Ministry of Health of Ukraine
Ukrainian Medical Stomatological Academy

S.M. Bilash, O.M. Pronina, M.M. Koptev

Clinical Anatomy and Operative Surgery of areas and organs of head, neck, chest and abdomen

Manual for training of specialists
for II (Master's Degree) in branch of knowledge 22 "Health Care"
on speciality 222 "Medicine"

Recommended by the Scientific Board of Ukrainian Medical Stomatological Academy as a manual for English speaking students of the higher educational establishments of the Ministry of Health of Ukraine
(protocol № 3 from 5.12.18)

Poltava – 2018

UDC [611. 9+616-089](07)

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Clinical anatomy and operative surgery of areas and organs of head, neck, chest and abdomen. Manual for training of specialists for II (Master's Degree) in branch of knowledge 22 "Health Care" on specialty 221"Medicine".– Poltava: Publishing office "Kopir servis", 2018. – 186 p.

The manual on clinical anatomy and operative surgery for international students specializing in medicine corresponds to the syllabus and curriculum of the subject. The main issues for practical training and also recommendations on the methodology of the subject are represented sequentially. The manual includes theoretical material, assignments for self-control, situational tasks and the list of recommended literature for self-training.

It provides development of learning effectiveness of the students and is directed on mastering the subject "Clinical anatomy and operative surgery", gaining practical experience and skills which is of great importance in future medical practice.

Reviewers:
O.M.Slobodian – Doctor of Medicine, Professor, Head of Department of Anatomy, Topographic Anatomy and Operative Surgery, Higher State Educational Establishment of Ukraine "Bukovinian State Medical University";
Yu.I.Popovych – Doctor of Medicine, Professor, Head of Department of Clinical Anatomy and Operative Surgery, Ivano-Frankivsk National Medical University;
V.I.Liakhovskyi – Doctor of Medicine, Professor, Head of Department of Surgery No. 1, Ukrainian Medical Stomatological Academy;
O.M. Bieliaieva – PhD, Associate Professor, Head of Department of Foreign Languages with Latin Language and Medical Terminology, Ukrainian Medical Stomatological Academy.

Literary editor – I. V. Rozhenko
Literature on medicine and biology

UDC [611. 9+616-089](07)

ISBI 978-966-8716-54-6

CONTENTS

Academic discipline	Clinical anatomy and operative surgery
Module No.1	Clinical anatomy and operative surgery of the regions of head, neck, chest and abdominal cavity.
Content module No.1	Introduction to clinical anatomy and operative surgery. Clinical anatomy and operative surgery of areas and organs of head and neck.
Topic 1	Introductory lesson. Surgical instruments and suture equipment.
Year	II
Faculty	Foreign students training (medical)

1. The relevance of the topic

Every surgical intervention, regardless of the complexity and region, is performed by surgical instruments and requires high-quality suture materials. Profound knowledge of surgical instruments and rules of their use are important in professional activities of specialists in different fields of surgery that should be combined with knowledge of rules and surgical techniques.

2. Specific objectives

1. Classify general surgical instruments.
2. Explain the technique of general surgical instruments application.
3. Classify surgical suture materials.
4. Explain the use of basic types of suture materials.

3. Tasks for independent work to prepare for the lesson

3.1. List of the main terms, parameters, characteristics that should be learnt by the student while preparing for the lesson

Term	Definition
Operative surgery	The science dealing with surgical operations, methods of surgical interventions, which provides mechanical effect on organs and tissues with diagnostic, medical or reconstructive purpose
Clinical anatomy	Science dealing with anatomical issues which are relevant to various fields of practical medicine.
Topographic anatomy	The science dealing with structure, shape and relative location of organs and tissues in various parts of the human body

Developmental anatomy	The science that studies the age-related aspects of anatomical features of individual human development – ontogenesis. The branch of anatomy that studies structural changes of an individual from fertilization to maturity
Comparative anatomy	The science that studies similarities and differences in the body structure of animals and humans, the body structure itself at different stages of evolution, that clarifies the historical development of human organism − phylogenesis
General surgical instruments	Surgical instruments used for all types of surgery
Special surgical instruments	Surgical instruments used only for certain surgical interventions on the organs

3.2. Theoretic questions

1. What is the order of instruments placement on the table of scrub nurse?
2. What types of scalpels do you know? What positions for holding a scalpel do you know?
3. What is a scalpel position while performing the skin incision?
4. How should the scissors be held in the hand while dissecting tissue?
5. What is the difference between Kocher's and Billroth's hemostatic forceps?
6. What is the difference between Hegar's, Troianov, and Mathieu needle holders?
7. Is it correct position of the forceps in the hand when its end is directed to the palm?
8. What types of surgical needles do you know?
9. What are the requirements for suture material?
10. What is the classification for suture materials? What are their comparative characteristics?

3.3. Practical skills acquired in class

1. Arrange the instruments on the table of scrub nurse.
2. Perform the soft tissue cutting with a scalpel.
3. Apply hemostatic forceps on the blood vessels.

4. The content of the topic

At the beginning of the lesson the teacher should acquaint students with educational facilities of department, equipment, main tasks of the department in teaching and research work.

Description of surgical instruments

Starting with surgical instruments, the teacher explains that there are general and special instruments and surgical suturing devices, proceeds to description of each instrument specifying its application in surgical practice and the way of its application.

General surgical instruments can be distributed into the following groups: for tissue separation (cutting instruments), for bleeding arrest (hemostatic instruments), auxiliary (fixing) instruments and instruments for tissue connecting.

Instruments for tissue separation include scalpels (bellied, sharp-pointed, straight).

When dissecting tissue surgeons often use scissors: straight or curved along the plane or edge. There are scissors for special purpose: ocular, vascular and others.

Hemostatic instruments include clamps, which can have straight or curved working surface. Kocher's clamps are widespread in surgical practice (with teeth on working surface), Mikulich's (with teeth and diagonal notches on working surface) and Billroth's (without teeth). Hemostatic clips "mosquitoes" are used for small vessels bleeding arrest. Halstead clamps provide simultaneous capture of both vascular wall and adjacent tissue.

Auxiliary (fixing) instruments are used to examine occurring wound, identify bleeding vessels, pathologically changed tissues and organs by thorough widening of the wound edges. It is performed by capturing the wound edges with fixing tools, namely, tweezers, hooks, mirrors etc.

Hooks can be sharp-pointed, blunt, laminar, one-, two-, three- and four toothed. If surgeon manipulates in the depth of the wound near large vessels and nerves, it is advisable to use blunt or laminar hooks.

Tweezers are often used as fixing instruments. Anatomical forceps (without teeth) is preferable in case of soft tissue capture (blood vessels, nerves, walls of the intestines and others), and surgical ones are used while capturing the edges of dissected skin, aponeurosis, tendons.

The group of auxillary (fixing) instruments includes probes, namely, grooved, bulbous-end and Kocher probe. Grooved probes are used in cutting of aponeurosis and fascia, the bulbous-end – to examine the depth and direction of the wound channel or fistule, detection of foreign bodies and other. Kocher probe is used in thyroid gland surgery.

Deshana ligature needles also belong to auxiliary group of instruments. They are used to bring the ligature under the vessels and ducts. There are right and left-handed Deshana needles, they can be sharp-pointed and blunt-ended.

Instruments for tissue connection include needle holders (Hegar's, Troianov, Mathieu), curved surgical needles (taper and cutting), straight, pointed and blunt (for liver), clamps, tweezers and Michel clips remover.

Cutting (triangular) surgical needles are used in case of suturing the skin, aponeurosis, fascia and taper (round) one – while suturing the walls of hollow and parenchymatous organs.

Atraumatic needles are used for angiorrhaphy, suturing of the heart and lung wounds.

The teacher indicates the order of instruments placement on the table of scrub nurse, rules for passing them to the surgeon and how the surgeon should hand back the instruments to the nurse.

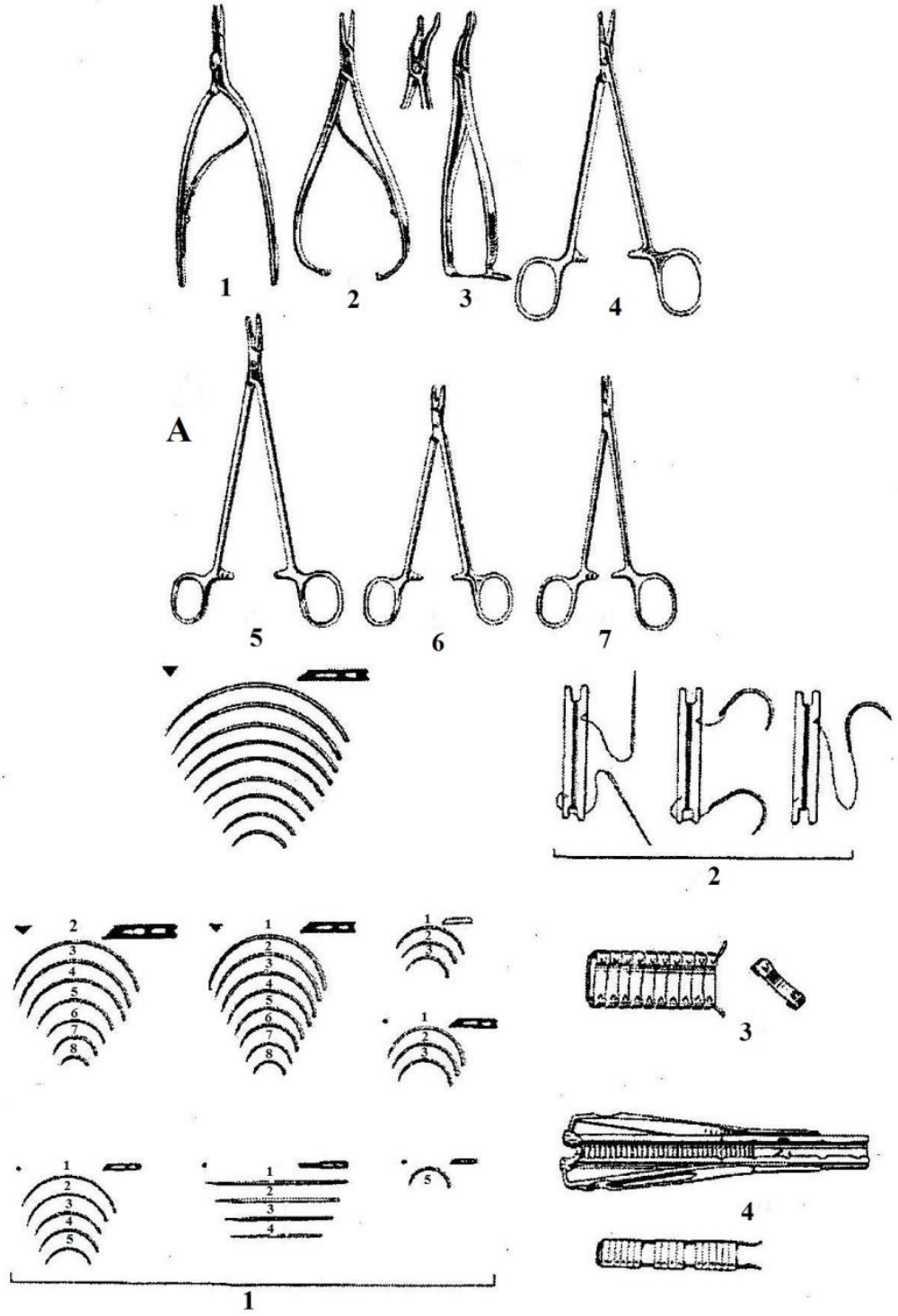

Fig.1. Instruments for tissue connection:

A − needle holders: 1 − for angiorrhaphy; 2 − with bent handles and ratchets; 3 – Troianov's; 4 − with straight ring handles and ratchets; 5 − curved with straight ring handles and ratchets; 6, 7 − straight and curved with straight ring handles and ratchets; B − surgical needles: 1 − surgical needles straight and curved (cutting and taper); 2 − atraumatic surgical needle; 3 − the metal clips (Michel); 4 − forceps for metal clips applying.

