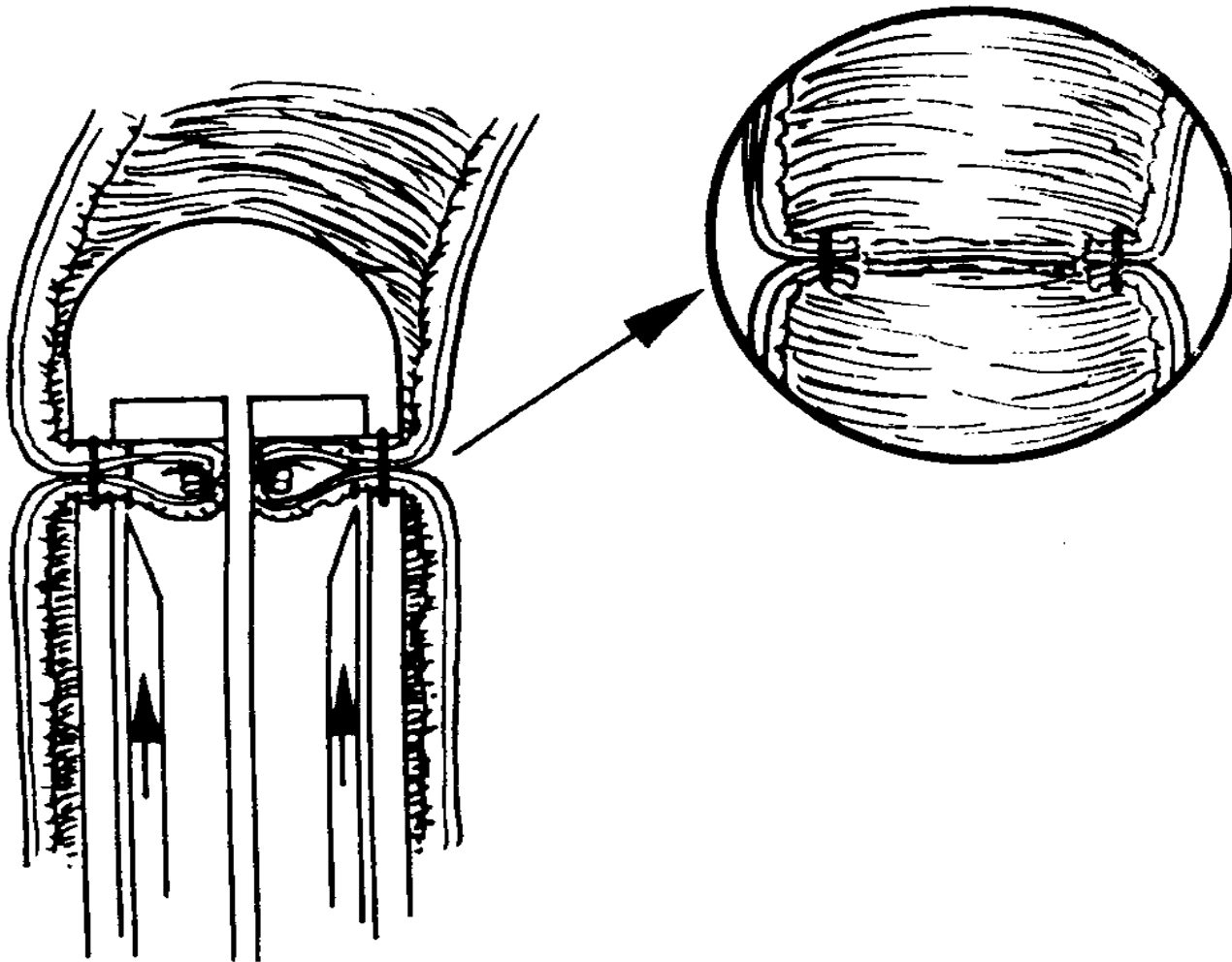
Mechanical stapler KC for stitching of esophagus, intestine and rectum



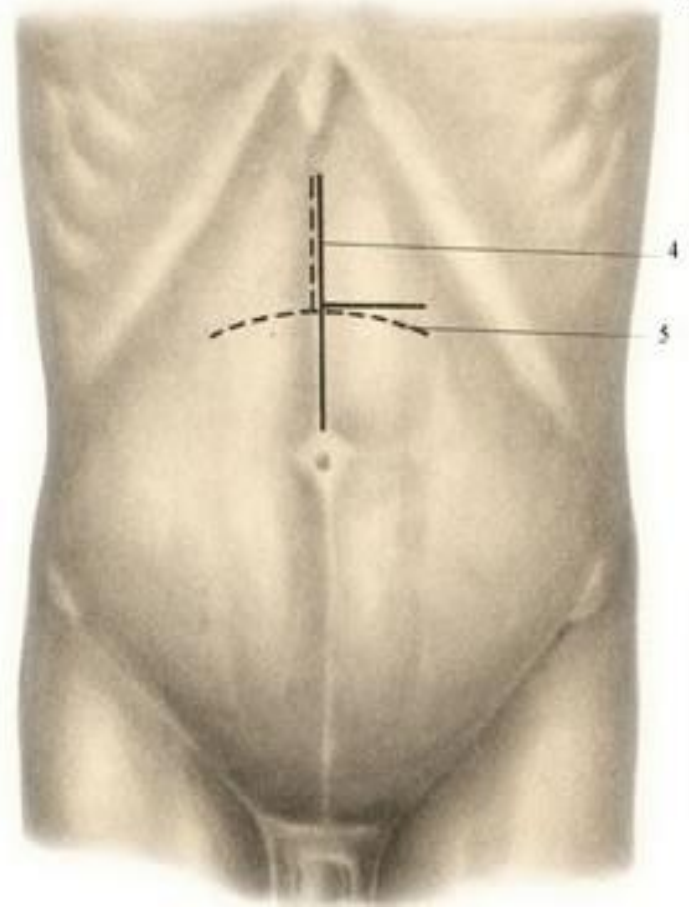
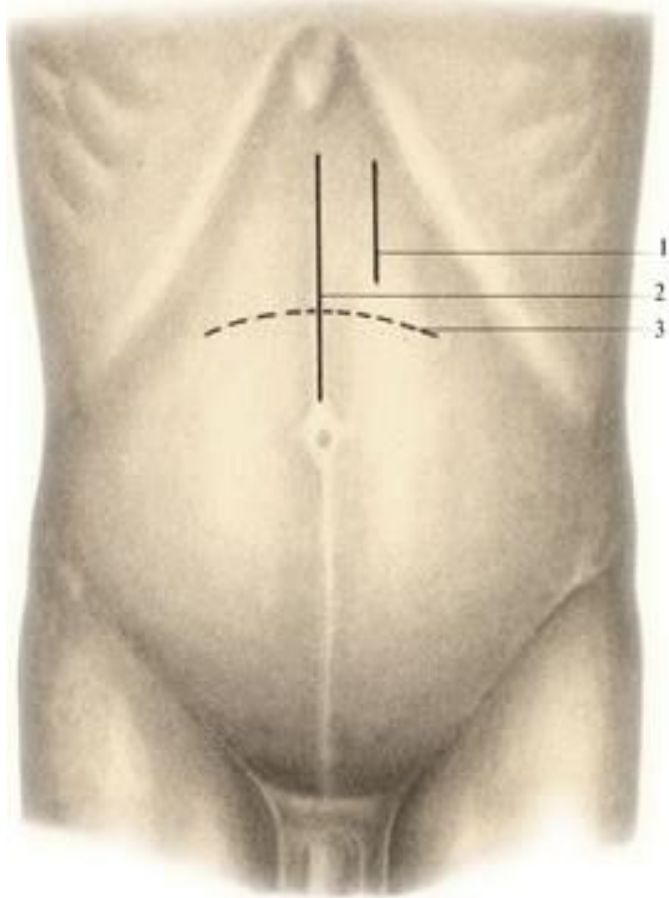
End-to-end anastomosis on
the small intestine



End-to-end anastomosis
on the stomach



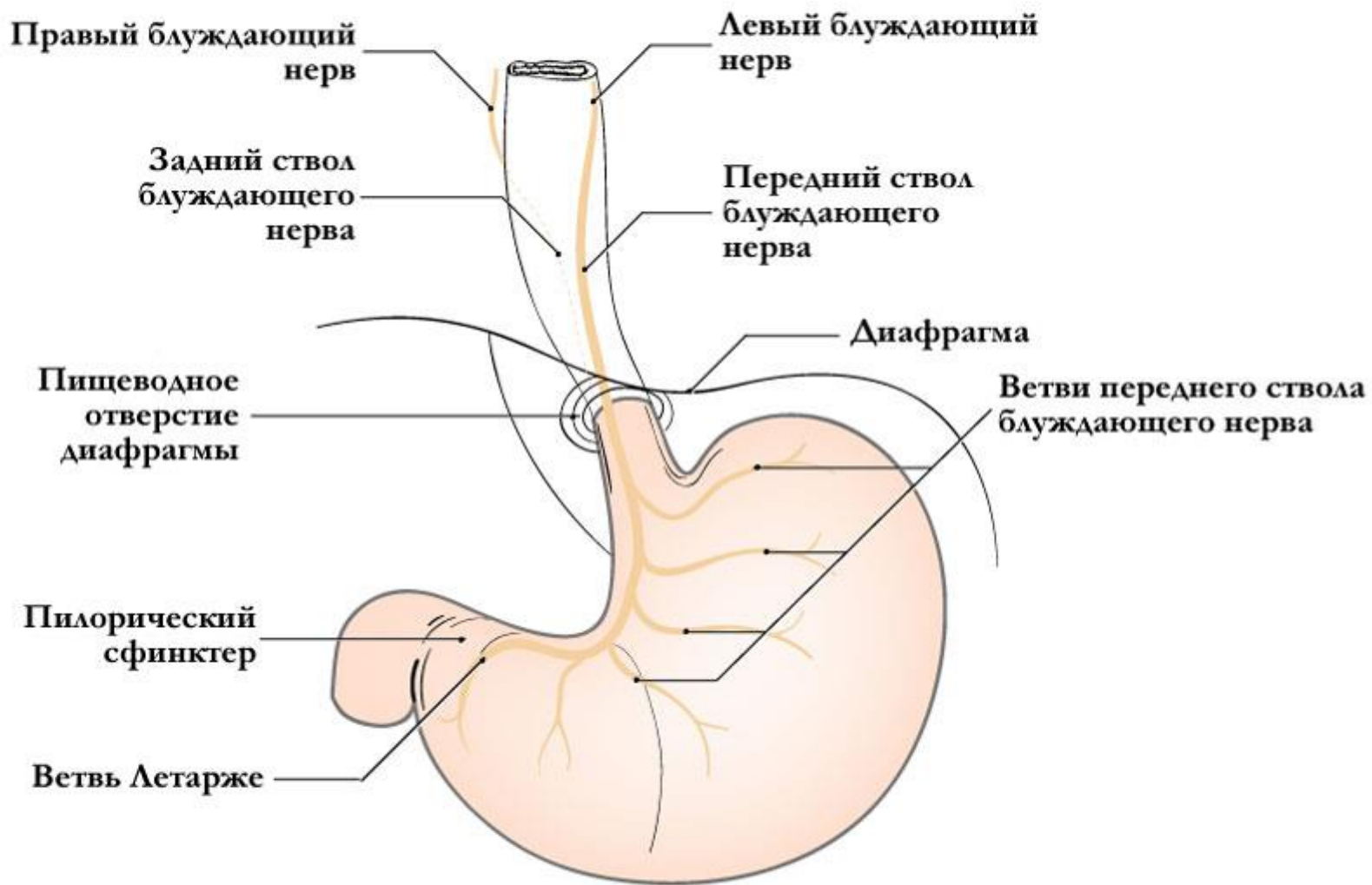
End-to-end anastomosis on the small intestine.
Fixation of tantalum clips and work of round knife.



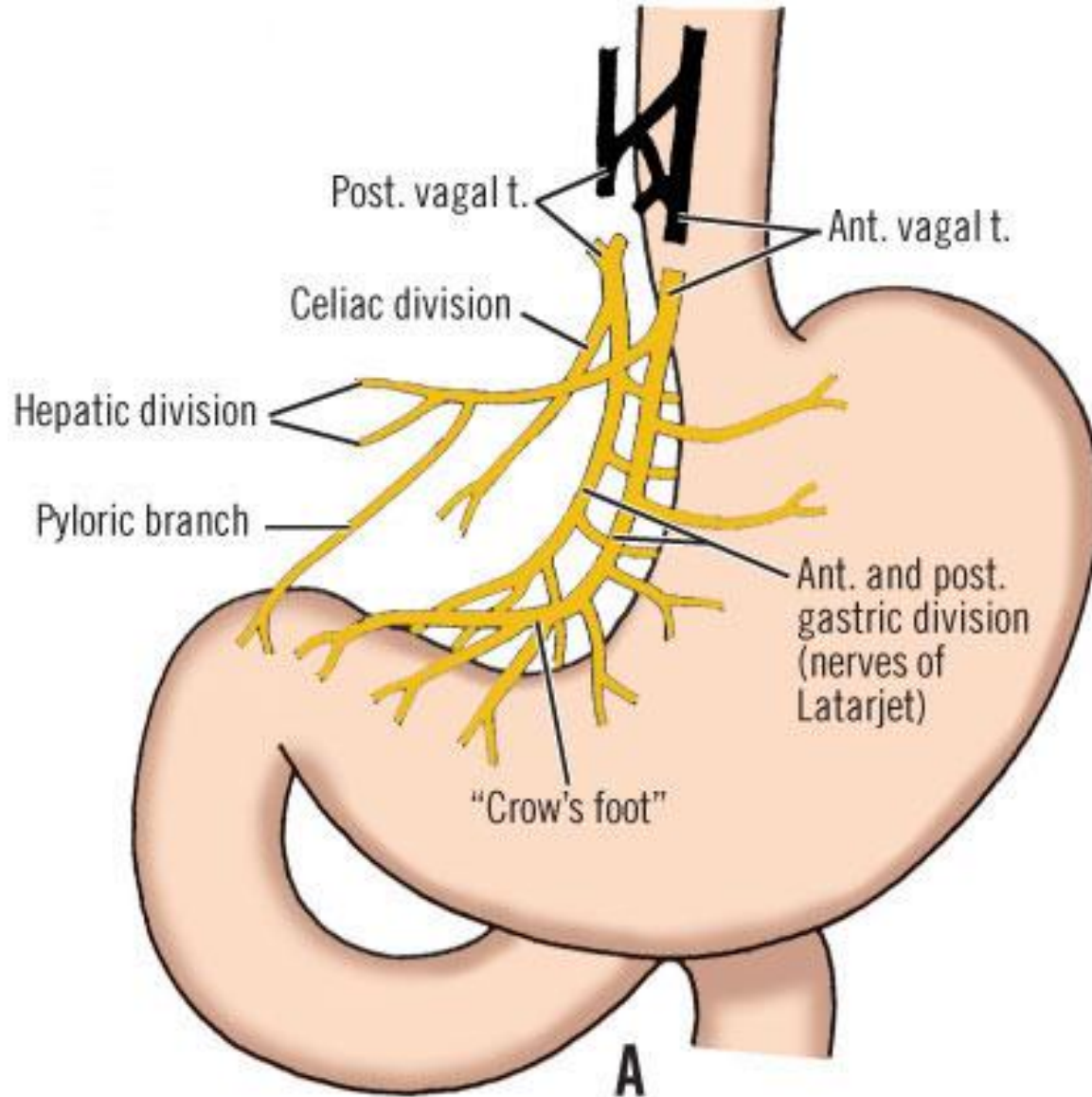
Accesses to the stomach.

- 1 — left transrectal; 2 — superior middle;
- 3 — transverse; 4 — combined upper middle;
- 5 — combined transversal.

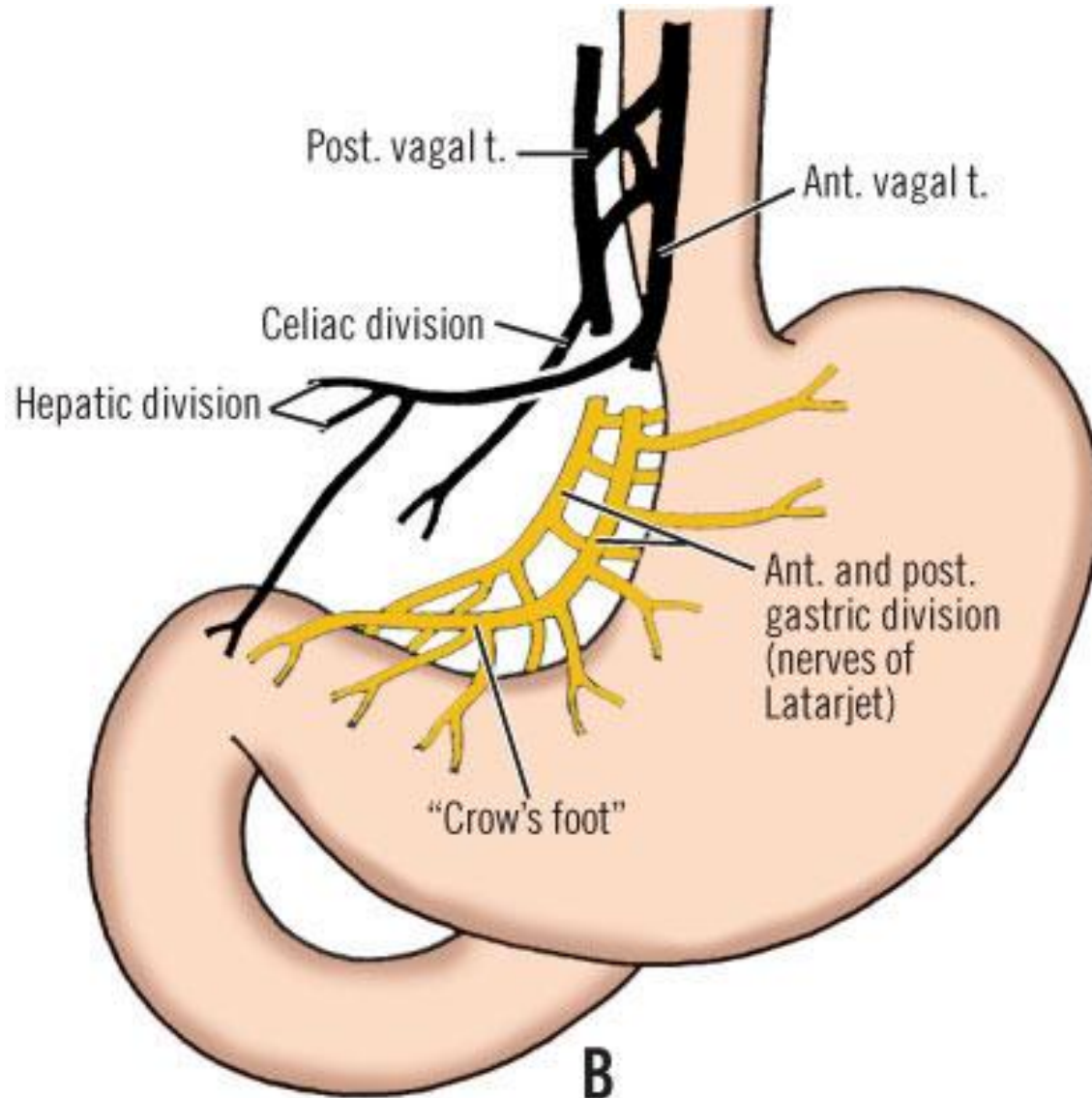
Иннервация желудка



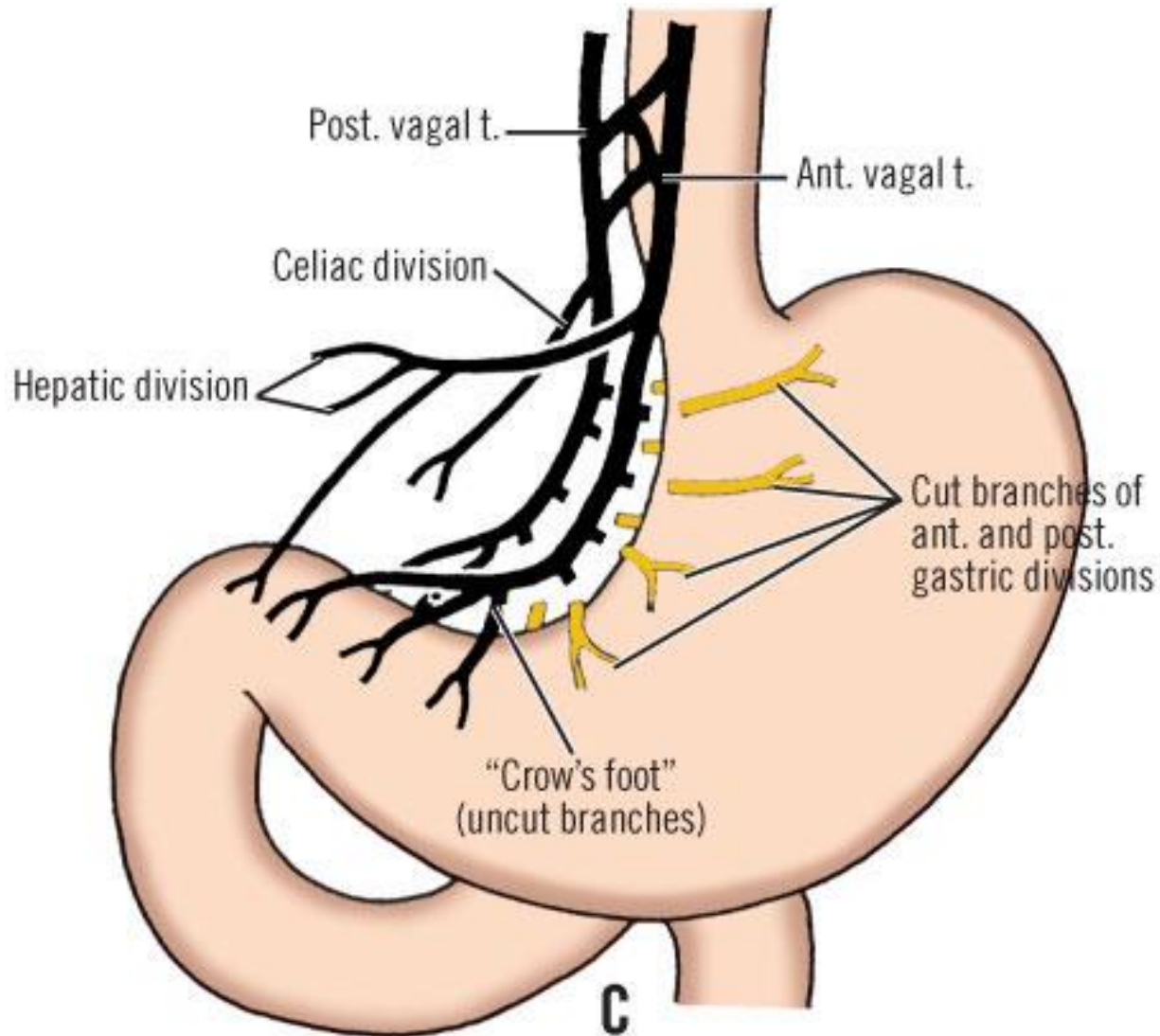
Truncal vagotomy (nerves to be preserved are in black).

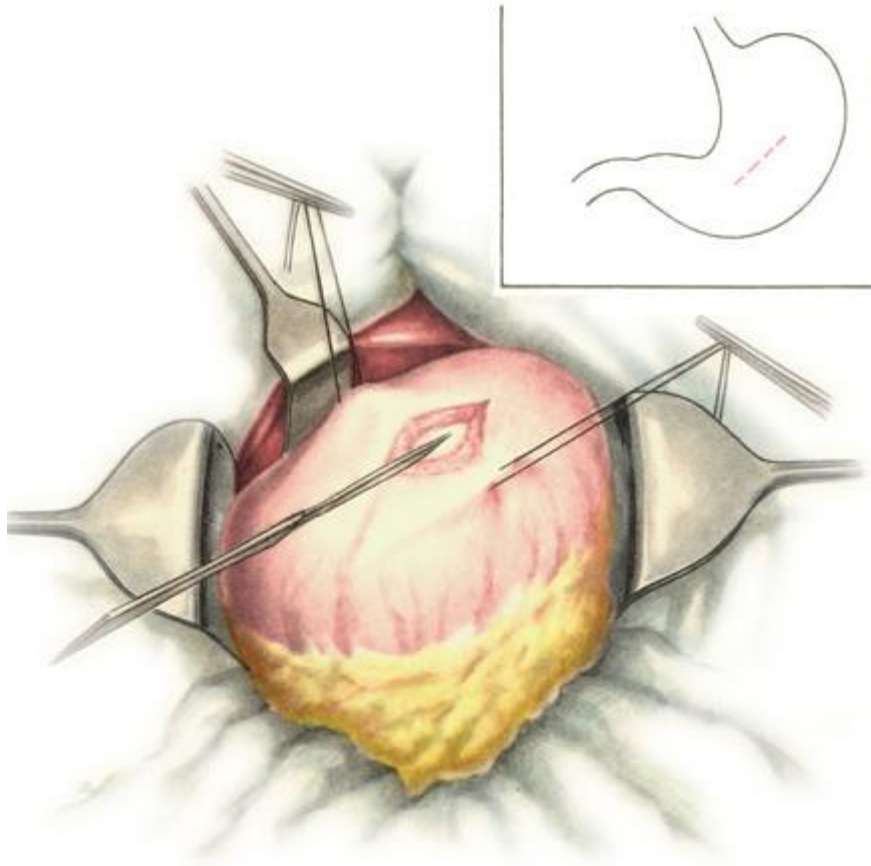


Selective vagotomy (nerves to be preserved are in black).

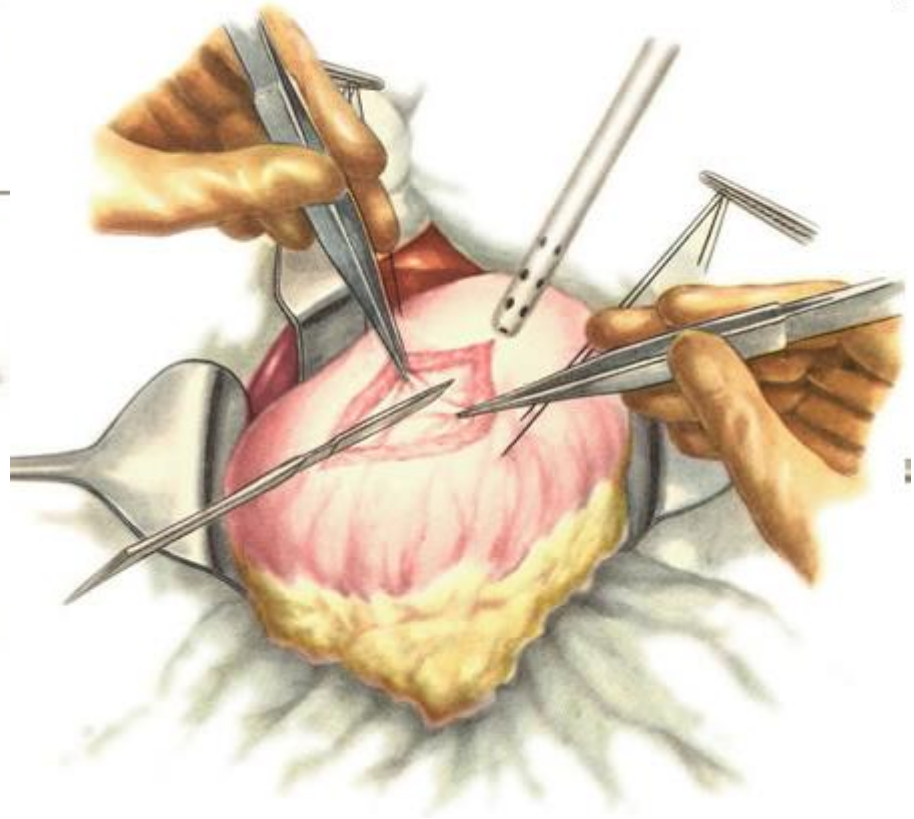


Parietal cell or proximal gastric vagotomy (nerves to be preserved are in black).

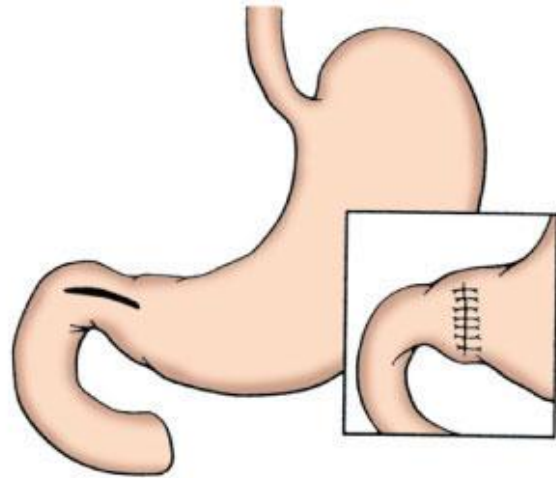




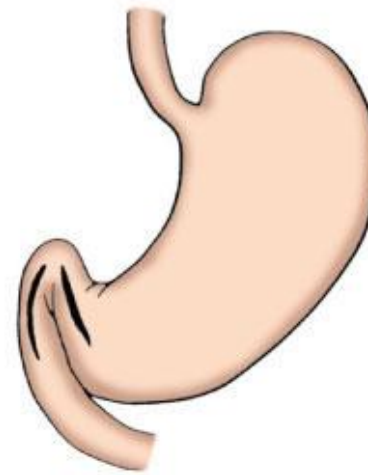
Gastrotomy
Dissection of the serous and muscular
layers of stomach.



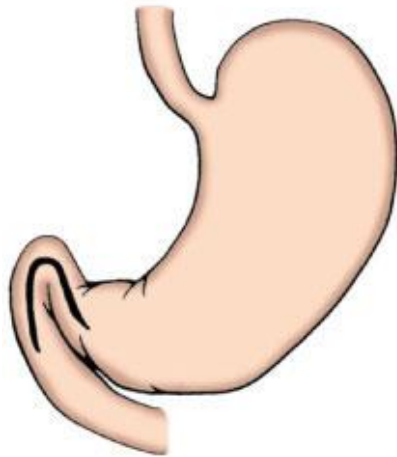
Dissection of the mucous layers of stomach.



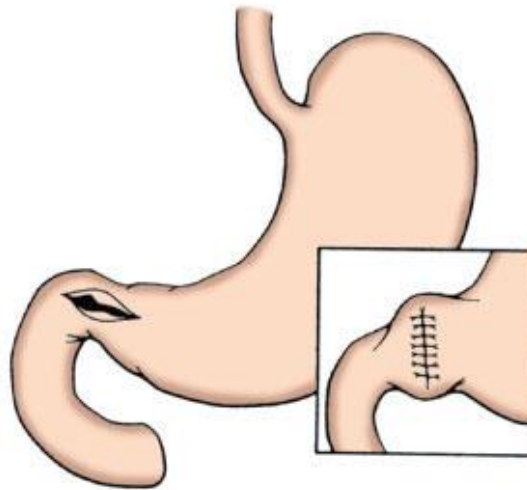
Heineke 1886
Mikulicz 1888



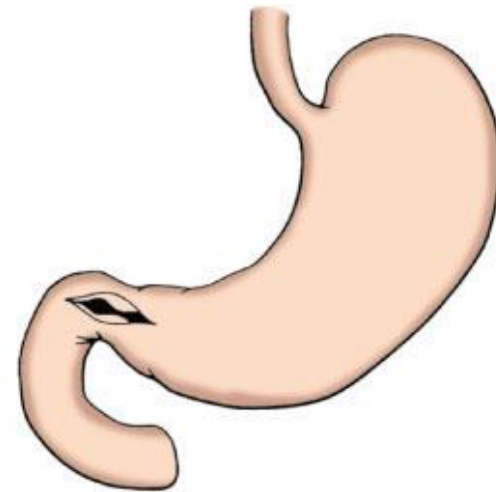
Jaboulay 1892



Finney 1902



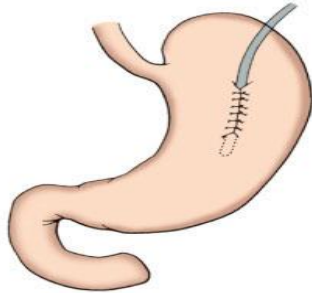
Defour-Fredet 1908
Weber 1910



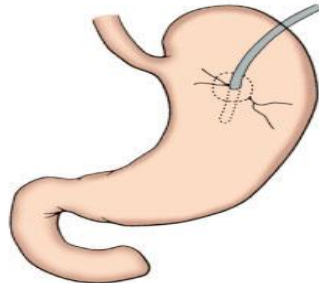
Rammstedt 1912

Pyloroplasty. The Heineke-Mikulicz procedures consist of incising the gastroduodenal wall longitudinally through all layers and closing the defect transversely. The Jaboulay variation has separate longitudinal incisions involving the gastric and duodenal walls and a side-to-side anastomosis. Finney consists of a horseshoelike gastroduodenal incision (distal part of stomach and first and second parts of duodenum) with a transverse closure. Defour and Fredet modified the Heineke-Mikulicz procedure for infants. It consisted of a longitudinal incision of the serosa and muscular layers, leaving the mucosa intact, and closing transversely. A procedure identical to that of Defour and Fredet was described two years later by Weber. The Rammstedt procedure is essentially a Defour-Fredet operation except that he did not close the gastroduodenal wall, leaving the mucosa uncovered.

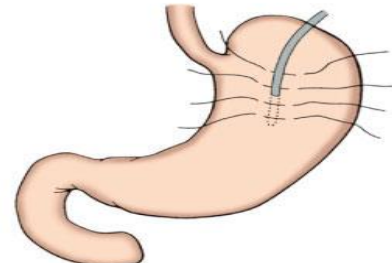
Types of gastrostomy



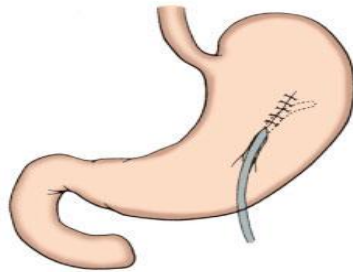
Witzel 1891



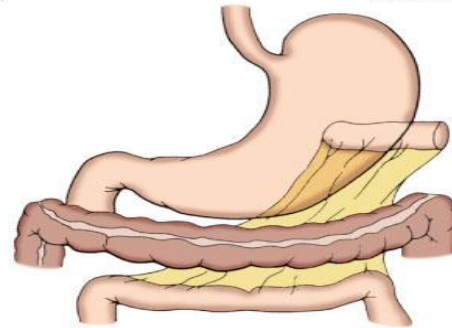
Stamm 1894



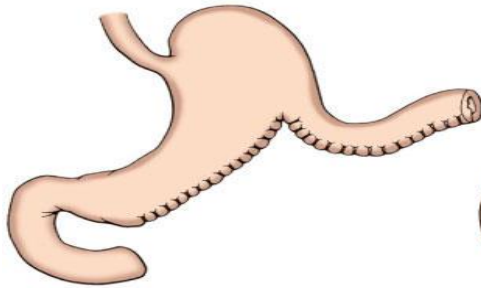
Kadar 1896



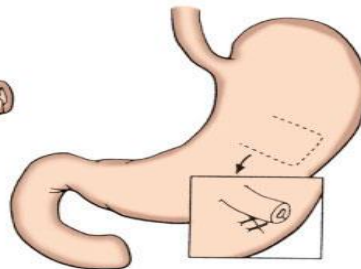
Marwedel 1896



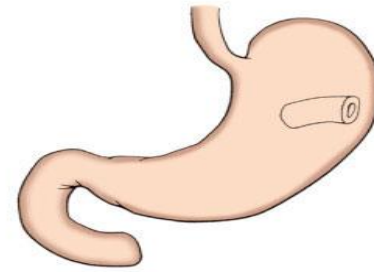
Tavel 1906



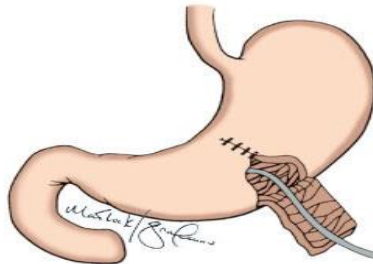
Beck-Carrell 1905
Jianu 1912



Janeway 1913

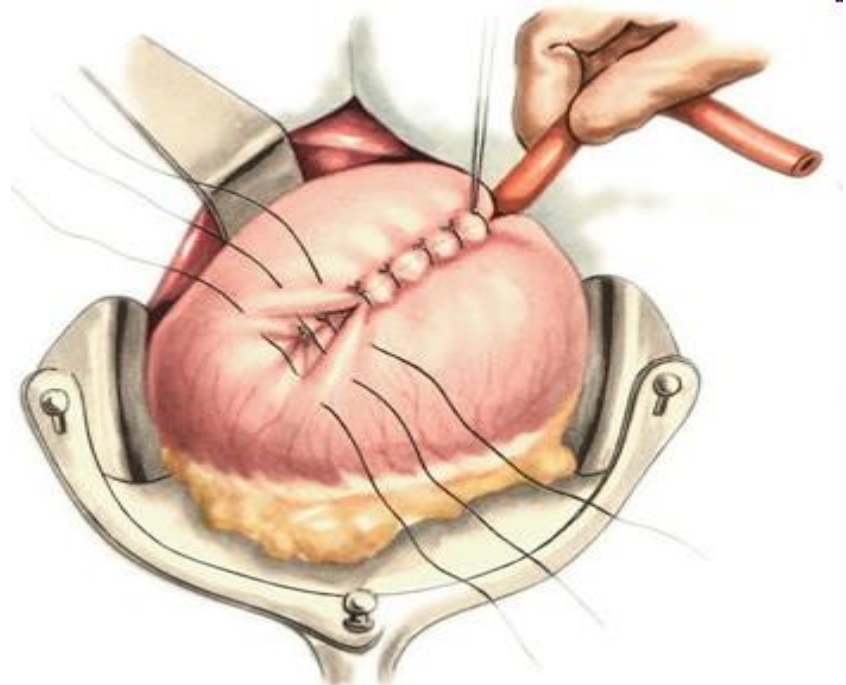
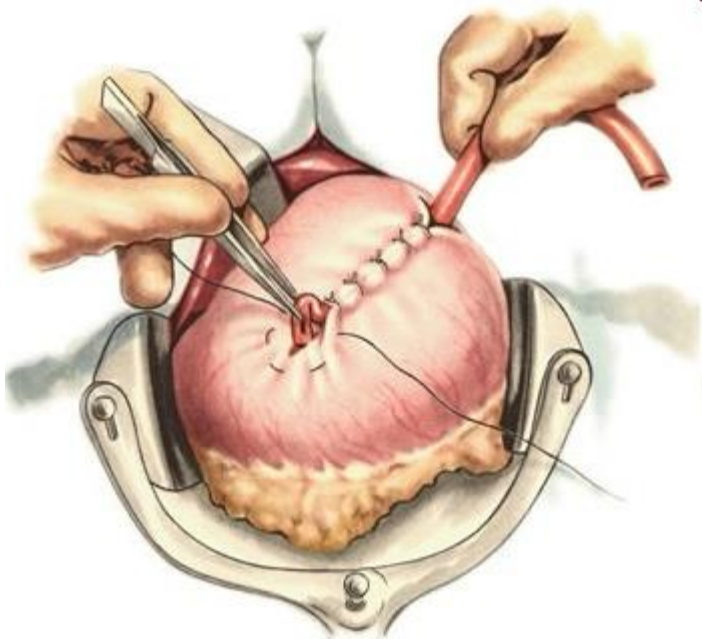
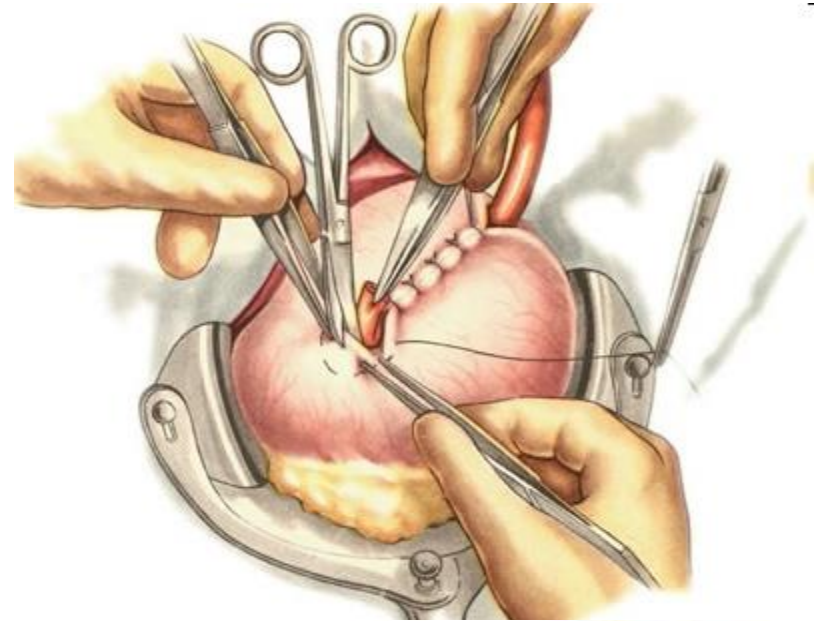
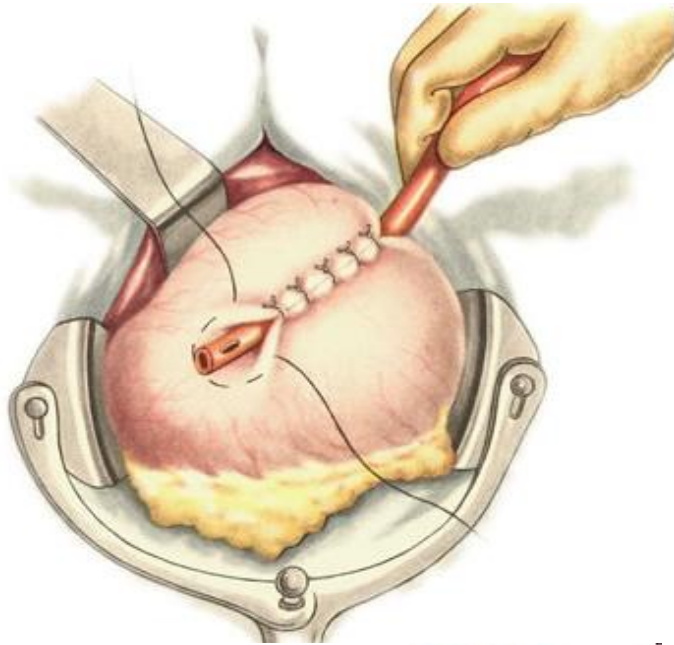


