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 adhesia.

**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

- Ileum
- Mesenterium
  - Anastomoses (аркады)
  - aa. ileales (ветви a. mesenterica superior)
- Aa. rectae
- Tunica serosa (peritoneum viscerale)
- Tunica muscularis, stratum longitudinale
- Tunica muscularis, stratum circulare
- Tela submucosa
- Tunica mucosa
- Plicae circulares [KERCKRING]
  - Noduli lymphoidei solitarii
- Noduli lymphoidei aggregati
Intestinal wall

a – Internal sheath:
  1 – Mucous membrane
  2 – Submucous base

б – 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

Albert-Koher (1824)

Pirogov (1849)

Schmiden (1911)

Connell (1836)
Classification of intestinal sutures

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

Purse-string (Doyen)

Lambert (1825)

Z-suture
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 cm 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 (Moultonovsky-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-Moutlanovsky`s suture

Serous-muscular Lambert`s suture
Side-to-side anastomosis
Side-to-side anastomosis
Side-to-side anastomosis

Isoperistaltic

Antiperistaltic
Bypass anastomosis
Anastomosis is completed. Serous-serous sutures on the mesentericum (а), cross section of the intestinal wall (б)
Anastomosis checking
Mechanical stapler UKL for stitching of the duodenum, intestine, hileum of lung
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

Правый блуждающий нерв
Левый блуждающий нерв
Задний ствол блуждающего нерва
Передний ствол блуждающего нерва
Диафрагма
Ветви переднего ствола блуждающего нерва
Пищеводное отверстие диафрагмы
Пилорический сфинктер
Ветвь Летарже
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.
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 horseshoe-like 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
Gastrostomy by Stamm—Kader.
Gastrostomy by Toprover (permanent)
A. gastrica sinistra

Determination of gastric resection borders.
RESECTION OF STOMACH

Billroth I

Billroth II

Classic Billroth I 1881

Standard Billroth I

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.
Dissection of a. et v. gastrica sinistra.

Mobilization of stomach (lesser curvature).

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

Dissection of a. et v. gastrica dextra.
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
ENTEROSTOMY

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

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.
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.
3. If possible, the appendicular artery is doubly ligated 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.
7. After burying the stump, the serosal defect of the mesenteriolum is sewn with interrupted sutures.

- If the appendix is markedly inflammed, these sutures should not be made.
Retrograde resection in the presence of an immobile caecum

Since the appendectomy has to be performed with in 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.
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.
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
Carrying of suture-taped under the bowel and suturing it to the peritoneum and skin.
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.
Hemicolecotomy

Ligation and cutting of mesenteric vessels
Hemicolecctomy

Cutting of the ascending colon
Hemicolecctomy

Close the ileum. Making of stump.
Hemicolecotony

Ileocolon anastomosis side-by-side
Hemicolecctomy

Ileocolon anastomosis side-by-side
Accesses to the liver

Transpleural by 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.
Holotopy 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.

A. cystica

Calot's triangle

A. cystica

Calot's triangle

Right hepatic artery Left hepatic artery

Proper hepatic artery

Calot's triangle

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

Legation and dissection of the duct
Cystic artery denudation

Subserous separation of gallbladder
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
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!!!