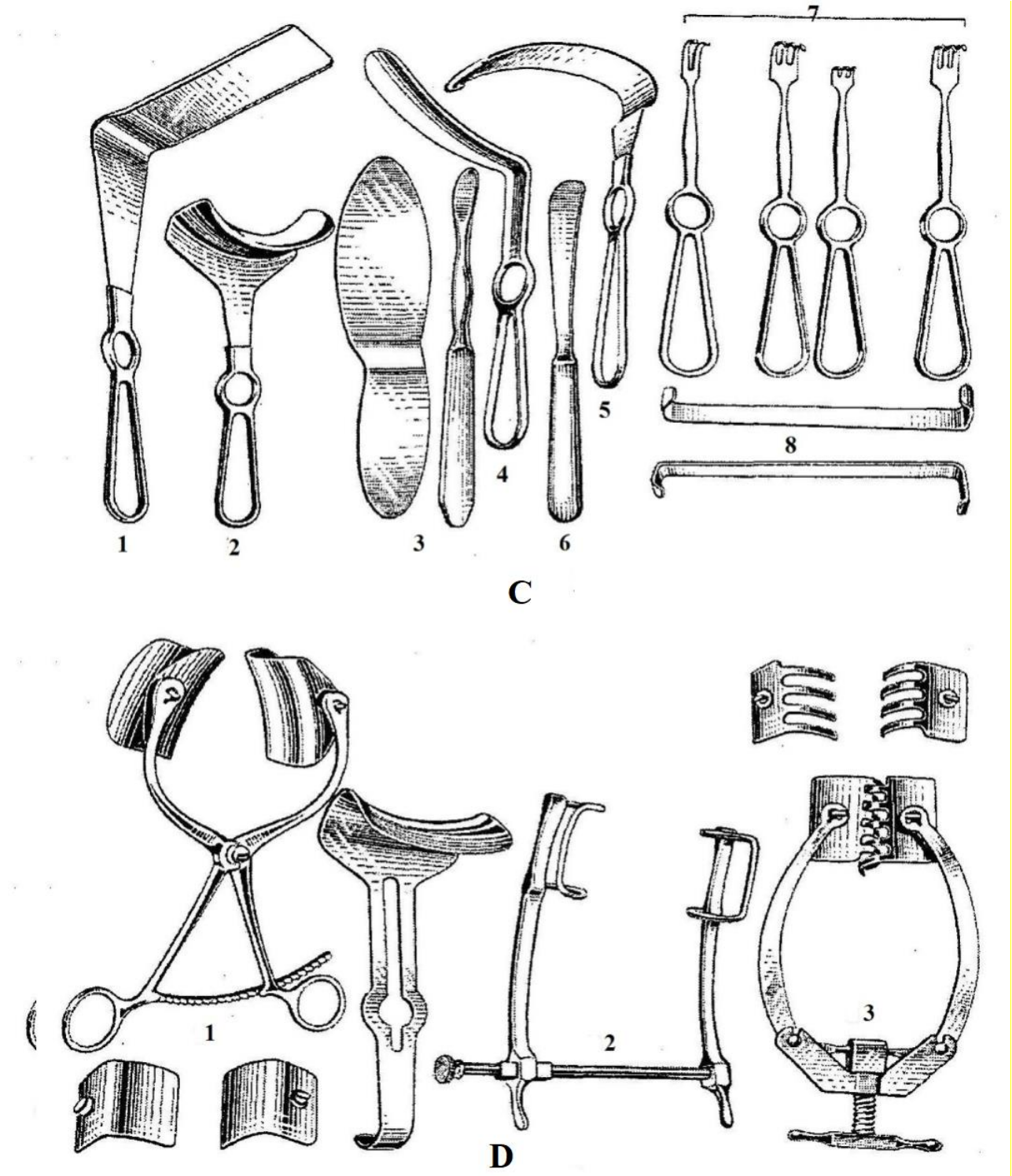

Fig.2. Auxiliary tools:

B – retractors: 1 – liver speculum; 2 – abdominal wall speculum; 3 – kidney abduction speculum; 4 – soft tissue elevator; 5 – speculum for heart; 6 – Buial'skii spatula; 7 – surgical toothed hooks; 8 – laminar hooks; C – retractors: 1 – double with ratchet; 2 – without ratchet; 3 – screw retractor used for ribs.

The teacher shows different positions of scalpel fixing (dinner knife position, pen holding position, fiddlestick position, amputating knife position) depending on the objectives of the incision **(Fig.3−8).**

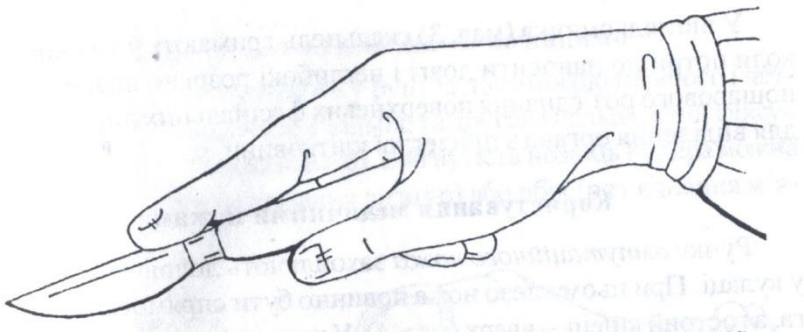

Fig.3. Dinner knife position of the scalpel

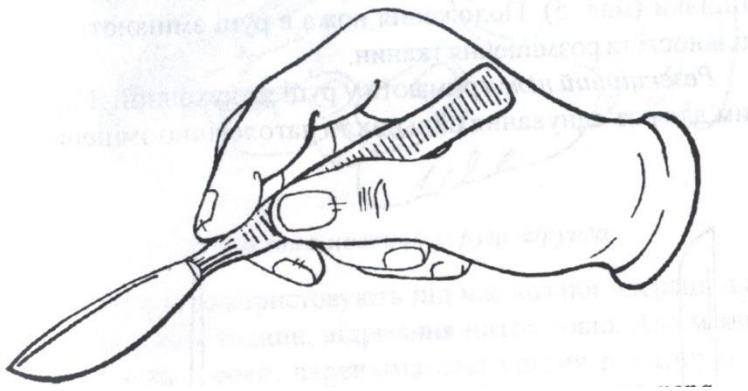

Fig.4. Pen holding position

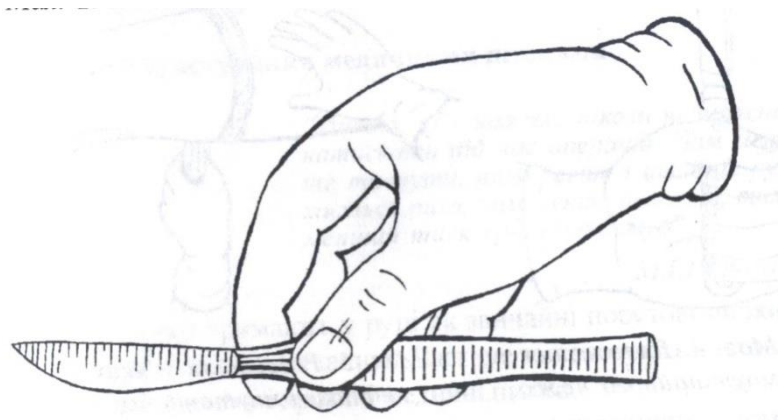

Fig.5. Fiddlestick position

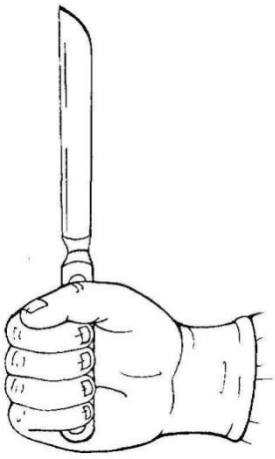

Fig.6. Position like amputation knife

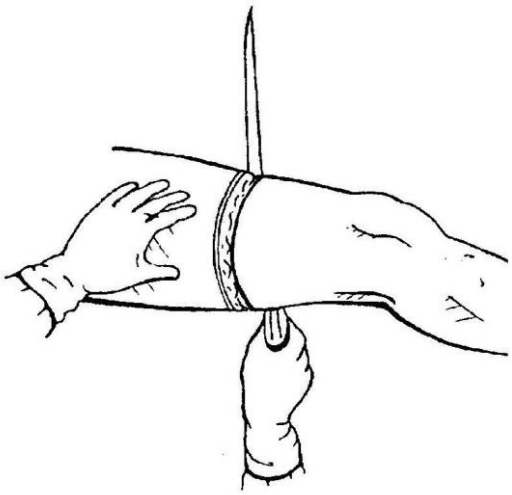

Fig.7. Dissection of the leg soft tissues using amputation knife

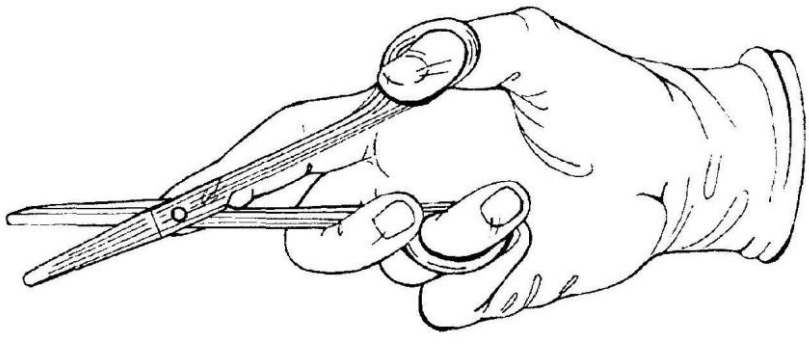

Fig.8. Position of scissors in the surgeon's hand

The teacher should draw attention to certain types of special surgical instruments, namely, retractors, tongue forceps, tracheostomic cannulas, intestinal clamps, trocars, liver speculum, and the like.

The first practical lesson in each academic group includes presentation of topics "General surgical instruments", "Special surgical instruments", suturing surgical devices and instruments for blood vessels suturing **(Fig.1, 2).**

5. Materials for self-control

A. Tasks for self-control:

Test No.1. The scrub nurse gave the surgeon bellied scalpel instead of required sharp-pointed one. What is the main difference between them?

a) length of handle;
b) thickness of handle;
c) length of working part;
d) sharpness of blade;
e) angle of the point.

Test No. 2. The surgeon used Billroth clamp, curved along the edge during surgery. What is it used for?

a) separation of tissues;
b) bleeding arrest;
c) separation of wound edges;
d) providing surgery technique;
e) connection of tissue.

Test No. 3. The surgeon used scissors while separating tissues. Scissors were fixed in the hand in such a way, that the thumb of the surgeon was in one of two rings. What finger of the surgeon should be in the second ring of the instrument to provide optimal fixation in the hand?

a) 1st;
b) 2nd;
c) 3rd;
d) 4th;
e) 5th.

Test No. 4. On the table for general surgical instruments of scrub nurse the following instruments were placed: scalpels, scissors, haemostatic clamps, hooks, tweezers, packer, towel clips, grooved probe, Luer cannula, Hegar needle holders, needles, suture material and gauze wipes. What should not be on the table?

a) hooks;
b) packer;
c) towel clips;
d) grooved probe;
e) Luer cannula.

Test No. 5. While performing surgical access the surgeon dissect aponeurosis. What hooks should be used for separation of aponeurosis edges?

a) sharp single-toothed;
b) blunt single-toothed;
c) sharp multi-toothed;
d) blunt multi-toothed;
e) Farabeuf hook.

B. Tasks for self-control:

Task No. 1. For removal of foreign body from the gastrocnemius muscle the scrub nurse placed cutting, auxiliary and connecting tissues instruments. Is it possible to start a foreign body removal surgery with these instruments?