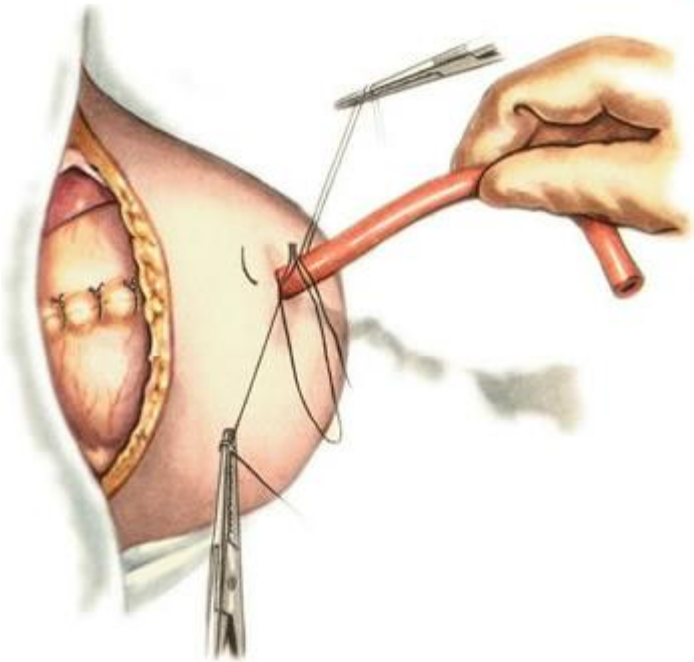
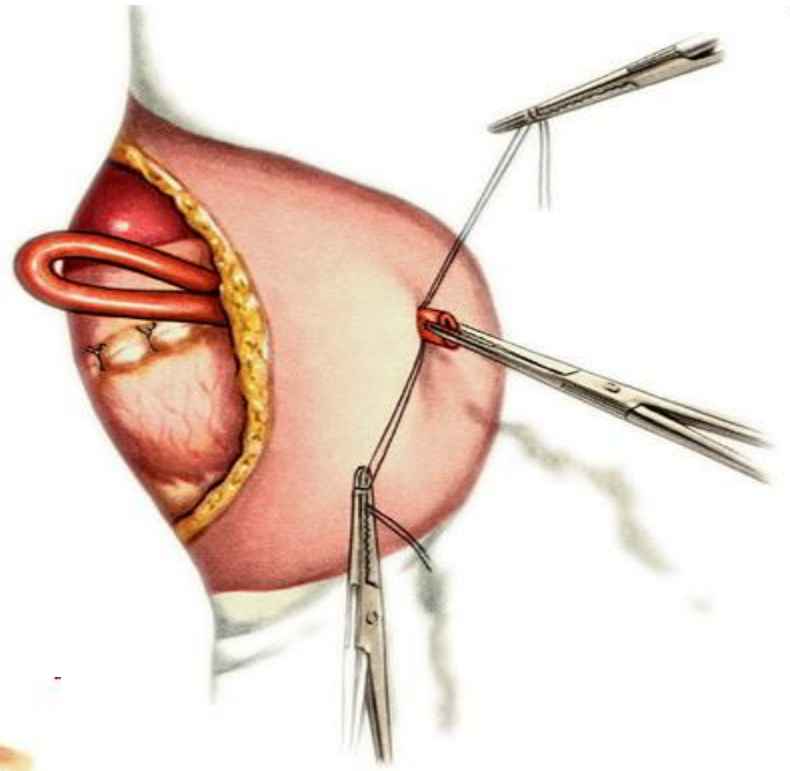
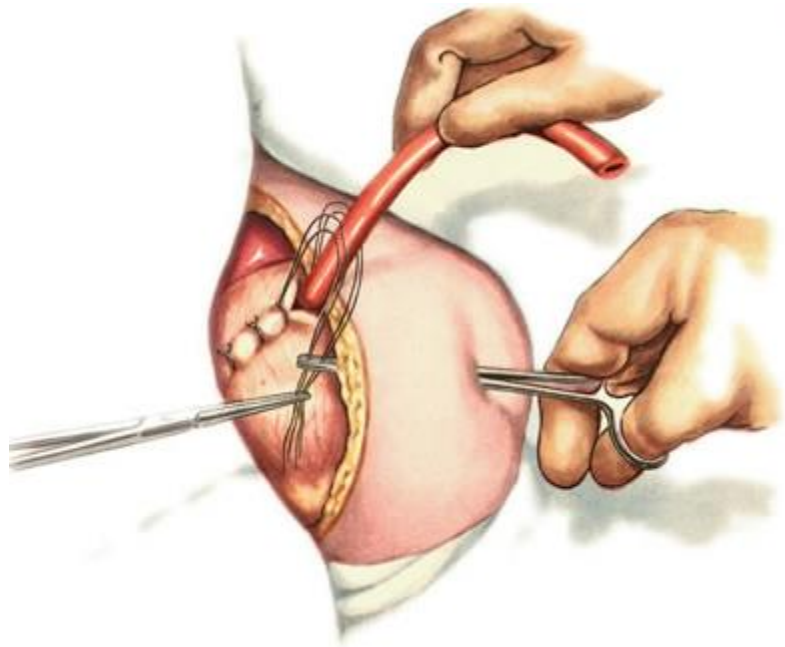
Spivack 1929



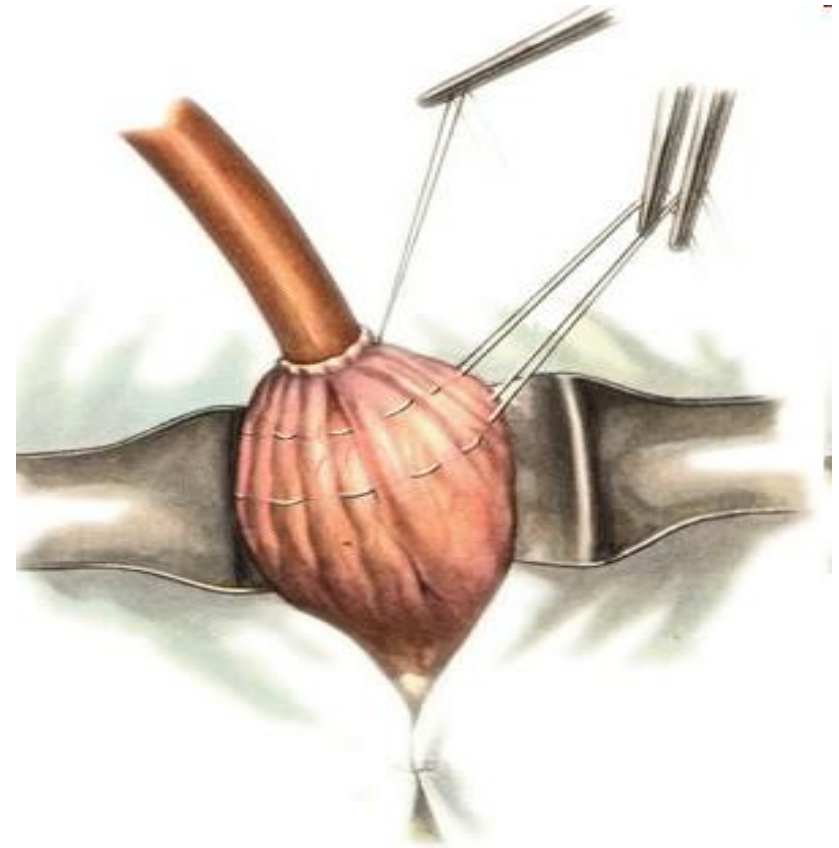
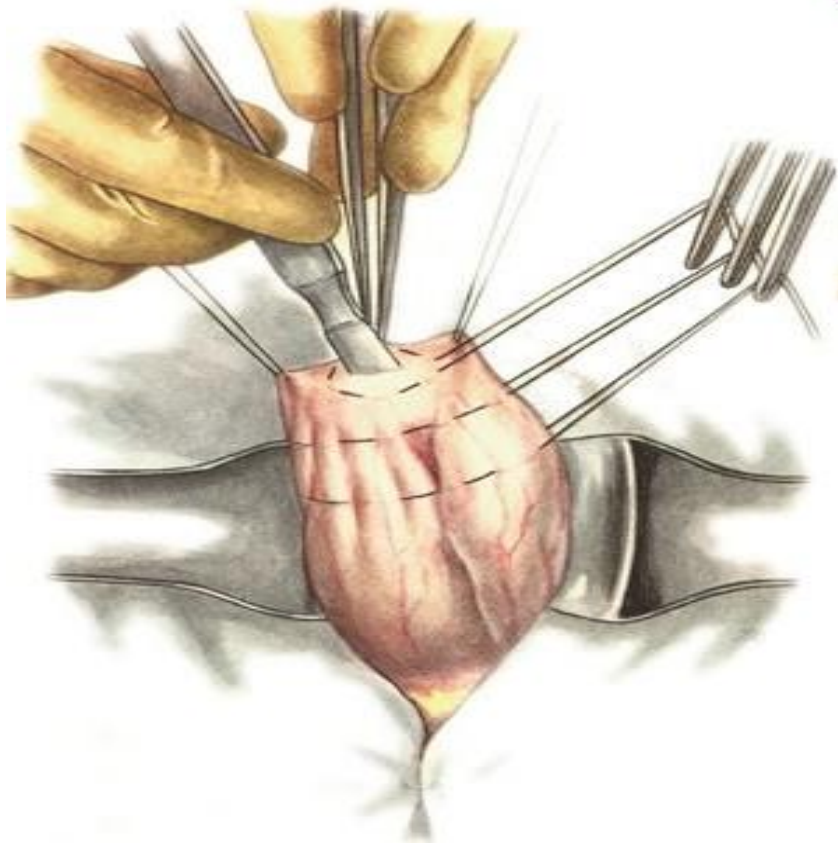
Patton 1955

Gastrostomy by Witzel

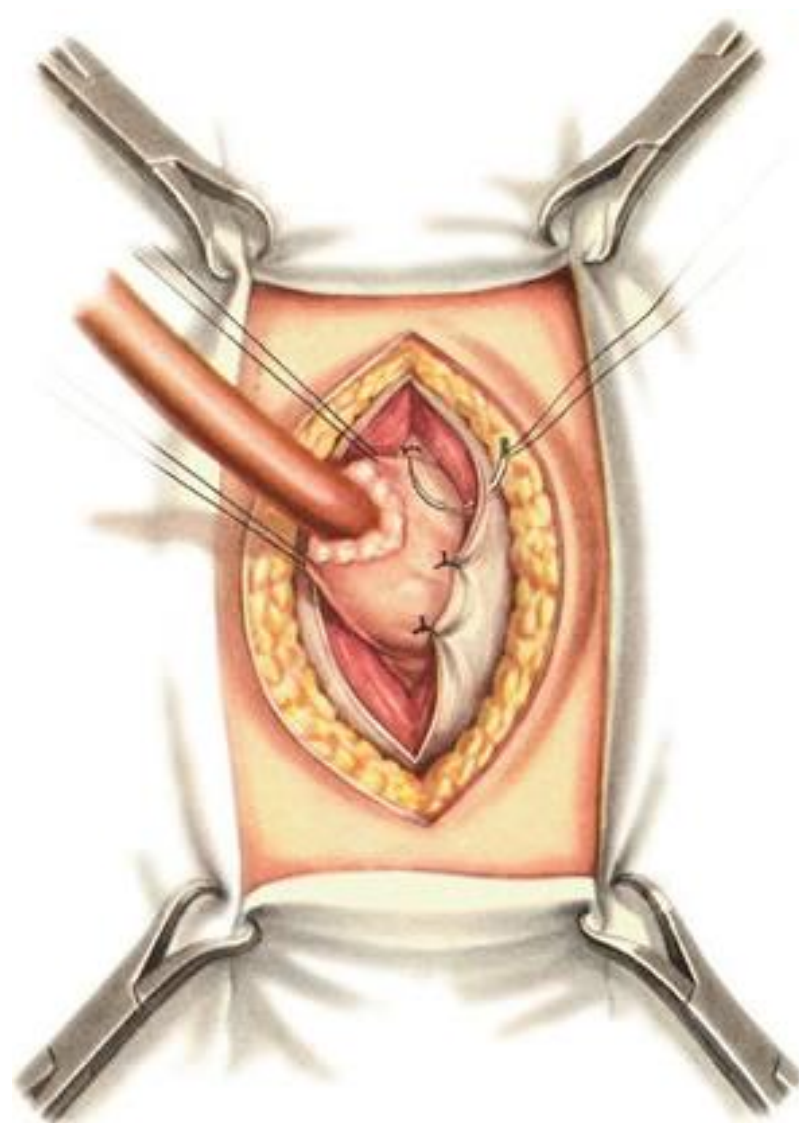
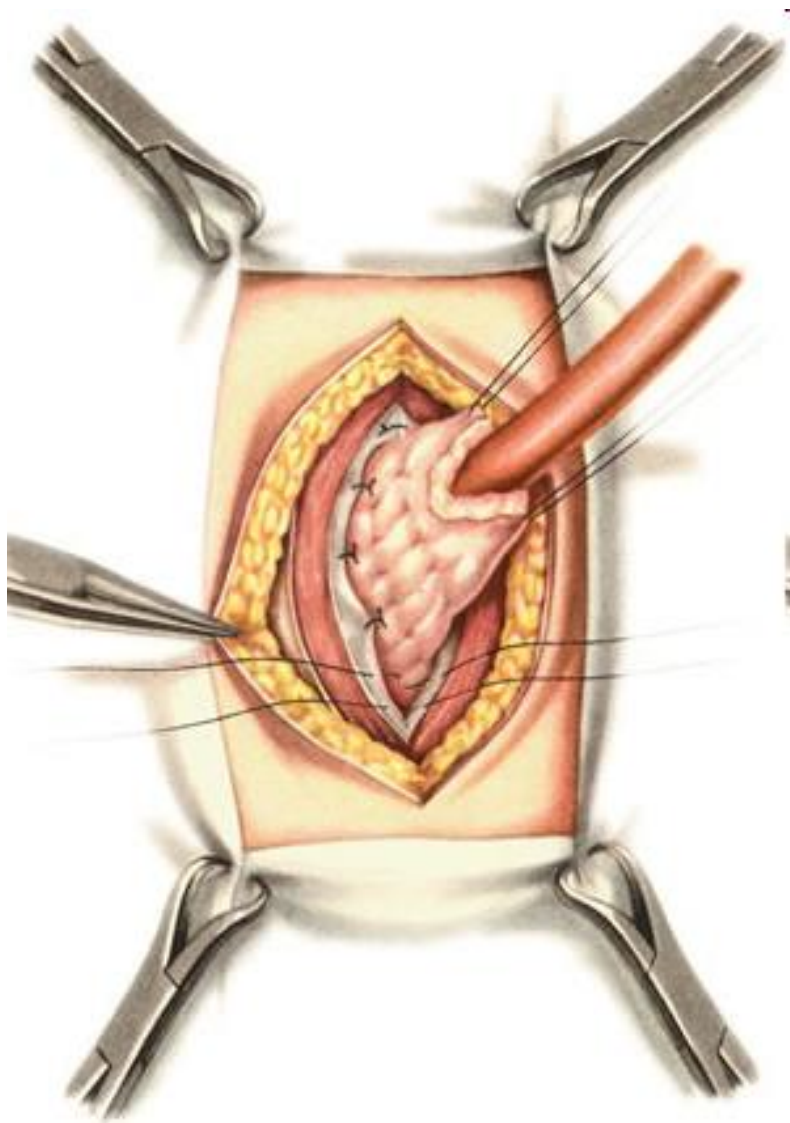




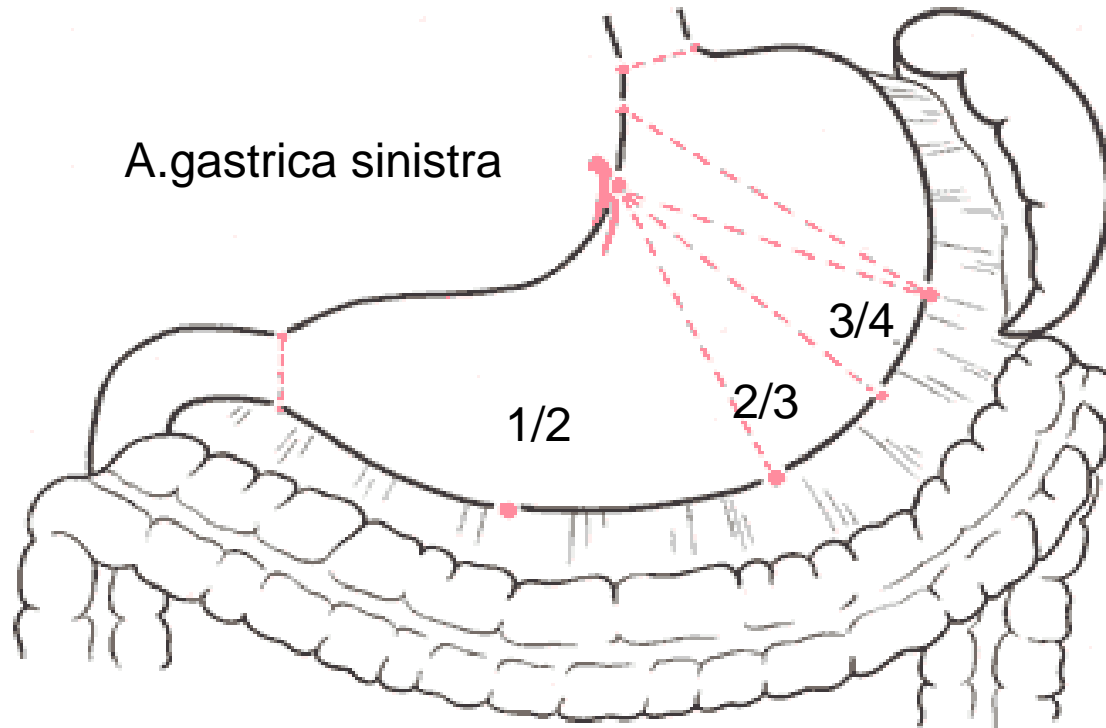
Gastrostomy by Stamm—Kader.



Gastrostomy by Toprover (permanent)

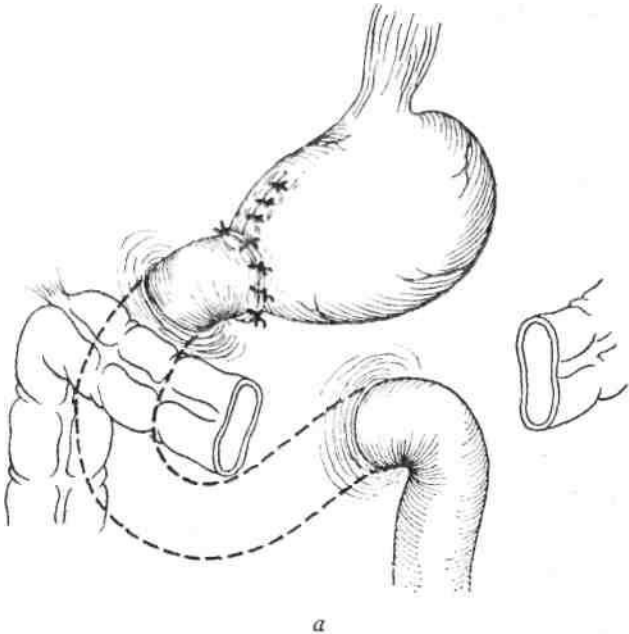


Determination of gastric resection borders.

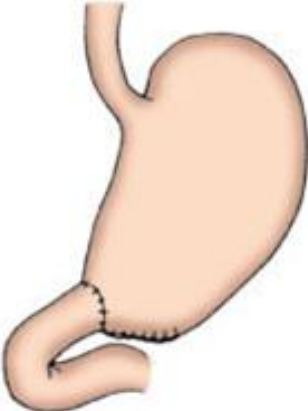


RESECTION OF STOMACH

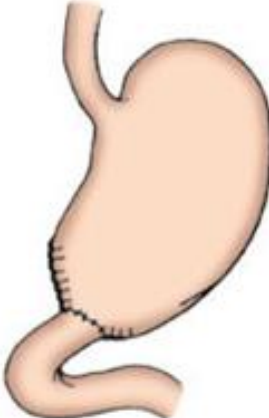
Billroth I



a

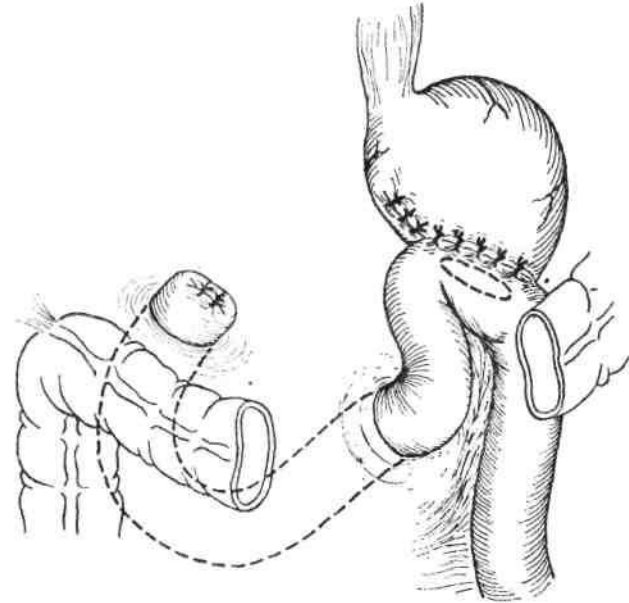


Classic Billroth I 1881

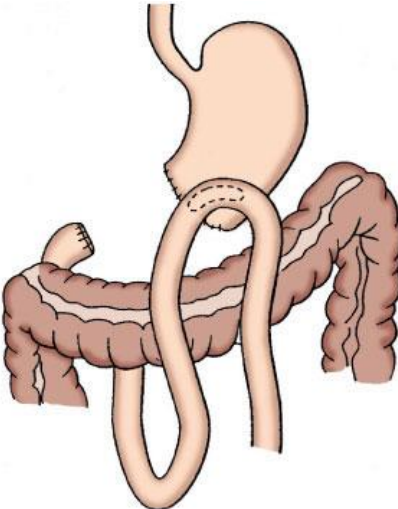


Standard Billroth I

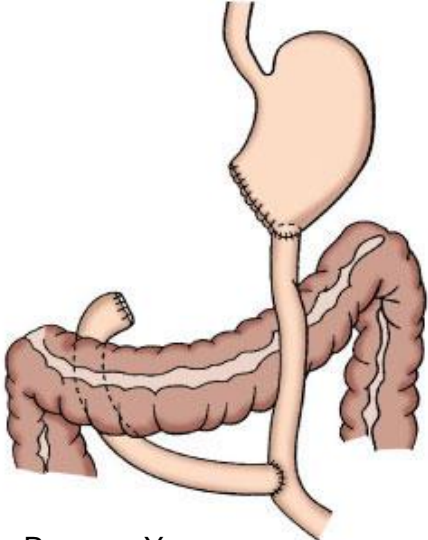
Billroth II



b

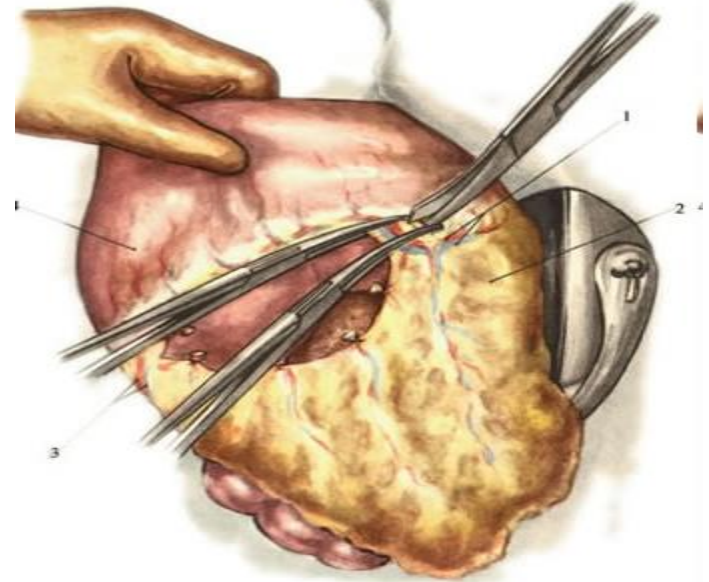
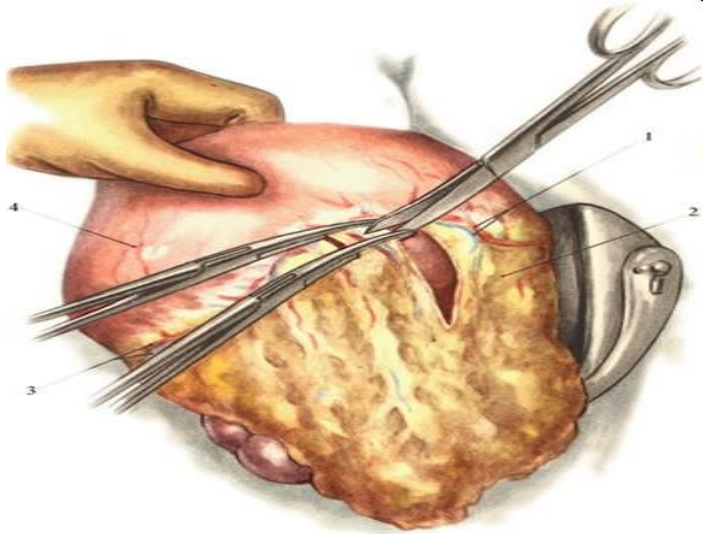


Billroth II 1885



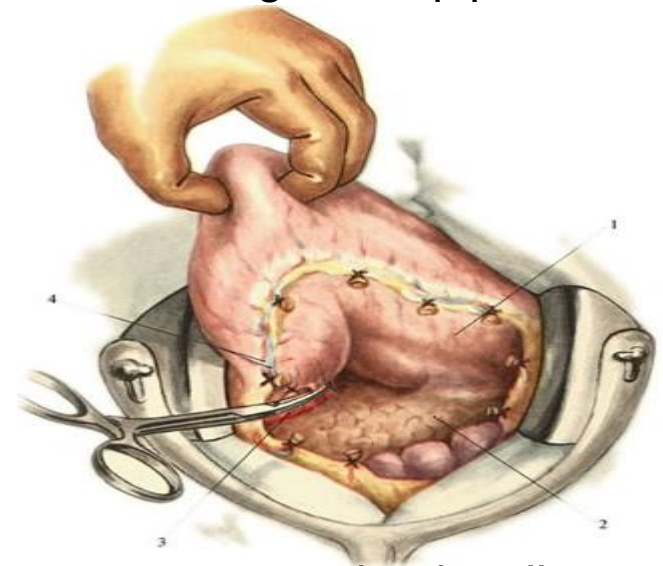
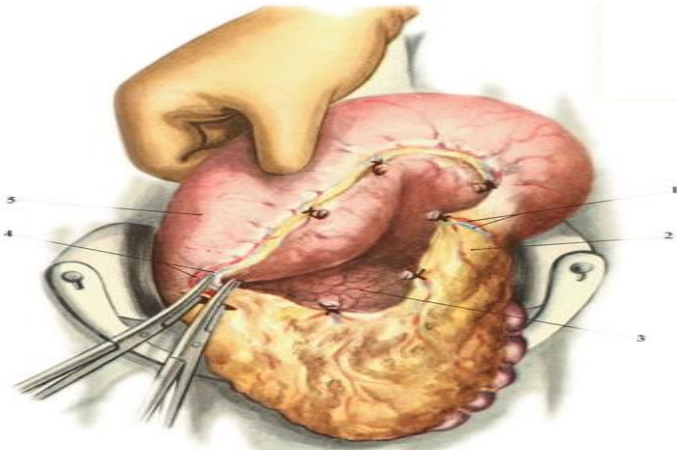
Roux-en-Y

Mobilization of stomach (greater curvature).



Dissection of lig. gastrocolicum.

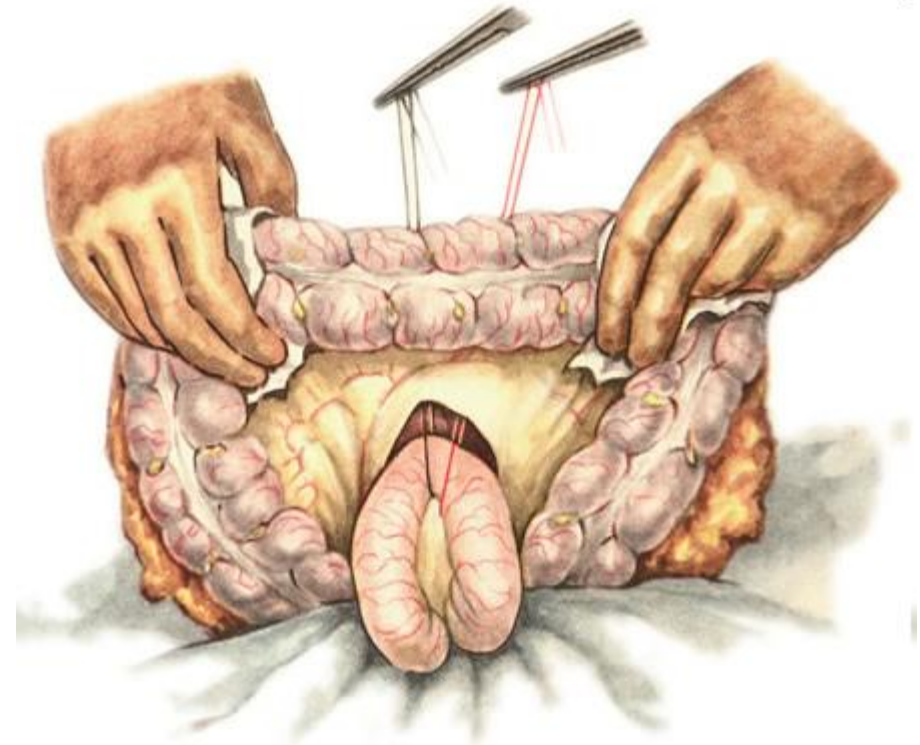
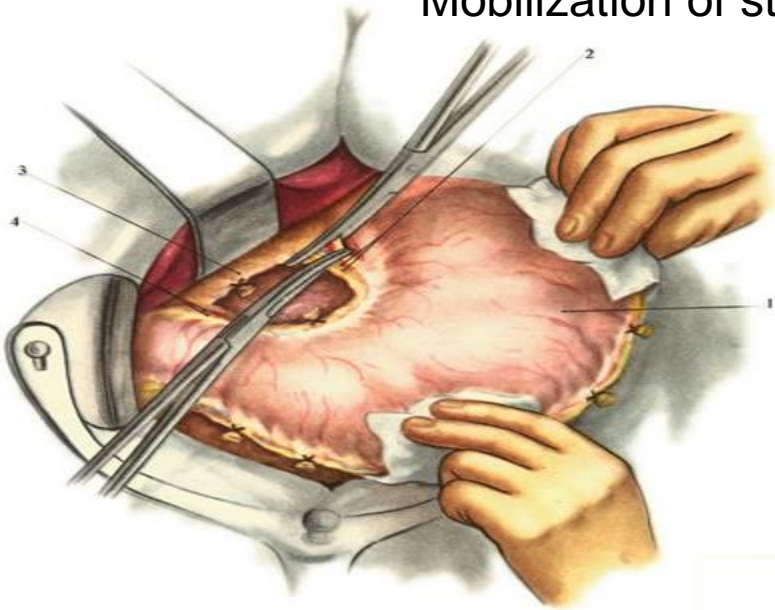
Dissection of a. et v. gastro-epiploica sinistra.



a. et v. gastro-epiploica dextra.

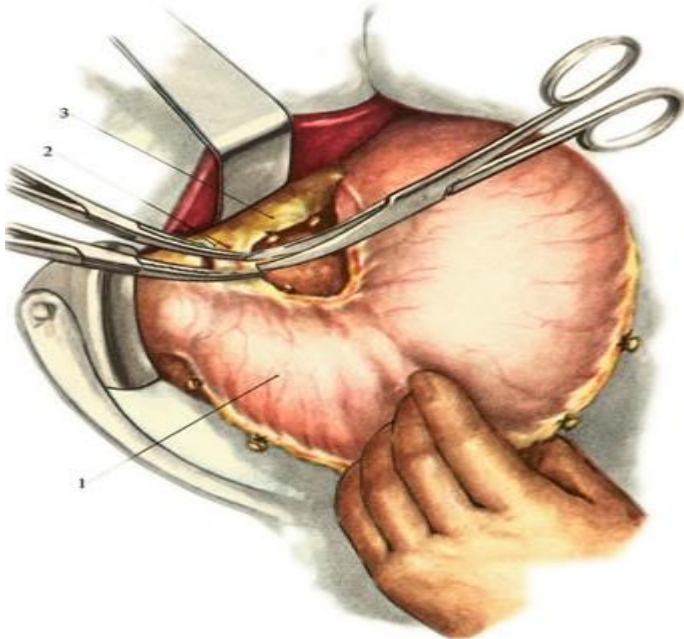
a. et v. gastroduodenalis.

Mobilization of stomach (lesser curvature).

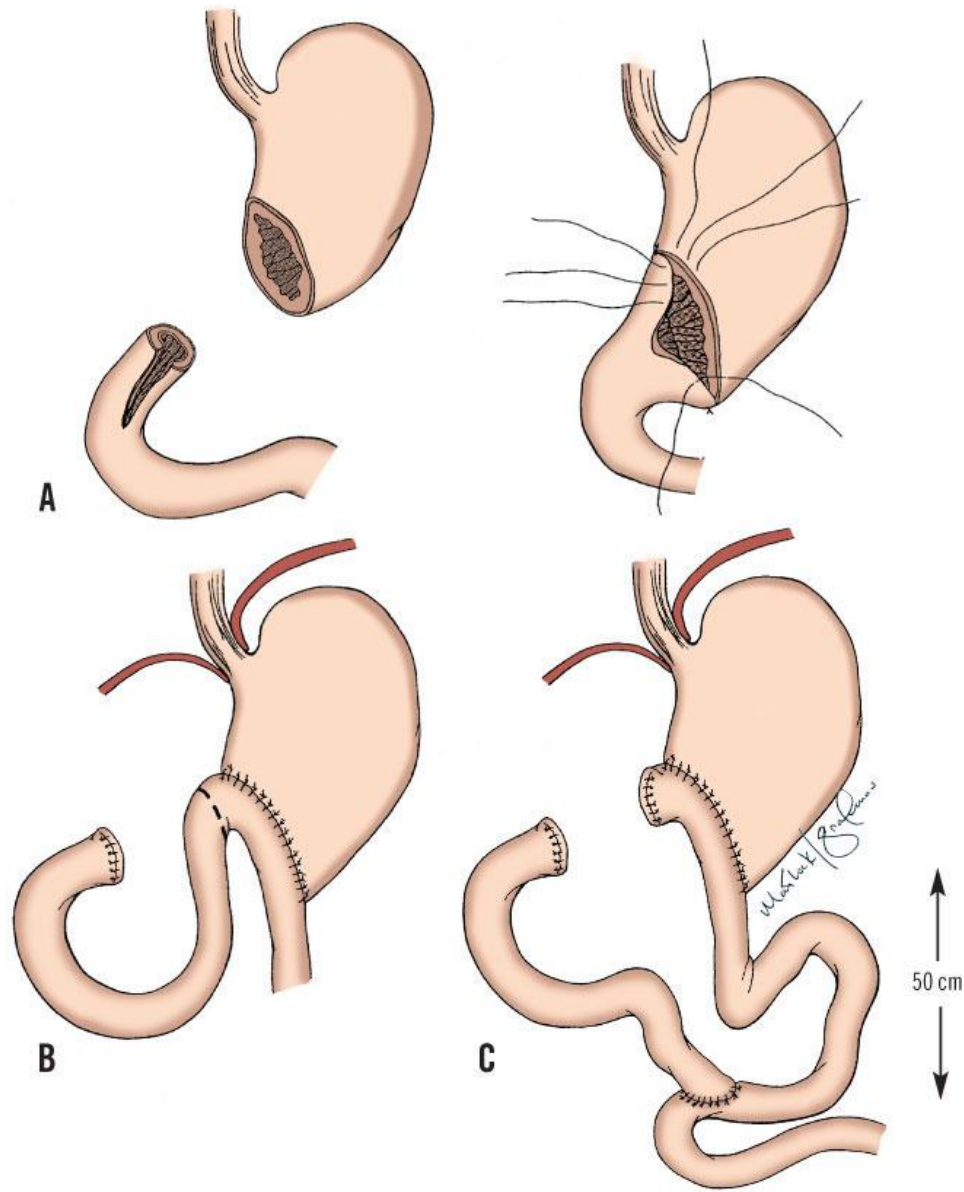


Insertion of the intestinal loop through foramen in mesocolon of transversal colon.

Dissection of a. et v. gastrica dextra.

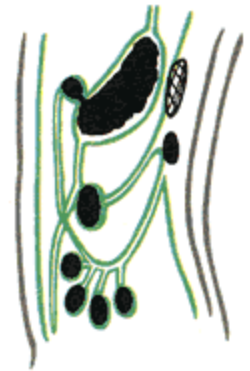
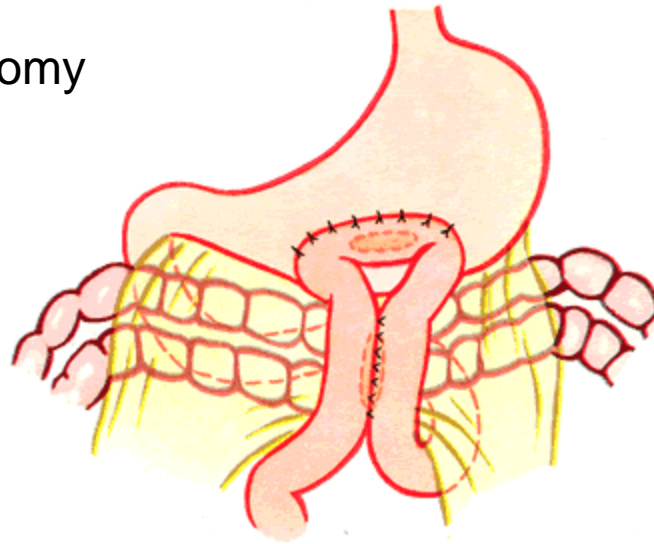


Dissection of a. et v. gastrica sinistra.