Task No. 2. The surgeon used pointed scissors for skin dissection during surgery. What mistake was made?

References

Basic literature

1. Tsyhykalo O.V. Topographic Anatomy and Operative Surgery / O.V.Tsyhykalo. – Vinnytsia, 2011. — 528 p.
2. Danilchenko S.I. Methodical Instruction For the 3st year students'of stomatological faculty self - preparation work (at class and at home) in studying operative surgery and toographical anatomy / S.I.Danilchenko, E.N.Pronina, O.Yu.Polovik. - Poltava, 2010. — 239 p.

Additional literature

1. Gray. H. F.R.S. Gray's anatomy / Henry F.R.S. Gray, R. A. Bolam. – London, 1994. – 1290 p.
2. McCraw J.B. Athlas of muscle and Musculocutaneous Flaps Head and Neck Reconstruction / John B McCraw, Phillip G Arnold. – Norfolk, Virginia, 1988. – 757 p.
3. Netter F. H. Atlas of Human Anatomy / Frank H.Netter. – East Hannover, New Jersey, 1990. – 592 p.
4. Hnatyuk M.S. Operative surgery and topographical anatomy (lectures) / M.S.Hnatyuk, O.B.Slabui. – Temopil, 2004. – 212 p.
5. Bernard C. Illustrated Manual of Operative Surgery and Surgical Anatomy / C.Bernard – 1991.-330 p.
6. Pemberton L.B. Workbook of Surgical Anatomy / L.B.Pemberton. – 1990. – 298 p.
7. Gliedman M.L. Atlas of Surgical Techniques / M.L.Gliedman. – New York etc., McGraw – Hill. – 1990. – 420 p.
8. Sabiston D.C. Atlas of General Surgery / D.C.Sabiston. – Philadelphia etc., Saunders. – 1994. – 220 p.
9. Chassin J.L. Operative Strategy in General Surgery / J.L.Chassin. – New York etc., Springer. – 1994. – 368 p.

Academic discipline	Clinical anatomy and operative surgery
Module No.1	Clinical anatomy and operative surgery of the sites of the head, neck, chest cavity and abdominal cavity.
Content module No.1	Introduction to clinical anatomy and operative surgery. Clinical anatomy and operative surgery of the head and neck
Topic 2	Primary surgical technique
Year	II
Faculty	Foreign students training (medical)

1. The relevance of the topic

Every surgical intervention, regardless of the complexity and region, is performed by surgical instruments and requires high-quality suture material. Profound knowledge of surgical instruments and rules of their use is important in professional activities of specialists in different fields of surgery that should be combined with knowledge of rules and surgical techniques.

2. Specific objectives:

1. Explain how to prepare the surgical field.
2. Explain how to carry out layer by layer infiltration anesthesia.
3. Explain how to carry out layer by layer separation of tissues.
4. Explain how to carry out layer by layer connection of tissues.
5. Explain the technique of bleeding arrest using hemostatic clips and ligatures on the vessels.

3. Tasks for independent work to prepare for the lesson

3.1. List of the main terms, parameters, characteristics that should be learnt by the student while preparing for the lesson

Term	Definition
Operative surgery	The science of surgical operations, methods of surgical interventions, the essence of which is to mechanical action on organs and tissues with a diagnostic, therapeutic or restorative purpose
Topographical anatomy	The science dealing with structure, shape and relative location of organs and tissues in various parts of the human body.
Special surgical instruments	Surgical instruments used only for certain surgical interventions on the organs.

3.2. Theoretic questions:

1. What are the surgical hand scrub techniques?
2. How is operating field prepared for surgery?
3. What are the methods for local anesthesia?
4. What is Vishnevsky anesthesia?
5. What types of scalpels do you know? Positions of scalpel holding.
6. What is the scalpel position for skin incision?
7. How should scissors be held in the hand when dissecting tissue?
8. What is the difference between Kocher hemostatic clamp and Billroth clamp?
9. What is the difference between Hegar's needle holders, Troyanov and Mathieu needle holders?
10. Define whether the position of tweezers in the hand is correct, if its end is directed to the palm of the hand.
11. What types of surgical needles do you know?
12. What are the requirements for suture material?
13. How can suture materials be classified? Name their comparative characteristics: biological, synthetic, absorbable and non-absorbable?
14. What main types of surgical knots are used in practice?
15. What is the basic principle for tissue disconnection?
16. How should the skin, fascia, muscles be disconnected?
17. What is the principle of tissue connection?
18. What are the types of skin sutures?
19. What instruments are needed for injections and infusions?

3.3. Practical activities performed in class:

1. Surgical scrubbing of the surgeon's hands.
2. Preparation of operating field and surgical draping, namely, placing of sterile

coverings on it.
3. Layer by layer tissue disconnection.
4. Bleeding arrest in the surgical wound.
5. Layer by layer connection of tissues.
6. Tying of main types of surgical knots.

4. Content of the topic:

Preparation of operating field

Surgery starts with preparation of operating field. Hair should be removed by special cream − depilator. The skin of the surgical field should be disinfected twice by 70% of alcohol, and then by 2% solution of iodine. It should be noted that iodine causes skin irritation and may be an allergen, so, now it is rarely used. Alcohol solutions of iodophores (iodonate, betadine, betazidone, iodopirone) are used more often. Alcohol solution of Gibitanum, Roccal and peracetic acid can also be used. The skin of the surgical field should be isolated by sterile sheets or self-adhesive sterile drapes, through which surgical incisions are performed.

In general, during operation, the surgical field is disinfected 4 times (according to Grossikh-Filonchikov):

- before conducting the local anesthesia, or placing of sterile coverings (for general anesthesia);
- before layer by layer tissue dissection (performing of operative access);
- before skin suturing (after all stages of surgery);
- before applying an aseptic dressing on the surface of the surgical wound.

The technique for conduction of layer by layer local infiltration anesthesia

The teacher explains that there are two types of anesthesia: general and local, and then assigns the scrub nurse, surgeon and assistant from the number of students. The scrub nurse places syringe, injection needles, and other instruments required for local anesthesia on the table for instruments. The surgeon and assistant at this time occupy appropriate places and start disinfection of operating field, perform surgical draping.

The teacher emphasizes priority of domestic authors in development of local anesthesia methods, points out the principles of anesthesia by the method of Vishnevsky creeping infiltration.

Layer by layer tissue disconnection

The teacher draws attention to sparing performing of incisions, taking into account direction of skin folds, muscle fibers, topography of neurovascular bundles. Incision is usually performed with bellied scalpel, fixing the skin at the moment of incision by the fingers of the left hand. After skin incision, the edges of the wound are dilated with sharp hooks and bleeding arrest from damaged blood vessels should be performed. Then subcutaneous tissue, superficial and proper fascia are incised. Large vessels and nerve trunks can be located under the proper fascia, so, they are incised through a grooved probe. Vessels and nerves that are in the direction of incision, if possible, are drawn aside. Fascia propria can also be incised with blunt scissors, bringing in the lower branch of the scissors below the fascia. Disconnection of muscles, if possible, is performed according to blunt pattern in direction of the

muscle fibers, if necessary, the muscles are incised. Periosteum is incised with scalpel, then the edges of the periosteum are exfoliated with straight or curved raspatory. Periosteum should be retained as much as possible, as in future it will provide regenerative function. Currently, laser devices "Scalpel-1", "Scalpel-2", "Romashka" are used in surgery.

Suturing

The first series of continuous sutures (simple, locking, mattress) students perform on fascia propria. Assistant shows how to tie the knot properly while suturing. Students put loop stitches on the skin. The distance from the edge of incision is 0.3−0.5 cm. The wound edges are carefully put together. The distance from one knot to another is about 1 cm **(Fig. 9, 10, 11).**

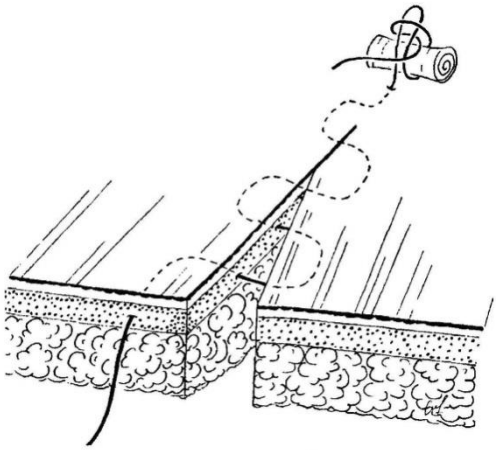

Fig.9. Intracutaneous continuous suture

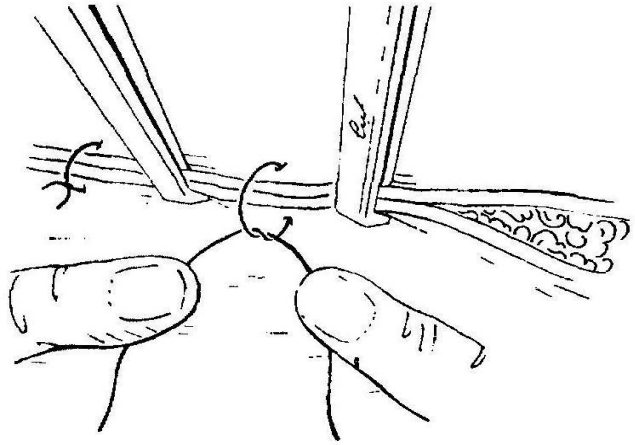

Fig.10. Tying the surgical knot on apposed wound edges

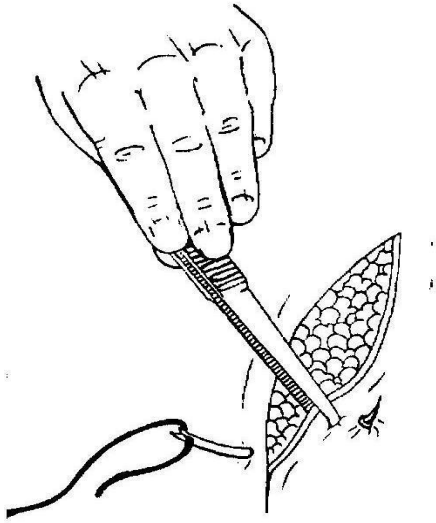

Fig.11. Stringing of dense skin on the needle with tweezers

5. Materials for self-control
A. Tasks for self-control:

Test No. 1. The surgeon has performed the operation. Which should be the sequence of its stages?
a) access, procedure, exit;
b) access, exit, procedure;
c) procedure, access, exit;
d) procedure, exit, access;
e) exit, procedure, access.

Test No. 2. Surgeon is performing surgical access. What does this stage of surgical intervention include?
a) access to the organ or formation where the intervention is performed;
b) examination of adjacent organs or formations in surgical field;
c) preparation of organs or formations for intervention;
e) action pertaining the organ or formation where the intervention is performed;
d) connection the tissues.

Test No. 3. Surgeon is performing operative procedure. What does this stage of surgical intervention include?
a) access to the organ or formation where the intervention is performed;
b) examination of adjacent organs or formations in the operational field;
c) preparation of organs or formations for intervention;
d) action pertaining the organ or formation where the intervention is performed;
e) connection the tissues.

Test No. 4. Surgeon is performing operative exit. What does this stage of surgical intervention include?
a) access to the organ or formation where the intervention is performed;
b) examination of adjacent organs or formations in the operational field;
c) preparation of organs or formations for intervention;
d) action pertaining the organ or formation where the intervention is performed;
e) connection the tissues.

Test No. 5. The scrub nurse placed general surgical instruments on the sterile table. What instruments should be on this table?
a) for tissue separation;
b) for tissue disconnection and bleeding arrest;
c) for tissue disconnection, bleeding arrest and auxiliary;
d) for tissue disconnection, bleeding arrest, auxiliary and for tissue connection;
e) for tissue disconnection, bleeding arrest, auxiliary and special.

B. Tasks for self-control:

Task No. 1. While making incision of the skin and subcutaneous tissue, uneven, jagged edges of the wound were formed. What rule did the surgeon ignore while incising the skin?

Task No. 2. When removing a foreign body, the surgeon disinfected the surgical field with 96 ° alcohol and performed its sterile draping. Was the preparation of surgical field carried out correctly?

Task No. 3. The final bleeding arrest in the wound was performed with Kocher's clamp, which assistant applied on bleeding vessel; surgeon lifted the ligature to the clamp without removing the clamp, tied the vessel with two knots. When assistant removed the clamp, bleeding started again. What was the mistake?

Task No. 4. Three hours after stitching the wound the severe bleeding occured. How can this be explained?

Task No. 5. While suturing the wound the surgeon used silk ligature and tightened knot strongly. Did he connect the edges of damaged muscle correctly?

Task No. 6. While connecting the edges of wound, surgeon made the cavity in subcutaneous tissue. The skin was sutured with knot stitches. Was the tissue connection performed properly?

Task No. 7. When applying the interrupted sutures on the skin of the wound, that is 12 cm in length, an area of excess skin was formed at the angle of the wound. What mistake has the surgeon done?

Task No. 8. In 48 hours after suturing the skin, marginal necrosis occured. What caused it?

References

Basic literature

1. Tsyhykalo O.V. Topographic Anatomy and Operative Surgery / O.V.Tsyhykalo. – Vinnytsia, 2011. — 528 p.
2. Danilchenko S.I. Methodical Instruction For the 3st year students'of stomatological faculty self - preparation work (at class and at home) in studying operative surgery and toographical anatomy / S.I.Danilchenko, E.N.Pronina, O.Yu.Polovik. - Poltava, 2010. — 239 p.

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2. McCraw J.B. Athlas of muscle and Musculocutaneous Flaps Head and Neck Reconstruction / John B McCraw, Phillip G Arnold. – Norfolk, Virginia, 1988. – 757 p.
3. Netter F. H. Atlas of Human Anatomy / Frank H.Netter. – East Hannover, New

Jersey, 1990. – 592 p.
4. Hnatyuk M.S. Operative surgery and topographical anatomy (lectures) / M.S.Hnatyuk, O.B.Slabuj. – Temopil, 2004. – 212 p.
5. Bernard C. Illustrated Manual of Operative Surgery and Surgical Anatomy / C.Bernard – 1991.-330 p.
6. Pemberton L.B. Workbook of Surgical Anatomy / L.B.Pemberton. – 1990. – 298 p.
7. Gliedman M.L. Atlas of Surgical Techniques / M.L.Gliedman. – New York etc., McGraw – Hill. – 1990. – 420 p.
8. Sabiston D.C. Atlas of General Surgery / D.C.Sabiston. – Philadelphia etc., Saunders. – 1994. – 220 p.
9. Chassin J.L. Operative Strategy in General Surgery / J.L.Chassin. – New York etc., Springer. – 1994. – 368 p.

Academic discipline	Clinical anatomy and operative surgery
Module No.1	Clinical anatomy and operative surgery of the sites of the head, neck, chest cavity and abdominal cavity.
Content module No.1	Introduction to clinical anatomy and operative surgery. Clinical anatomy and operative surgery of the head and neck.
Topic 3	Clinical anatomy and operative surgery of the craniocerebral region of the head. Borders, external hallmarks. Head shape, age features. Division into regions: fronto-parieto-occipital, temporal, mastoid process region. Layers of the cranial vault, cellular spaces, blood supply and innervation, lymphatic drainage. Trepanation of the Chipault triangle. Primary surgical debridement of craniocerebral wounds. Antrotomy.
Year	II
Faculty	Foreign students training (medical)

1. The relevance of the topic: traumas of the head soft tissues, penetrating and nonpenetrating wounds of the cranial vault, hematomas of different localization, intracranial tumors can often be found in surgical practice. A good knowledge of the anatomical and physiological features of the soft tissues of fronto-parieto-occipital, temporal, mastoid process regions is essential for correct opening of hematomas, abscesses and phlegmons. In addition, it will help to understand the peculiarities of the course of pathological processes and use optimal surgical techniques in the treatment.

2. Specific objectives.

1. Explain the topography of the vessels and nerves of the cranial vault, the regions of their location for carrying out conduction anesthesia, dissection of flaps when performing surgical interventions.
2. To analyze the features of the layered structure of the cranial vault tissues.
3. To analyze the ways of development of phlegmon, purulent edema, hematoma on the cranial vault.
4. Explain connections of the craniocerebral subcutaneous veins with the sinuses of dura mater.
5. Explain how to perform primary surgical debridement of the craniocerebral wounds.
6. Explain the technique of bleeding arrest from blood vessels of the subcutaneous tissue, skull bones, cerebral meninges and venous sinuses.
7. Explain the borders of the Chipault triangle trepanation.
8. Explain the antrotomy technique.

3. Tasks for independent work to prepare for the lesson

3.1. List of the main terms, parameters, characteristics that should be learnt by the student while preparing for the lesson.

Term	Definition
Antrotomy	Trepanation of the mastoid process
Trepanation of the Chipault triangle	The region of the mastoid process, within which anthrotomy is performed

3.2. Theoretic questions:

1. The head borders. Craniocerebral and facial parts of the head. Their division into regions.
2. Sections of the cranial vault and their borders.
3. The borders of the frontal-parietal-occipital region.
4. Layers of the fronto-parieto-occipital region.
5. Vessels and nerves of the fronto-parieto-occipital region.
6. The borders of temporal region.
7. Layers of the temporal region.
8. Cellular spaces of the temporal region.
9. Vessels and nerves of the temporal region.
10. Borders and layers of the mastoid region.
11. The borders of the Chipault triangle trepanation.
12. Technique of antrotomy. Common errors and complications.

3.3. Practical skills acquired in class:

1. To master layer preparation of the studied regions.
2. To diagnose subaponeurotic and subperiostal abscesses and hematomas of cranial vault on the basis of obtained knowledge.
3. To determine the possible ways of spreading of purulent infection from the cellular layers of temporal region.
4. To identify the borders of the Chipault triangle trepanation and specify the possible complications.
5. To perform primary surgical debridement of cranial wounds and trepanation of mastoid process.

4. The content of the topic:

Frontal-parietal-occipital region

At the beginning of the class students analyze studied information, namely, borders and layered structure of fronto-parieto-occipital regions and start preparation of this region **(Fig.12)**.

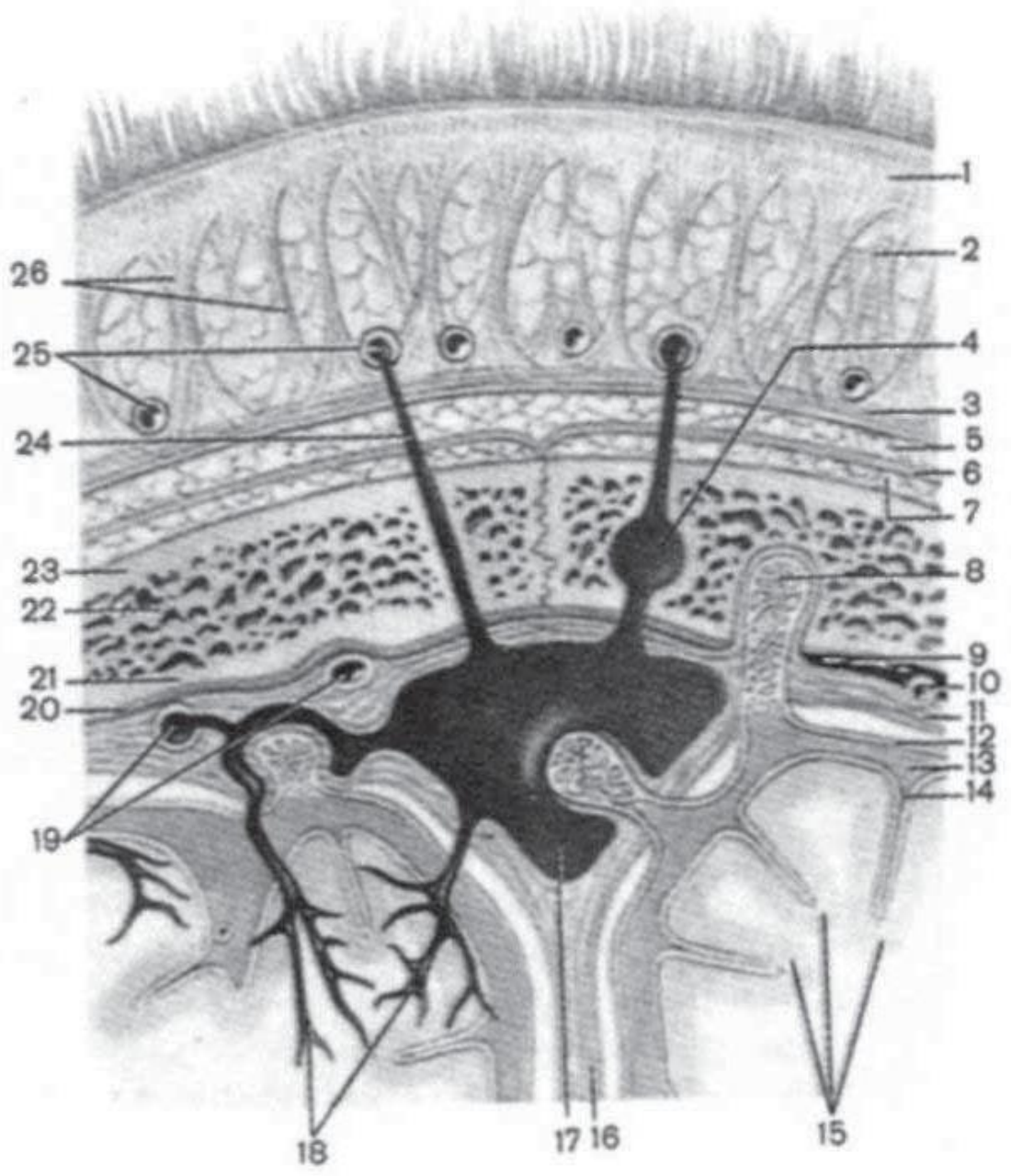

Fig.12. Layers of the cranial vault presented in frontal section, conducted through the fronto-parieto-occipital region (scheme by S.N. Delitsyn, with changes).

1 − skin; 2 − subcutaneous tissue; 3 − epicranial aponeurosis; 4 − diploic vein; 5 – subaponeurotic cellular tissue; 6 − periosteum; 7 – subperiosteal cellular tissue; 8 − arachnoidal granulations; 9 − blood accumulated in the extradural space due to the middle meningeal artery damage (10); 11 – dura mater; 12 − arachnoidea mater encephali; 13 − cerebrospinal fluid of the subarachnoideal space; 14 − pia mater; 15 − cortex of the cerebral hemispheres; 16 − falciform process of dura mater; 17 – superior sagittal sinus of dura mater; 18 − brain veins; 19 − artery and vein of dura mater; 20 − extradural space; 21 − internal plate of parietal bone; 22 − spongy substance; 23 − external plate of parietal bone; 24 − vena emissaria parietalis; 25 − subcutaneous vessels; 26 − septa of connective tissue joining the skin with epicranial aponeurosis.

On the frontal, parietal or occipital part of the head, the shape of an imaginary flap is indicated. It is important to emphasize that the flap, which is cut out, should be directed downward. This provides sufficient blood supply to the flap and its engraftment.

Students separate the skin and subcutaneous cellular tissue along with aponeurosis. Special attention should be paid to the skin connection with aponeurosis through connective tissue strands extending from the skin to aponeurosis. The connection of the subcutaneous blood vessel walls with connective tissue strands and the possibility of prolonged vascular bleeding should be determined. The teacher gives a description of the scalp wounds on the cranial vault. After cutting out the aponeurotic flap, students insert a Kocher probe between the aponeurosis and periosteum. Moreover, students should check the friability of subaponeurotic cellular tissue. The next stage is dissection of the cranial vault periosteum.