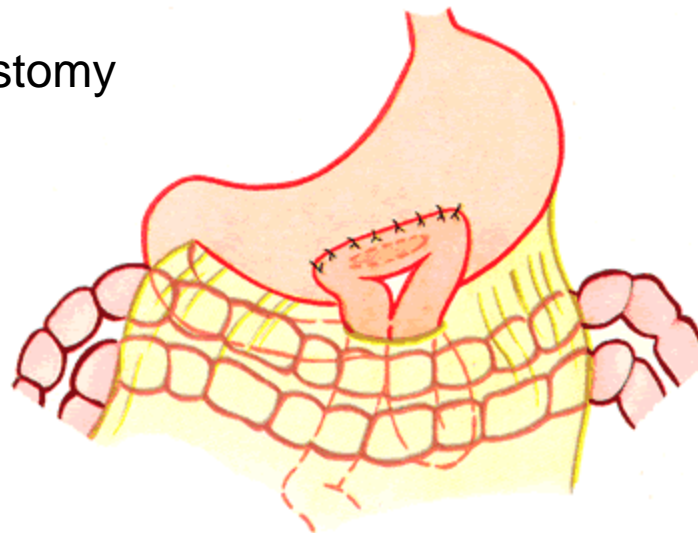


Reconstructive procedures for partial gastrectomy. **A**, Modified Billroth I. **B**, Billroth II. **C**, Roux-en-Y gastrojejunostomy.

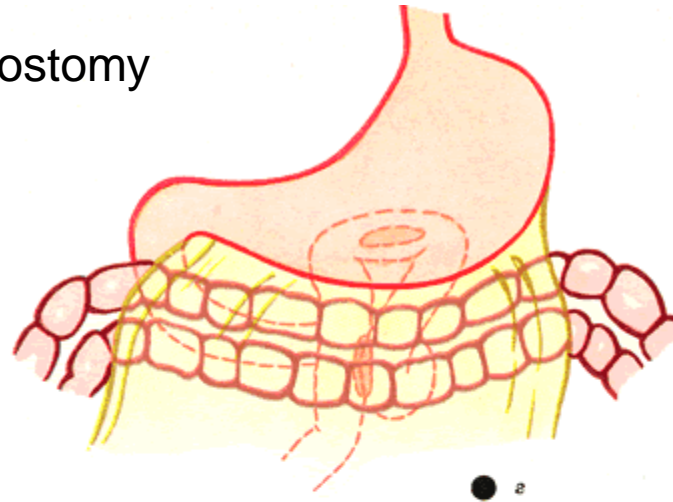
Anterior antecolic gastroenterostomy
by Welfler



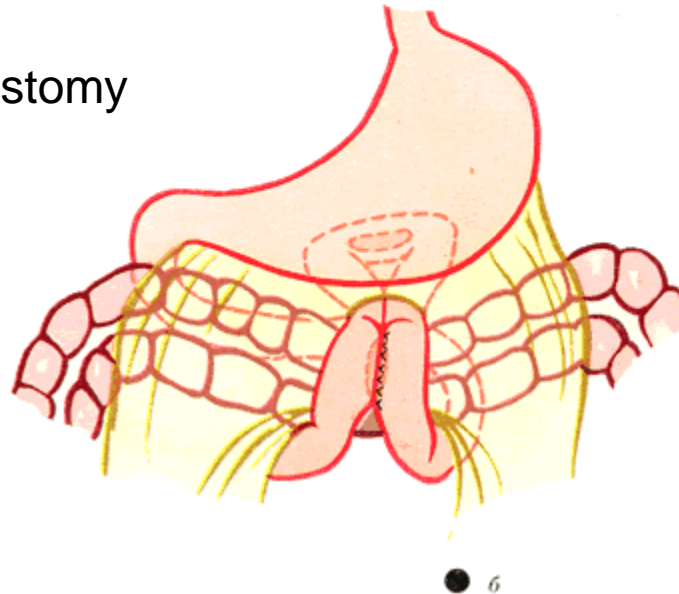
Anterior retrocolic gastroenterostomy



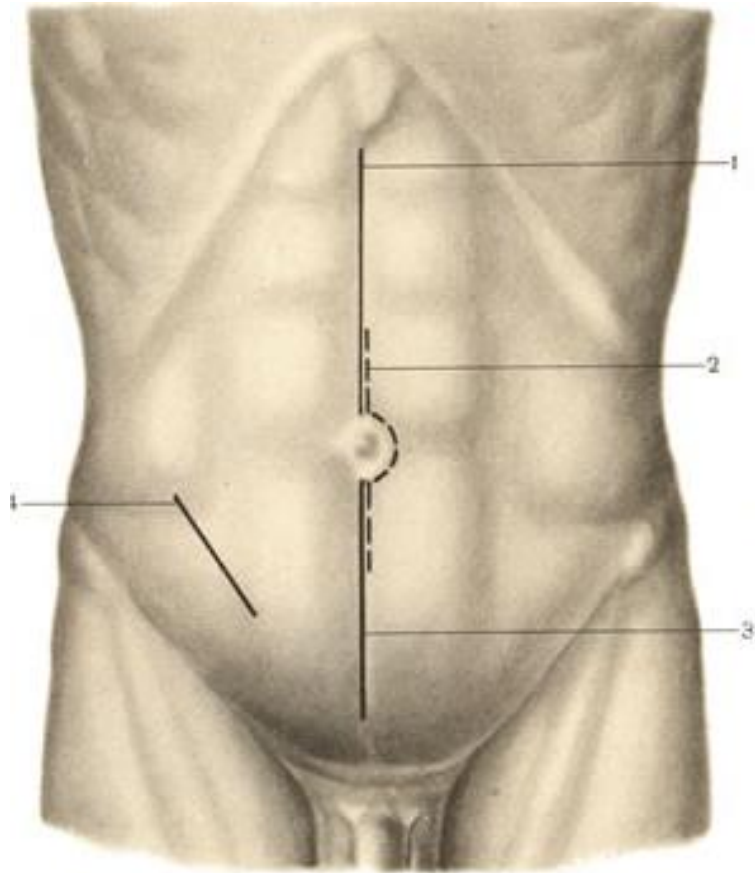
Posterior retrocolic gastroenterostomy by Hacker - Petersen



Posterior antecolic gastroenterostomy



Surgical accesses to the intestine



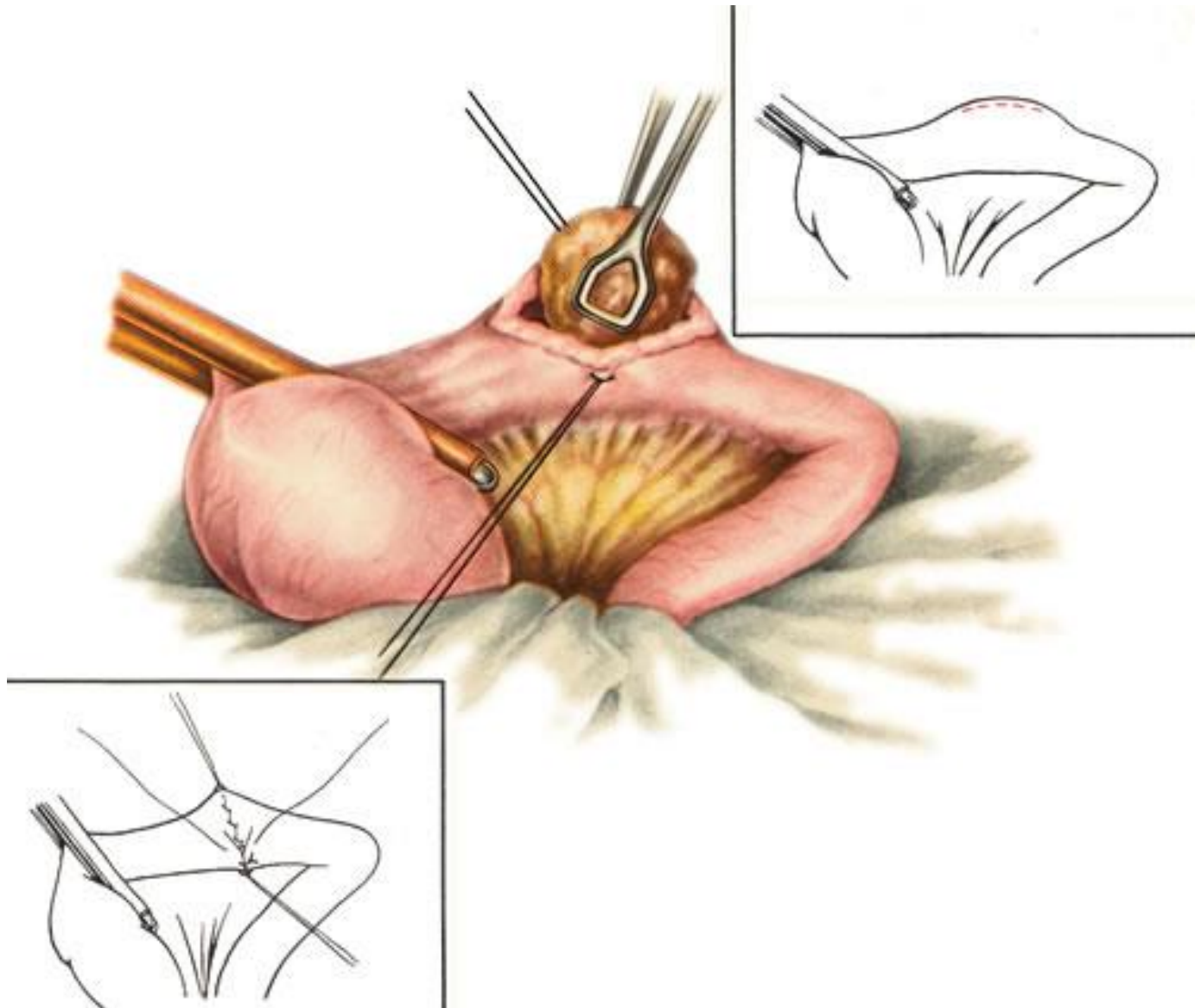
1 — superior median laparotomy;

2 — middle median laparotomy;

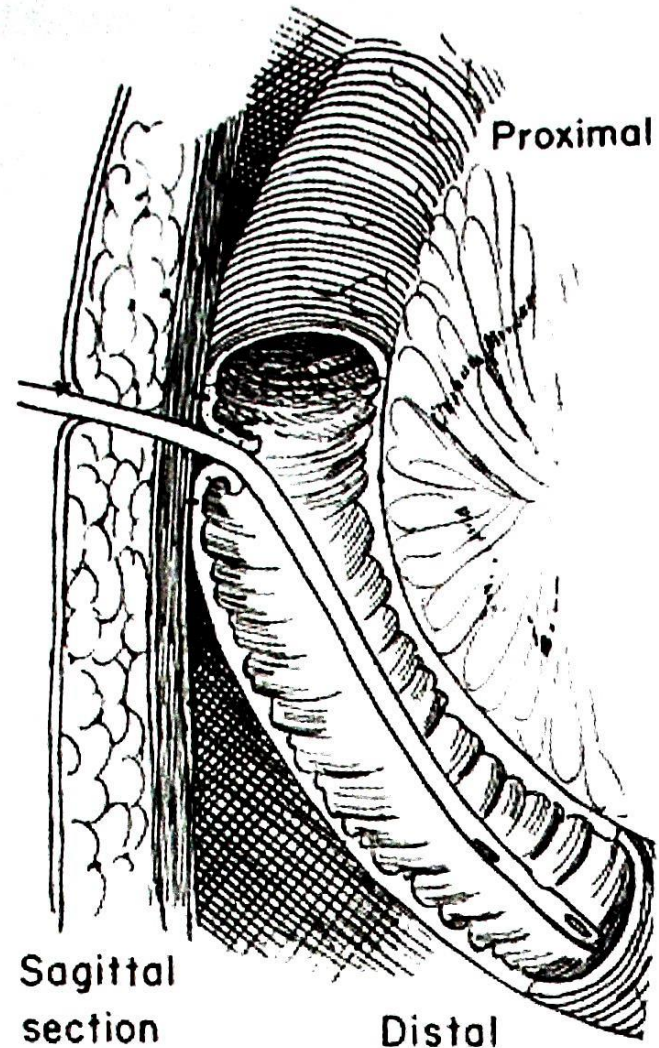
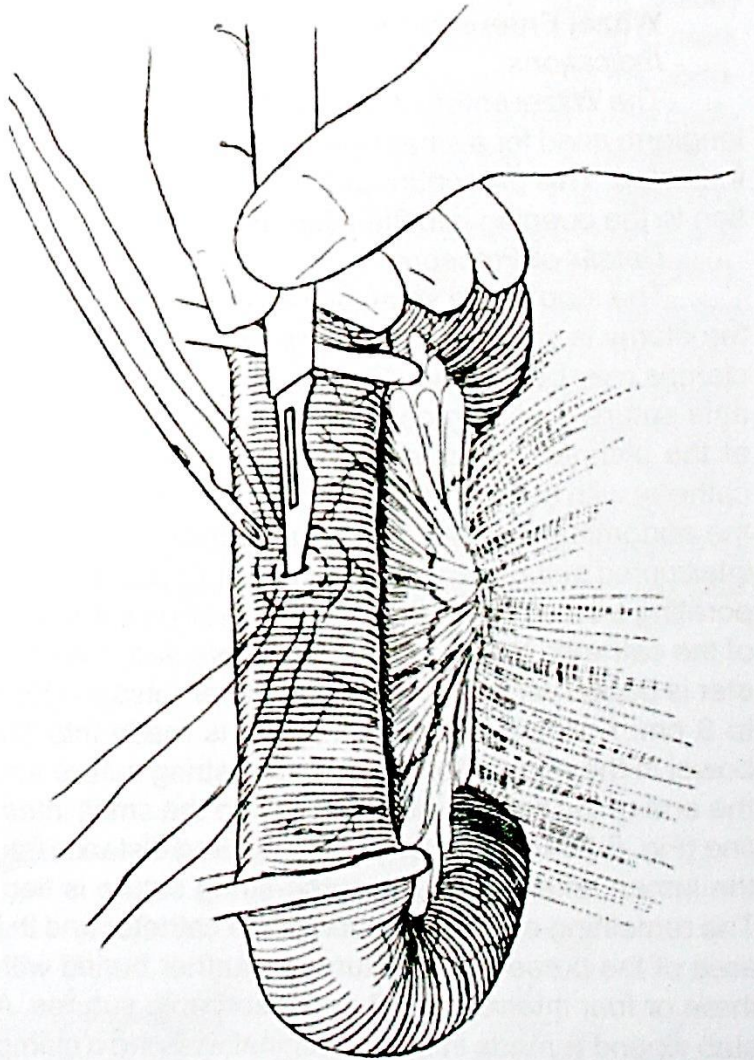
3 — inferior median laparotomy;

4 — oblique access through McBurney`s point.

ENTEROTOMY



ENTEROSTOMY

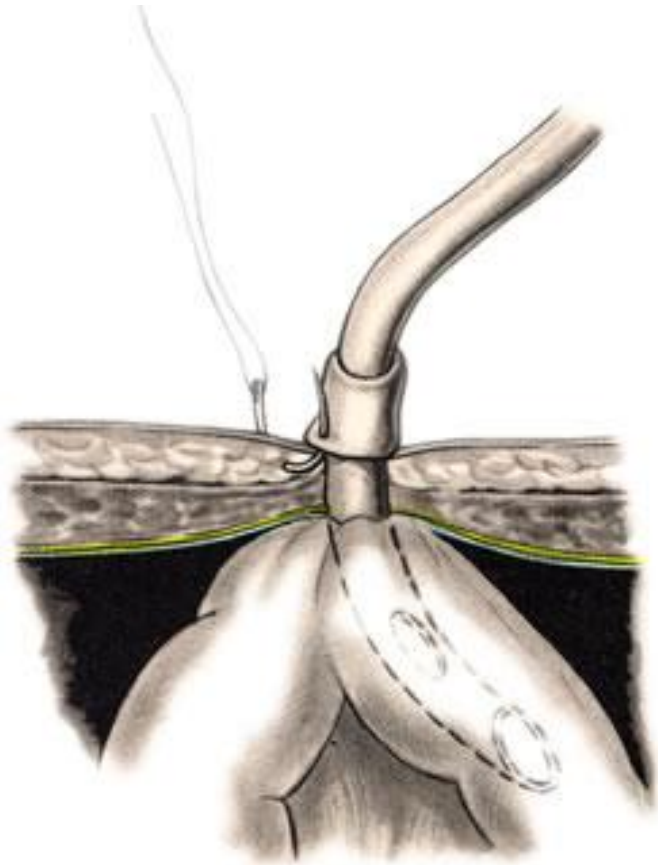


Sagittal
section

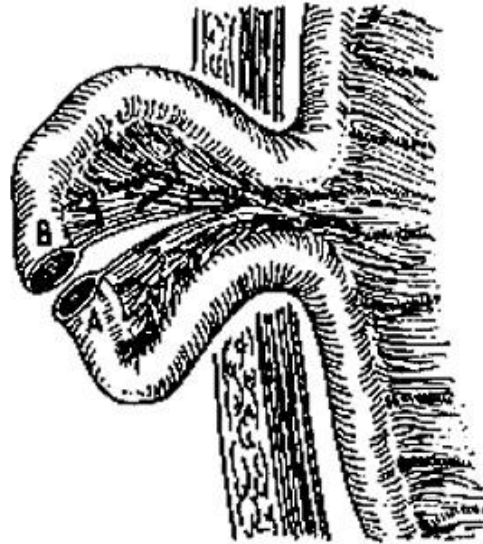
Distal

Proximal

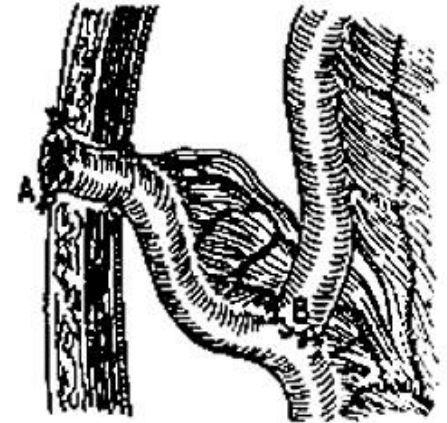
ENTEROSTOMY



A.



B.



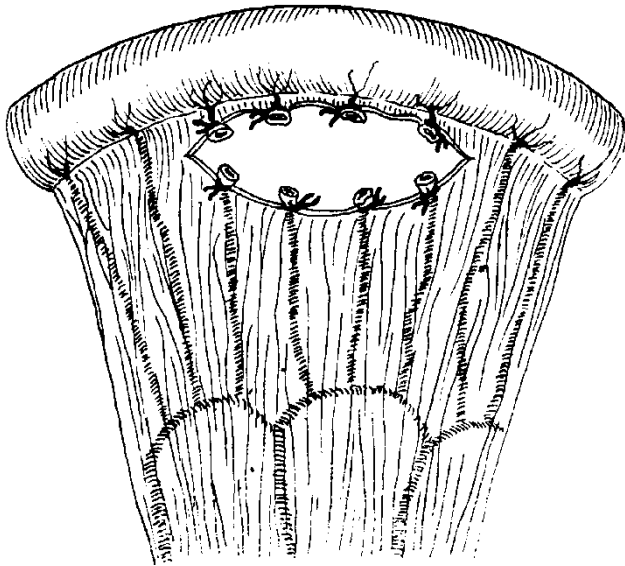
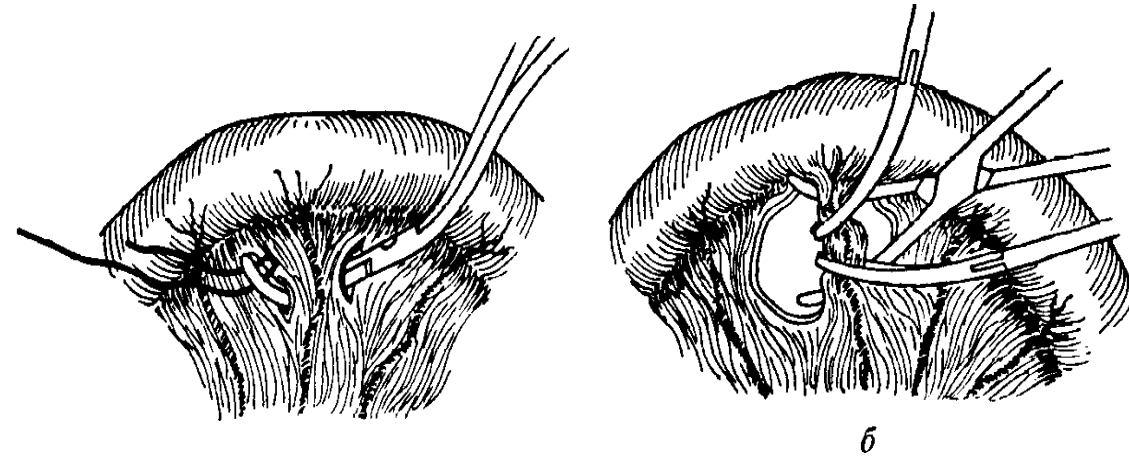
C.

A. By Witzel

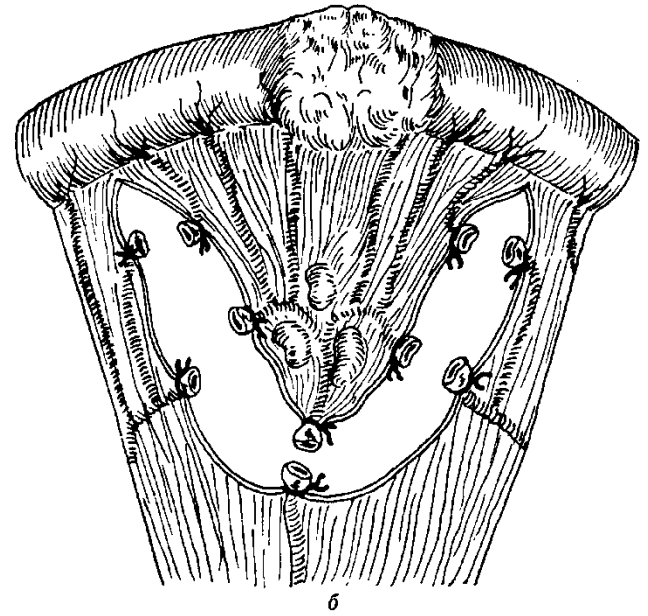
B. By Meyo

C. Distal loop will be off

Resection and anastomosis in small intestine



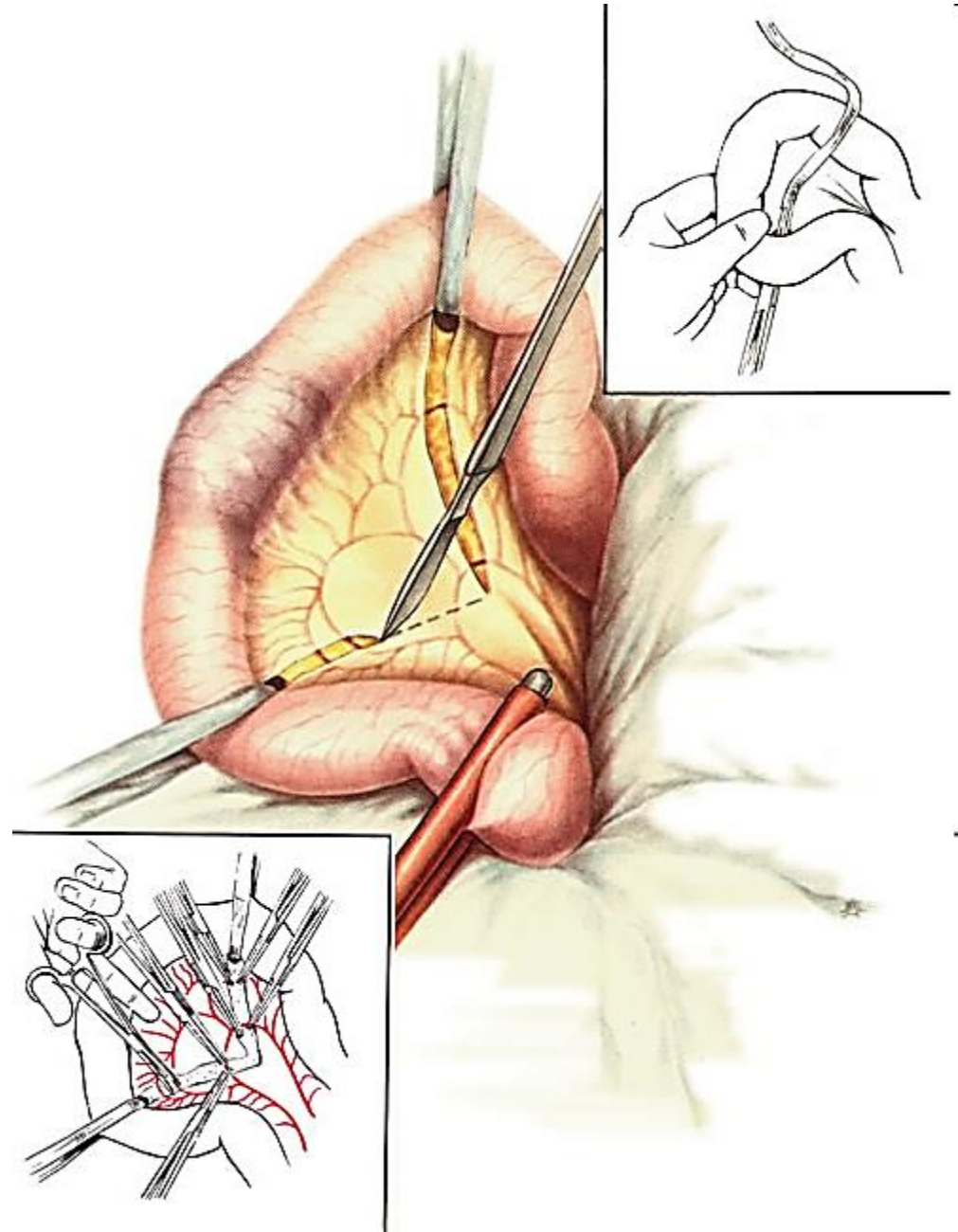
Marginal



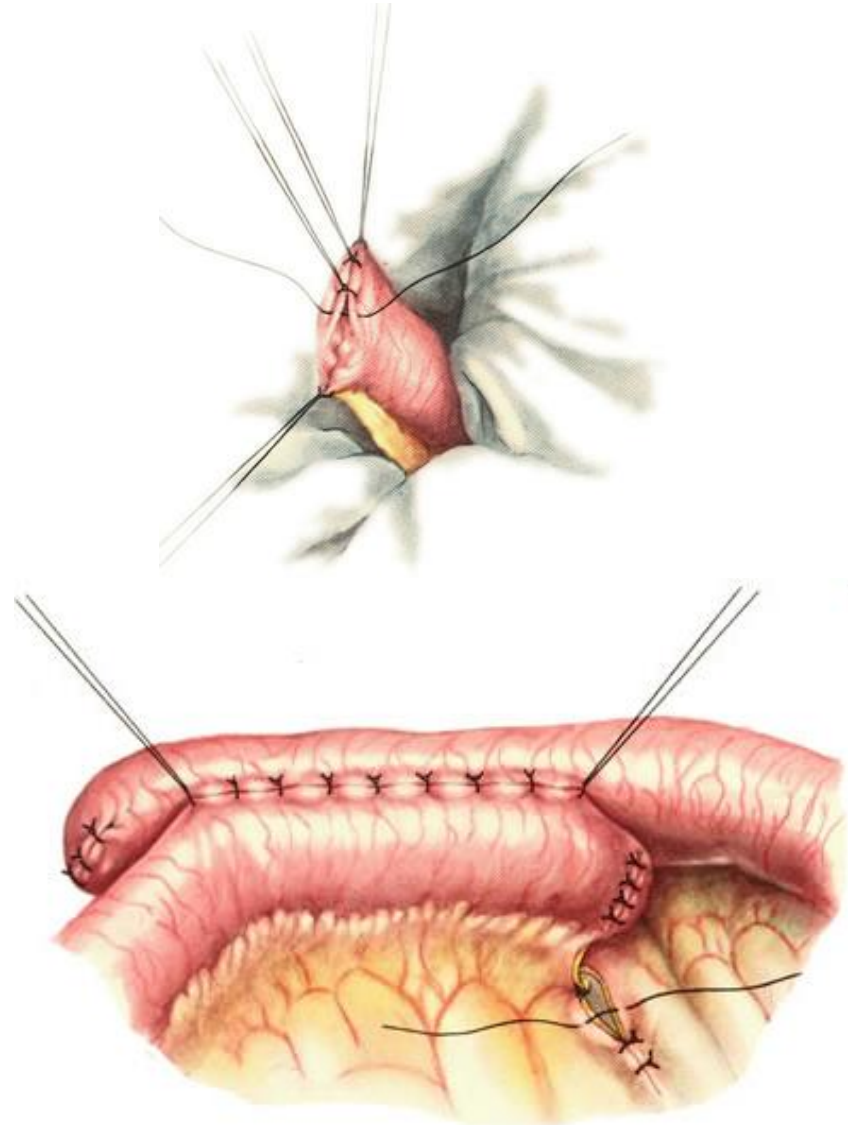
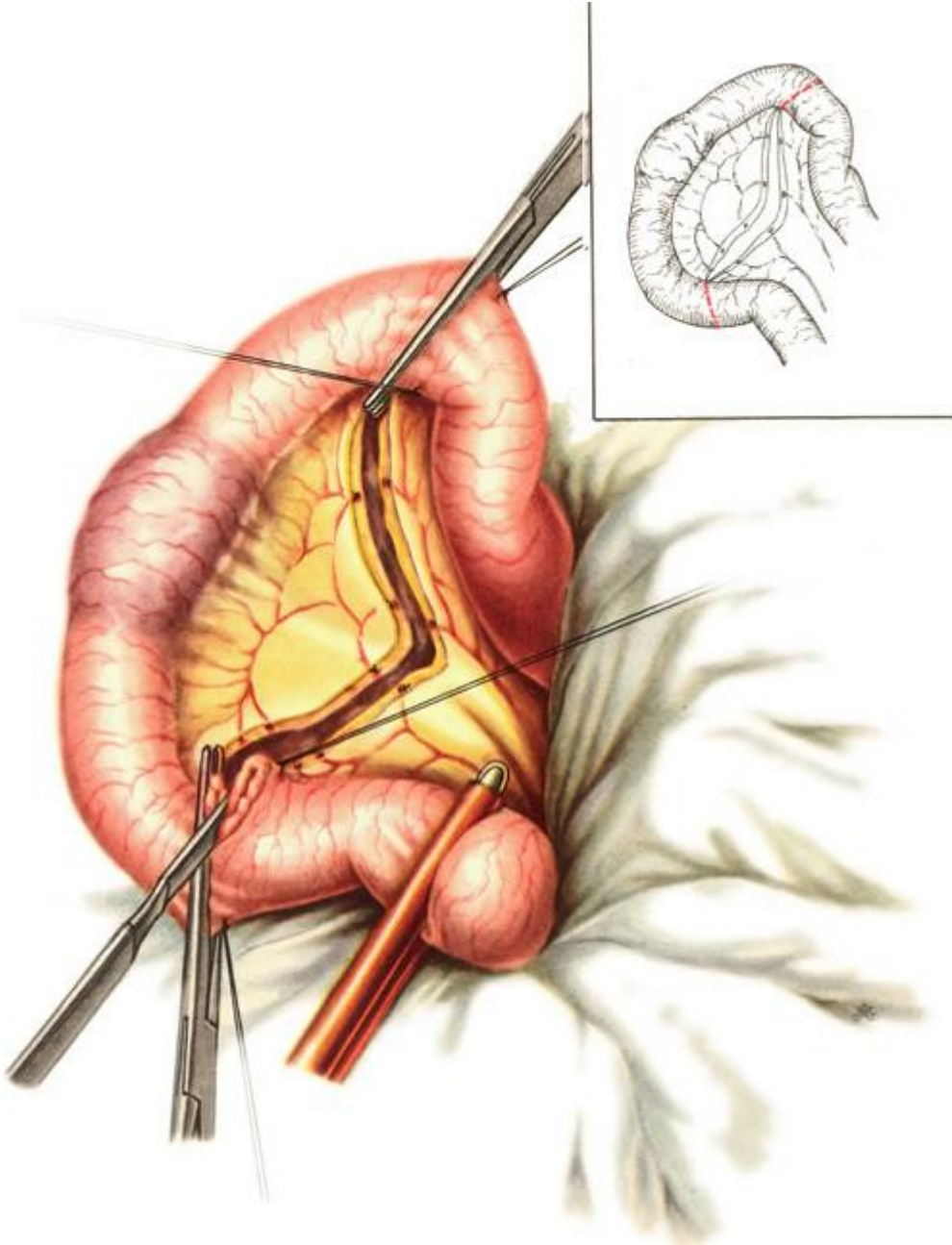
Segmental

RESECTION OF THE SMALL INTESTINE

Step 1. Mobilization
of the intestinal loop

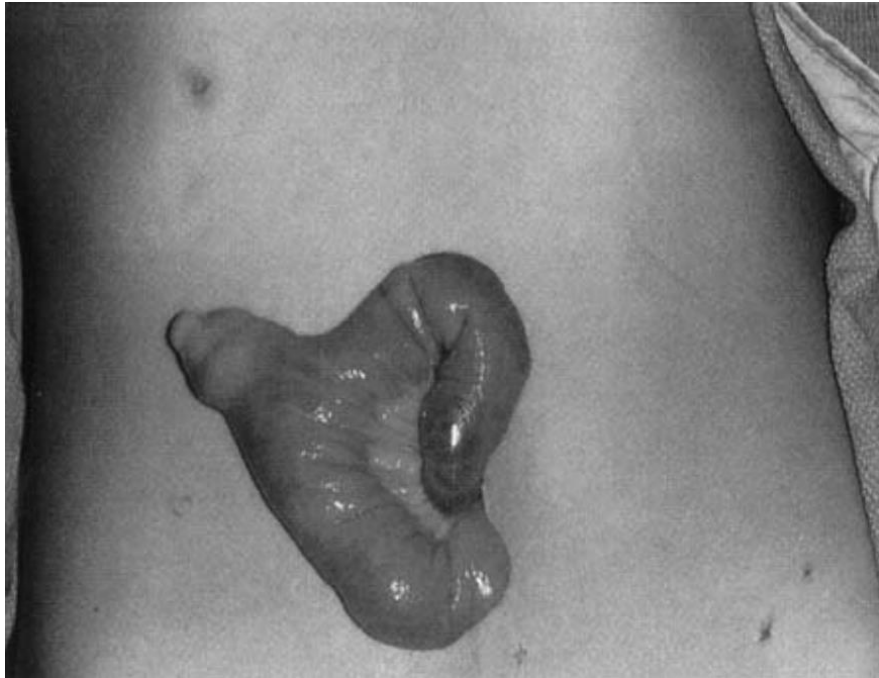


Step 2. Cutting of intestine

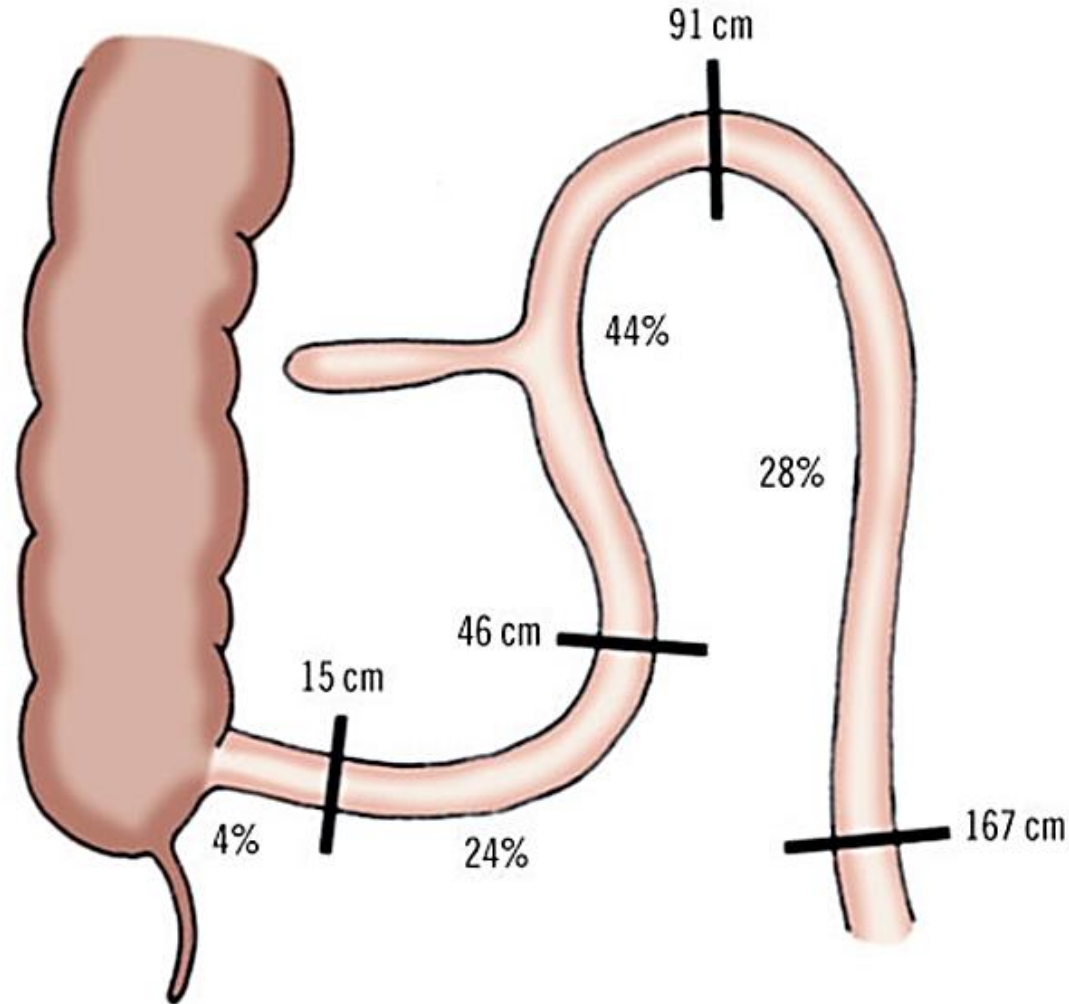


Step 3. Making of anastomosis

Meckel's diverticulum

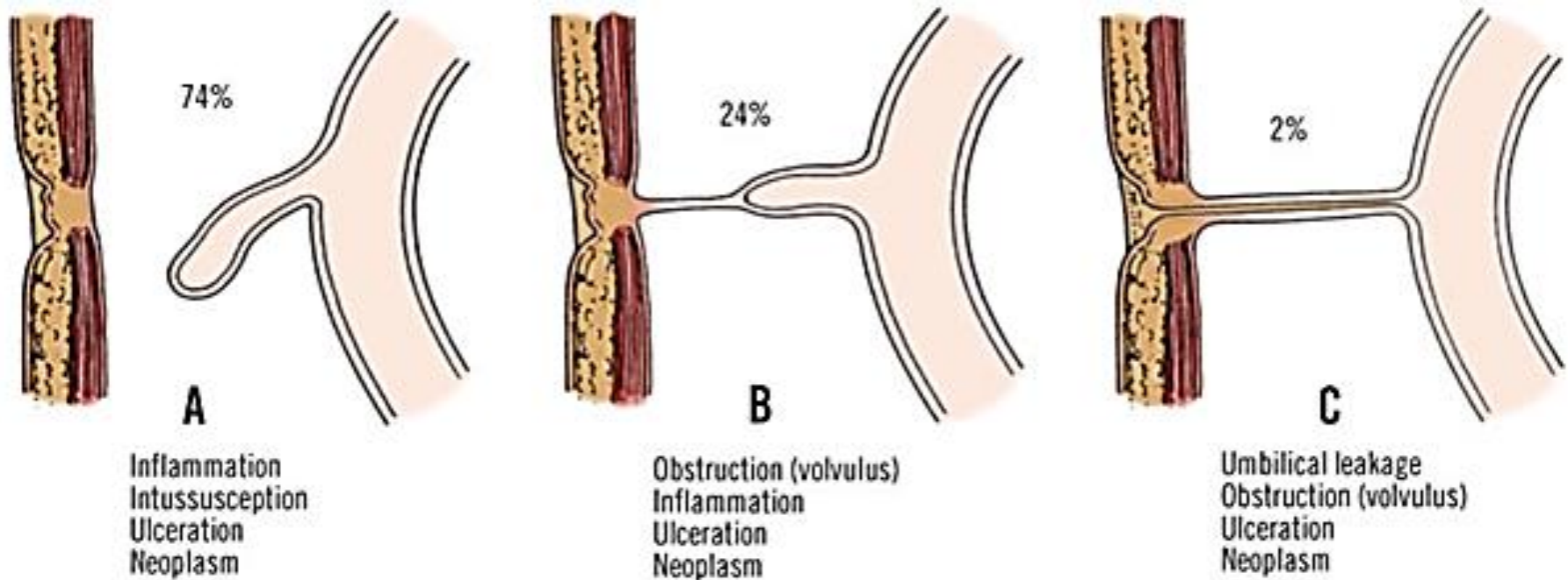


Meckel's diverticulum



Location on the ileum and frequency of occurrence of Meckel's diverticulum.

Meckel's diverticulum



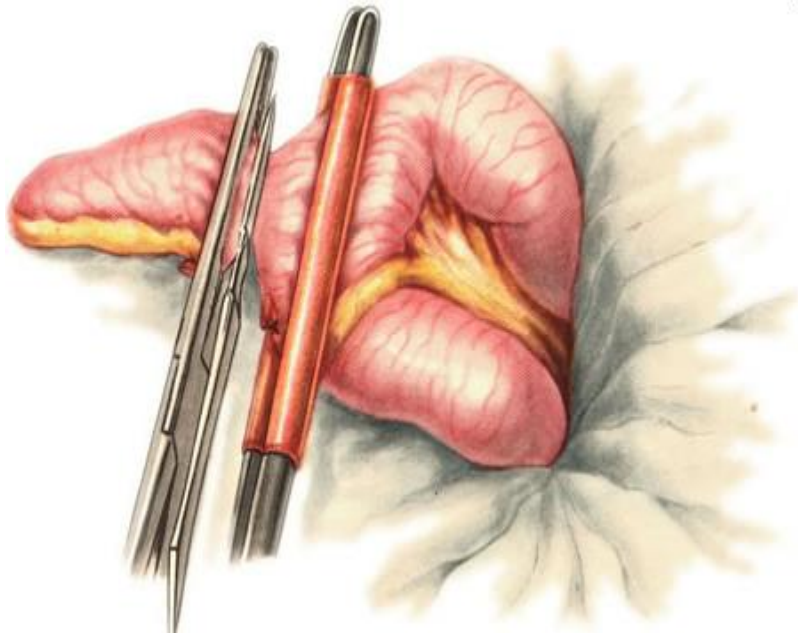
Major types of Meckel's diverticulum.

A. Diverticulum with free end not attached to body wall.

B. Diverticulum connected with the anterior body wall by a fibrous cord.

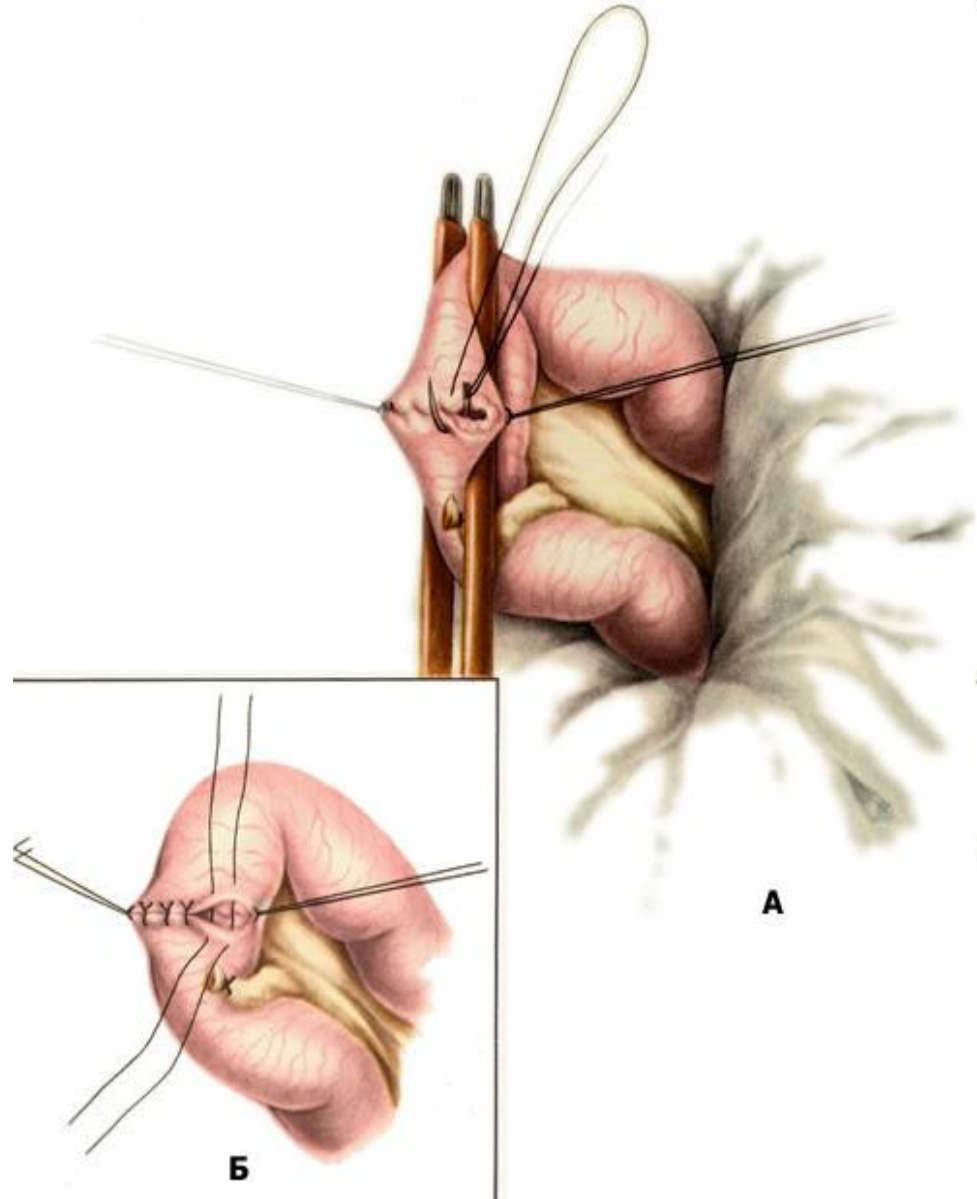
C. Fistula opening through the umbilicus.

RESECTION OF THE MECKEL`S DIVERTICULUM

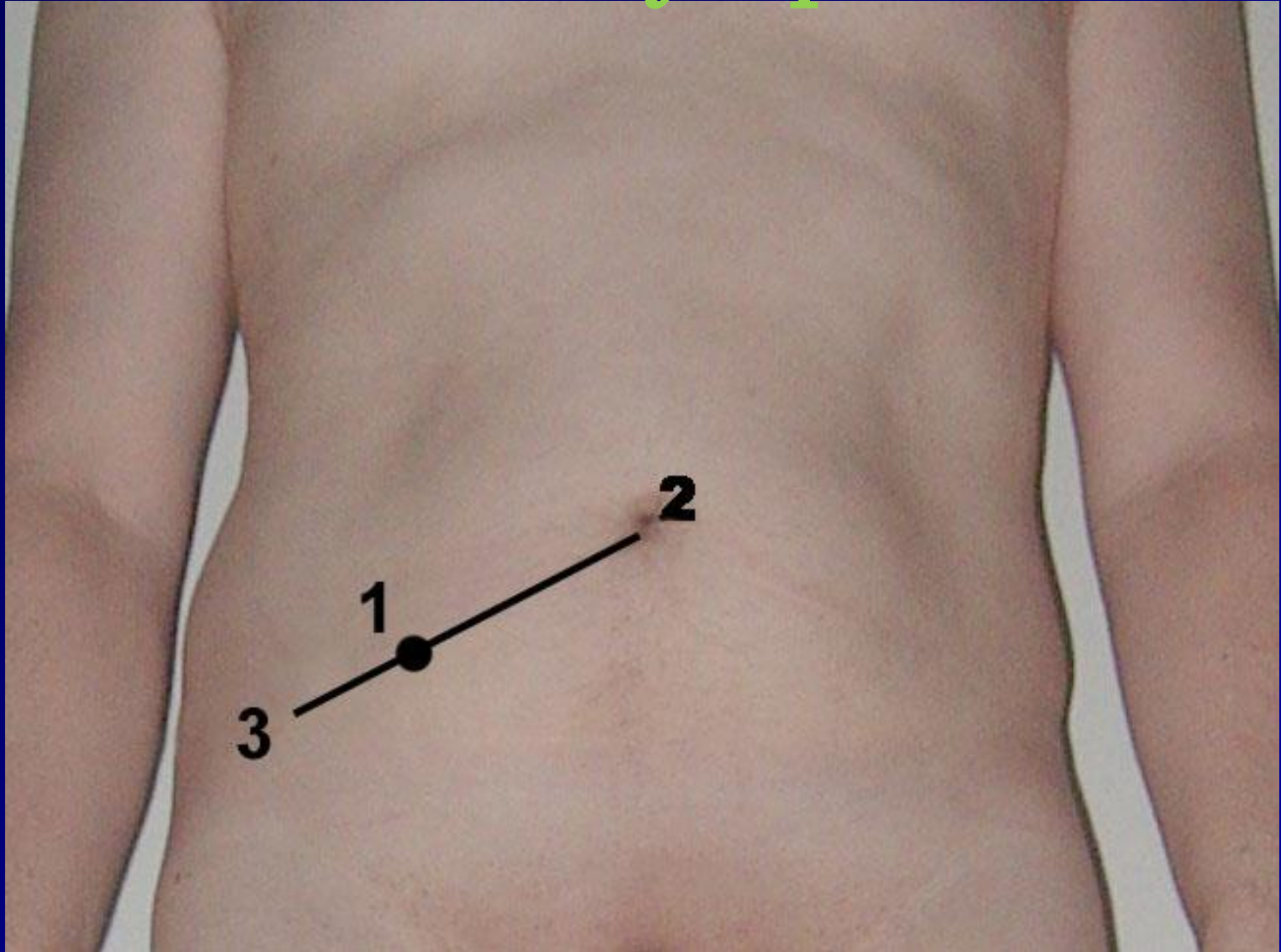


Cutting of the Meckel`s diverticulum

Stitching in transversal direction.



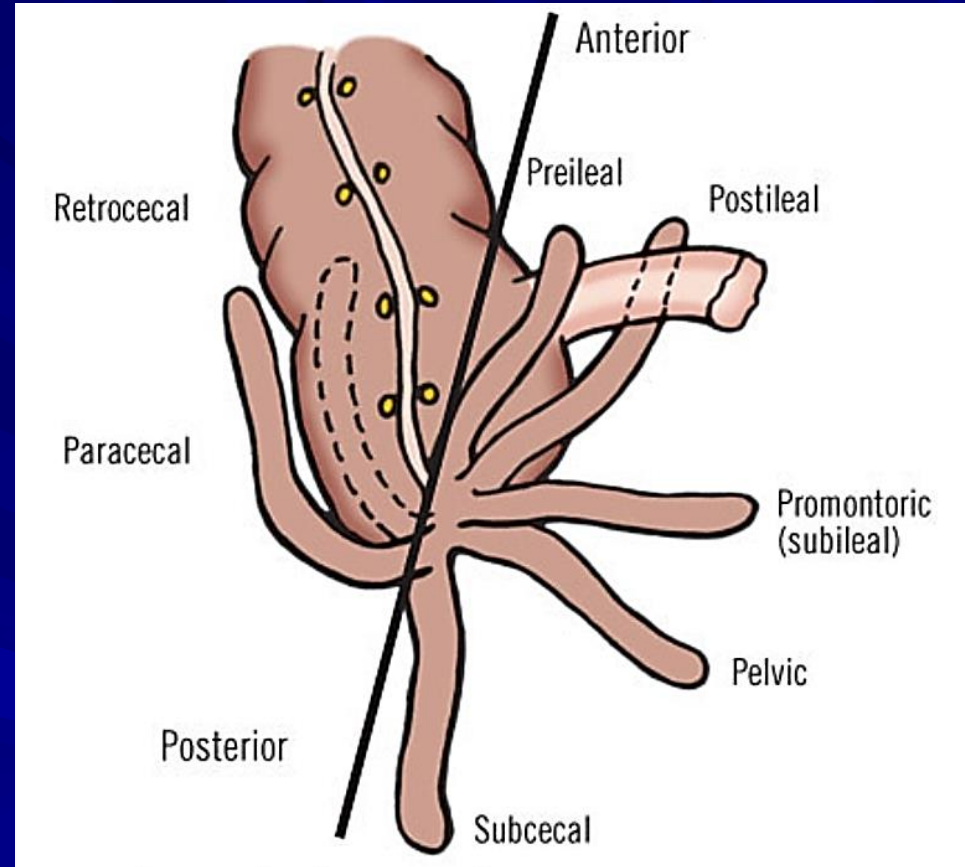
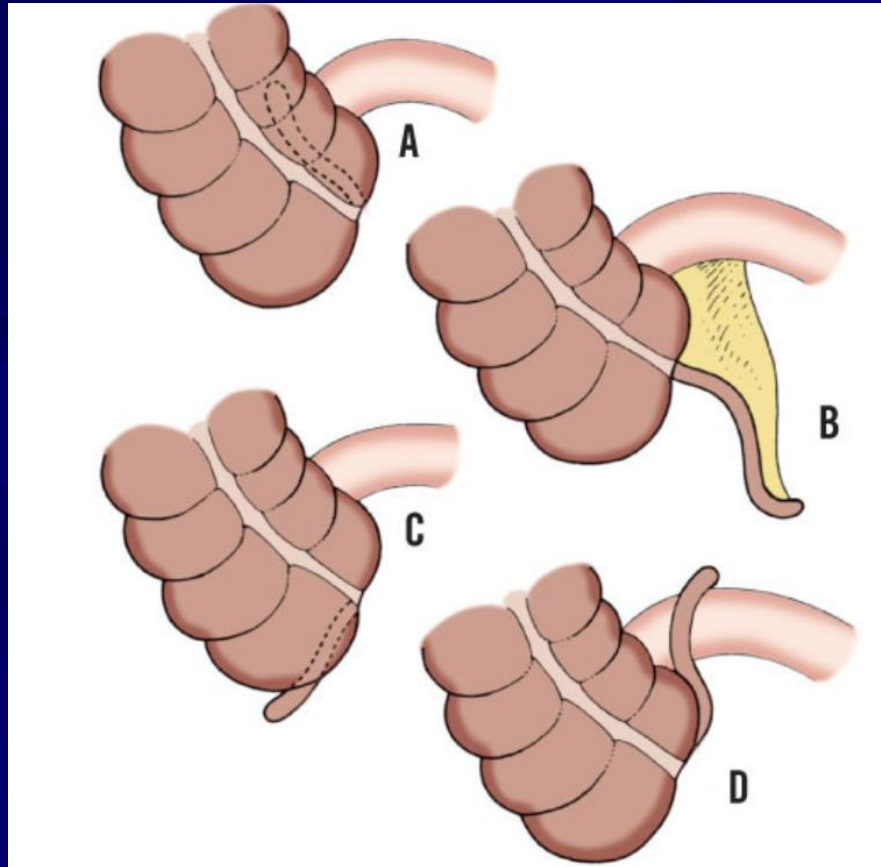
McBurney's point



McBurney's point (1) appears about **one-third** of the distance along a line starting at the **right ASIS** (3) and ending at the **umbilicus** (2).

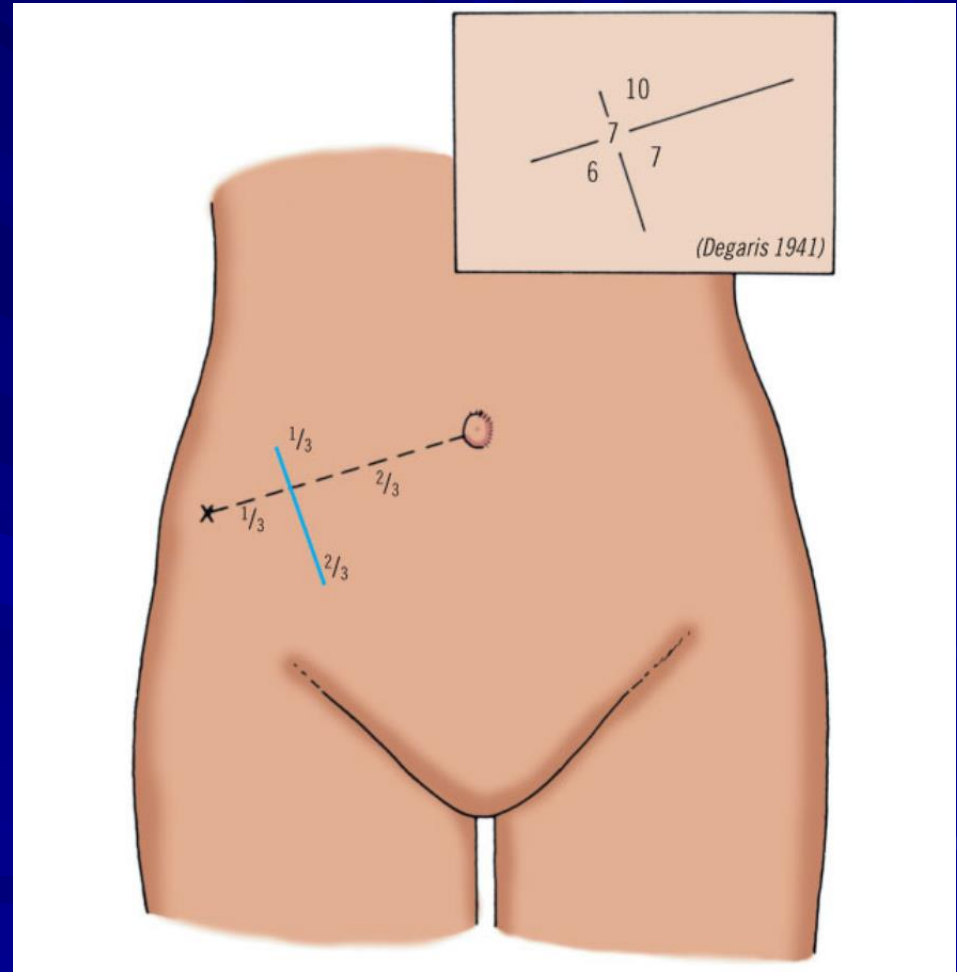
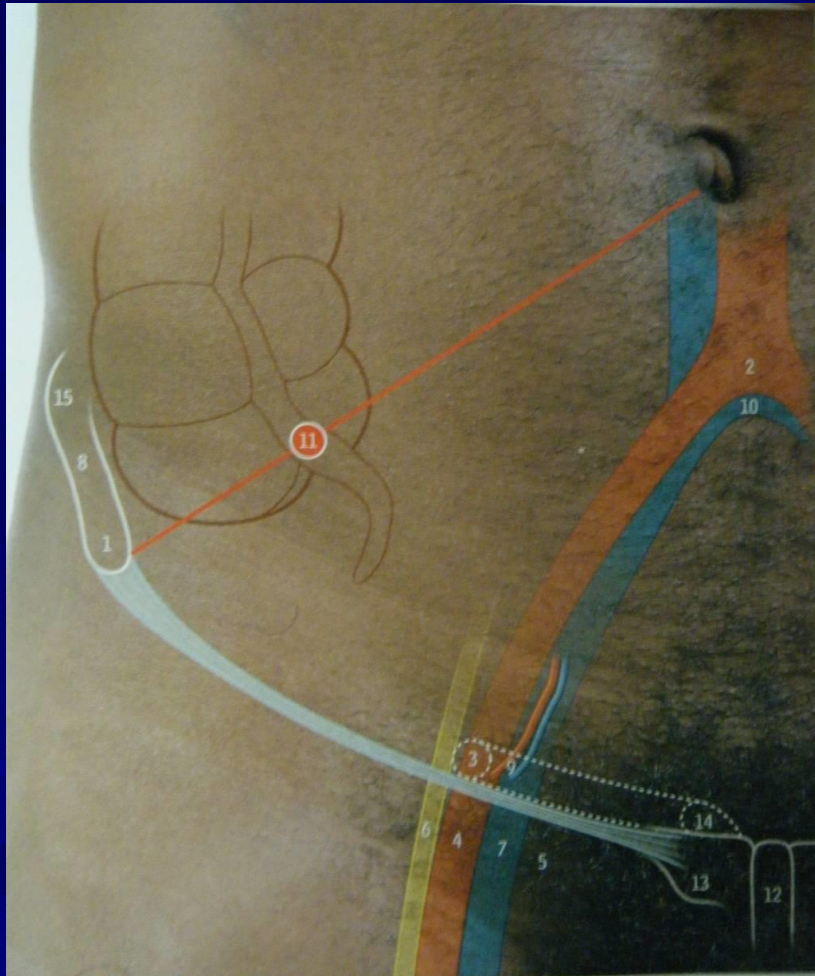
Appendix

Anterior and posterior positions of the appendiceal tip.



Variations in topographic position of the appendix. From its base at the cecum, the appendix may extend **(A)** upward, retrocecal and retrocolic; **(B)** downward, pelvic; **(C)** downward to the right, subcecal; or **(D)** upward to the left, ileocecal (may pass anterior or posterior to the ileum).

Incision for appendectomy (blue line) in relation to McBurney's point.



Anterograde appendectomy (in the case of mobile cecum)

1. The small bowel is pushed aside medially with an abdominal swab, and the cecum is exposed using a retractor.



Anterograde appendectomy

2. The caecum is now grasped with the left hand.

- By applying tension in a slight upward curve, the caecum is brought above the abdominal wall.

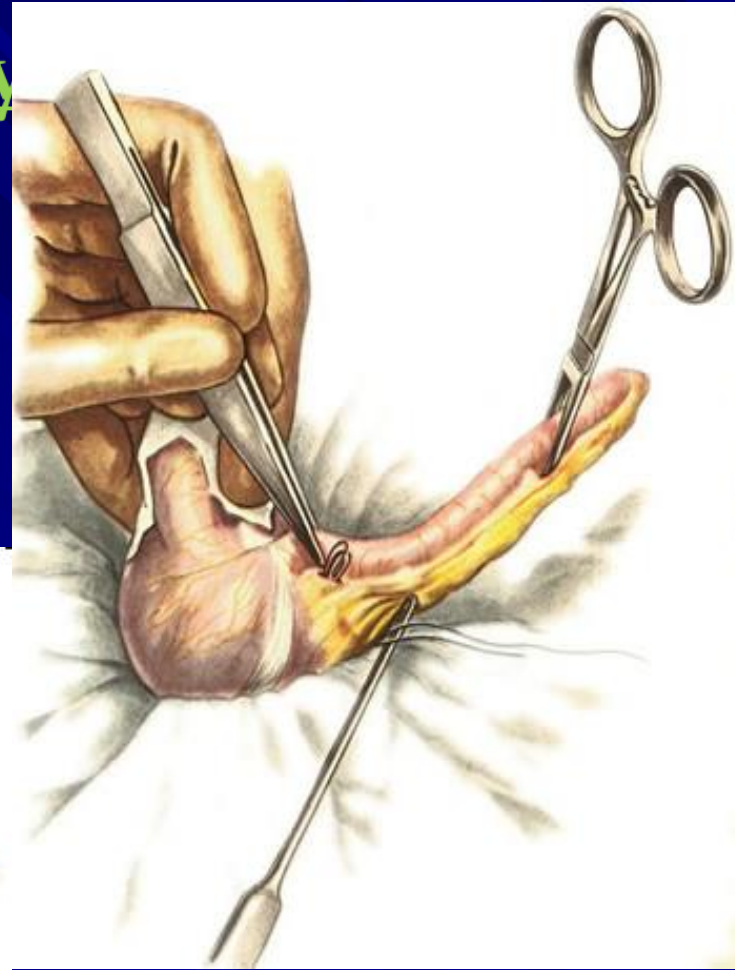
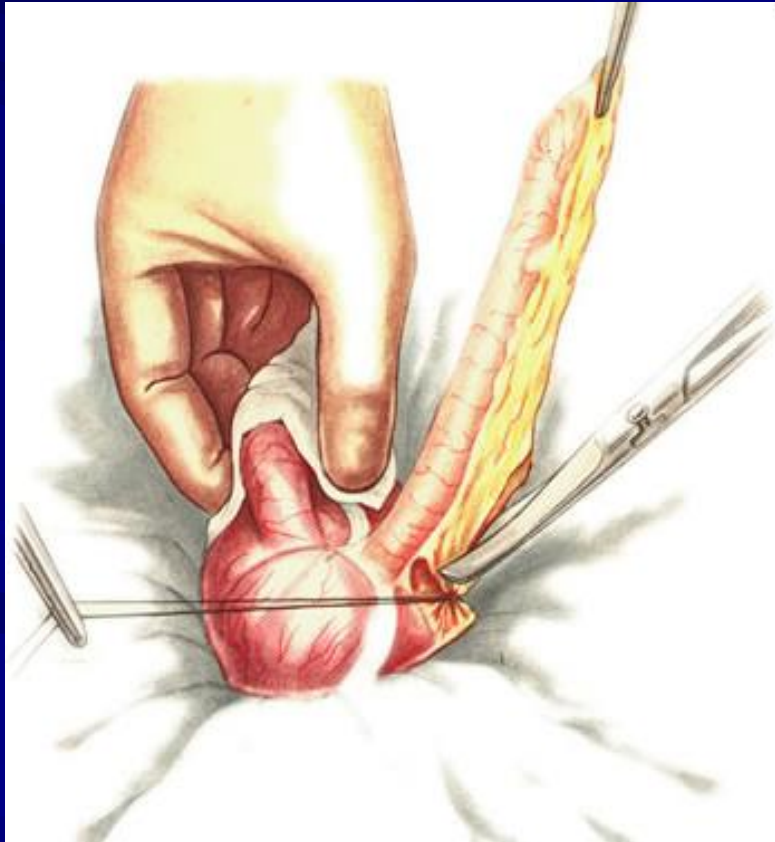
- The appendix is identified at the end of the tenia libera.

- It is grasped with a clamp at its mesenteriolum.



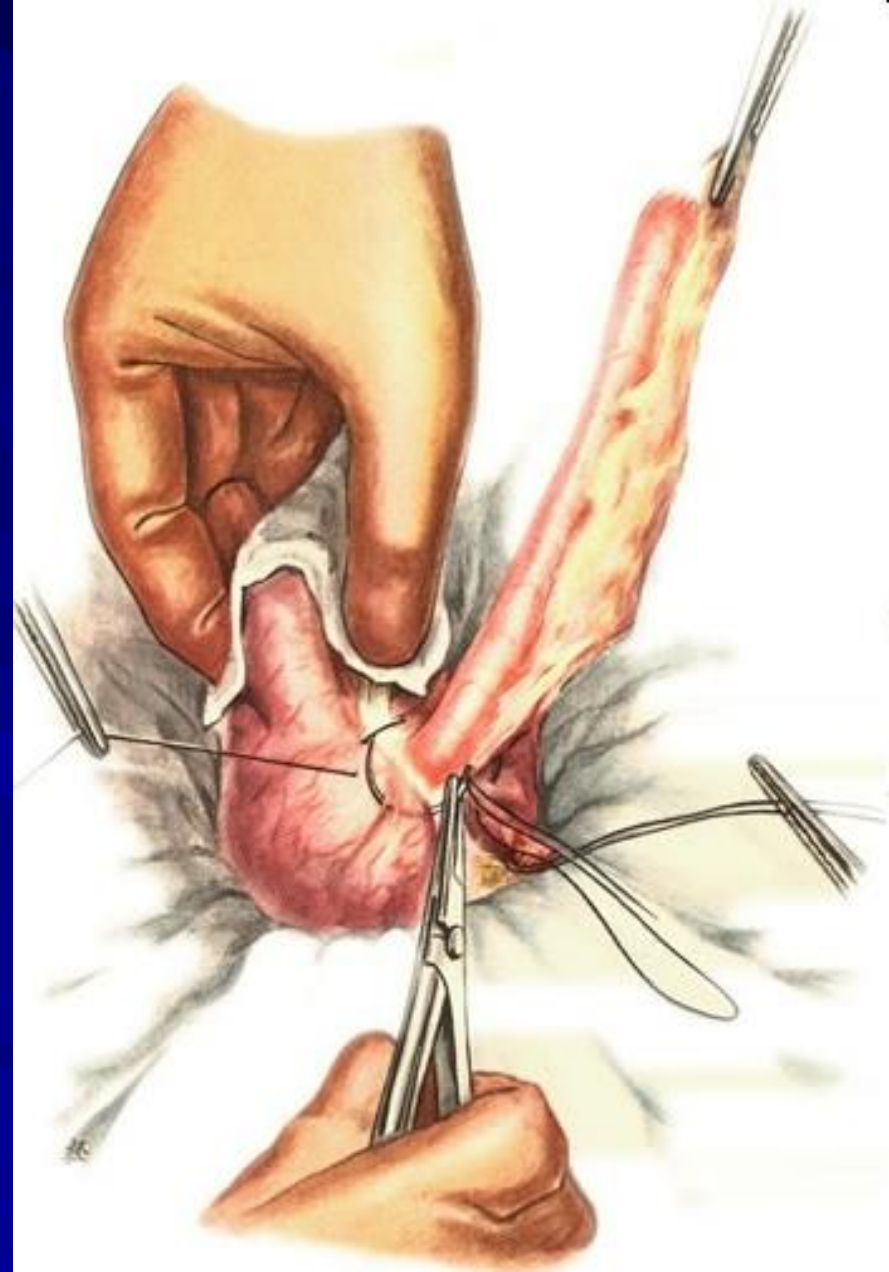
Anterograde appendectomy

3.If possible, the appendicular artery is doubly legated at the base of the appendix, and the appendix skeletonized down to its base.



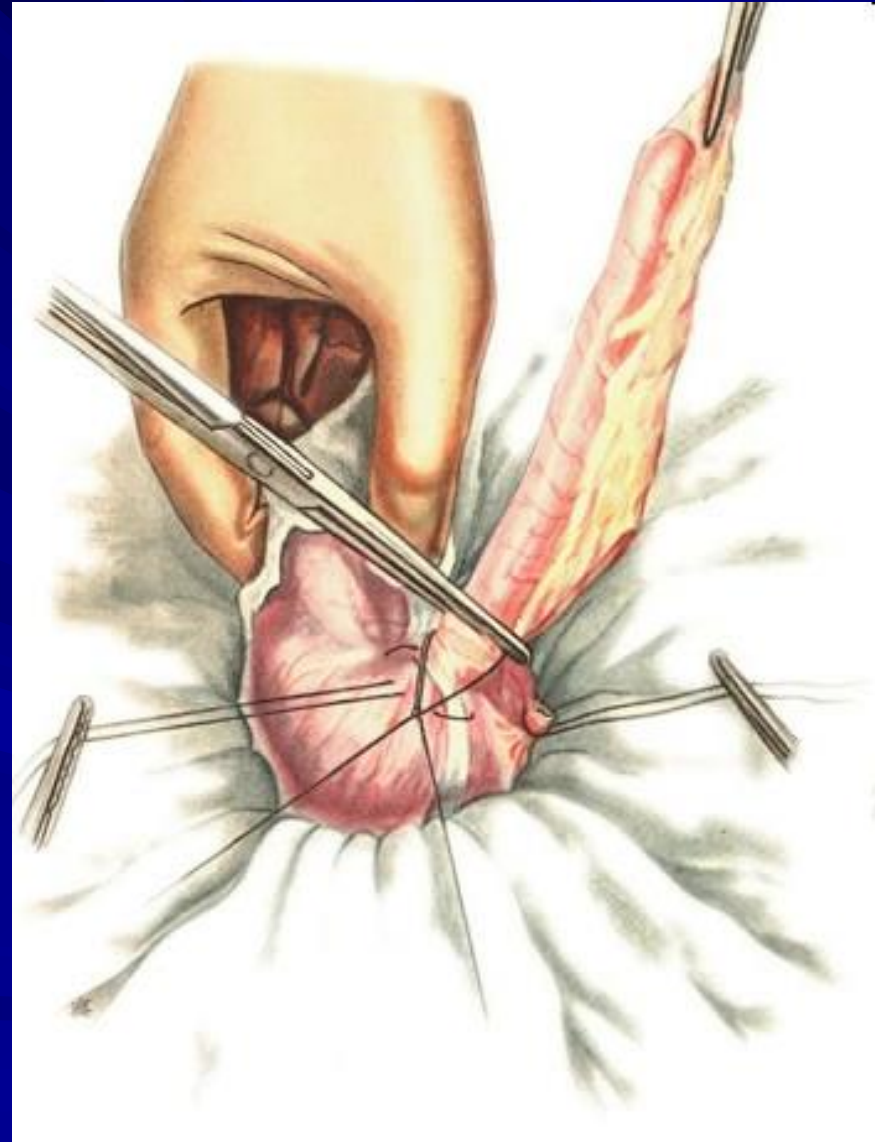
Anterograde appendectomy

4. After the appendix has been fully skeletonized its base is crushed with a straight clamp or an artery forceps.
- Below this, a purse string suture is applied to the caecum.



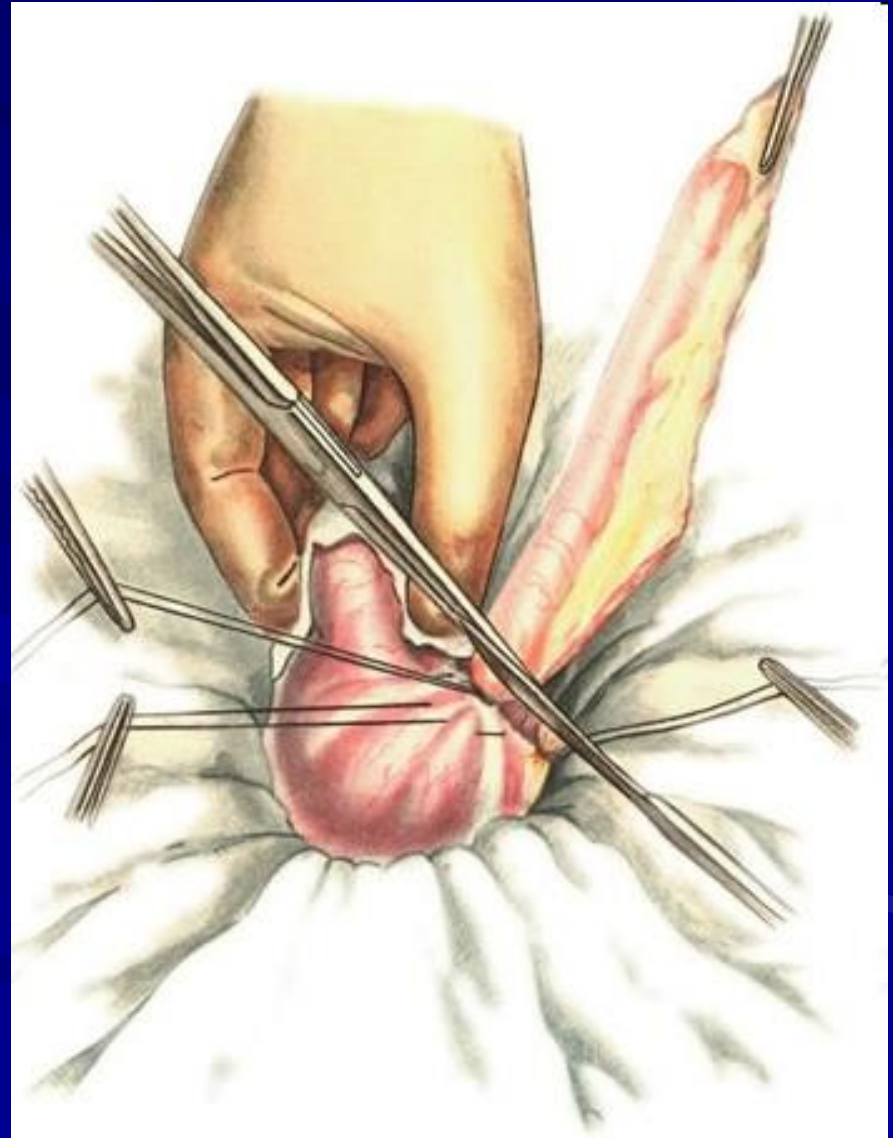
Anterograde appendectomy

5. The base of the appendix is ligated with silk or catgut.
- It is then grasped with a right angled clamp above the crushed site.



Anterograde appendectomy

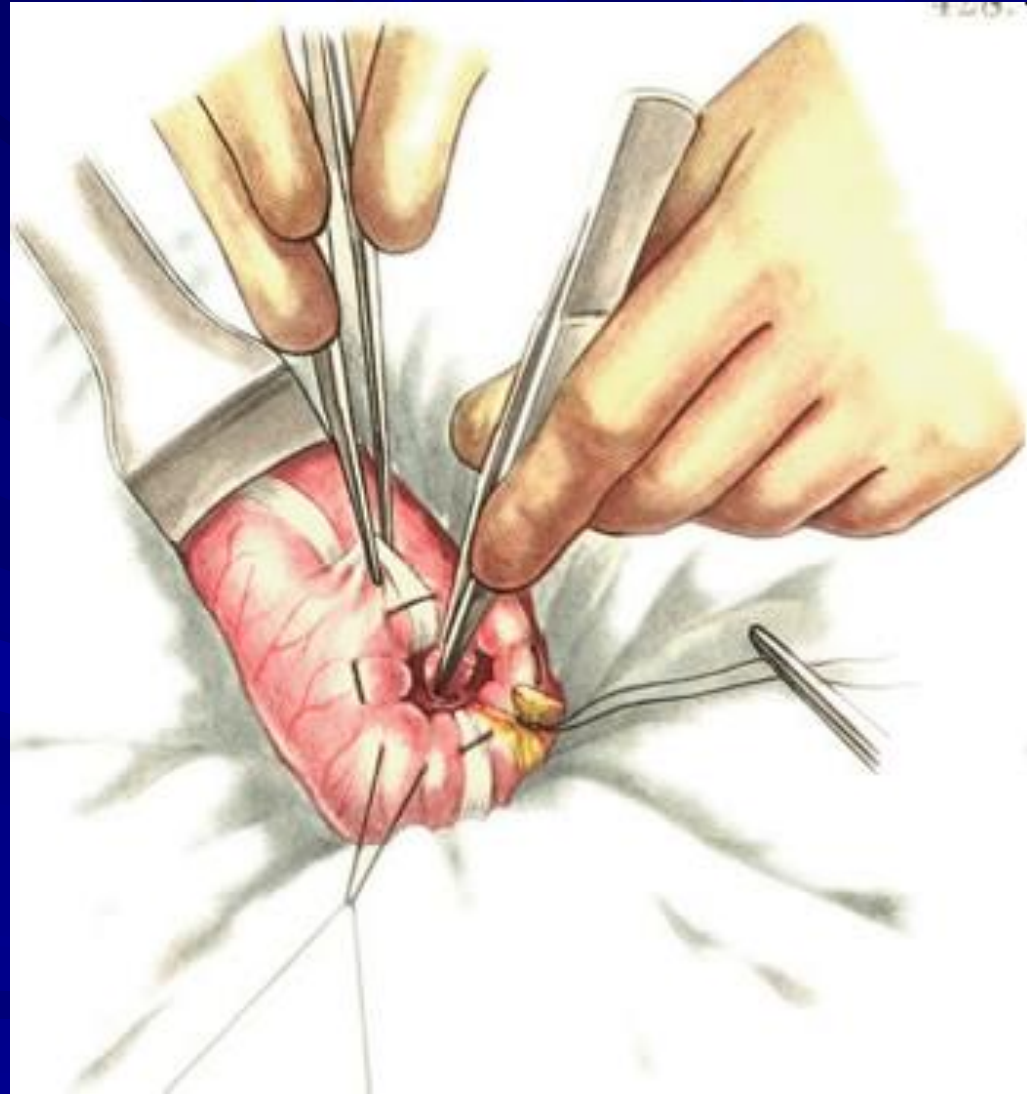
- The appendix is resected with a scalpel between the ligature and the clamp.