Due to the presence of the subperiosteal loose layer, the periosteum is easily exfoliated from the bone.

Students study the structure of the bone on the sagittal skull cut. It should be mentioned that the thickness of the inner lamina is very important while damaging the bones of the skull in case of the brain area traumas. In the process of fronto-parieto-occipital region preparation, attention should be paid to the radial direction of the neurovascular bundles.

Thus, summing up the information about the layer-by- layer structure of the cranial vault tissues, it should be noted that each layer is followed by a fiber layer: skin − subcutaneous tissue, epicranial aponeurosis − subaponeurotic tissue; periosteum − subperiosteal tissue. The first three layers are connected with each other by vertical connective tissue septums. The bones of the vault consist of the outer, inner laminae and diploe between them.

The blood flow to the frontal-parietal-occipital region is carried out by the arteries: supraorbital, suprathrochlear, superficial temporal artery and its branches (frontal and parietal), posterior auricular and occipital. Innervation: n. supraorbitalis, n. suprathrochlearis, n. auriculotemporalis, n. auricularis major, n. occipitalis major and n. occipitalis minor.

Temporal region

In the temporal region, a lingulate flap with a width 2.5 cm and 4 cm in length are cut out. First, the students separate the skin from the deeper tissues. Pay attention to the absence of pronounced epicranial aponeurosis in this region. The latter is thinned and defined as superficial temporal fascia. After detaching the skin with subcutaneous tissue and superficial fascia, the students isolate the temporal fascia, separate its surface and deep plates and make sure that there is a closed cellular space between them above the zygomatic arch. After this, they dissect the deep plate of the temporal fascia, introduce a Kocher probe, penetrating zygomatic arch, and make sure in connection between the subaponeurotic tissue and the fatty body of the cheek. After detaching the subfascial layer, the students cut out a lingulate flap of the temporal muscle and exfoliate it. On the posterior surface of the temporal muscle, they prepare the branches of deep temporal artery and the same name nerve. Between the muscle and periosteum, a deep layer of loose tissue of the temporal region is exposed. The next stage is periosteum dissection.

At the bone preparation, students study the structure of the temporal bone squama. Pay attention to the presence of a furrow for the middle meningeal artery, the possibility of damage to this artery due to the injuries of the temporal bone.

Blood supply of the site: the superficial temporal artery and its branches, as well as deep temporal branches of the maxillary artery.

Innervation: auriculotemporal nerve and facial nerves, deep temporal branches of the mandibular nerve.

Mastoid region

On the bone preparation students examine the boundaries of the site corresponding to the mastoid process **(Fig.13)**. After that, students perform the layer-by- layer preparation of the mastoid region. Pay attention that the skin is thin, has a strong connection with deeply placed aponeurosis.

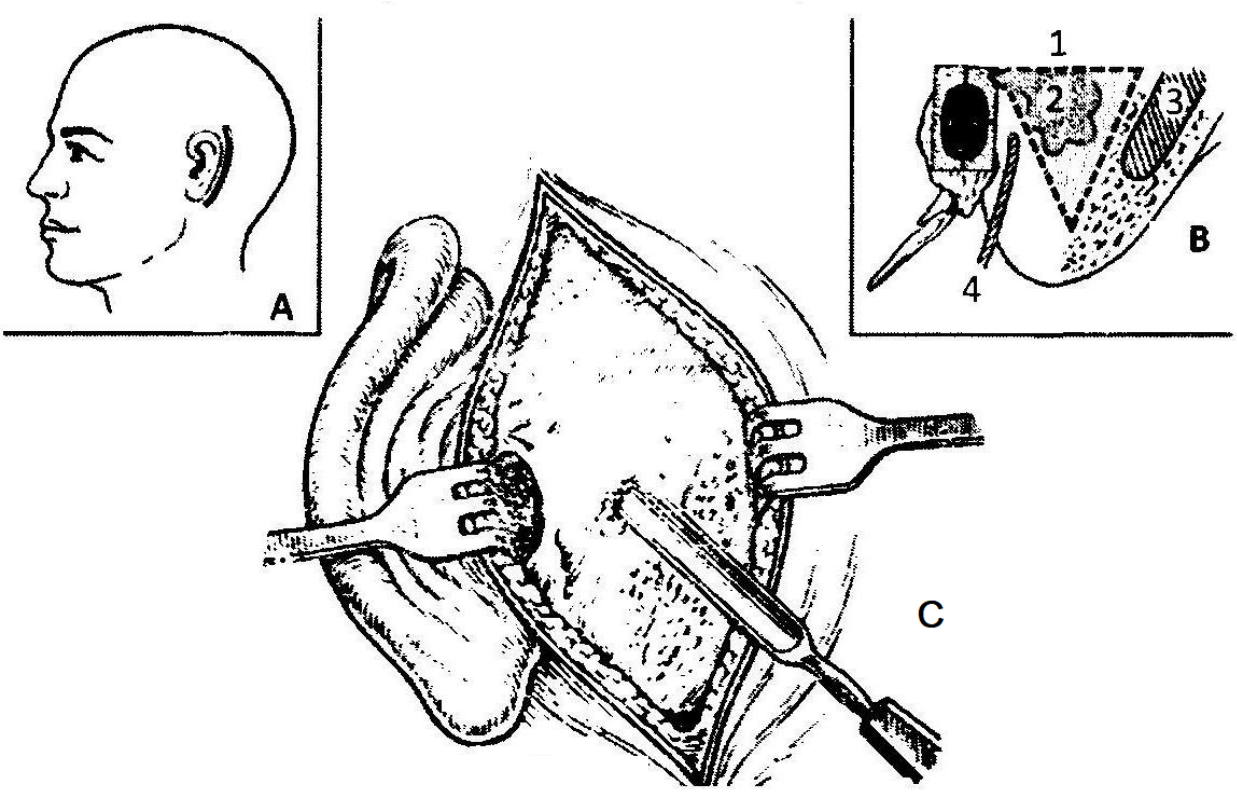

Fig.13. Trepanation of the mastoid process

А− line for soft tissues cutting according to Schwarz;

Б− scheme of the Chipault triangle on the skeletonized process: 1− middle cranial fossa; 2− main mastoid air cells; 3− sinus cavernosus; 4− facial nerve;

В− trepanation technique.

In the process of preparation, it should be noted that the periosteum has a close connection with the bone. On the mastoid process cut, they study the structure, possible pneumatic or sclerotic forms of structure of its cells. The presence of the largest cell – antrum is detected.

On the bone preparation students study the boundaries of the Chipault triangle, within which the trepanation of the mastoid process – anthrotomia should be performed.

Primary surgical treatment of craniocerebral wounds

Craniocerebral injury is the indication for the primary surgical treatment of craniocerebral wounds. It is noted that the aim of this operation is to transform the infected wound into uninfected. The signs of penetrating and impenetrable craniocerebral wounds should be determined. So, in case of damage to the dura mater, wounds are considered to be penetrating, and if integrity is preserved, they are impenetrable. The main stages of primary surgical treatment for craniocerebral wounds are as follows:

- removal of the foreign bodies, bone fragments, treatment with antiseptics, anesthesia;
- layer-by-layer removal of non-viable wound edges within the healthy tissues;
- conducting a thorough hemostasis;
- examination of the wound bottom.

Only the fragments of bones that are not fixed to the periosteum, along with the extraneous bodies, should be removed.

During the layer-by-layer treatment of craniocerebral wounds, special attention is paid to the state of the dura mater. If it is not damaged, pulsates, has no signs of subdural hematomas, then it is not dissected. At the end of the surgery, the stitches are put into aponeurosis; the skin is not stitched or fixed with thin sutures.

In case of penetrating wound, the arcuate incision is performed on the dura mater, the bone fragments, foreign bodies, blood clots are removed from the medullary substance.

The crushed brain tissue (detritus) and small bone fragments in it are washed away with a stream of the physiological solution using a rubber bag. After a thorough hemostasis, the dura mater is sutured. If it is not possible (significant defects of the dura mater), it is not stitched, thin sutures are put into aponeurosis, as well as the skin, the rubber tube drainages are left in the wound angles for 1-2 days.

5. Materials for self-control

A. Tasks for self-control:

Test No. 1. The injured person has a cut wound in the anterior part of the fronto-parieto-occipital region. What is the front boundary of this region?

a) linea nuchae superior;
b) nasal bridge and superciliary arch;
c) linea temporalis superior;
d) linea temporalis inferior;
e) seam between the parietal and frontal bones.

Test No. 2. The patient has an abscess 2 x 2 cm in size in the frontal-parietal-occipital area. In what layer is the inflammatory process localized in this case?

a) intradermal;
b) in subcutaneous tissue;
c) interaponeurotic tissue;
d) subaponeurotic tissue;
e) subperiosteal tissue.

Test No. 3. The doctor determined the pulse of the patient on the superficial temporal artery. Where is the pulsation point of this artery?
a) for 1 transverse finger in front of the ear tragus;
b) for 1 transverse finger behind the ear;
c) 2 cm behind the mastoid process;
d) along the anterior edge of the masseter muscle;
e) over the ear.

Test No. 4. A patient has a purulent mastoiditis. The surgeon cuts the abscess. What section will be the most anatomically reasonable and least traumatic in this case?
a) transverse;
b) longitudinal;
c) radial to the vertex;
d) radial to ear tragus;
e) arcuate.

Test No. 5. A patient has an abscess in the left temporal region. The surgeon cuts the abscess. What section will be the most anatomically reasonable and least traumatic in this case?
a) transverse;
b) longitudinal;
c) radial to the vertex;
d) radial to ear tragus;
e) arcuate.

B. Tasks for self-control:
Task No. The patient M. was brought to the emergency hospital with complaints of headache, swelling in the area of the cranial valt. The patient slipped and fell two hours ago. The examination revealed the presence of fluctuating swelling, limited by the front edge of the orbit, posteriorly − by the upper nuchal line, on the sides − the upper temporal line. Diagnosis: hematoma of the cranial vault. In what cellular tissue layer is hematoma localized?

Task No. 2. During anthropometry, the surgeon went beyond the posterior borders of Chipault triangle. Heavy bleeding occurs. What is the source of bleeding?

Task No. 3. During anthrotomy, paralysis of the facial muscles on the side of intervention (left-sided anthrotomy) occurred in the patient. What is the cause of this complication?

Task No. 4. After an injury to the skull, a palpable fluctuating tumor within the boundaries of the left temporal bone was observed. Where is hematoma located?

Task No. 5. During anthrotomy, the surgeon went beyond the borders of Chipault triangle. What formations can be damaged in this case?

References

Basic literature

1. Tsyhykalo O.V. Topographic Anatomy and Operative Surgery / O.V.Tsyhykalo. – Vinnytsia, 2011. — 528 p.
2. Danilchenko S.I. Methodical Instruction For the 3st year students'of stomatological faculty self - preparation work (at class and at home) in studying operative surgery and toographical anatomy / S.I.Danilchenko, E.N.Pronina, O.Yu.Polovik. - Poltava, 2010. — 239 p.

Additional literature

1. Gray. H. F.R.S. Gray's anatomy / Henry F.R.S. Gray, R. A. Bolam. – London, 1994. – 1290 p.
2. McCraw J.B. Athlas of muscle and Musculocutaneous Flaps Head and Neck Reconstruction / John B McCraw, Phillip G Arnold. – Norfolk, Virginia, 1988. – 757 p.
3. Netter F. H. Atlas of Human Anatomy / Frank H.Netter. – East Hannover, New Jersey, 1990. – 592 p.
4. Hnatyuk M.S. Operative surgery and topographical anatomy (lectures) / M.S.Hnatyuk, O.B.Slabuj. – Temopil, 2004. – 212 p.
5. Bernard C. Illustrated Manual of Operative Surgery and Surgical Anatomy / C.Bernard – 1991.-330 p.
6. Pemberton L.B. Workbook of Surgical Anatomy / L.B.Pemberton. – 1990. – 298 p.
7. Gliedman M.L. Atlas of Surgical Techniques / M.L.Gliedman. – New York etc., McGraw – Hill. – 1990. – 420 p.
8. Sabiston D.C. Atlas of General Surgery / D.C.Sabiston. – Philadelphia etc., Saunders. – 1994. – 220 p.
9. Chassin J.L. Operative Strategy in General Surgery / J.L.Chassin. – New York etc., Springer. – 1994. – 368 p.