Anterograde appendectomy

6. The previously iodized appendix stump is invaginated with the help of a dissecting forceps and the purse string suture tied.

- A second similar suture is applied as a precaution
- The second suture may be a Z-stitch.



Anterograde appendectomy

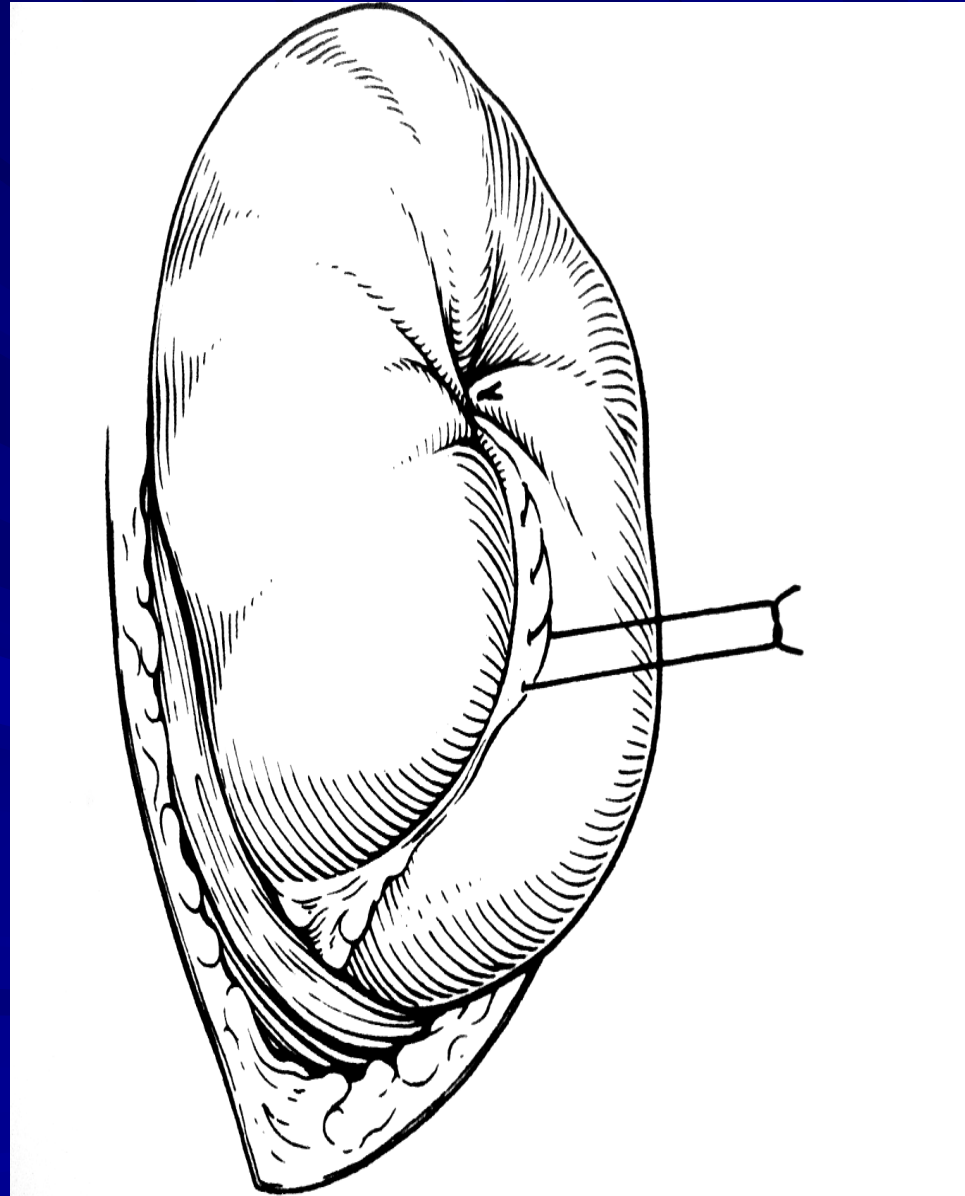
- The second suture may be a Z-stitch.



Anterograde appendectomy

7. After burying the stump, the serosal defect of the mesenteriolum is sewn with interrupted sutures.

- If the appendix is markedly inflamed, these sutures should not be made.



Retrograde resection in the presence of an immobile caecum

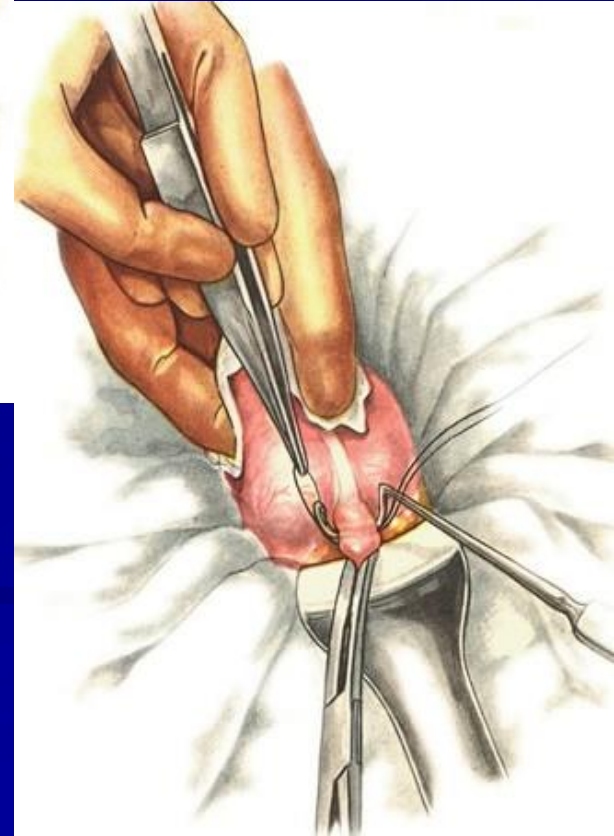
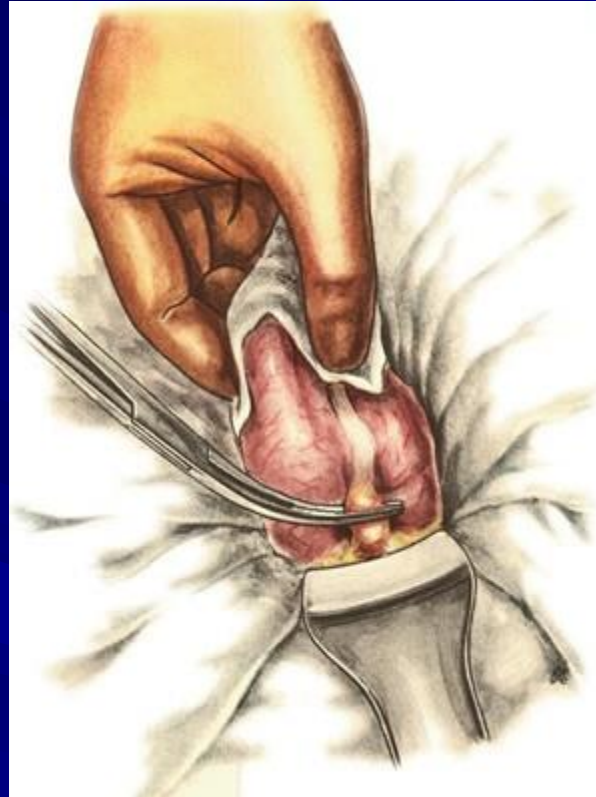
- Since the appendectomy has to be performed within the abdominal cavity owing to dense adhesions or the retrocaecal position of the appendix, the incision must be sufficiently large.

Retrograde appendectomy (in the case of immobile caecum)

1. In order to mobilize the firmly adherent caecum, the lateral peritoneal reflection is incised.

- The caecum is free from the lateral abdominal wall by blunt dissection until the base of the appendix comes into view as a prolongation of the tenia libera.

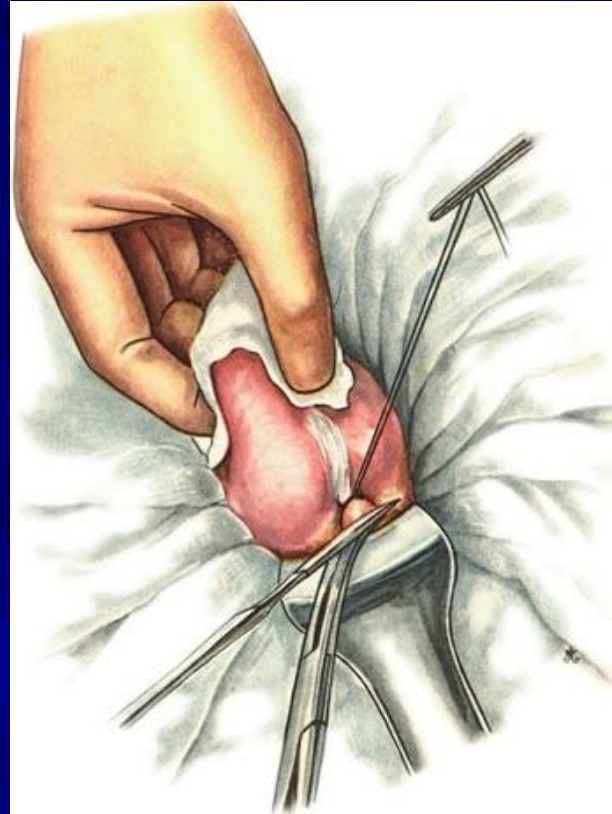
- The appendix is then isolated at its base, crushed, and ligated.



Retrograde appendectomy

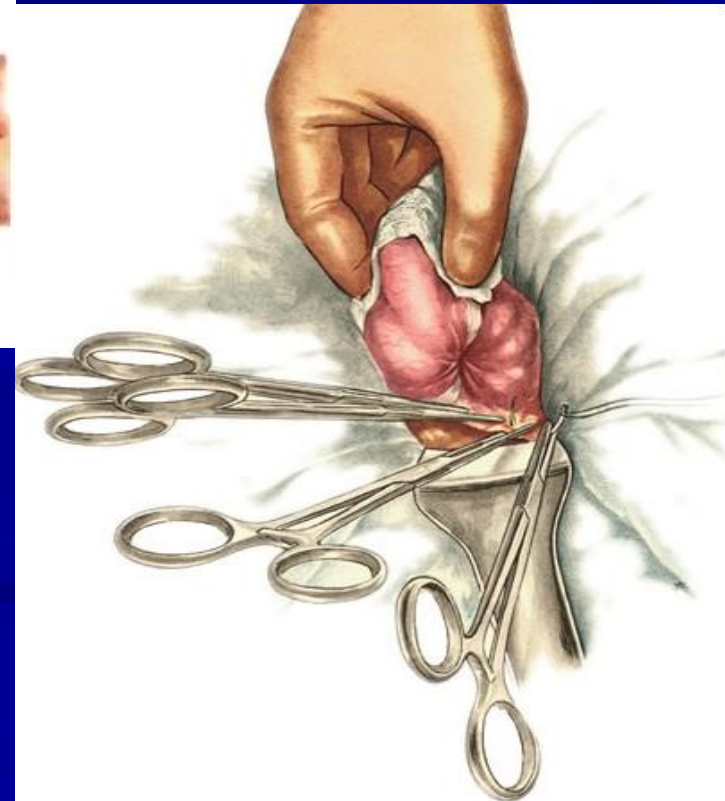
2. By pulling the appendix downward and the caecum upward, the course of the appendix can be followed.

- Any adhesions and the mesenteriolum itself have to be ligated and divided step by step.

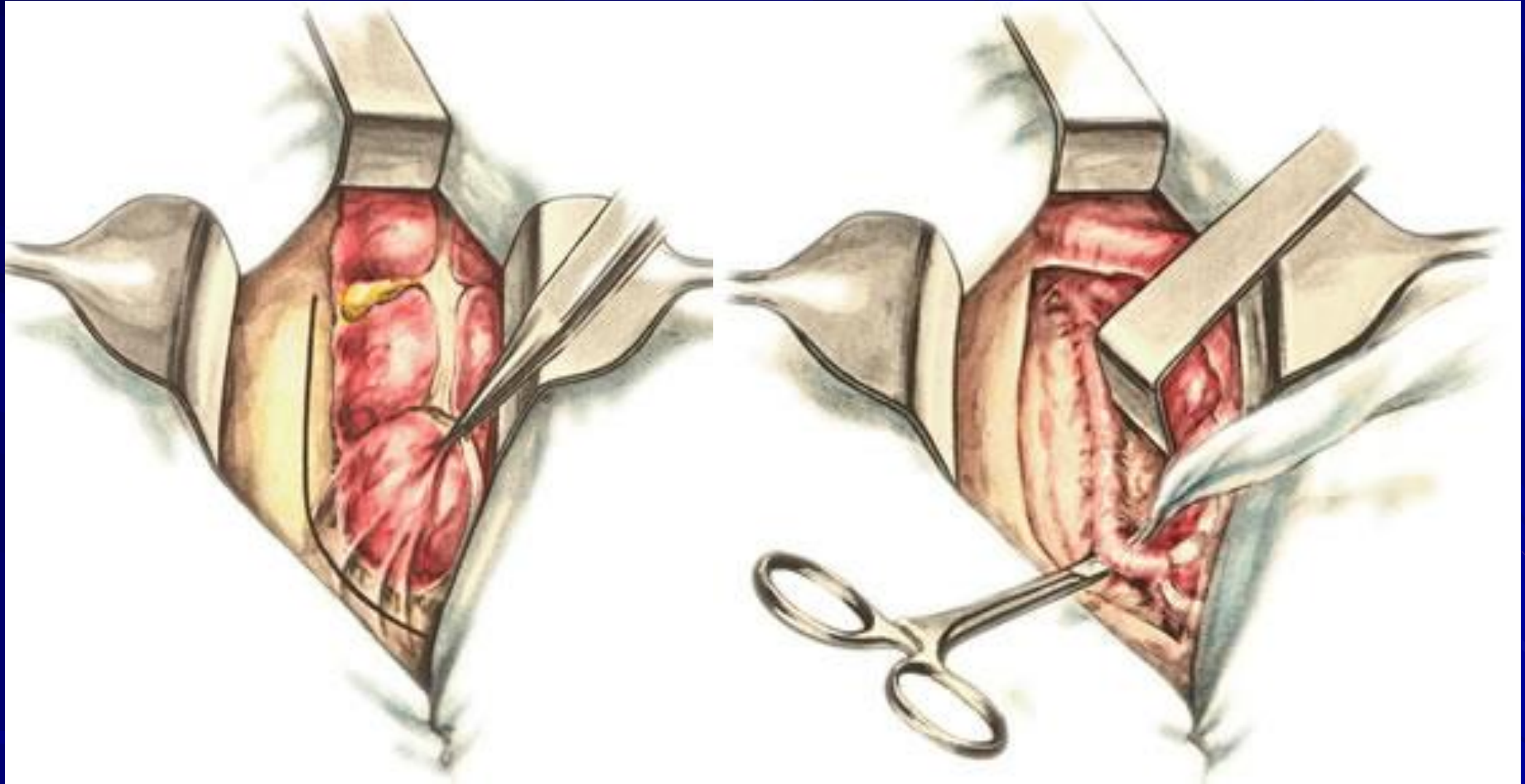


Retrograde appendectomy

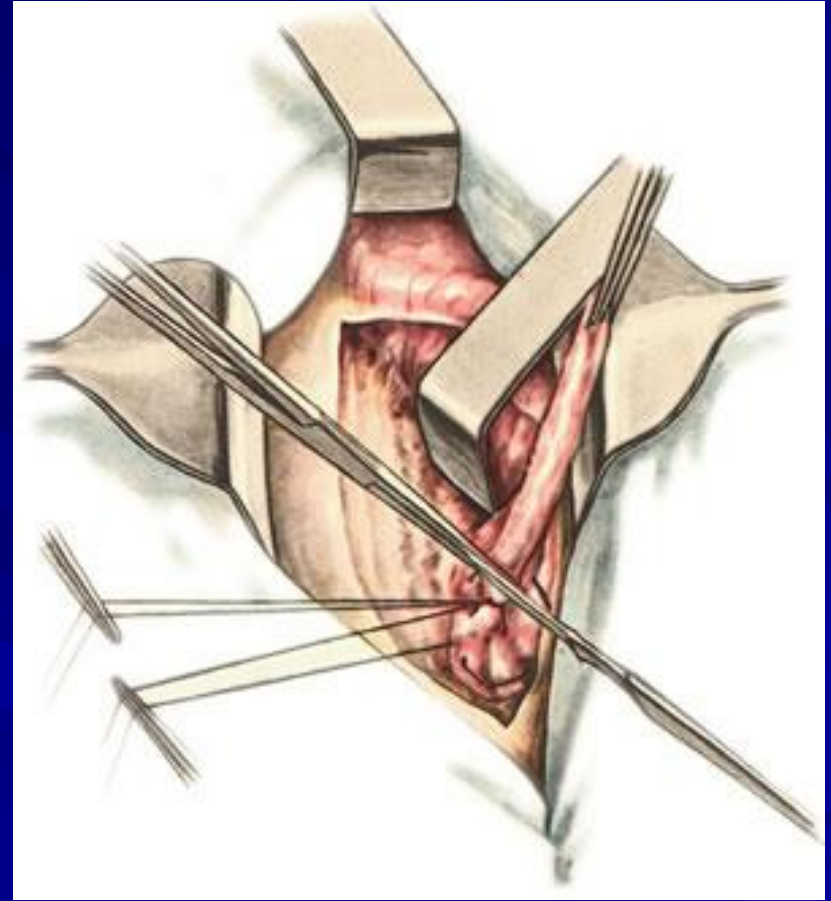
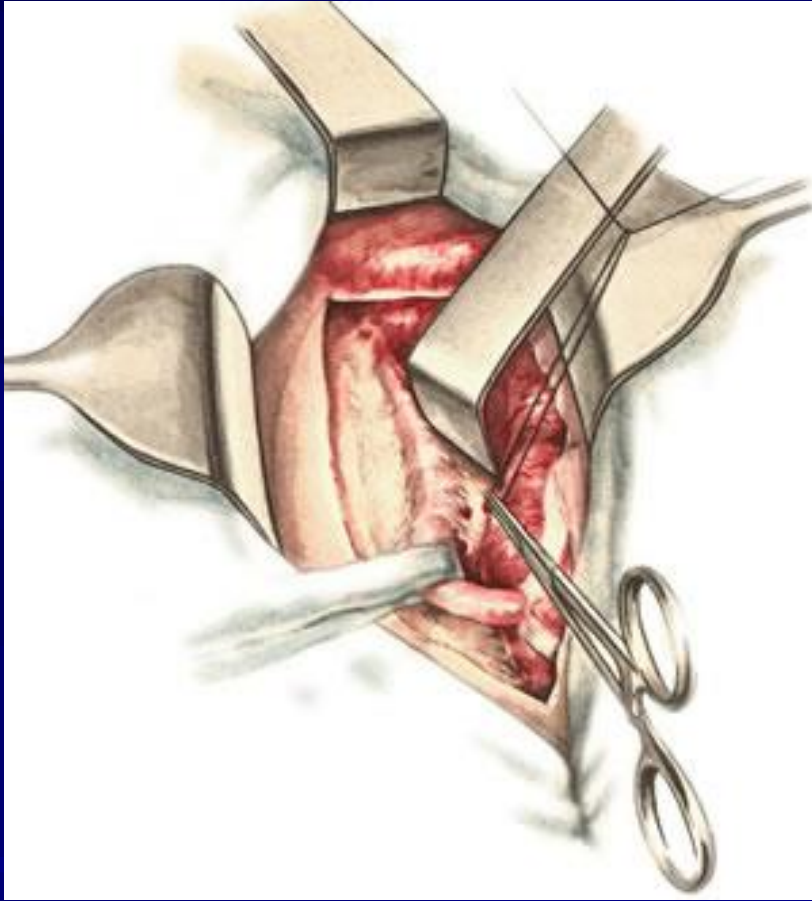
3. After applying a crushing clamp, the appendix is transected, and the stump buried using two purse string sutures. • A Z-like suture may also be applied



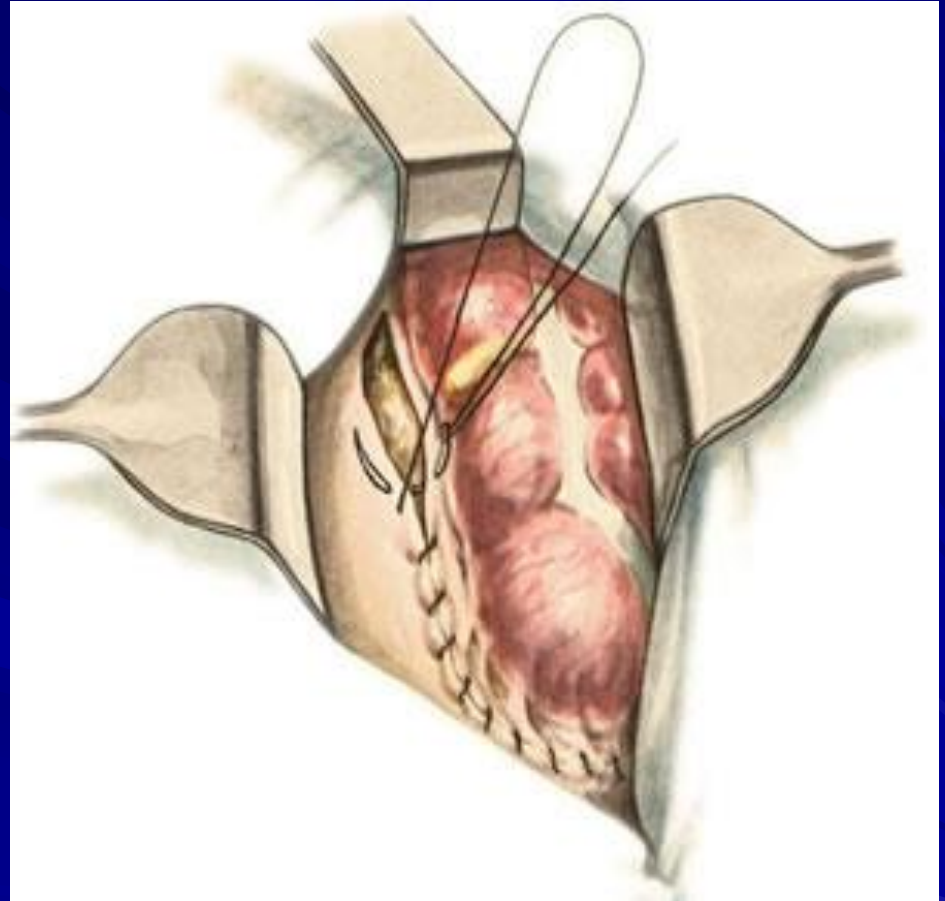
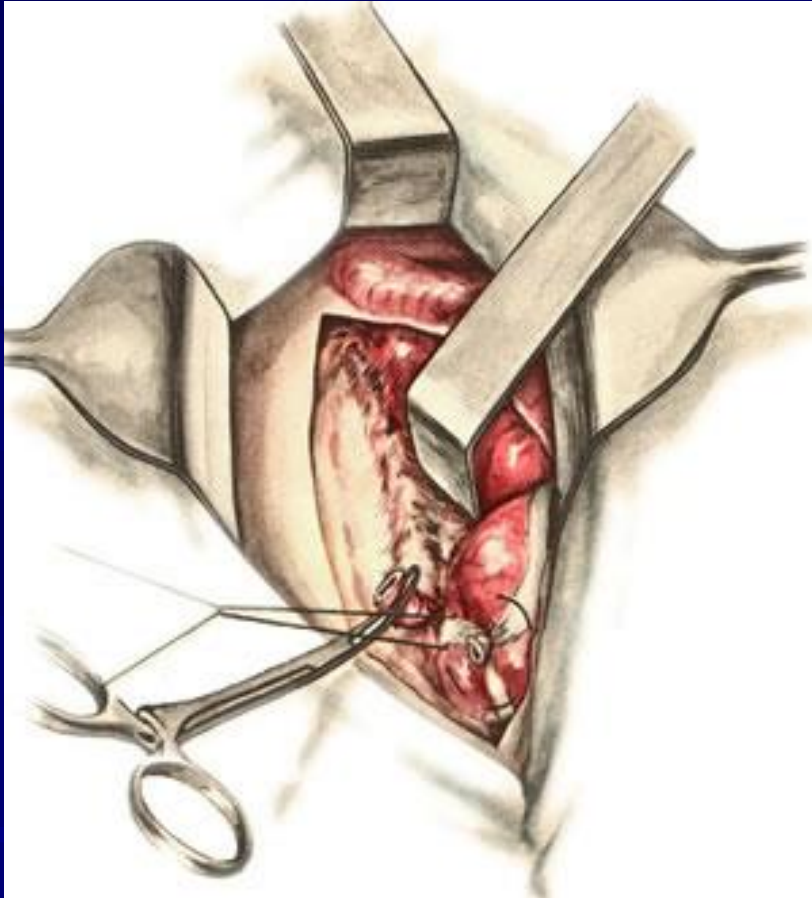
Appendectomy in case of retrocecal position of the appendix



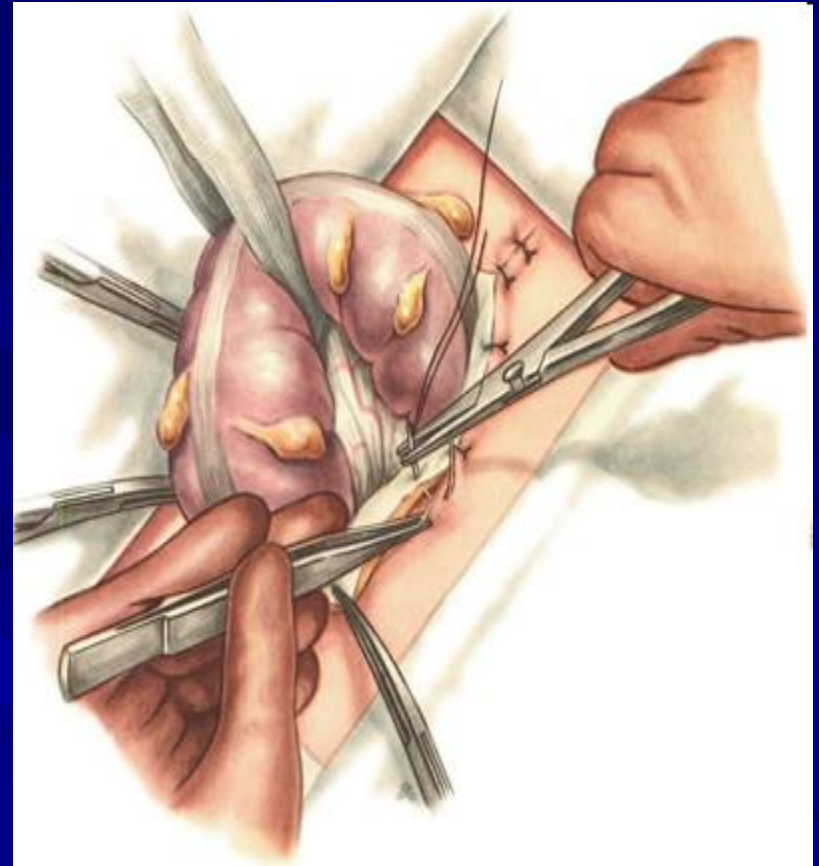
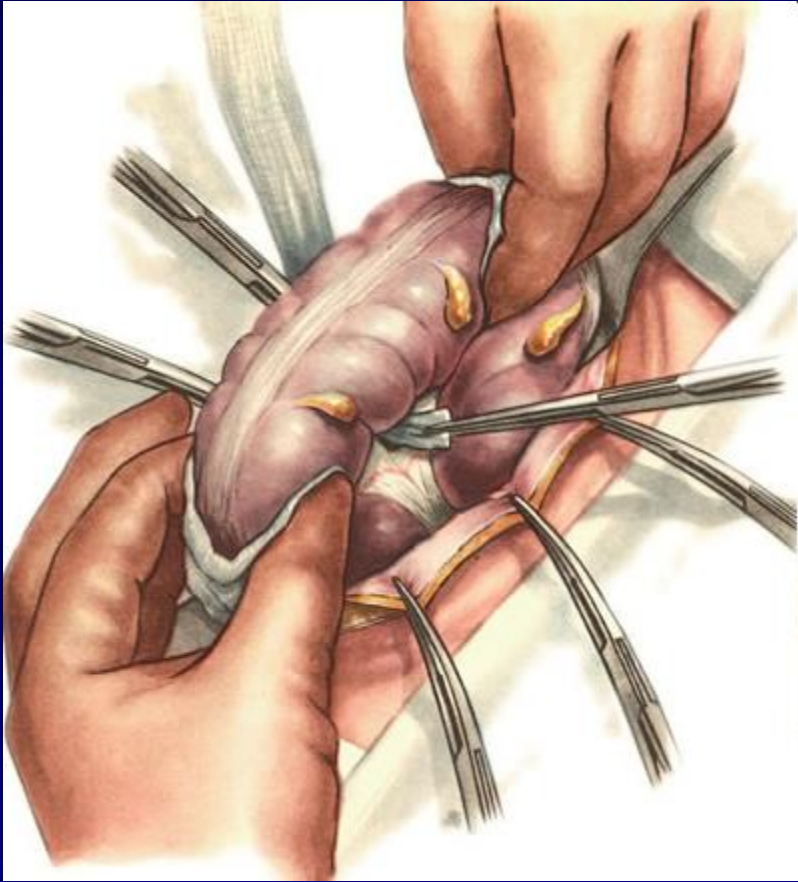
Appendectomy in case of retrocecal position of the appendix



Appendectomy in case of retrocecal position of the appendix

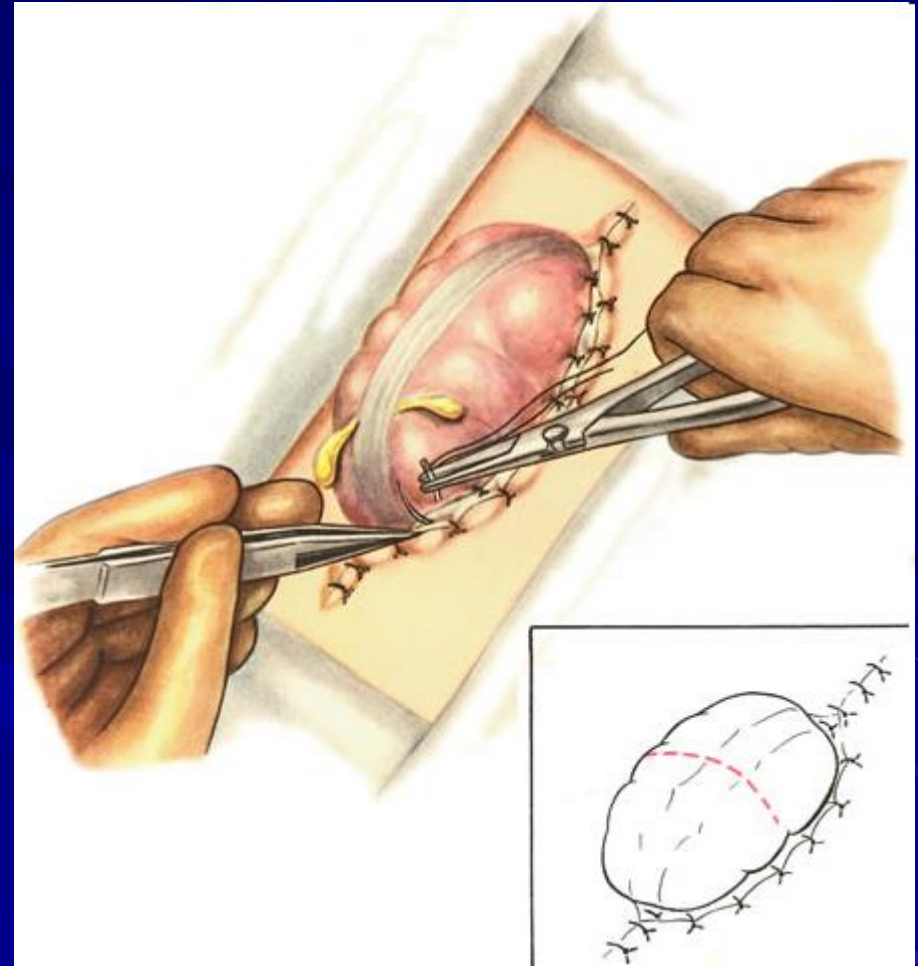
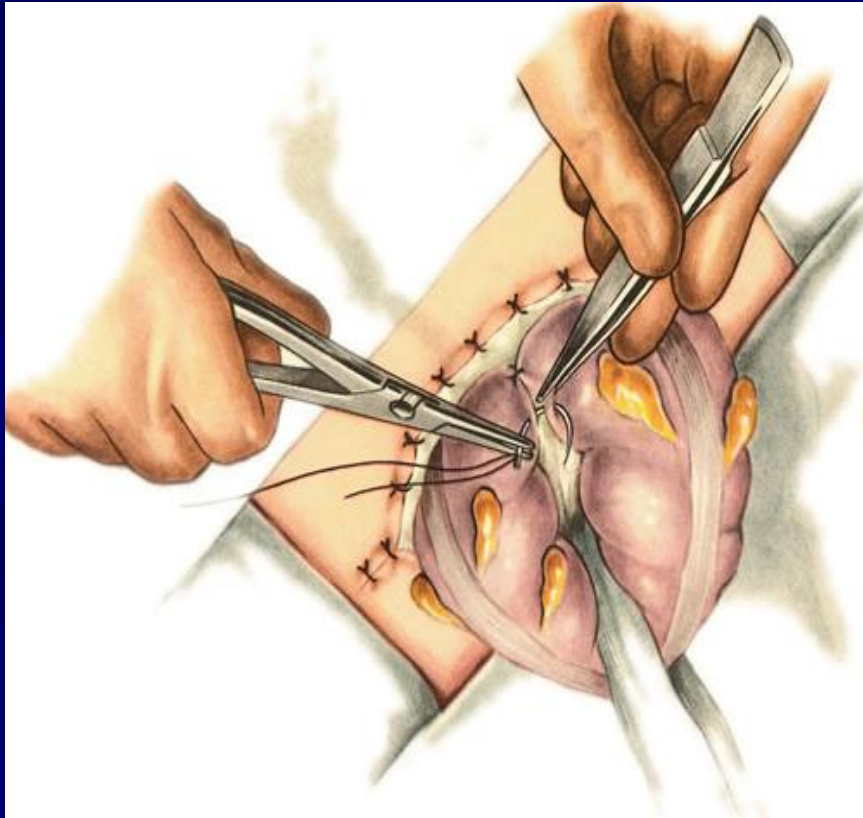


ANUS PRAETERNATURALIS. OPERATRION BY MAYDL



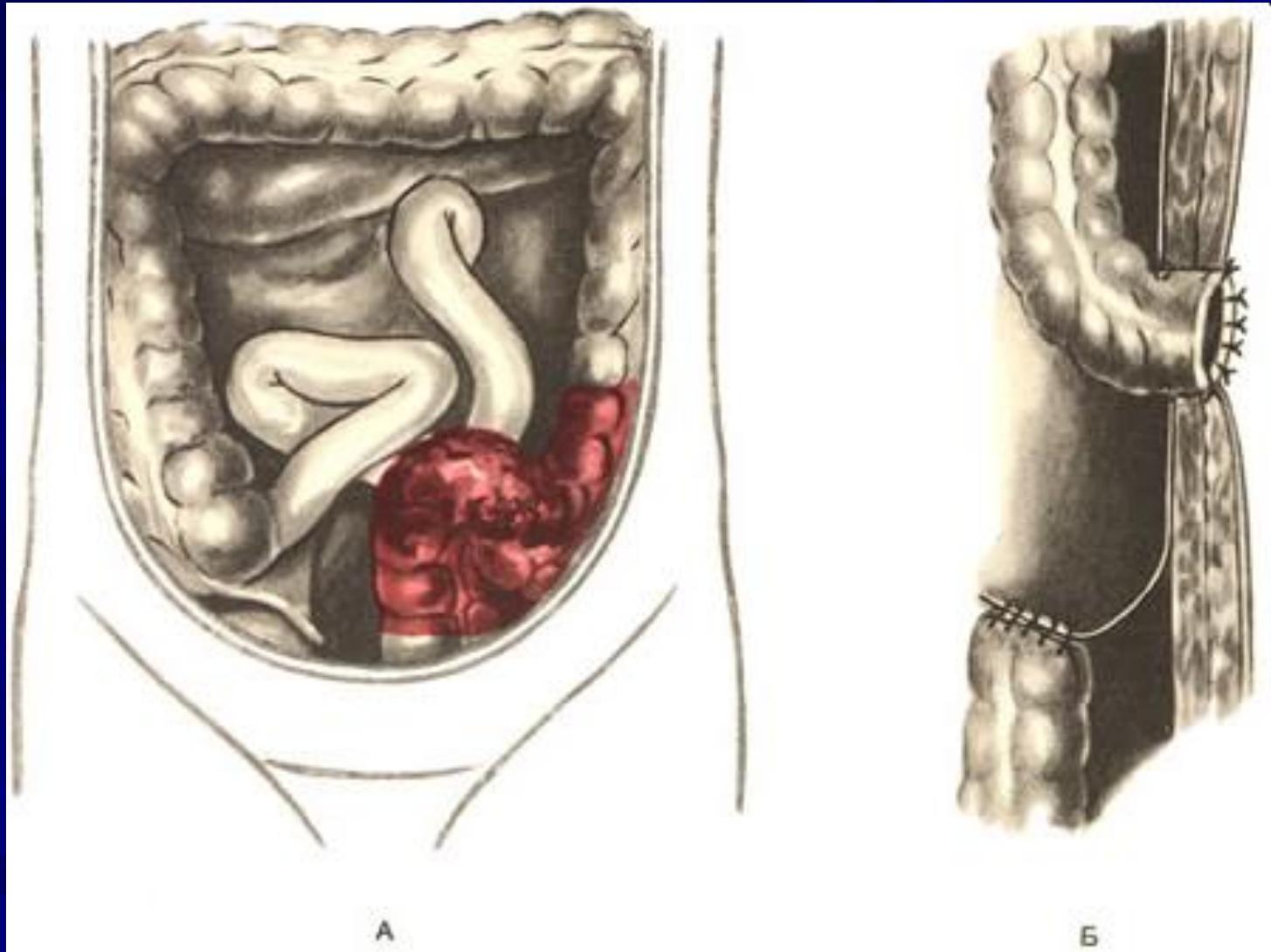
Carrying of suture-taped under the bowel and suturing it to the peritoneum and skin

ANUS PRAETERNATURALIS. OPERATRION BY MAYDL



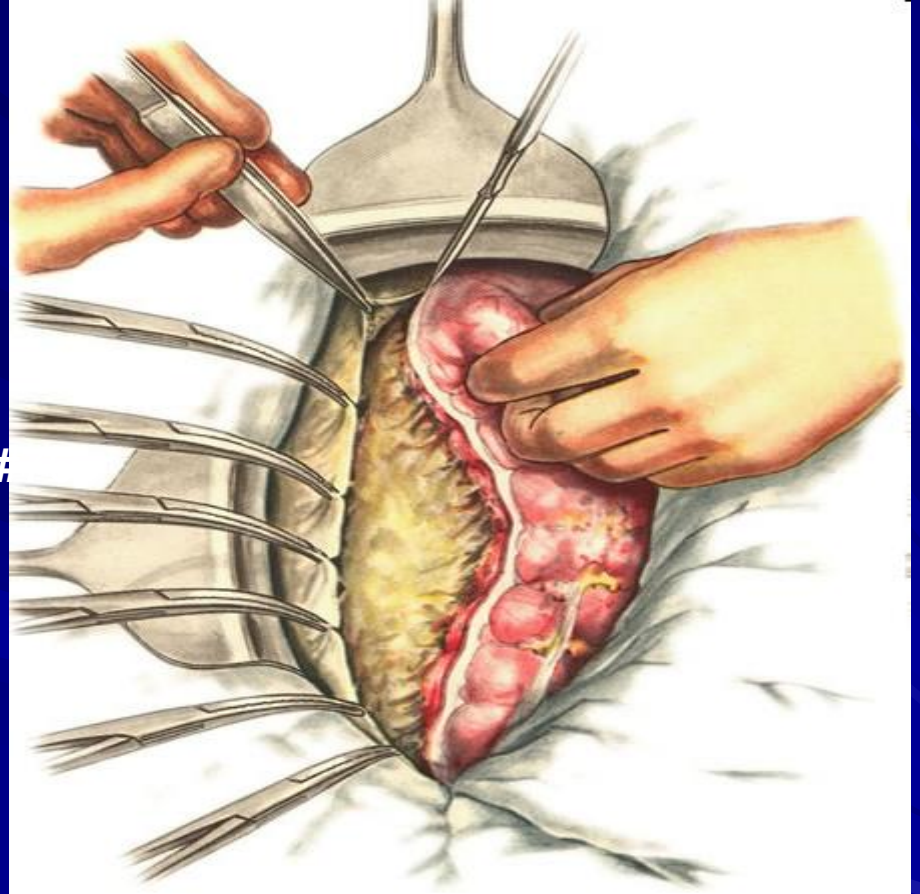
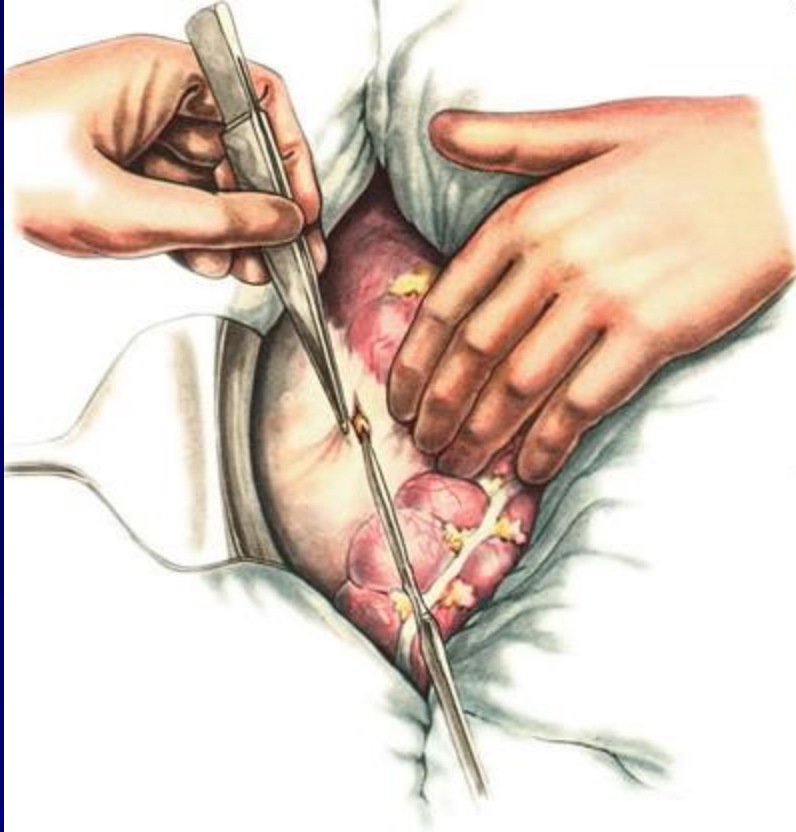
Imposition of the spur and opening of intestine in the cross direction

Sigostoma by Hartmann



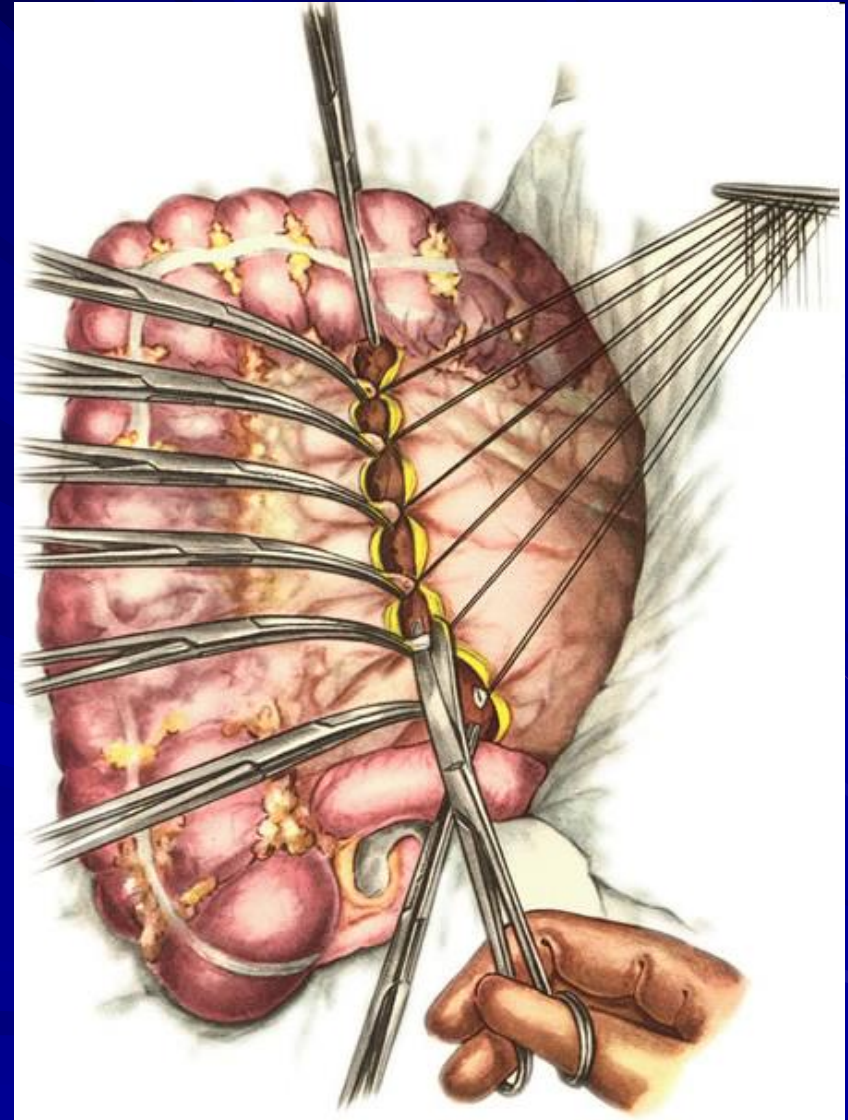
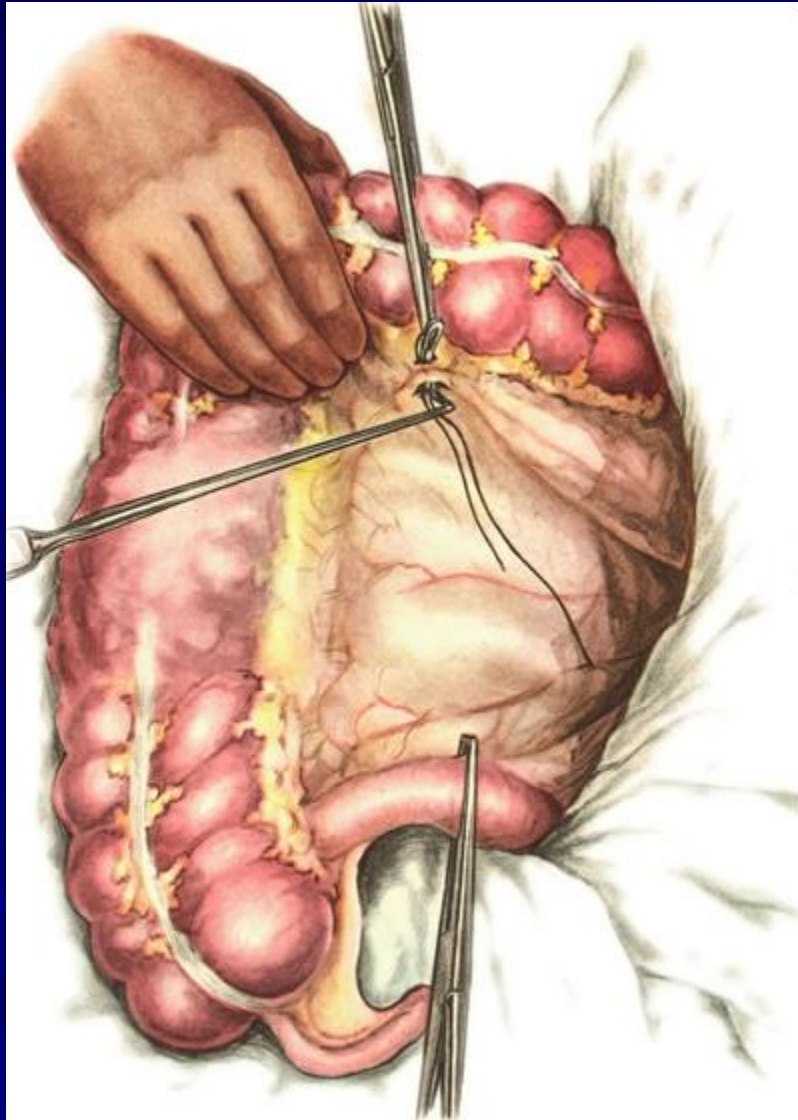
Resection of the rectum with tumor and making of the sigostoma

Resection of the ascending colon. (Hemicolectomy)



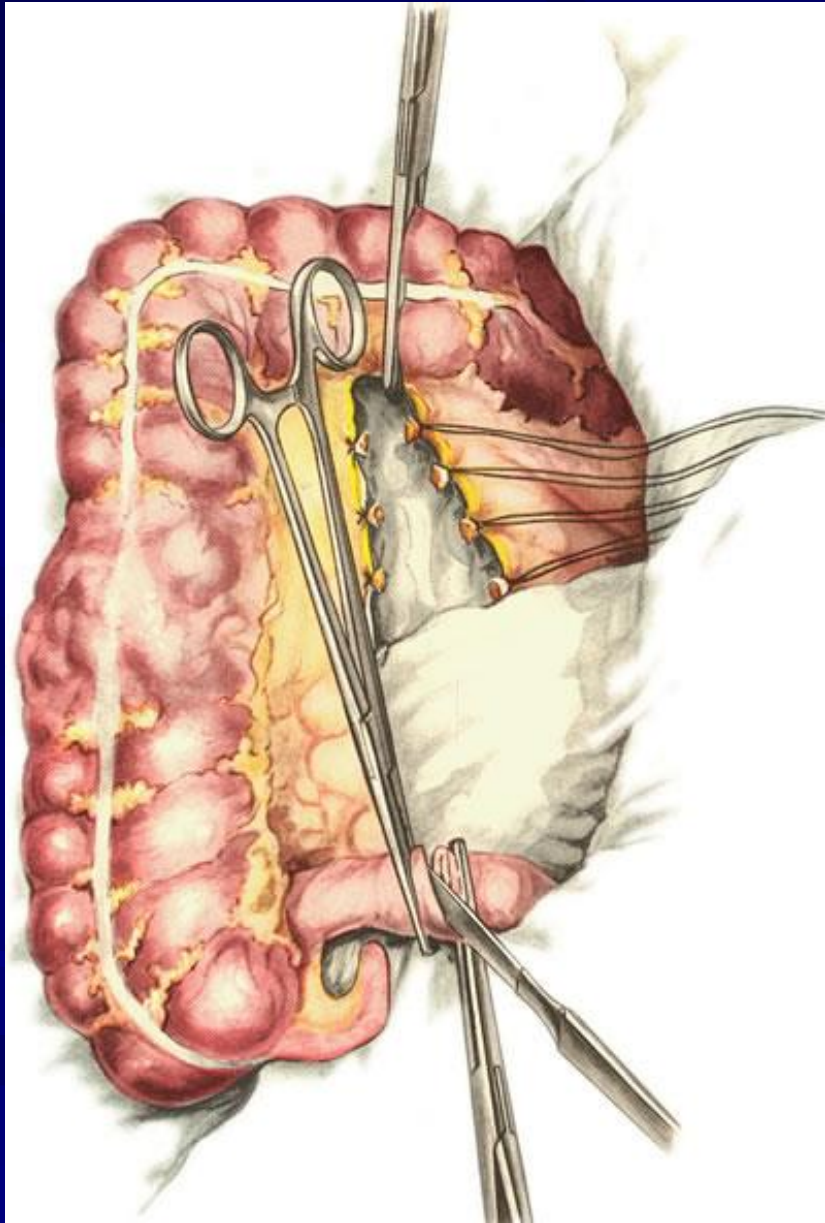
Mobilization of the cecum and colon ascendens. Cutting of parietal peritoneum in place of flexura coli dextra.

Hemicolectomy



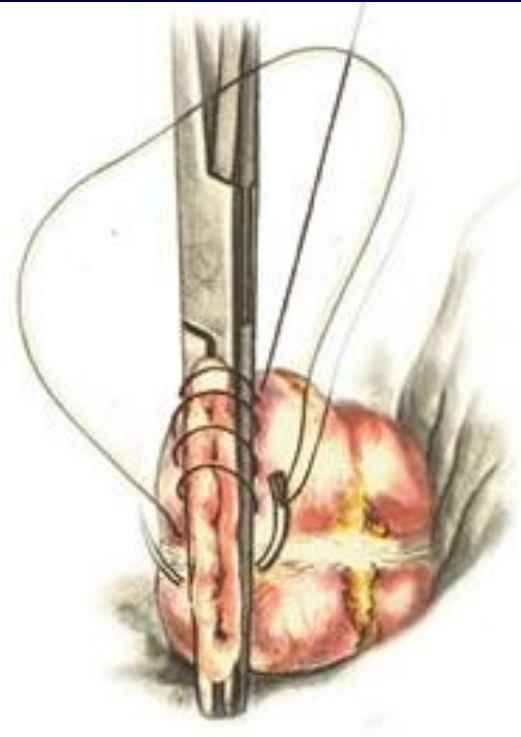
Ligation and cutting of mesenteric vessels

Hemicolectomy



Cutting of the ascending colon

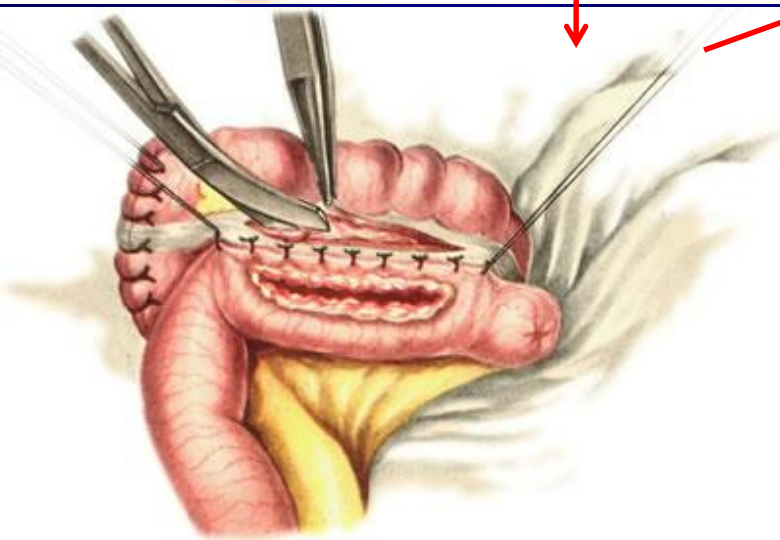
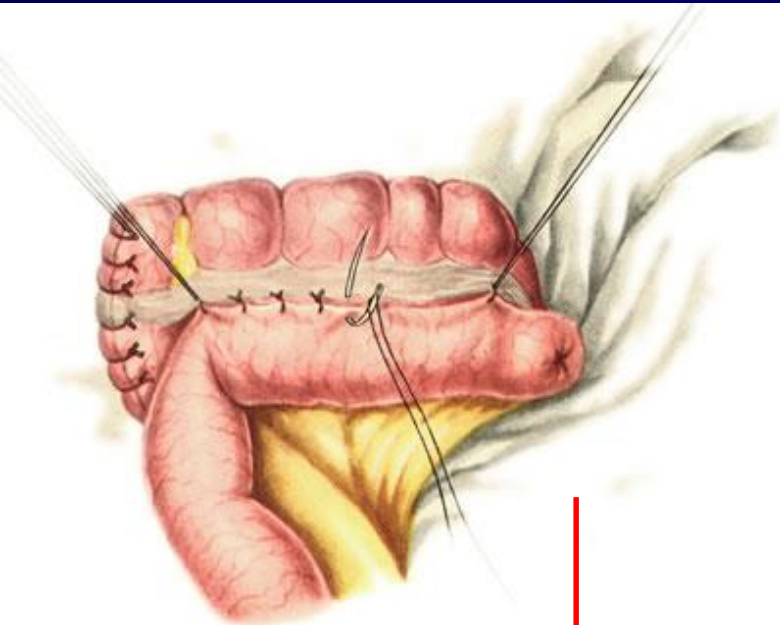
Hemicolectomy



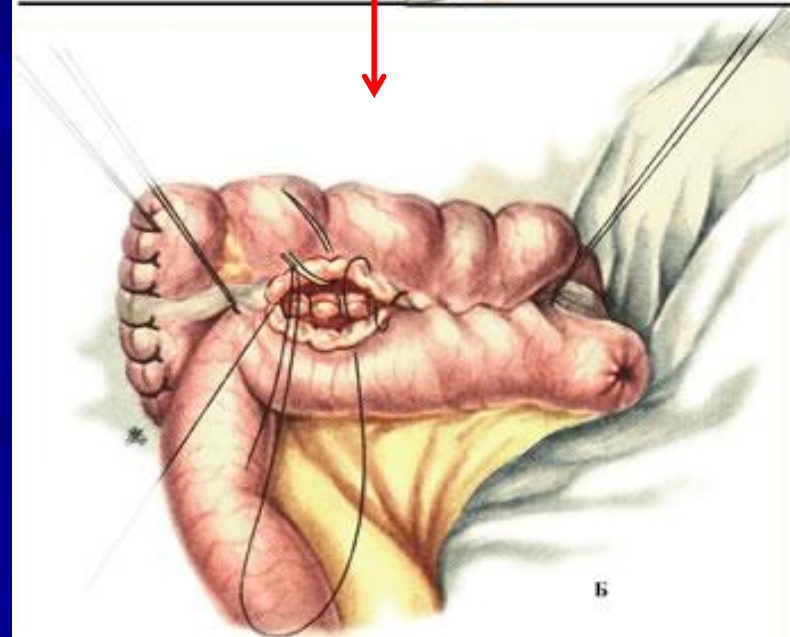
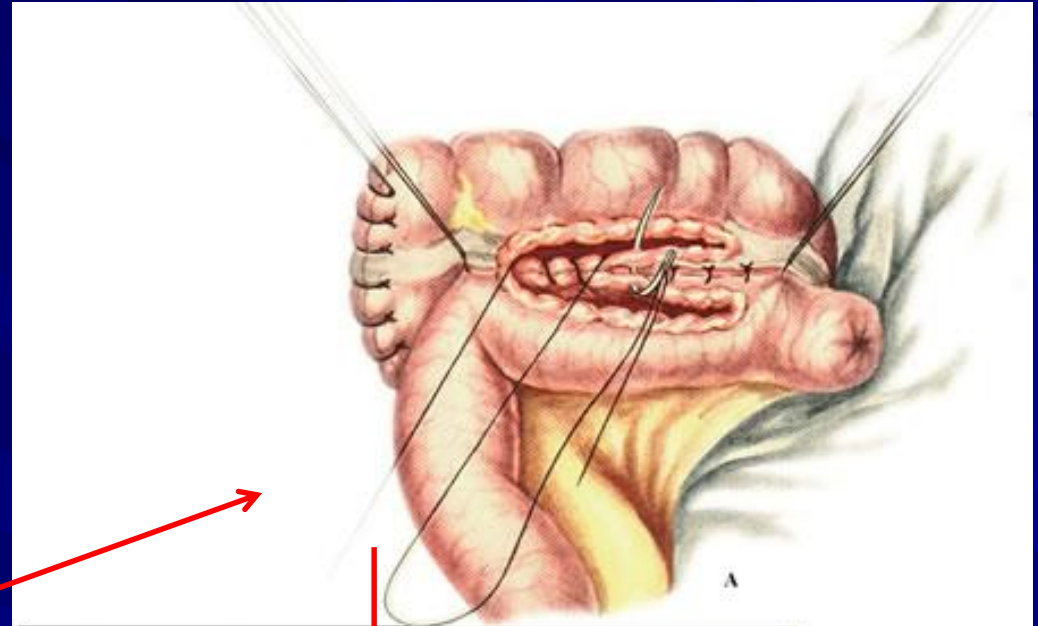
Close the ileum. Making of stump.



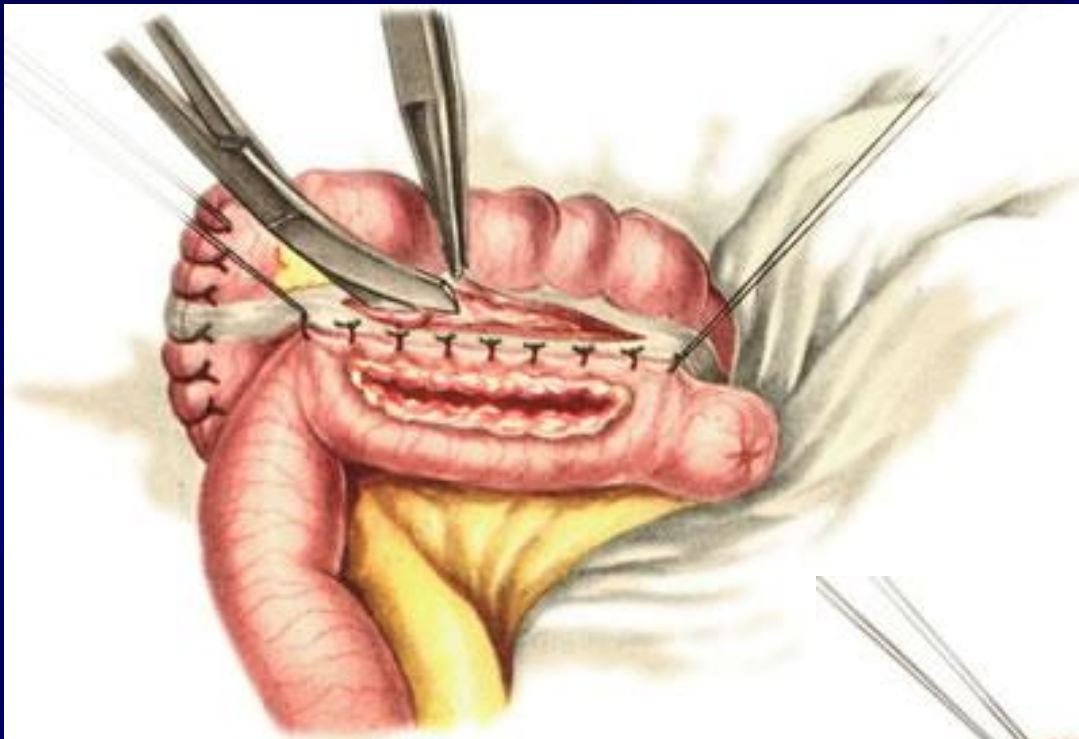
Hemicolectomy



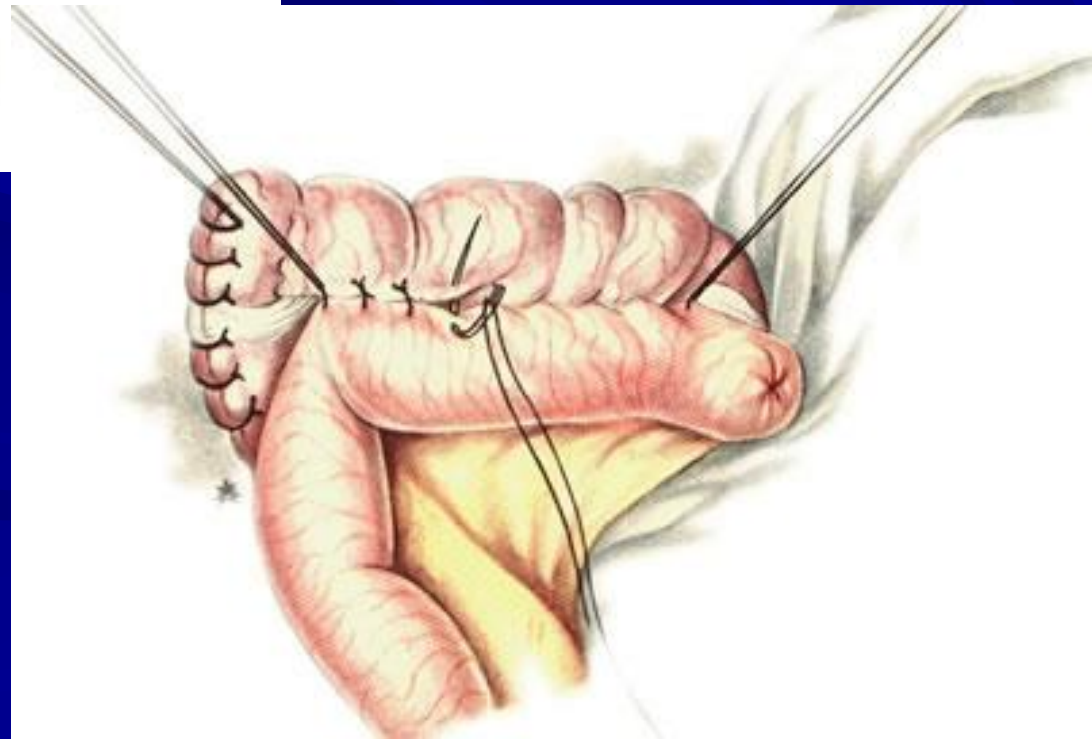
Ileocolon anastomosis side-by-side

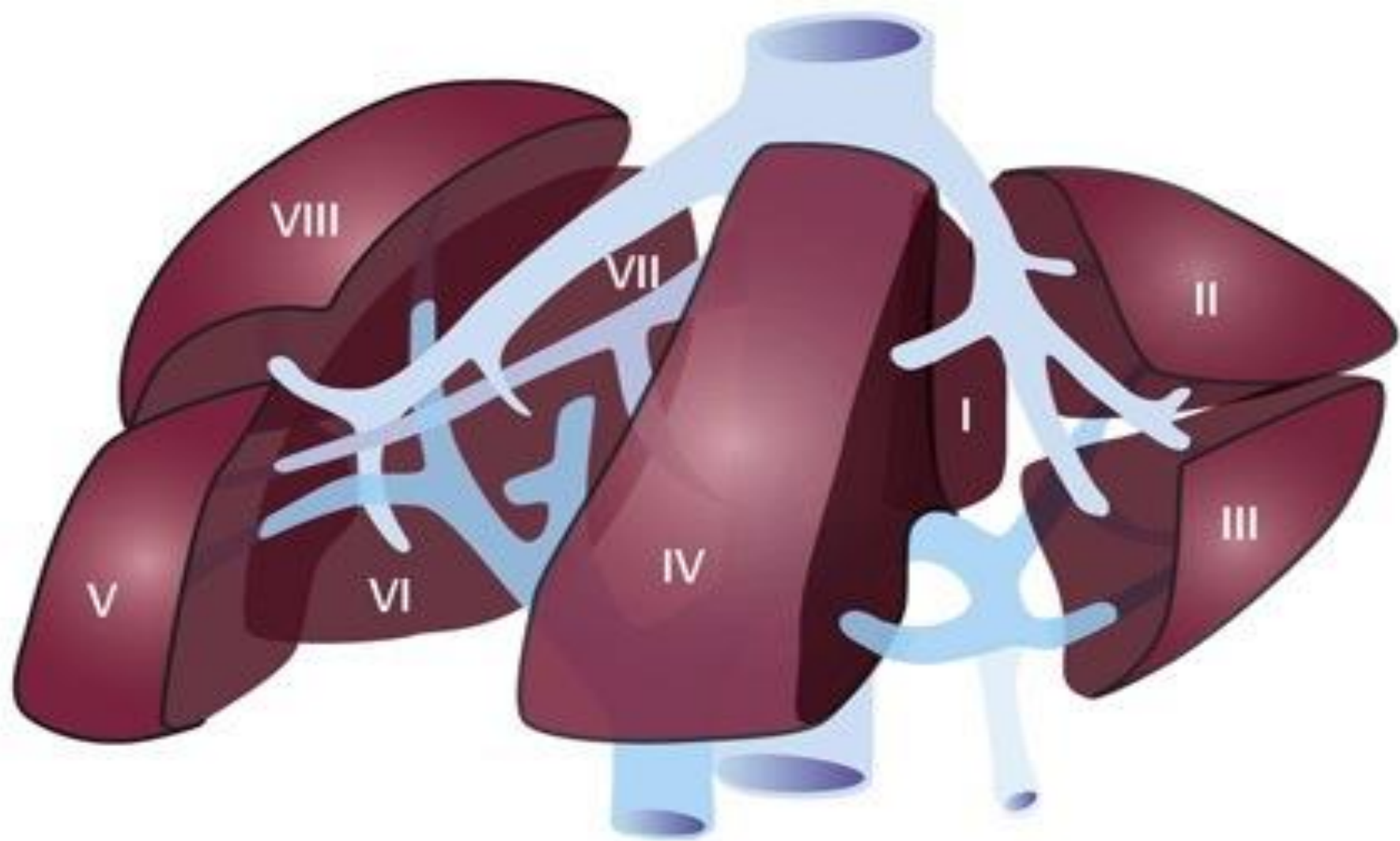


Hemicolectomy

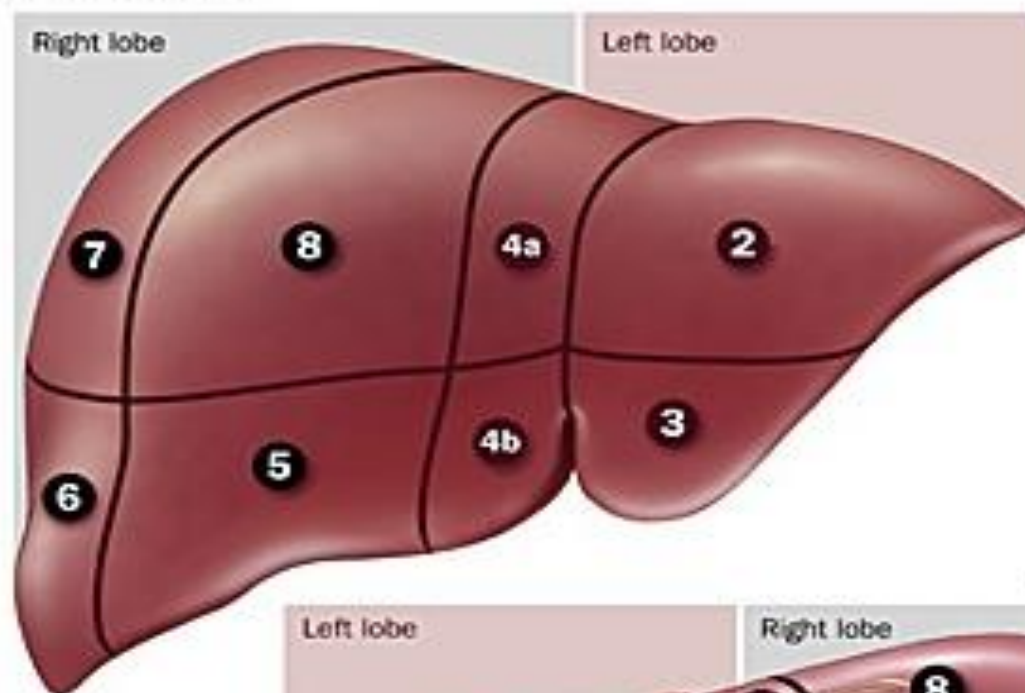


Ileocolon anastomosis side-by-side

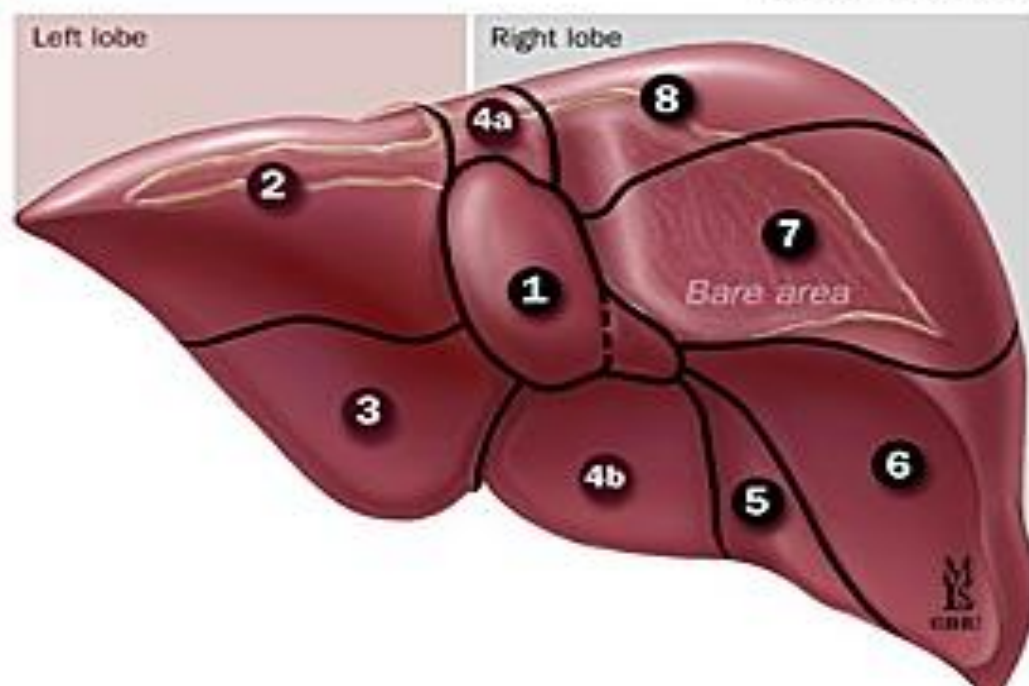




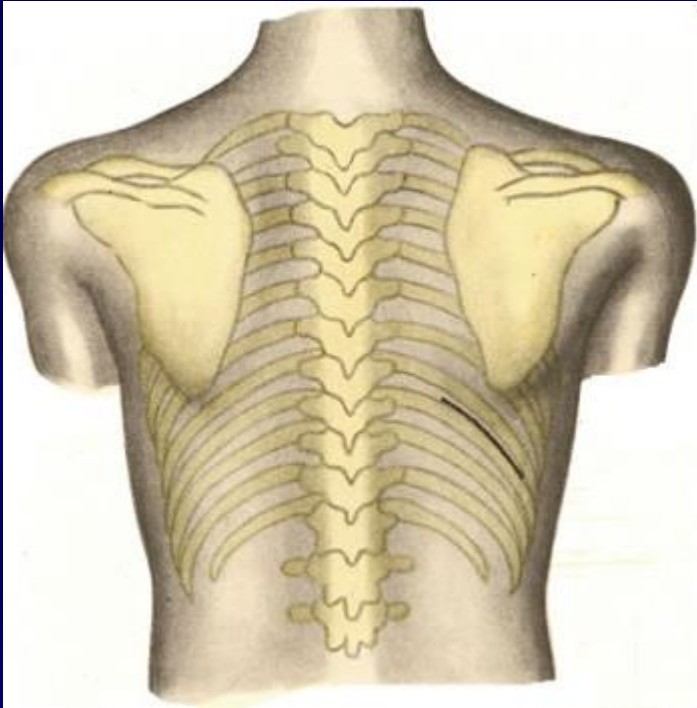
A Anterior surface



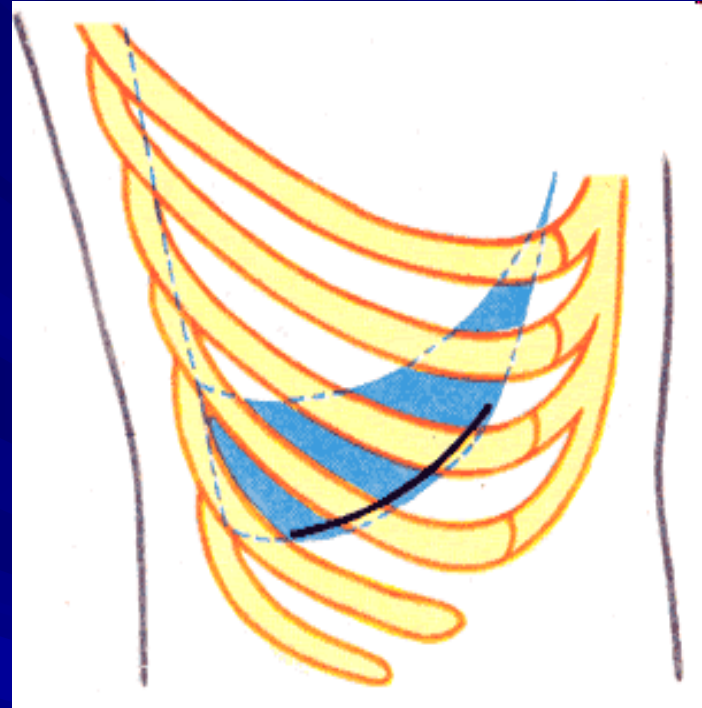
B Posterior surface



Accesses to the liver

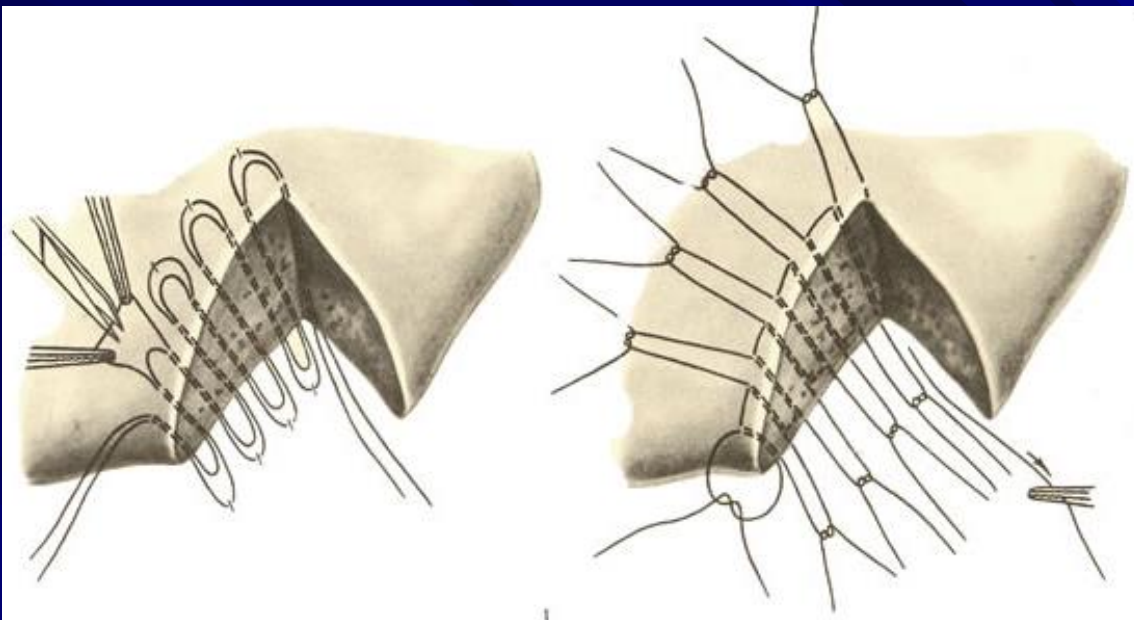


Transpleural bu Wolkman-Israel.

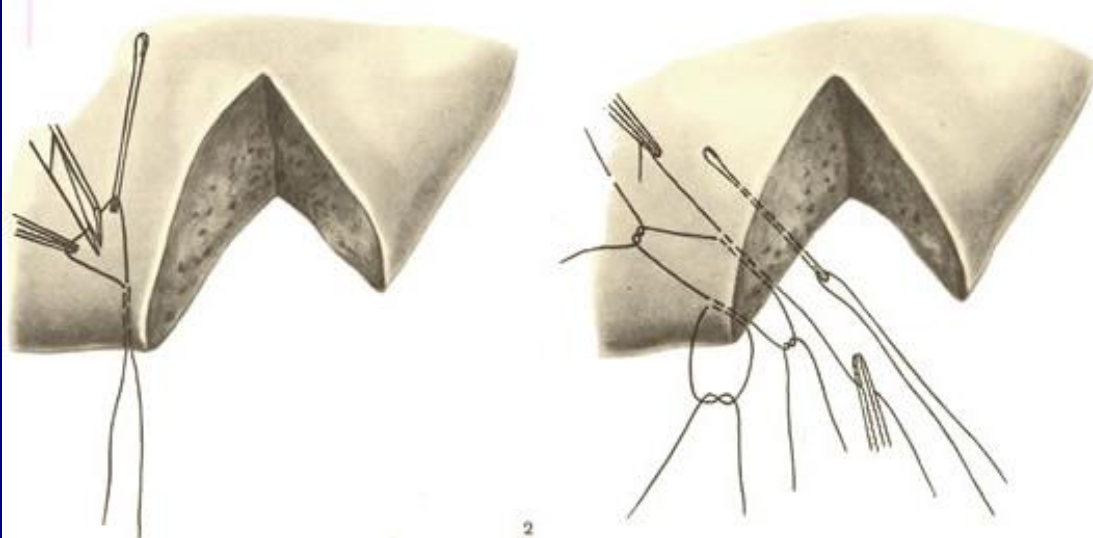


Extrapleural by Melnikov.