Academic discipline	Clinical anatomy and operative surgery
Module No.1	Clinical anatomy and operative surgery of the sites of the head, neck, chest cavity and abdominal cavity.
Content module No.1	Introduction to clinical anatomy and operative surgery. Clinical anatomy and operative surgery of the head and neck.
Topic 4	Clinical anatomy and operative surgery of the cranial cavity. Base of the skull: external and internal. Cranial fossae, their contents. Topography of the brain meninges and venous sinuses of the dura mater of the brain. The scheme of craniocerebral topography (Kronlein-Briusova-Yehorov). Trepanation of the skull.
Year	II
Faculty	Foreign students training (medical)

1. The relevance of the topic: the treatment of injuries to the skull, hematomas, posttraumatic hypostases of the brain, tumors, cysts demands the substantial knowledge of topography of the main furrows (sulci) of the brain and cerebral gyri, schemes of the craniocereberal topography, as well as the knowledge of technique for conducting the surgical interventions and the bleeding arrest from the vessels.

2. Specific objectives.

1. Explain the topography of the external and internal bases of the skull, cranial fossae and their contents.
2. Explain the topography of the cerebral meninges and venous sinuses of the cranial dura mater.
3. Draw a scheme of the cranio-cerebral topography according to Kronlein-Briusova, Yehorov.
4. Analyze the various methods of trepanation (craniotomy, craniectomy) of the skull.
5. Explain the technique of cranioplasty conducting in the parietotemporal region.

3. Tasks for independent work to prepare for the lesson

3.1. List of the main terms, parameters, characteristics that should be learnt by the student while preparing for the lesson.

Term	Definition
Primary surgical treatment of the brain wounds	The surgical intervention, which involves the transformation of the wound of the brain part of the head from the dirty (infected) into a clean and creating the proper conditions for healing by its primary tension.
Trepanation of the skull	Opening of the cranial cavity for operative access to the brain and its meninges in case of surgical intervention.

3.2. Theoretic questions:

1. Blood supply of the brain.
2. Cranio-cerebral topography scheme according to Kronlein-Briusova.
3. Special surgical tools for interventions on the brain part of the head.
4. Types of anesthesia in case of brain interventions.
5. Methods for bleeding arrest from the sinuses of the cranial dura mater.
6. Technique for bleeding arrest from the brain vessels.
7. Primary surgical treatment of penetrating head injuries.
8. Cranioplasty of the parieto-temporal region.
9. Decompressive trepanation of the skull according to Cushing.

3.3. Practical skills acquired in class:

1. Perform the osteoplastic trepanation of the skull on the corpse.
2. Be able to stop bleeding from the middle meningeal artery and sinuses of the dura mater of the brain.

4. The content of the topic:

Topographic and anatomical features of the external and internal skull base

While making the analysis of the topography of the external and internal base of the skull, students pay attention to the bones forming the cranial fossae.

Thus, the anterior cranial fossa on the inner base of the skull is separated from the middle by the posterior margin of the lesser wings of the sphenoid bone. It is formed by two orbital surfaces of the frontal bone with the cribriform lamina (lamina cribrosa) of the ethmoid bone; the body and the lesser wings of sphenoid bone complement the fossa.

Attention should be drawn to the fact that the anterior cranial fossa is located above the nose cavity and orbits. It contains frontal lobes of the brain and olfactory bulbs (bulbus olfactorius) which are located underneath them on the sides of the crista galli on the cribriform plate of ethmoid bone. About 30 nerve trunks pass to them from the nose cavity through the holes in the cribriform lamina. The anterior and posterior ethmoidal arteries (aa. ethmoidales anterior et posterior) and ethmoidal nerves (nn. ethmoidales) pass through these holes in the mucous membrane of the nasal cavity. The anterior meningeal artery (a. meningea anterior) passes from the anterior ethmoidal artery to the dura mater. It is emphasized that foramen caecum through which the venous plexus of the nasal cavity is connected with the superior sagittal venous sinus (sinus sagittalis superior) is located in front of crista galli.

At the base of the lesser wings of sphenoid bone the paired optic foramina are located, through which the optic nerves (n. opticus) and the ophthalmic artery (a. ophtalmica) without a vein of the same name pass from the cavity of the skull to the orbit.

The middle cranial fossa (fossa cranii media) consists of three bones – the sphenoid bone and the two temporal bones. Anteriorly and laterally it is bounded by the lesser wings of the sphenoid bone. These are two triangular projections of bone that arise from the central sphenoid body. Anteriorly and medially it is bounded by the limbus of the sphenoid bone. The limbus is a bony ridge that forms the anterior border of the chiasmatic sulcus (a groove running between the right and left optic

canals). Posteriorly and laterally it is bounded by the superior border of the petrous part of the temporal bone. Posteriorly and medially it is bounded by the dorsum sellae of the sphenoid bone. This is a large superior projection of bone that arises from the sphenoidal body. The floor is formed by the body and greater wing of the sphenoid, and the squamous and petrous parts of the temporal bone. The middle cranial fossa consists of a central portion, which contains the pituitary gland, and two lateral portions, which accommodate the temporal lobes of the brain.

The central part of the middle cranial fossa is formed by the body of the sphenoid bone. It contains the sella turcica which is a saddle-shaped bony prominence. It acts to hold and support the pituitary gland, and consists of three parts:

1) the tuberculum sellae (horn of the saddle) is a vertical elevation of bone. It forms the anterior wall of the sella turcica, and the posterior aspect of the chiasmatic sulcus (a groove running between the right and left optic canals);

2) the hypophysial fossa or pituitary fossa (seat of the saddle) sits in the middle of the sella turcica. It is a depression in the body of the sphenoid, which holds the pituitary gland;

3) the dorsum sellae (back of the saddle) forms the posterior wall of the sella turcica. It is a large square of bone, pointing upwards and forwards. It separates the middle cranial fossa from the posterior cranial fossa.

The sella turcica is surrounded by the anterior and posterior clinoid processes. The anterior clinoid processes arise from the sphenoidal lesser wings, while the posterior clinoid processes are the superolateral projections of the dorsum sellae. They serve as attachment points for the tentorium cerebelli, a membranous sheet that divides the brain.

The depressed lateral parts of the middle cranial fossa are formed by the greater wings of the sphenoid bone, and the squamous and petrous parts of the temporal bones. They support the temporal lobes of the brain. It is the site of many foramina – small holes by which vessels and nerves enter and leave the cranial cavity.

Features and contents of the middle cranial fossa

Sphenoid bone: the sphenoid bone resembles a bat having a centrally placed body with greater and lesser wings extending to both sides. The body contains the sphenoid air sinuses that are lined with mucous membrane and communicate with the nasal cavity. Like all other air sinuses of the skull, they serve as voice resonators.

Optic canal (canalis opticus): it is located anteriorly and transmits the optic nerve (n. opticus) and the ophthalmic artery (a. ophtalmica).

Superior orbital fissure. It is a slit-like opening between the lesser and the greater wings of the sphenoid bone. It transmits many important structures including the lacrimal (n. lacrimalis), frontal (n. frontalis), trochlear (n. trochlearis), oculomotor (n. oculomotorius), nasociliary (n. nasociliaris) and abducent nerves (n. abducens) as well as the superior ophthalmic artery (a. ophthalmica superior).

Foramen rotundum and foramen ovale. Foramen rotundum is situated behind the medial end of the superior orbital fissure, perforating the greater wing of the sphenoid. It transmits the maxillary nerve (n. maxillaris). Foramen ovale is situated posterolateral to foramen rotundum, also perforating the greater wing of sphenoid. It transmits both the large sensory root and the small motor root of the mandibular nerve (n. mandibularis).

Foramen spinosum: it also perforates the greater wing of sphenoid, lying posterolateral to the foramen ovale. It transmits the middle meningeal artery (a. meningea media) into the cranial cavity.

Foramen lacerum: it is large irregularly shaped and lies between the apex of the petrous part of the temporal bone and the sphenoid bone. The opening of this foramen is filled with cartilage and fibrous tissue and only small blood vessels pass through it.

Carotid canal (canalis caroticus): it opens into the side of the foramen lacerum above the closed inferior opening. The internal carotid artery (a. carotica interna) enters the foramen lacerum through this canal.

Impression for trigeminal ganglion (ganglion trigeminale). Lateral to the foramen lacerum, on the apex of the petrous part of the temporal bone, there is an impression for the trigeminal ganglion.

Grooves on petrous bone. On the anterior surface of the petrous bone (petrous part of temporal bone), there are two grooves for nerves. The larger medial groove is for the greater petrosal nerve (n. petrosus major) (a branch of facial nerve) and the smaller lateral groove for the lesser petrosal nerve (n. petrosus minor), (a branch of tympanic plexus).

Arcuate eminence: it is a rounded eminence found on the anterior surface of the petrous bone and is caused by the underlying superior semicircular canal.

Tegmen tympani: it is a thin plate of bone that is actually a forward extension of the petrous part of temporal bone. From behind forwards, it forms the roof of the mastoid antrum, the tympanic cavity and the auditory tube. Tegmen tympani is clinically important because it is the only barrier that separates the infection in the tympanic cavity from the temporal lobe of the cerebral hemisphere.

Median part of middle cranial fossa. The median part is formed by the body of sphenoid bone. It has the following important structures:

Sulcus chiasmatis: it lies in front and is related to the optic chiasma. It leads laterally to the optic canal on each side.

Tuberculum sellae: it is an elevation that lies posterior to sulcus chiasmatis.

Sella turcica: it is a deep depression behind the elevation (tuberculum sellae). It lodges the pituitary gland.

Dorsum sellae: it is a square plate of bone that bounds the sella turcica posteriorly.

Posterior clinoid processes: these are two tubercles on the superior angles of the dorsum sellae. They give attachment to the fixed margin of the tentorium cerebelli.

Cavernous sinus: it is directly related to the side of the body of sphenoid bone. The oculomotor, trochlear and ophthalmic and maxillary divisions of trigeminal nerve (n. trigeminalis) pass along its lateral wall. The internal carotid artery (a. caroticus internus) and the abducens nerve (n. abducens) pass through it.

The posterior cranial fossa (fossa cranii posterior) is located above three bones: the occipital bone and two temporal bones.

It is bounded as follows: anteriorly and medially it is bounded by the dorsum sellae of the sphenoid bone. This is a large superior projection of bone that arises from the body of the sphenoid. Anteriorly and laterally it is bounded by the superior border of the petrous part of the temporal bone. Posteriorly it is bounded by the internal surface

of the squamous part of the occipital bone. The floor consists of the mastoid part of the temporal bone and the squamous, condylar and basilar parts of the occipital bone. The posterior cranial fossa houses the brainstem and cerebellum. The brainstem is comprised of the medulla oblogata, pons and midbrain and continues down through the foramen magnum to become the spinal cord. The cerebellum has an important role in coordination and fine motor control. Alongside the gross anatomical structures of the brainstem and cerebellum, the posterior cranial fossa also accommodates associated arteries and nerves. Some key structures will be discussed with regards to their foramina below.

Foramina. There are several bony landmarks and foramina in the posterior cranial fossa (foramen is simply a hole that allows the passage of a structure – usually a blood vessel or nerve).

The internal acoustic meatus is an oval opening in the posterior surface of the petrous part of the temporal bone. It transmits the facial nerve (n. facialis VII), vestibulocochlear nerve (n. vestibulocochlearis VIII) and labyrinthine artery (internal auditory artery).