Sutures of the liver



1 — by Kuznetsov-Pensky;

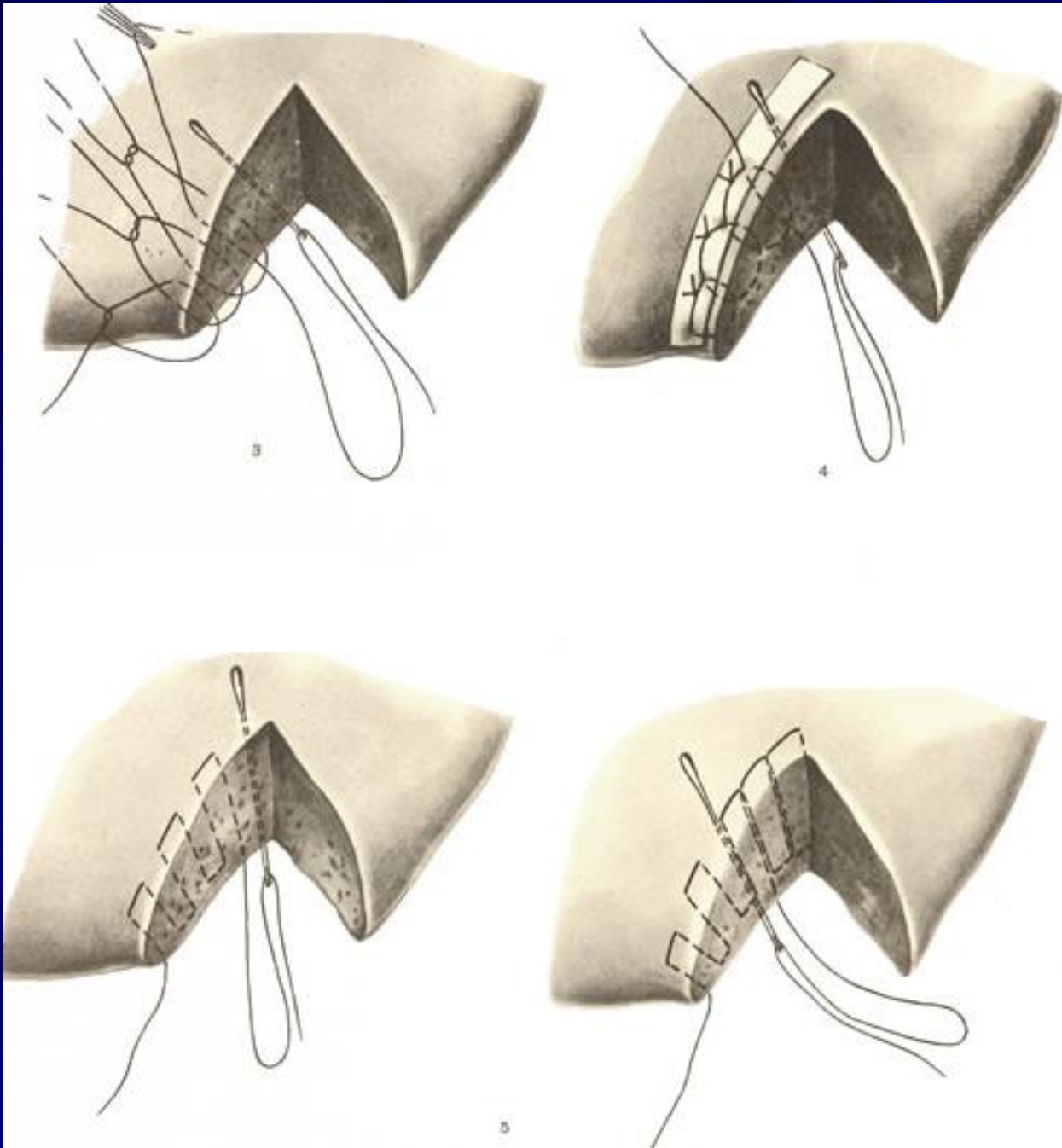


2 — by Jordano

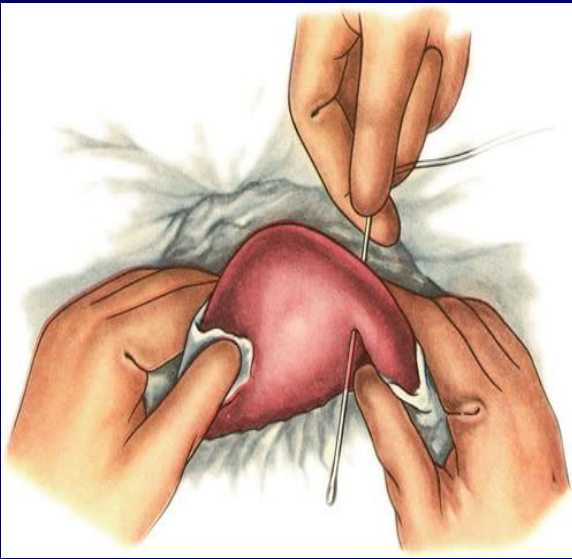
Sutures of the liver

3 — by Oppel;
4 — mattress
suture with strip;

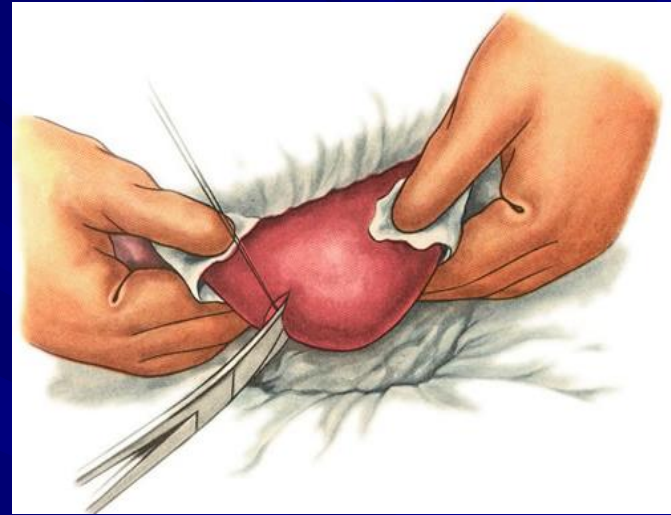
5 — by Rubanov.



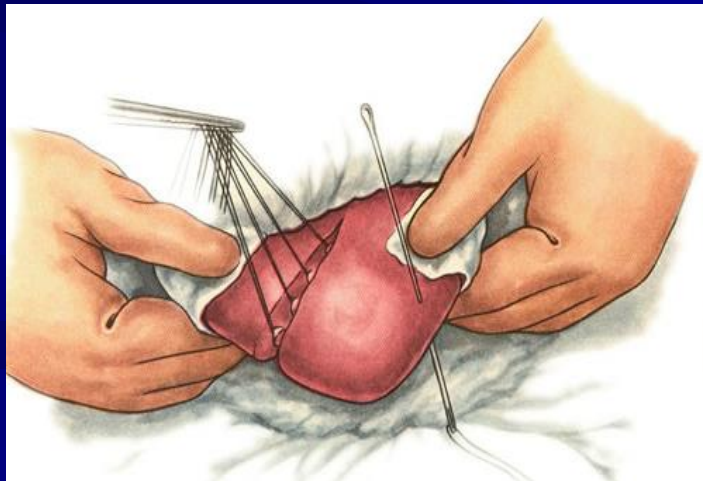
WEDGE RESECTION OF LIVER



Stitching of liver margin.



Dissection of stitching part.

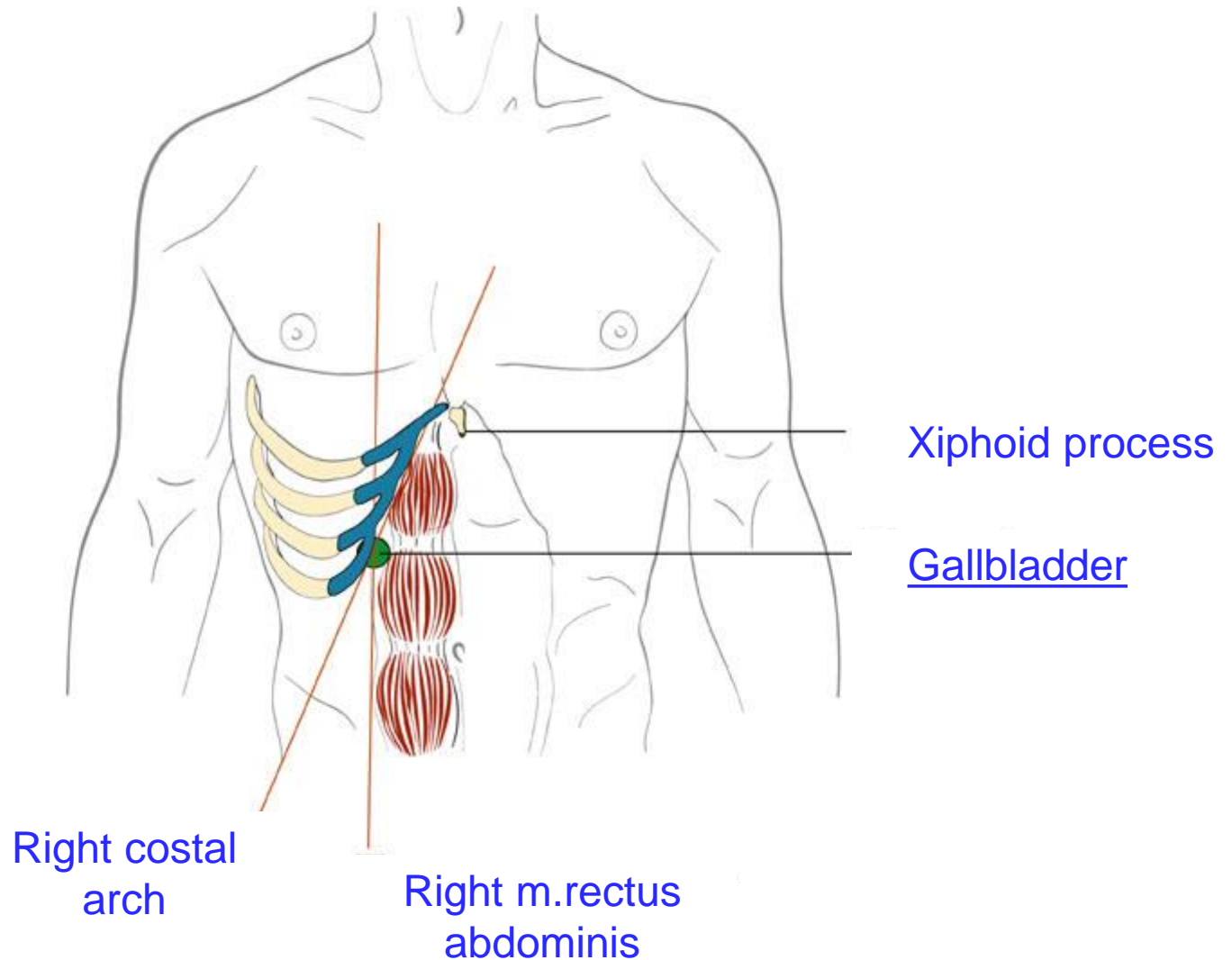


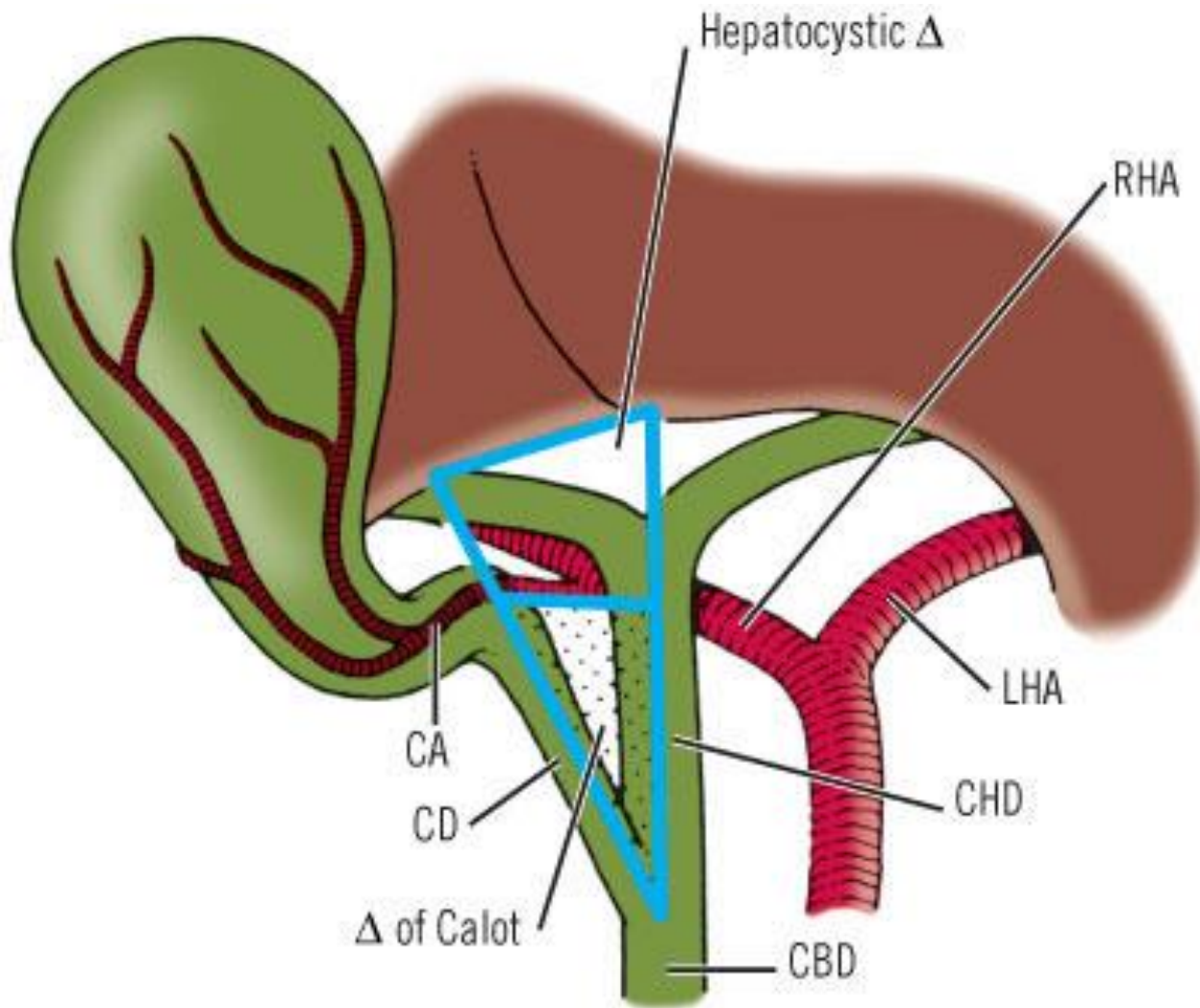
Next stitching of the part will be removing.



Peritonization with help of part of lesser omentum.

Holotomy of the gallbladder.

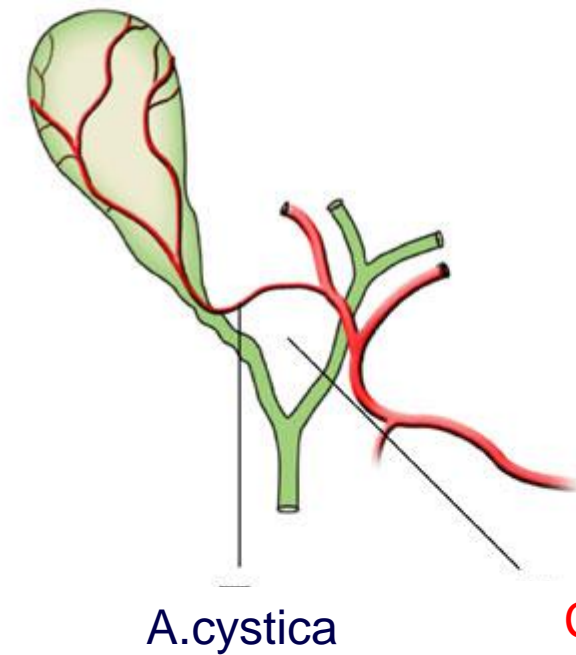




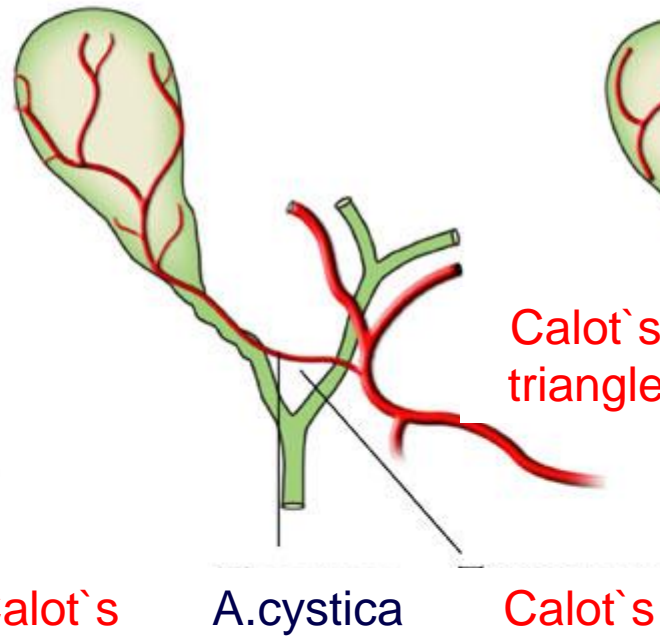
Hepatocystic triangle and triangle of Calot. Upper boundary of hepatocystic triangle is inferior border of liver. CA, Cystic artery. CD, Cystic duct. CHD, Common hepatic duct. CBD, Common bile duct. LHA/RHA, Left and right hepatic arteries.

Variants of Calot`s triangle.

(отхождения пузырной артерии)

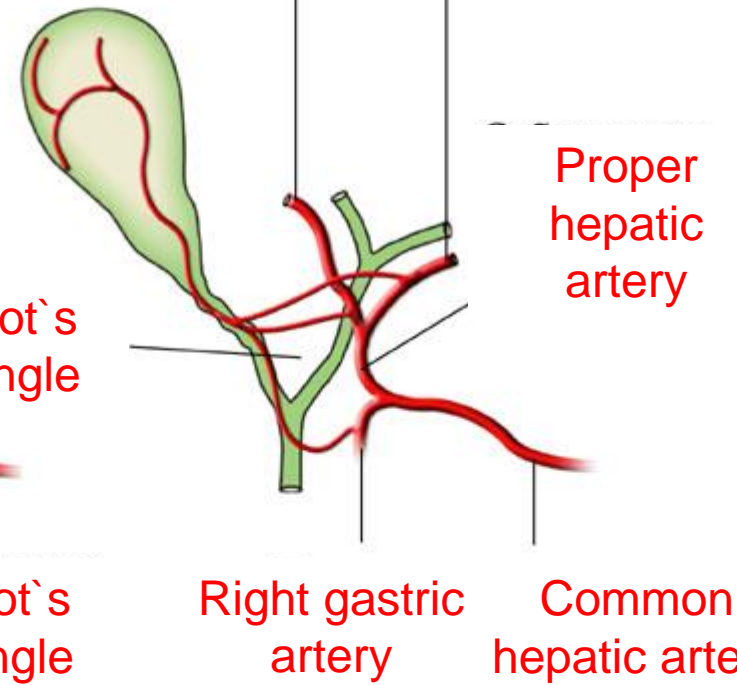


Calot`s triangle



Calot`s triangle

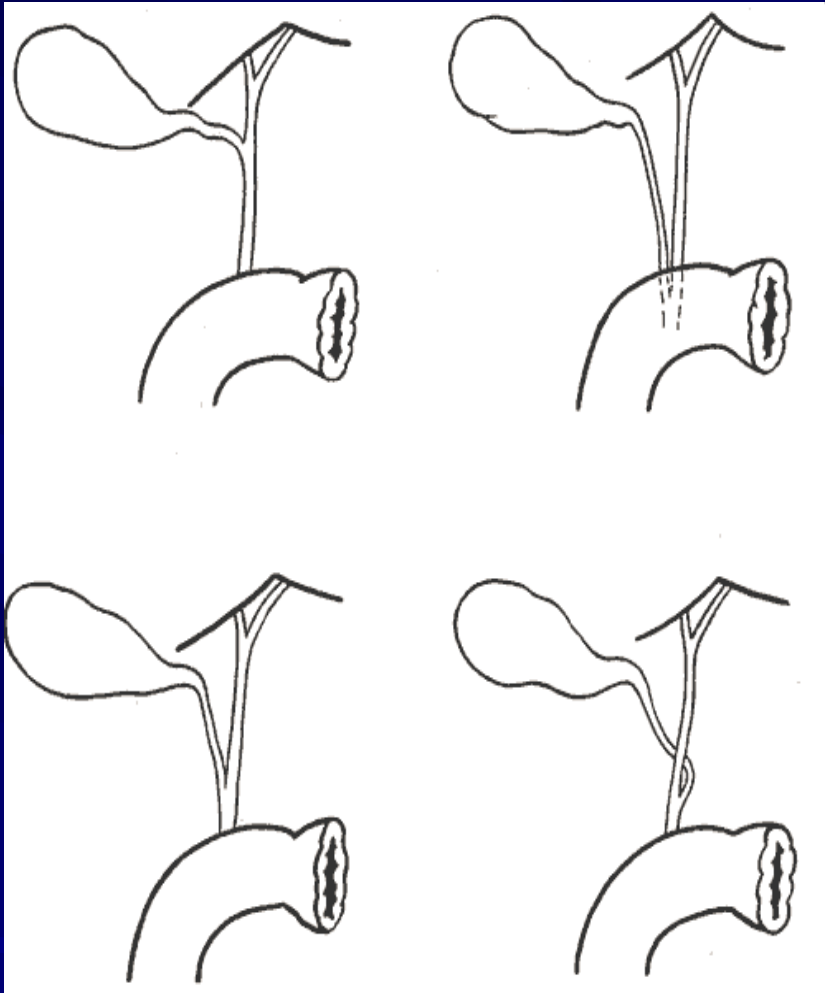
Right hepatic artery Left hepatic artery



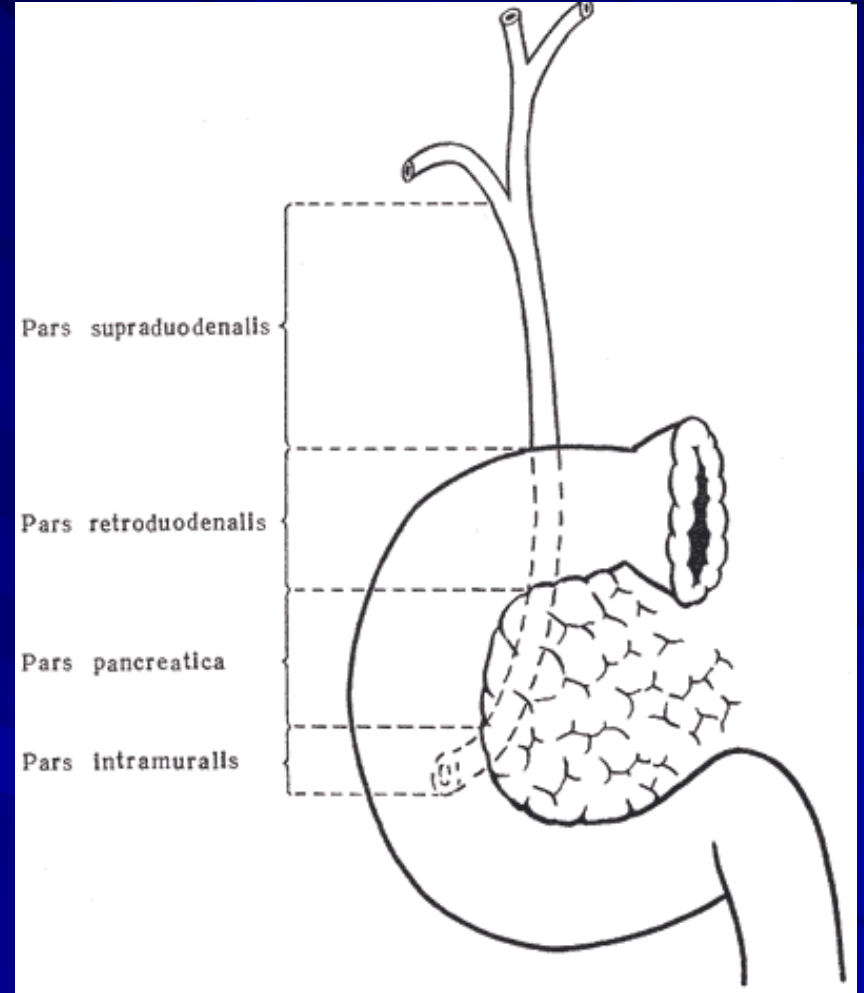
Proper hepatic artery

Right gastric artery

Common hepatic artery

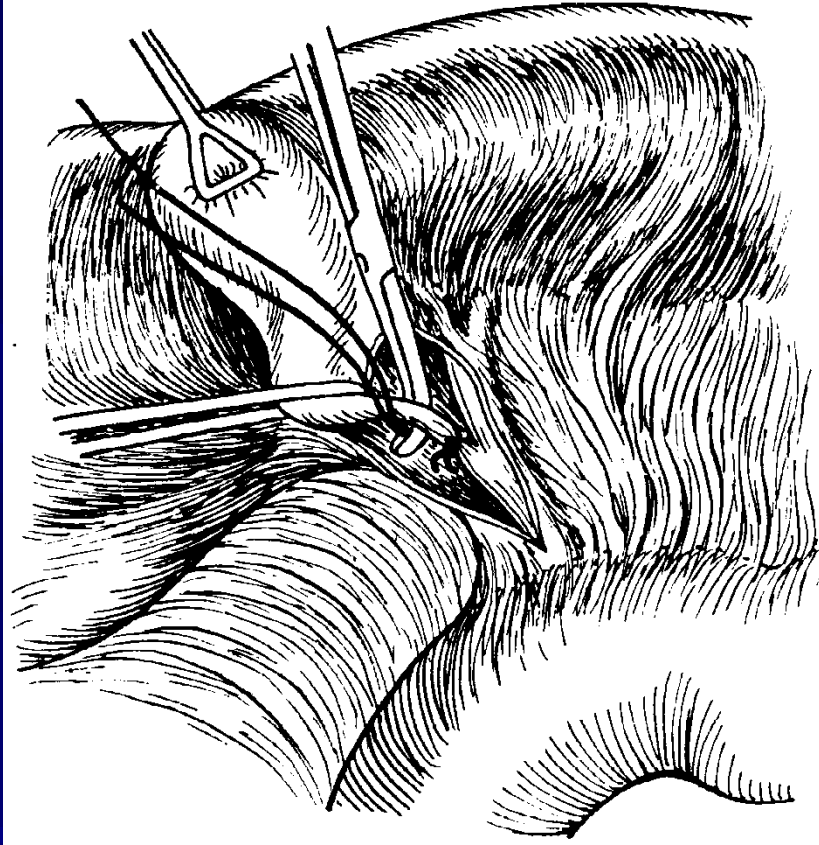


Cystic and common bile ducts.
 Different variants of its
 connection.



Anatomical subdivision of the
 common bile duct.

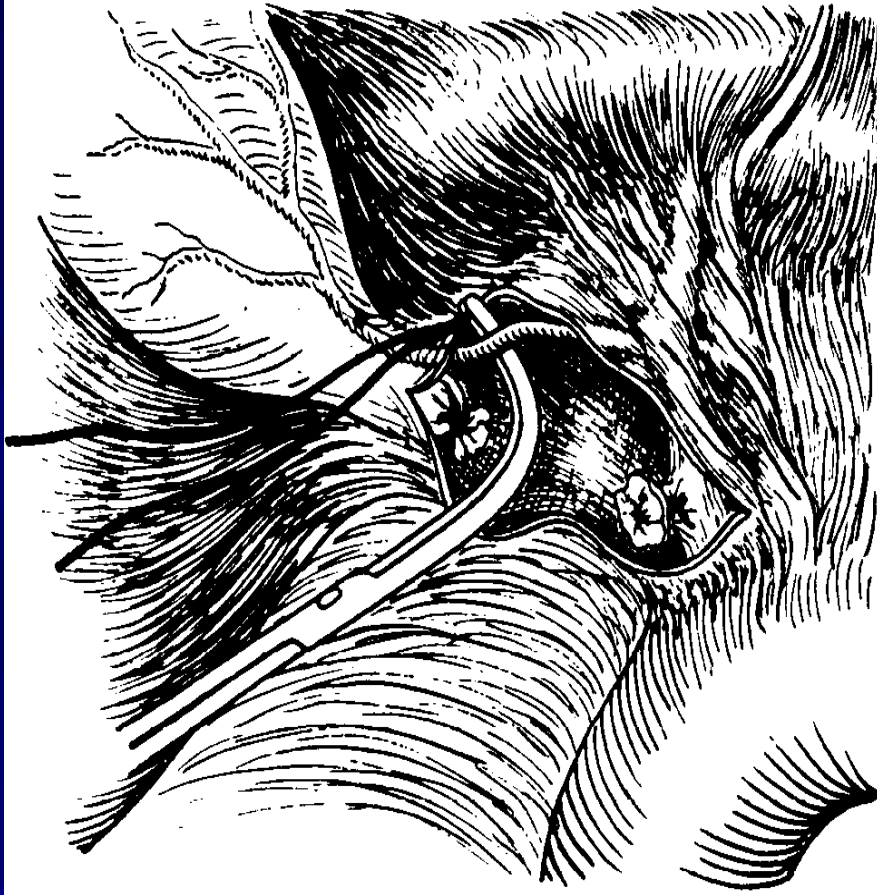
RETROGRADE CHOLECYSTECTOMY



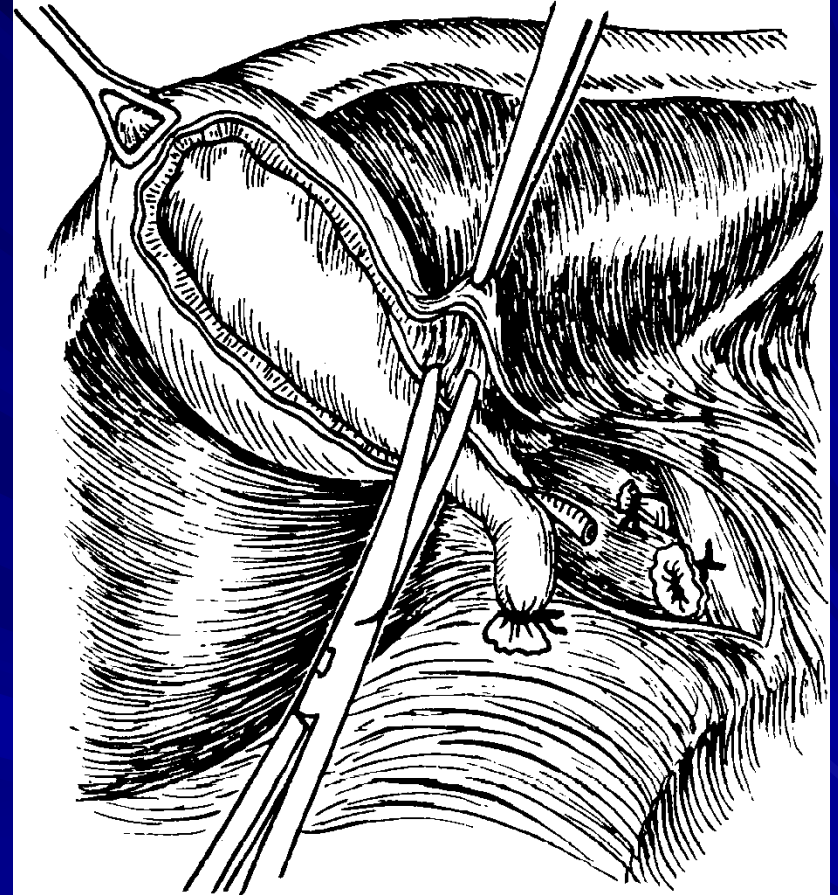
Cystic duct segregation



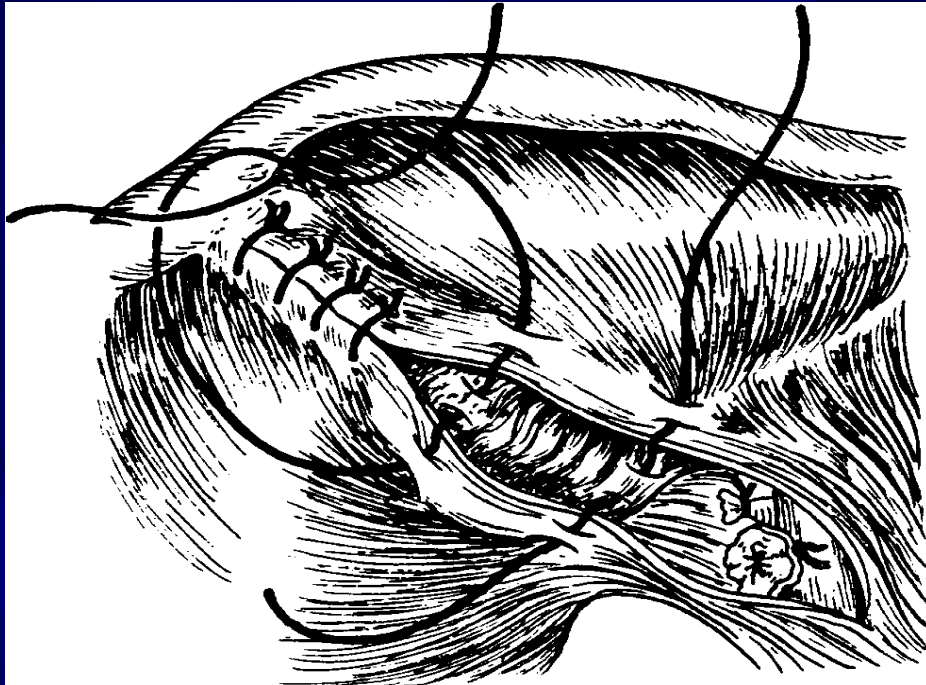
Ligation and dissection of the duct



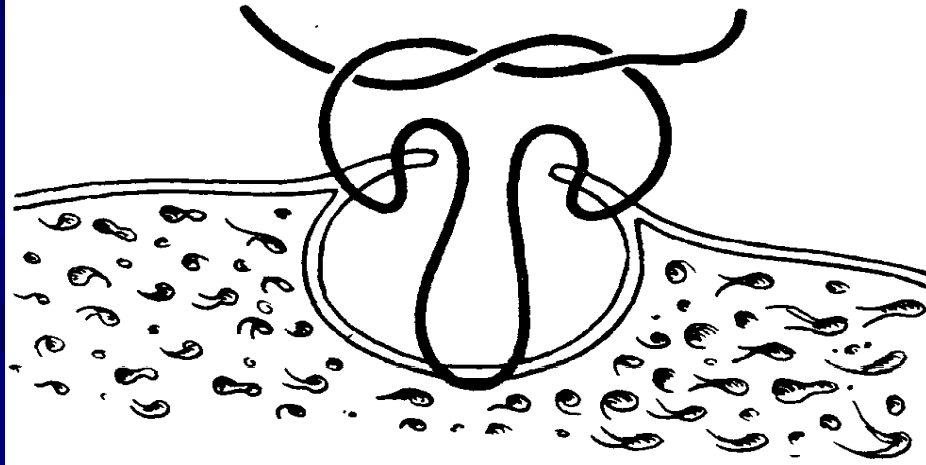
Cystic artery denudation



Subserous separation of
gallbladder



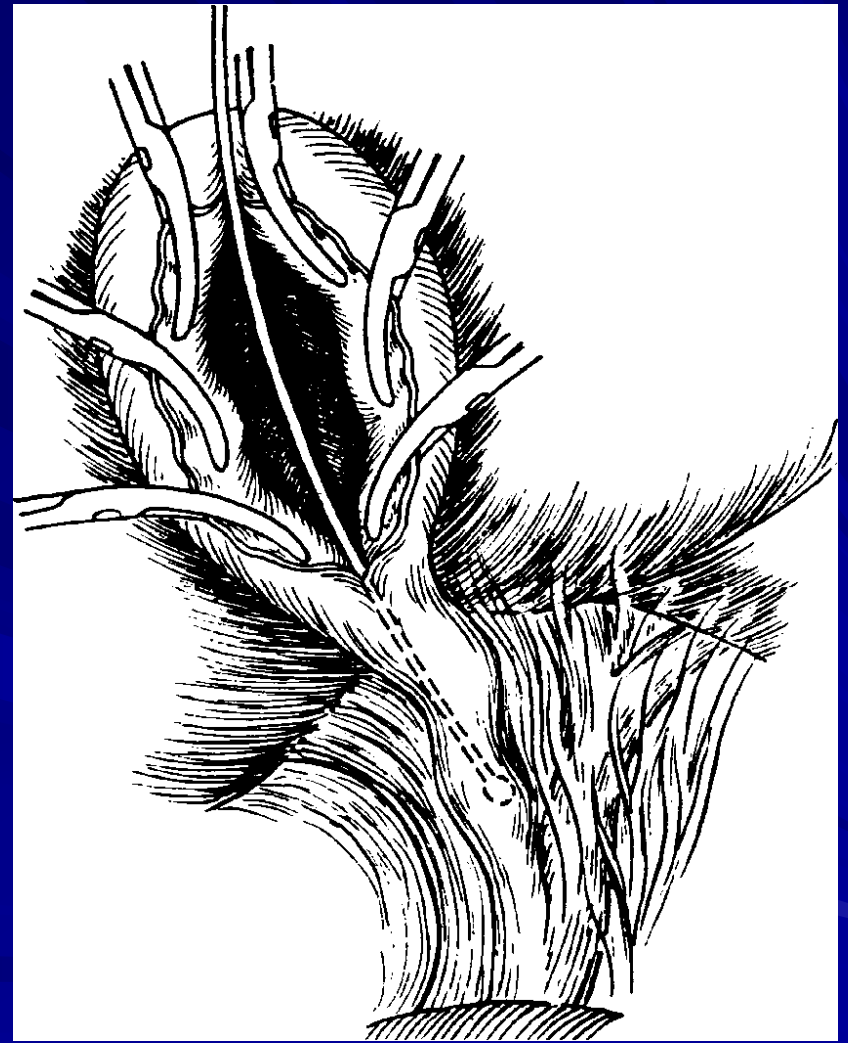
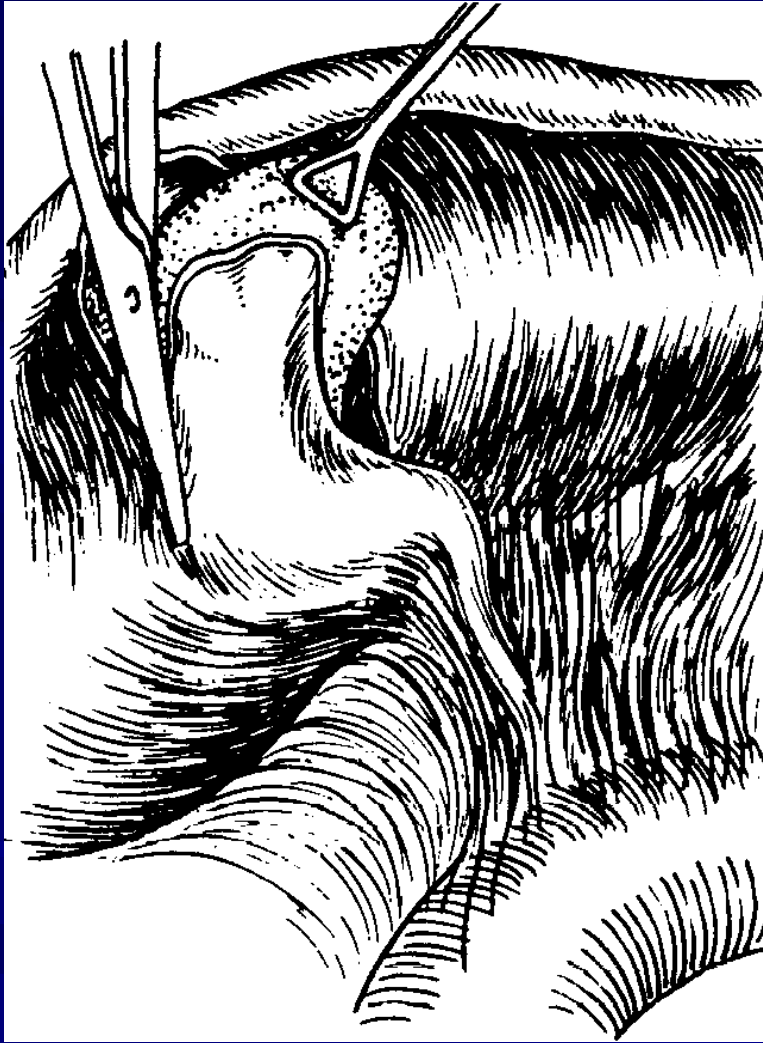
a



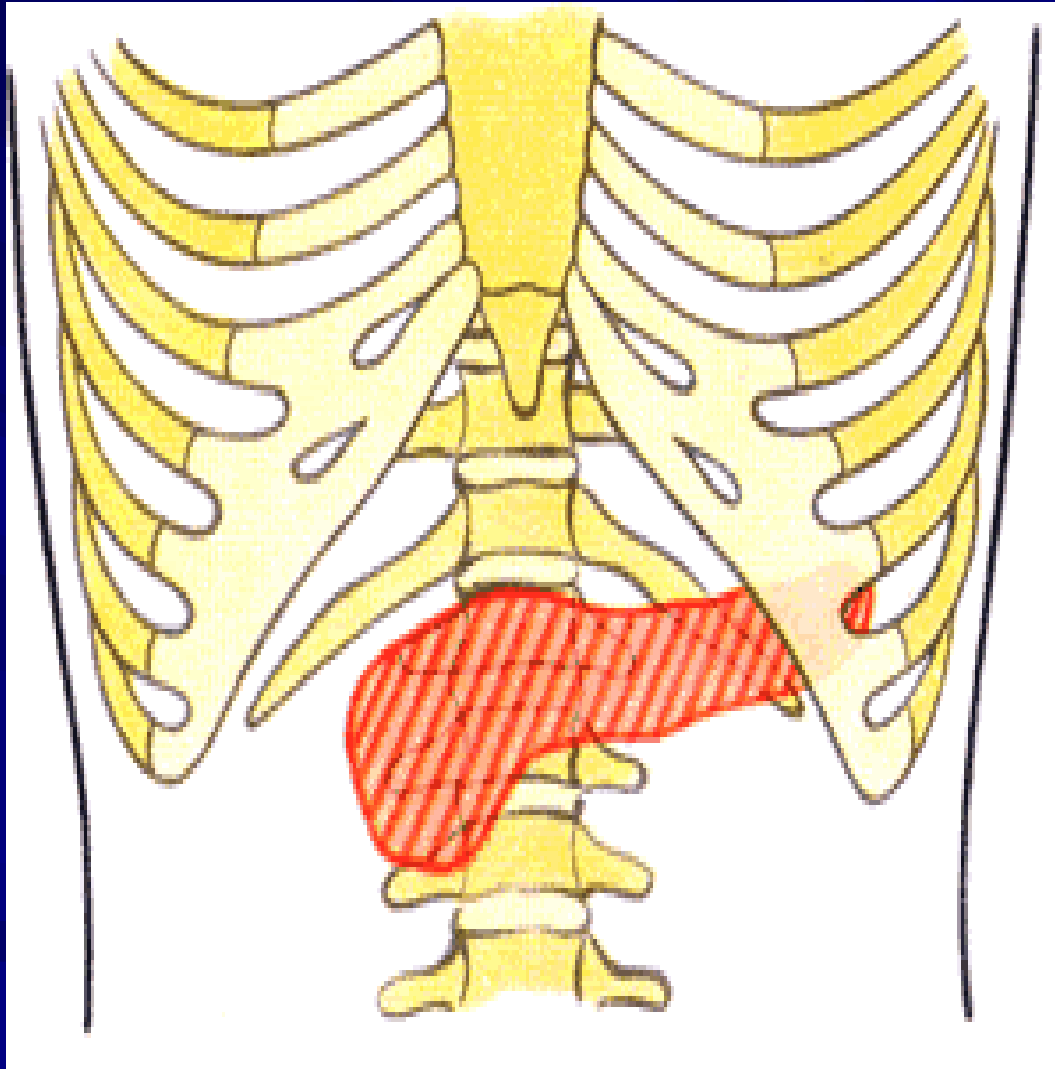
b

Peritonization of
gallbladder bed

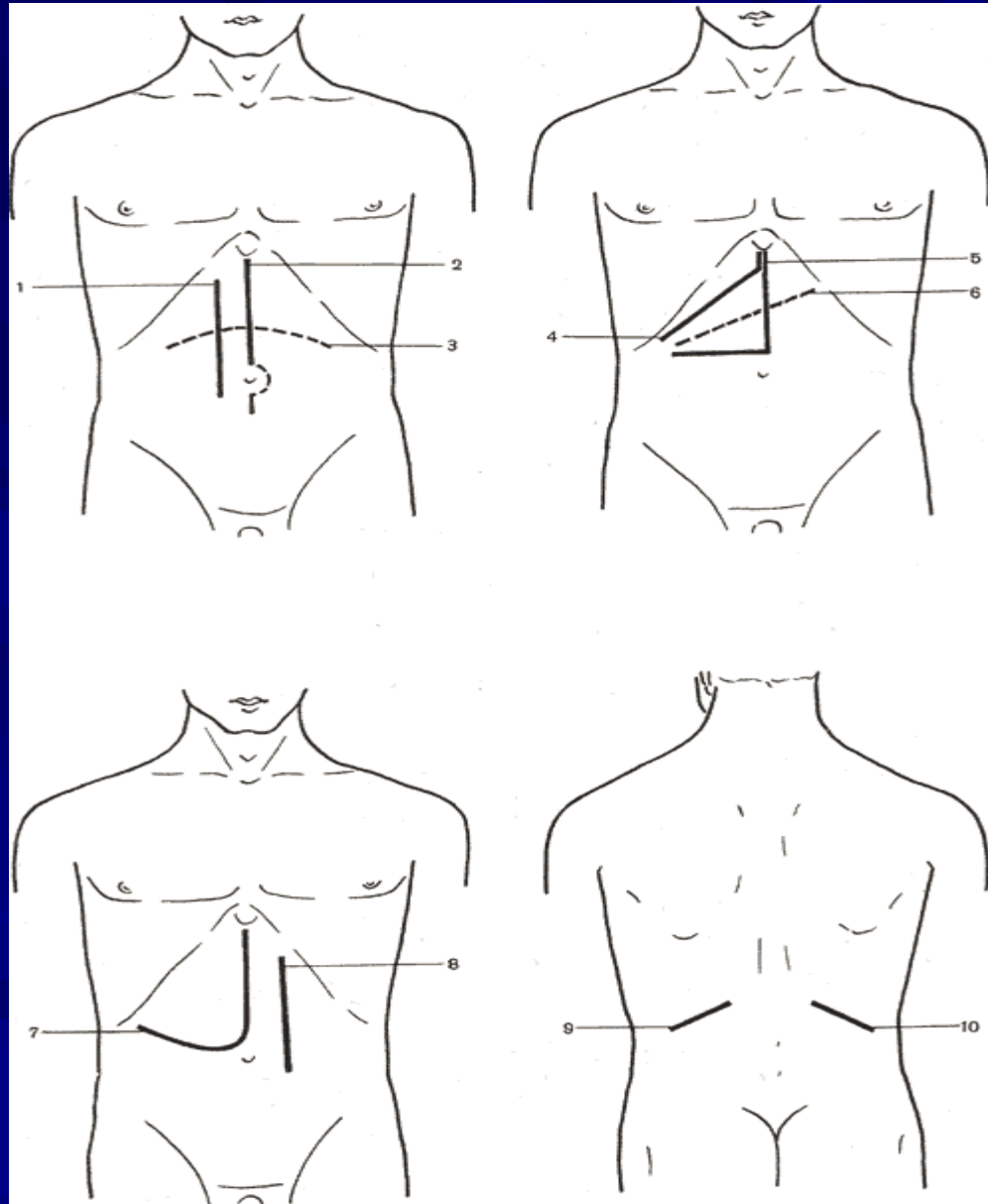
ANTEROGRADE CHOLECYSTECTOMY



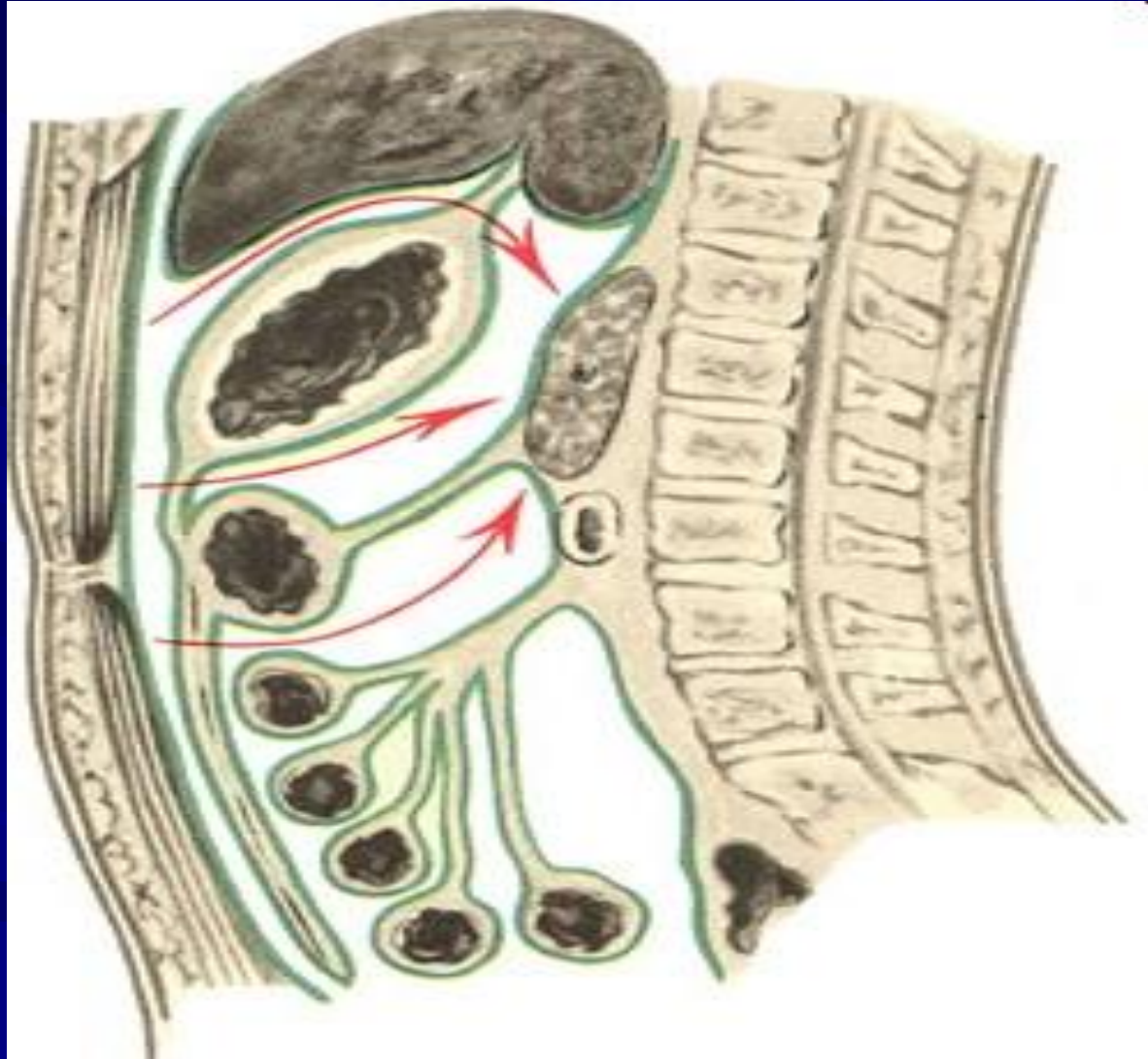
Skeletopy of pancreas.



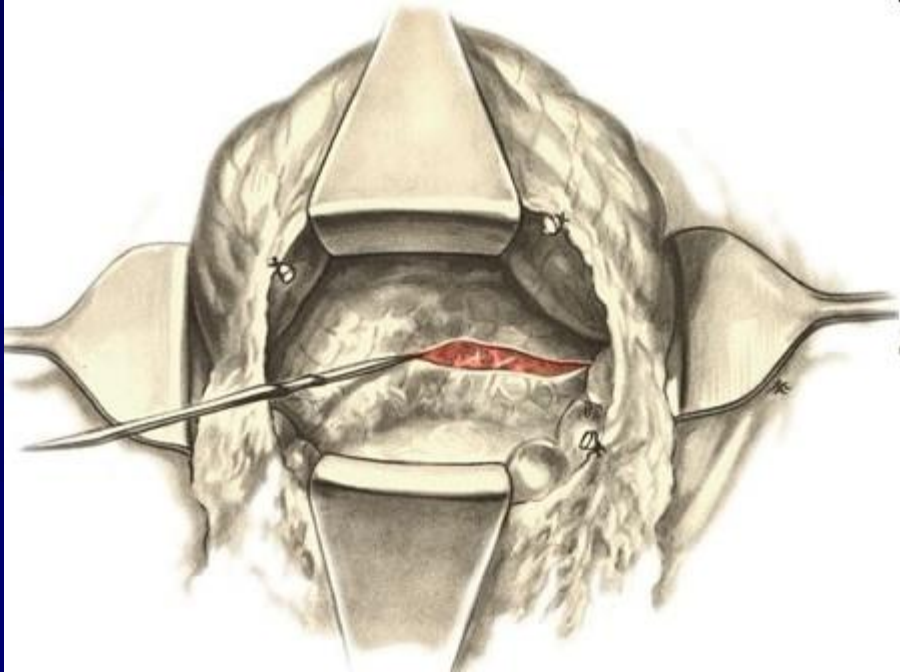
Surgical accesses to pancreas



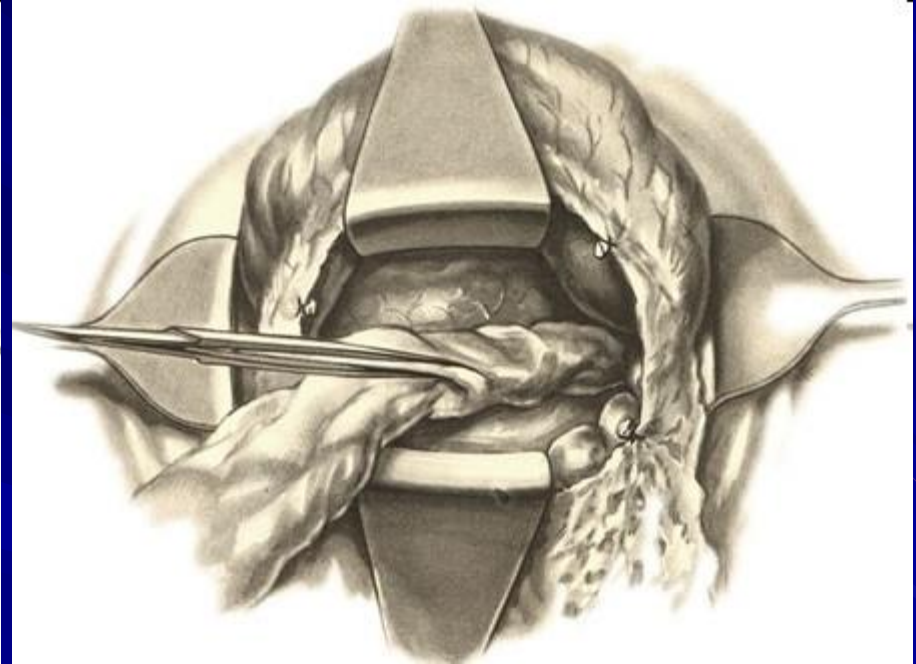
Different accesses to pancreas (sagittal section)



Acute pancreatitis

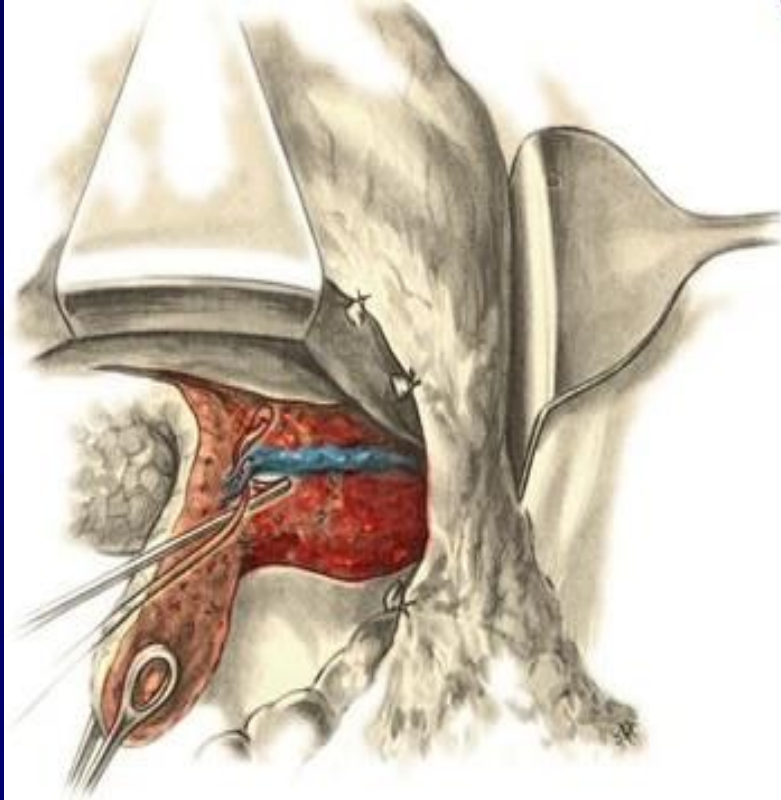


Dissection of capsule

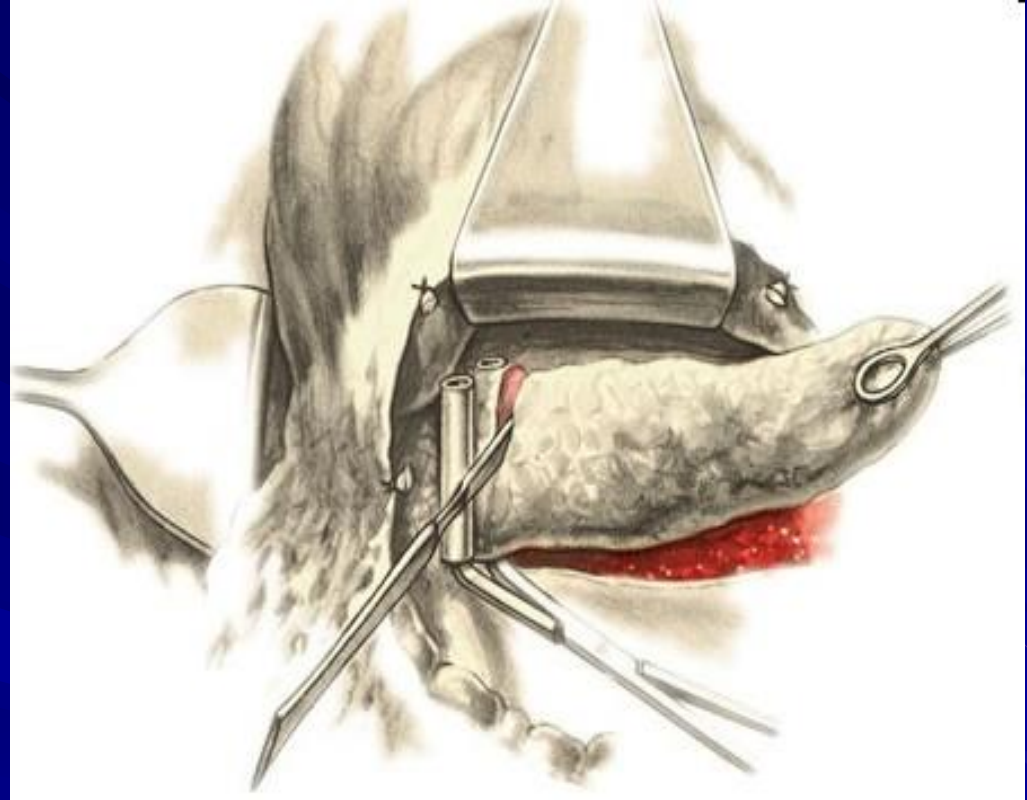


Tamponade

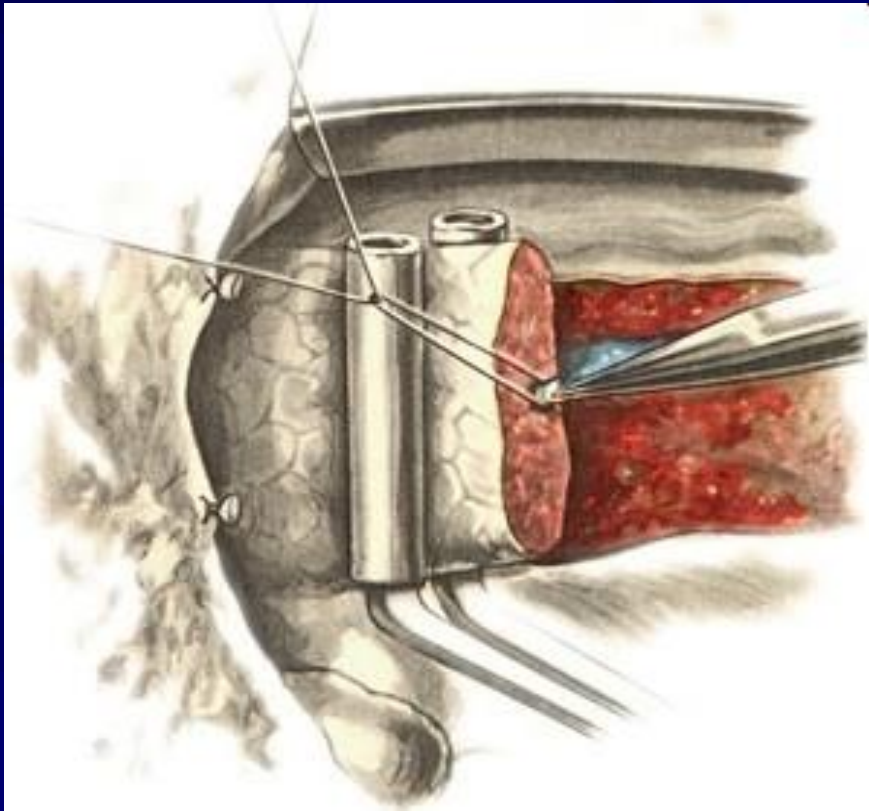
RESECTION OF PANCREAS



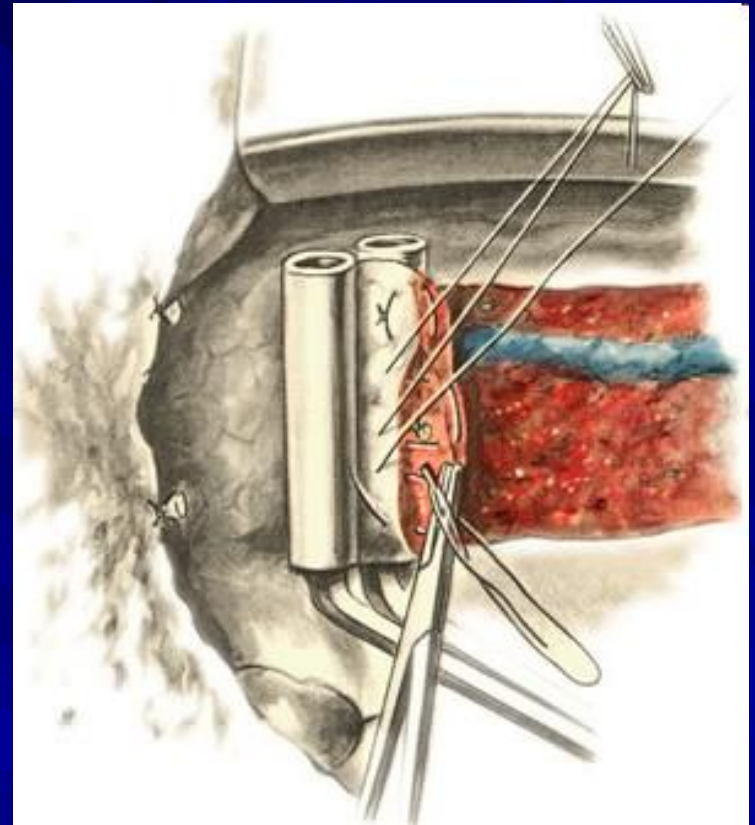
Ligation of arterial and venous branches to pancreas from splenic vessels.



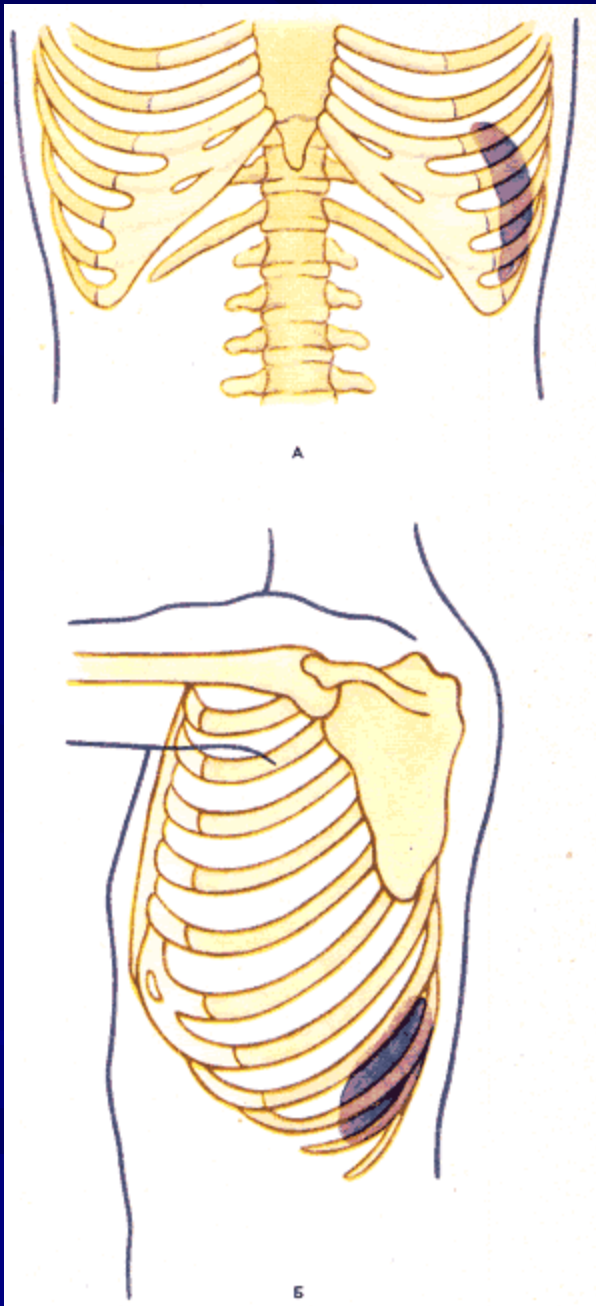
Partial resection of pancreas



Preparing of pancreatic stump by Brunshvig`s method. Isolated ligation of the pancreatic duct.



Π-shape sutures on anterior and posterior walls of stump.



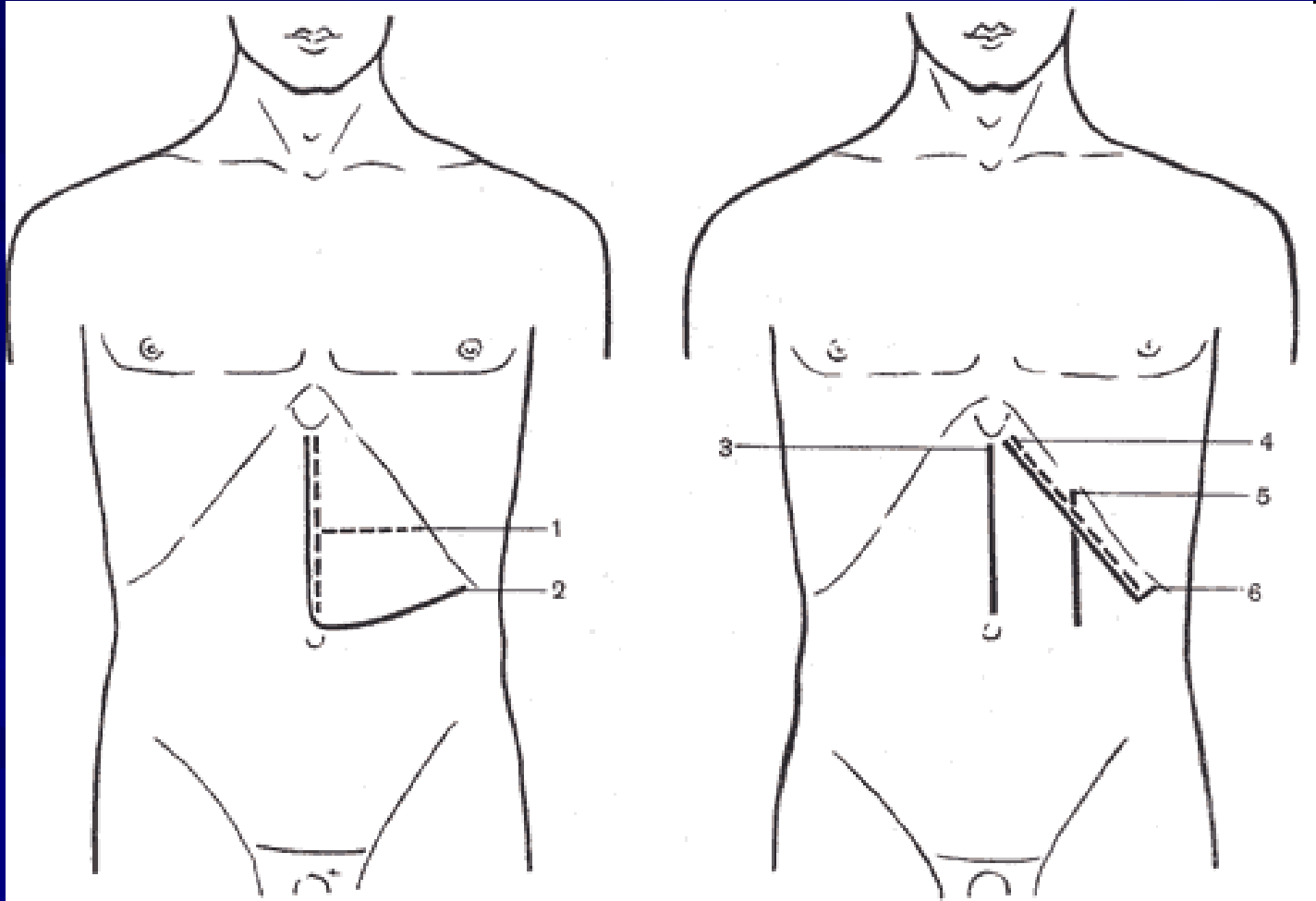
Skeletopy of spleen.

A — anterior view;

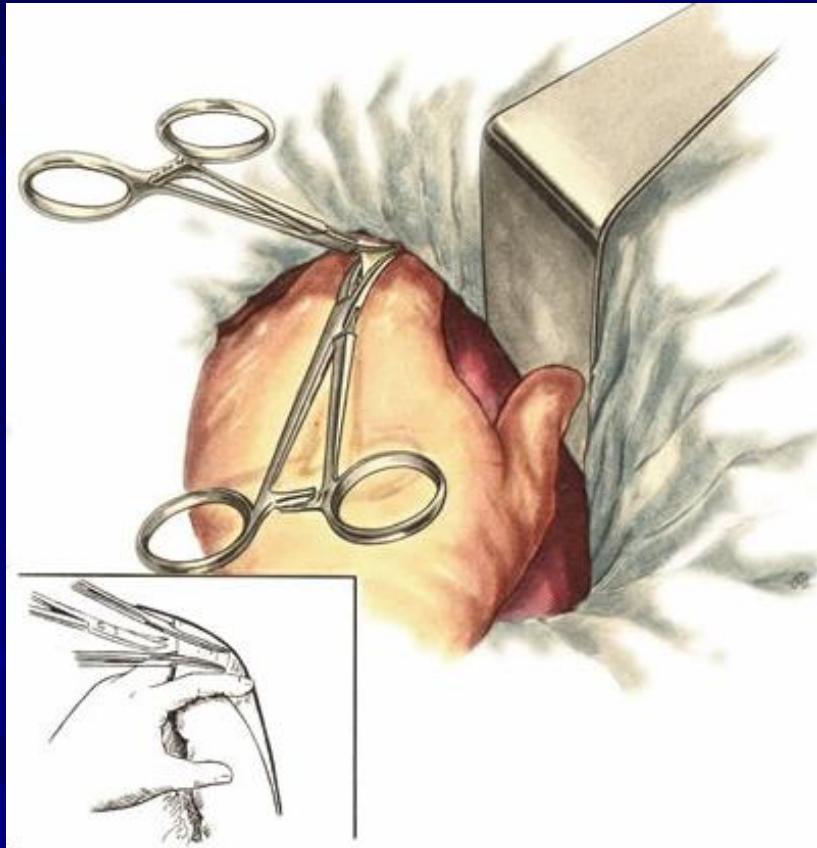
Б — lateral view.

Accesses to spleen.

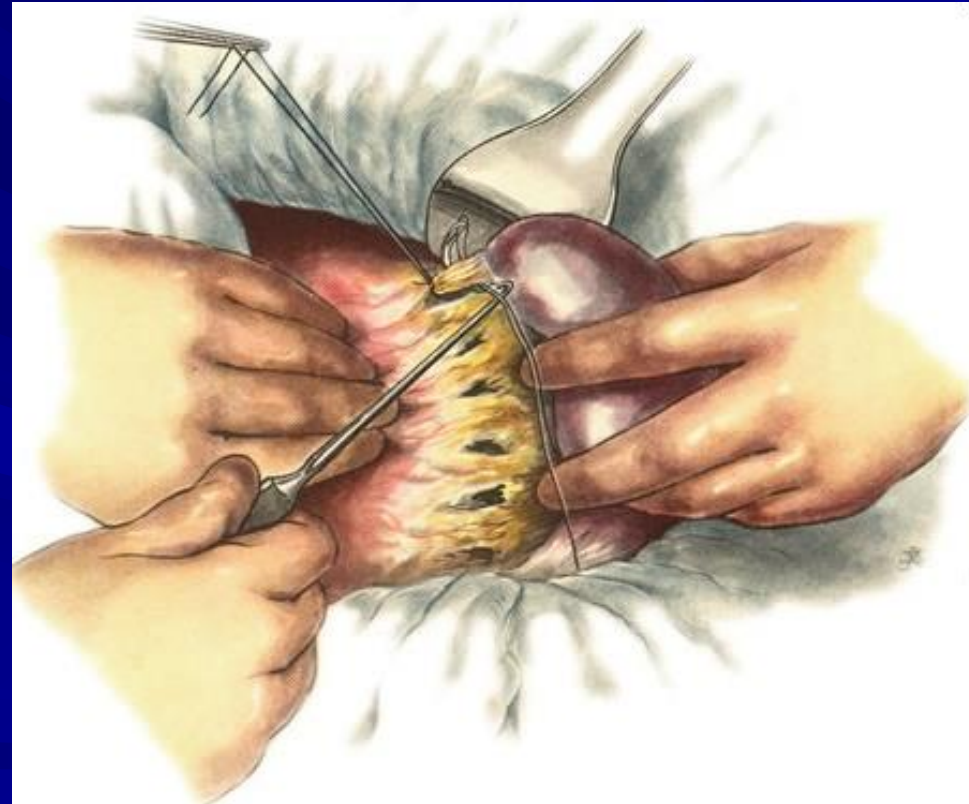
1 — T-shape; 2 — angle-shape; 3 — superior middle; 4 — oblique (by Cherni, Kerr);
5 — pararectal; 6 — oblique by Shprengel.



Resection of spleen. Apply forceps on lig. phrenicolienale.

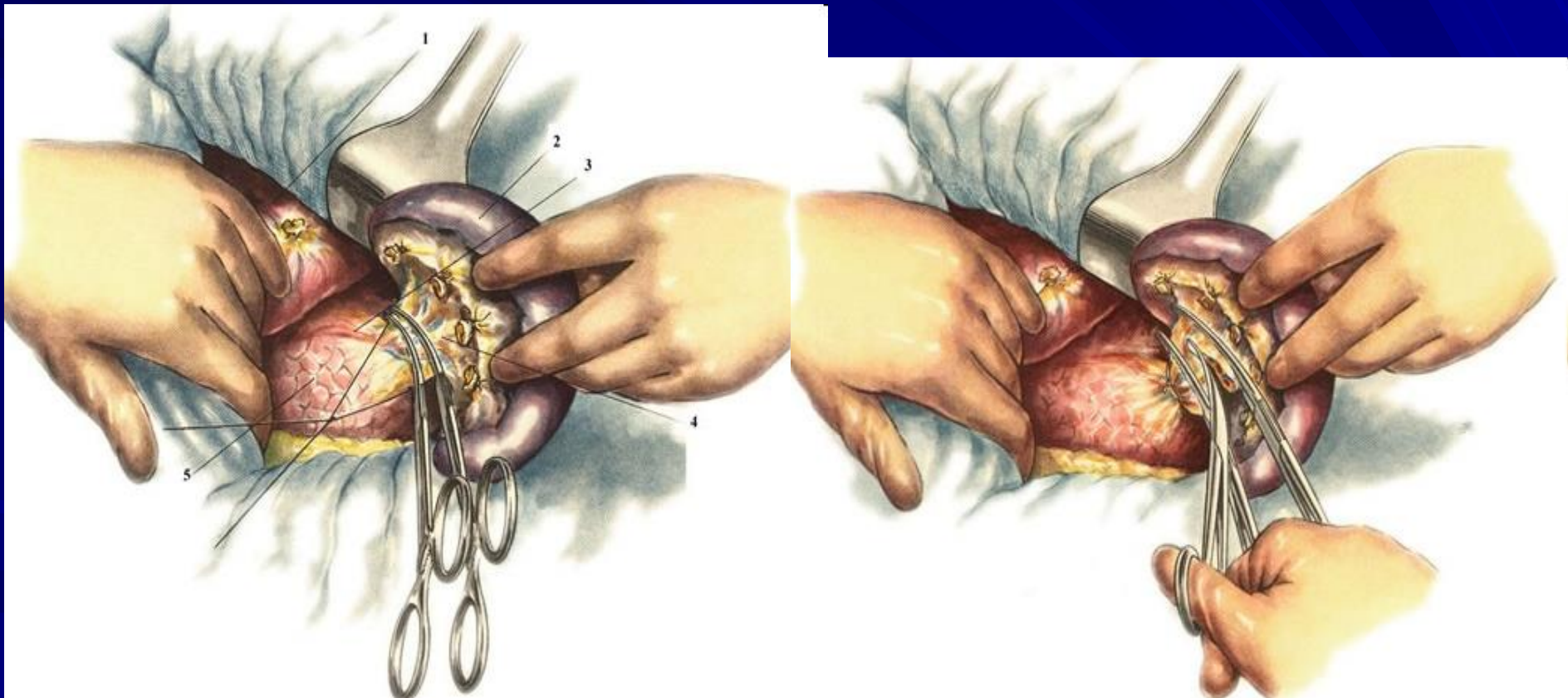


Ligation of lig. gastrolienale.



Ligation of spleen crus.

1 — ventriculus; 2 — lien; 3 — a. lienalis; 4 — cauda pancreatis.



Dissection of spleen crus between forceps.

Thanks a lot!!!