Occipital bone. A large opening, the foramen magnum, lies centrally in the floor of the posterior cranial fossa. It is the largest foramen in the skull. It transmits the medulla of the brain, meninges, vertebral arteries, spinal accessory nerve (n. ascendens), dural veins and anterior and posterior spinal arteries. Anteriorly an incline, known as the clivus, connects the foramen magnum with the dorsum sellae.

The jugular foramina are situated either side of the foramen magnum. Each transmits the glossopharyngeal nerve (n. glossopharyngeus), vagus nerve (n. vagus), spinal accessory nerve (descending) (n. descendens), internal jugular vein (v. jugularis interna), inferior petrosal sinus (sinus petrosus inferior), sigmoid sinus and meningeal branches of the ascending pharyngeal and occipital arteries (aa. occipitales).

Directly superior to the anterolateral margin of the foramen magnum is the hypoglossal canal. It transmits the hypoglossal nerve through the occipital bone.

The cerebellar are located posterolaterally to the foramen magnum. These are bilateral depressions that house the cerebellum. They are divided medially by a ridge of bone, the internal occipital crest.

Topographic and anatomical features of the external cranial base

On the skull students determine the boundary of its external base. It passes along a line wich connects protuberantia occipitalis externa with a sphenoidal rostrum (rostrum sphenoidalis) which lies between the wings of the vomer: on the superior nuchal line, through the base of the mastoid process, the posterior and lower margins of the external acoustic meatus, continues along the zygomatic process of the temporal bone, its crista infratemporalis, and on margo supraorbitalis of the frontal bone.

If you draw a line through the foramen magnum, which connects the apexes of the mastoid processes, then the external cranial base is divided into two parts: anterior and posterior. Within the posterior part, there is occipital protuberance (condylus occipitalis) which is connected with atlas, and foramen magnum through which the medulla oblongata passes.

The anterior part of external cranial base combines the superior wall of the pharynx, the superior wall of the eye socket and nasal cavity. The pharyngeal aponeurosis (fascia pharyngealis), atlanto-occipital membrane (membrana atlantooccipitalis), and fascial membranes of muscles, starting from the mastoid process, are attached to the external cranial base.

Meninges of the brain

While studing the meninges of the brain on the preparation of the head, pay attention to the fact that the outermost one is dura mater encephali. It is noted that it is connected loosely with the bones of the cranial vault, and tightly − with the internal base of the skull. Dura mater consists of two leaves that are loosely connected to each other and between which the main vascular-nervous formations of the skull pass.

The teacher accentuates that the founder of native surgery M. N. Burdenko introduced into the neurosurgical practice the plastics of dura mater defects applying the pedicled flap which is cut out from the outer sheet of the dura mater.

The anterior, middle and posterior meningeal arteries pass between the sheets of the dura mater within the cranial vault. On the bone preparation of the skull and on the tables, the students determine that the anterior meningeal artery (a. meningea anterior) deviates from the anterior ethmoidal artery (a. ethmoidalis anterior), which is the branch of the ophthalmic artery. The anterior ethmoidal artery penetrates into the anterior cranial fossa through the cranial foramina and ramifies within the frontal bone squama.

The middle meningeal artery (a. meningea media) is one of the largest among the middle meningeal branches. It departs from the maxillary artery (a. maxillaris) and penetrates into the cavity of the skull through the spinous foramen. First, this artery lies in the same name groove as a short common trunk and rises above the zygomatic arch, where it divides into the anterior and posterior branches.

The posterior meningeal artery departs from the ascending pharyngeal artery (a. pharyngea ascendens) and passes through the jugular foramen entering the cavity of the skull, where within the temporal bone squama divides into branches which supply blood to the posterior surface of the cereberral tentorium with falx cerebelli.

Meningeal arteries are accompanied by the same name paired veins, from which the anterior and posterior enter the superior sagittal sinus, and the middle ones − the pterygoid plexus.

The lymph from the dura mater flows into different groups of lymph nodes. So, from the frontal and parietal regions it comes to the superficial parotid nodes, and from the temporal and occipital − to the parotid lymph nodes.

The innervations of the dura mater is provided by I, II, and III branches of the trigeminal nerve, branches of the periarterial nervous system, as well as the elements of other cranial nerves.

Under the dura mater, an **arachnoid mater** (tunica arachnoidea) which evenly covers the brain gyri is located and does not penetrate into its grooves. The formations in the form of villi pass from the arachnoid mater. They penetrate into a dura mater and bound with sinuses of dura mater by Pacchioni's granulations.

The **pia mater** or vascular membrane of the brain (pia mater cranialis) covers the substance of the brain and penetrates into all sulci and ventricles, forming a plexus (plexus chorioideus) there. There is a network of blood vessels that provide a blood supply to the brain substance.

If in the process of cadaveric dissection exfoliate the pia mater, it is easily separated from the brain, due to loose tissue which lies between it and the brain.

Since between the **dura mater** and the inner surface of cranial vault bones there is a loose connection, where blood can accumulate in case of trauma, which leads to the emergence of epidural hematomas.

If hematoma or pus is localized between dura and arachnoid mater, then subdural processes occur. When pathological processes develop between arachnoid (arachnoidea encephali) and pia mater, they are called subarachnoid.

Three folds of the dura mater are: the falx cerebri, the falx cerebelli, and the cerebellar tentorium (tentorium cerebelli).

Students study the folds of dura mater. They determine that the falx cerebri lies in the sagittal plane from the cribriform plate of ethmoidal bone to the internal occipital protuberance and penetrates to the corpus callosum between the hemispheres of the brain. The falx cerebelli is a continuation of the falx cerebri. It separates the cerebellar hemispheres and extends to the large opening of the occipital bone.

At the same time, the preparation clearly shows that the cerebellar tentorium is located almost in the horizontal plane and separates the occipital lobes of the cerebral hemispheres from the cerebellum.

The teacher pays attention to the fact that the falx processes and the cerebellar tentorium are formed by double layer of dura mater. Due to this, venous sinuses are formed between the dura mater sheets. They are characterized by the presence of intima in the lumen of sinuses and absence of valves. There are no muscle fibers in the walls of these sinuses, so they are inelastic. When you are dissecting the wall of the sinus, it's gaping, and massive bleedings occur. Since the blood flows through the sinuses of the dura mater to the system of the internal jugular vein, air embolism may occur in case of injuries.

The venous sinuses of the cerebral dura mater

On the tables and anatomical preparations of the dura mater processes and internal cranial base, students determine the main sinuses.

The superior sagittal sinus (sinus sagittalis superior) begins with a blind foramen (foramen caecum), gradually expanding and ending within internal occipital protuberance. The inferior sagittal sinus (sinus sagittalis inferior) passes along the lower edge of the dura mater falx process. It lies anterioposteriorly, connects with a great cerebral vein large (v. cerebri magna) and forms strait venous sinus.

In the upper part of the cerebellar tentorium, near the internal occipital protuberance, strait sinus is connected with the superior sagittal sinus.

Students determine that the occipital sinus (sinus occipitalis) begins with a large opening of the occipital bone and goes to the internal occipital protuberance. It should be noted that in the region of occipital protuberance, occipital sinus along with the superior sagittal sinus and the straight sinus, form confluens of sinuses (confluens sinuum). In case of its damage the life threatening bleeding may occur.

On the tables and the bone preparation, students determine that in transverse groove **(sinus transversus) of occipital bone occurs** the transverse sinus, in which the venous blood flows out into the sigmoid sinus, which leads to the jugular opening. Cavernous sinus (sinus cavernosus) is a system of venous sinuses that surround the Turkish saddle with the pituitary gland.

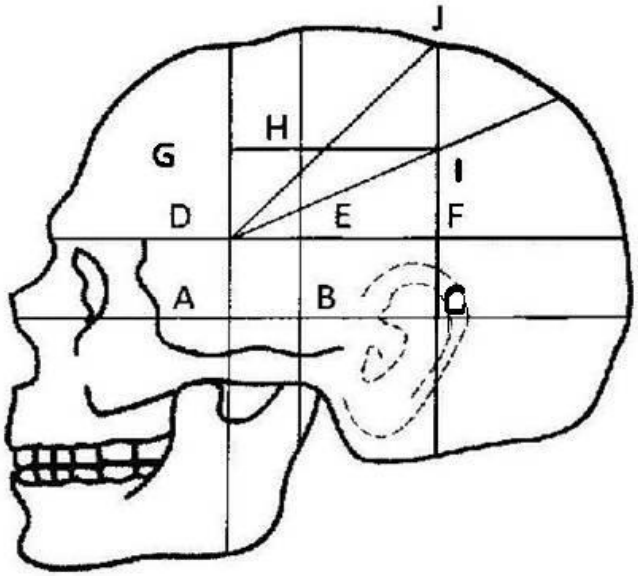

Fig. 14. Projection scheme of craniofacial topography according to Kronlein – Briusova.

ABC− lower horizontal; DEF − medium horizontal; GHI − top horizontal; ADG − front vertical; BEH − medium vertical; CFI – posterior vertical; D-J − projection of the central groove; H-J − the true length of the central groove; D-I − projection of lateral groove; A − projection of the main trunk a.meningea media; D − projection of the anterior branch a.meningea media; F − projection of the posterior branch of a. meningea media.

Projection of the cerebral arterial circle:
rectangle A-B-E-D − projection a.carotis interna;
line D-G-H-I − projection a.cerebri anterior;
line B-I − projection of lateral grooves and projection a.cerebri media;
line B-E-F − projection a.comunicans posterior;
line D-E − projection of the cerebral arterial circle.

Blood supply of the brain (Circle of Willis)

On the anatomical preparation of the brain, skull and tables, students study the main sources of its blood supply. Thus, through the carotid canal (canalis caroticus) of the pyramid of the temporal bone, the internal carotid artery enters the cavity of the skull. First, it enters the cavernous sinus, where ramifies into a number of small branches and is divided into anterior (a. cerebri anterior) and medial (a. cerebri media) cerebral arteries. The second source of blood supply to the brain is the vertebral arteries. They penetrate into the cavity of the skull through a large opening of the occipital bone and merge into the common trunk, forming the basilar artery (a. basilaris), from which the number of branches at first goes to the cerebellum and medulla oblongata. Within the dorsum of the Turkish saddle, the main arteries branch out to its final branches − the posterior cerebral arteries.

Brain arteries around the Turkish saddle are connected between each other. So, the right and left anterior cerebral arteries (a.a. cerebri anterior) have a connecting branch (r. communicans anterior). They go to the longitudinal fissure between the hemispheres of the brain.

Between the posterior cerebral artery and the internal carotid artery, there are also connecting branches (r. communicans posterior) on both sides. They essentially provide blood supply to the brain. The teacher pays attention to the individual variability of the connecting branches development (r. communicans anterior), and their absence in some cases.

The teacher emphasizes that the feature of brain veins is that they do not follow the course of arteries. From the cerebral hemispheres of the brain, venous blood flows through the veins of the large hemispheres to the venous sinuses, mainly in the superior sagittal sinus. From the lower sinus (sinus sagittalis inferior) and the ventricles of the brain, the blood flows out into the great cerebral vein (v. cerebri magna).

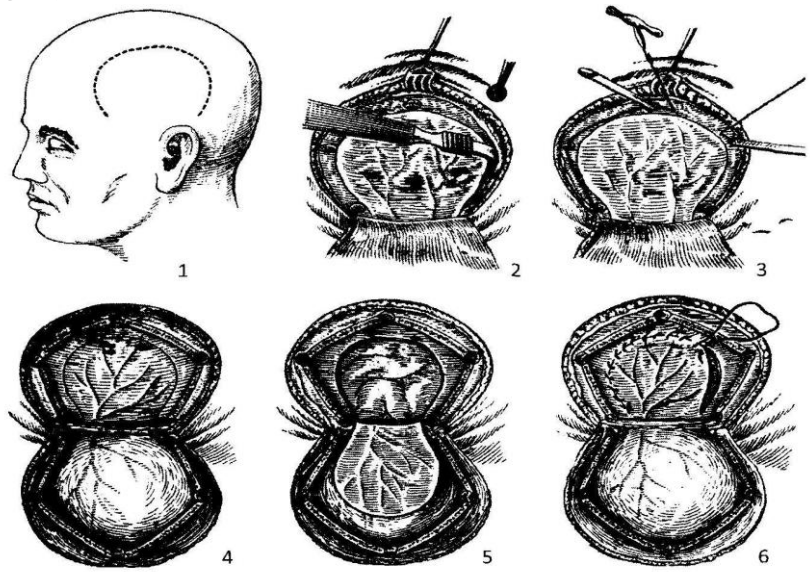

Fig. 15. Osteoplastic trepanation of the skull in the temporal region

1 – dissection of skin-aponeurotic flap; 2 − periosteum is cut and exfoliated with raspatory in the side of the flap, three holes in the bones were made with cutters; 3 − the spaces between the holes are done with Gigli saw; 4 − periosteal bone flap is turned, the dura mater is cut: 5 – the dura mater flap is turned; the brain substance is exposed; 6 − continuous suturing is performed on dura mater.

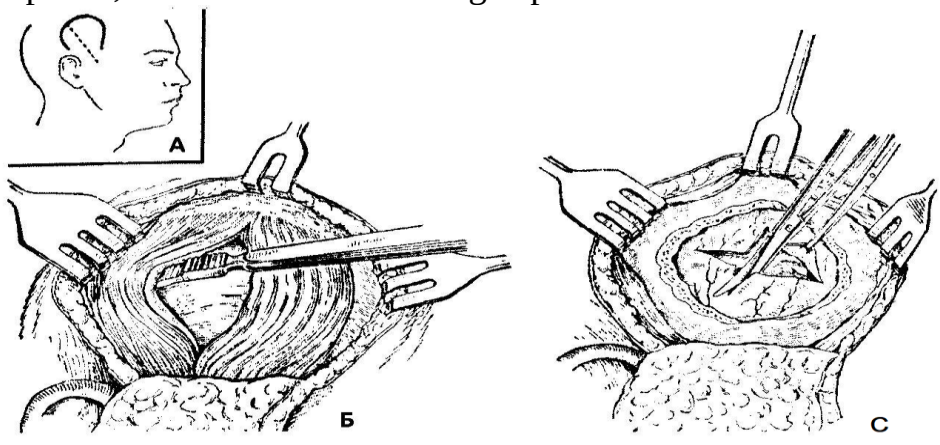

Fig.16. Decompressive trepanation according to Cushing

The osteoplastic trepanation consists in the opening of the cranial cavity by the temporary removal of a bundle of soft tissues and a bone flap on a periosteal pedicle with a return to their place at the end of the operation. It should be emphasized that the decompression operation consists in the final resection of the bone flap unlike the osteoplastic trepanation. In case of decompressing trepanation the dura mater of the brain is not sutured unlike osteoplastic one **(Fig. 15, 16)**.

5. Materials for self-control
A. Tasks for self-control:

Test No.1. As a result of the craniocerebral trauma the reduced skin sensitivity occurred in patient. What area of the cerebral cortex can be affected?
a) gyrus centralis posterior;
b) regio occipitalis;
c) regio tympanica;
d) regio frontalis;
e) gyrus centralis anterior.

Test No.2. The patient has a trauma of the skull. What sinus can be affected?
a) sinus sagittalis superior;
b) sinus petrosus superior;
c) sinus petrosus inferior;
d) sinus sagittalis inferior;
e) sinus cavernosus.

Test No.3. A woman has disorder of tactile sensitivity. What part of the brain is damaged?
a) gyrus centralis posterior;
b) medulla oblongata;
c) cerebellum;
d) gyrus centralis anterior;
e) regio temporalis.

Test No.4. The patient has a trauma of soft tissues and parietal bones of the sagittal suture, which is accompanied by severe bleeding. Which of the formations could be damaged?
a) sinus sagittalis superior;
b) sinus petrosus superior;
c) sinus rectus;
d) sinus sagittalis inferior;
e) there is no right answer.

Test No.5. The victim has subdural hematoma which is detected in the temporal region. What artery is damaged?
a) a. meningea media;
b) a. cerebri media;
c) a. communicans posterior;

d) a. meningea anterior;
e) there is no right answer.

B. Tasks for self-control:

Task No.1. A patient with a chop wound of the parietal site is experiencing severe bleeding. Despite treating wounds with 3% solution of hydrogen peroxide and imposing compressed bandage, the blood does not stop. What is the reason for such severe bleeding, how to stop it?

Task No.2. During the primary surgical treatment of impenetrable wound of the frontal region, the surgeon decided to cut soft tissues at a distance of 1 cm from the edge of the wound within normal tissues. Is it correct?

Task No.3. In case of the wound of the cerebral part of the head with the damage to the skull bones, there was a severe bleeding from the diploid veins. What is the correct technique for bleeding arrest?

Task No.4. In case of penetrating brain injury, many cerebral detritus, small fragments of the bones were detected in the wound. How should the extraneous parts be released from the wound channel?

Task No.5. While suturing penetrating skull wound, the surgeon stitches tightly the skin. Are his actions correct?

Task No.6. During the osteoplastic trepanation of the skull, the surgeon performs all the trepanation openings by a wire saw. What was the surgeon's mistake?

Task No.7. The surgeon connected the holes during conducting osteoplastic trepanation of the skull. By closing the bone flap freely lies on the dura mater. What is the surgeon's mistake?

Task No.8. A sudden brain prolapse arose after the cut of a dura mater during decompressive trepanation of the skull according to Cushing. What should a surgeon do to prevent this complication?

Task No.9. After the osteoplastic trepanation of the skull, the surgeon separated the bone flap from the periosteum. What is the surgeon's mistake?

Task No.10. During the trepanation of the posterior cranial fossa, Cushing's crossbow cut was used. Does it correspond to the region of trepanation?

References

Basic literature

1. Tsyhykalo O.V. Topographic Anatomy and Operative Surgery / O.V.Tsyhykalo. – Vinnytsia, 2011. — 528 p.
2. Danilchenko S.I. Methodical Instruction For the 3st year students'of stomatological faculty self - preparation work (at class and at home) in studying

operative surgery and toographical anatomy / S.I.Danilchenko, E.N.Pronina, O.Yu.Polovik. - Poltava, 2010. — 239 p.

Additional literature

1. Gray. H. F.R.S. Gray's anatomy / Henry F.R.S. Gray, R. A. Bolam. – London, 1994. – 1290 p.
2. McCraw J.B. Athlas of muscle and Musculocutaneous Flaps Head and Neck Reconstruction / John B McCraw, Phillip G Arnold. – Norfolk, Virginia, 1988. – 757 p.
3. Netter F. H. Atlas of Human Anatomy / Frank H.Netter. – East Hannover, New Jersey, 1990. – 592 p.
4. Hnatyuk M.S. Operative surgery and topographical anatomy (lectures) / M.S.Hnatyuk, O.B.Slabuj. – Temopil, 2004. – 212 p.
5. Bernard C. Illustrated Manual of Operative Surgery and Surgical Anatomy / C.Bernard – 1991.-330 p.
6. Pemberton L.B. Workbook of Surgical Anatomy / L.B.Pemberton. – 1990. – 298 p.
7. Gliedman M.L. Atlas of Surgical Techniques / M.L.Gliedman. – New York etc., McGraw – Hill. – 1990. – 420 p.
8. Sabiston D.C. Atlas of General Surgery / D.C.Sabiston. – Philadelphia etc., Saunders. – 1994. – 220 p.
9. Chassin J.L. Operative Strategy in General Surgery / J.L.Chassin. – New York etc., Springer. – 1994. – 368 p.

Academic discipline	Clinical anatomy and operative surgery
Module No.1	Clinical anatomy and operative surgery of the sites of the head, neck, chest cavity and abdominal cavity.
Content module No.1	Introduction to clinical anatomy and operative surgery. Clinical anatomy and operative surgery of the head and neck.
Topic 5	Training operation "Trepanation of the skull"
Year	II
Faculty	Foreign students training (medical)

1. The relevance of the topic: treatment of cranial injuries, hematomas, posttraumatic hypostases of the brain, tumors, cysts demands substantial knowledge of topography of the main furrows and folds of the brain, schemes of the craniocereberal topography, and also knowledge of technique for performing the operative measures as well as the measures for bleeding arrest from the vessels.

2. Specific objectives.
1. Analyze various methods of trepanation (craniotomy, craniectomy) of the skull.
2. Explain the technique of cranioplasty in the parietotemporal region.

3. Tasks for independent work to prepare for the lesson
3.1. List of the main terms, parameters, characteristics that should be learnt by the student while preparing for the lesson.

Term	Definition
Trepanation of the skull	Opening of the cranial cavity in order to conduct rapid access to the brain and its meninges for surgical intervention.

3.2. Theoretic questions:
1. Indications for the decompression trepanation of the skull.
2. Technique of osteoplastic trepanation of the skull.
3. Indications for the osteoplastic trepanation of the skull.
4. Technique of decompression cranial trepanation.

3.3. Practical skills acquired in class:
1. Perform bone-plastic trepanation of the skull on the corpse.
2. Perform decompression trepanation of the skull on the corpse.

4. The content of the topic:

Trepanation of skull

The osteoplastic trepanation consists in the opening of the cranial cavity by temporarily removing the flap of soft tissues and periosteal flap with returning them

to their place at the end of the operation. It should be emphasized that the decompression operation consists, unlike the osteoplastic trepanation, in the final resection of the bone flap. In case of decompressing trepanation the dura mater of the brain is not sutured unlike osteoplastic one.

Students determine the shape of a possible flap on the head of a corpse. At the same time, it is necessary to pay attention to the fact that the base of the bone flap is wide and directed to the magistral vessels. The one-flap Wagner-Wolf method and the two-flap Olivecron method should be discussed. The teacher emphasizes that currently such surgery is usually performed applying two-flap technique.

First, the flap which includes the skin, epicranial aponeurosis, muscle is cut out. The flap is turned to the base and closed with a drape moistened with warm saline. After that, the surgeon begins to cut out a bone flap. At the same time, he retreats from the edge of the skin wound by 1 cm and dissects the periosteum. The periosteum is peeled off with raspatory on both sides of the incision. Five notches are done on the bone. Moreover, at the base of the musculoperiosteal flap, the distance between the incisions should be at least 4 cm. Assistants drill a trepanning hole with a drilling brace. The teacher points to a rather careful technique for performing trephination opening, especially when the inner plate expands, to prevent the damage to the dura mater of the brain and the medullary substance. After the formation of 5 trepanation holes, a wire saw with Polenov conductor is alternately inserted in them and a bone is sawed between the holes. After connecting the trepanation holes, an elevator is placed on the base of the periosteal flap and the flap is broken.

Periosteal-bone flap is turned out; the brain membrane is cut with a cross-section. After that, the surgeon performs appropriate surgical procedures on the brain: removal of the tumor, cysts, aneurysms of the vessel, etc.

At the end of the operation, the dura mater of the brain is sutured with interrupted sutures, if there are no contraindications; the bone flap is placed on its place and fixed with three rows of sutures: the first series of sutures is applied to the periosteum, the second − to the muscle, the third − to aponeurosis. At the end of the operation, the silk sutures are placed to the skin.

The indication for decompression trepanation of the skull is the increase in intracranial pressure in case of significant tumors, hydrops and other brain diseases, in cases of impossible removal of pathological conglomerate, increased edema and swelling of the brain.

The purpose of the operation is the removal of the part of the skull vault, the opening of the dura mater of the brain. Decompression trepanation is performed directly above the site of the damage or in the right temporal region (according to Cushing), if the localization of the damage is unknown.

The surgeon performs an arched section in accordance with the attachment of the temporal muscle; the base is directed to the zygomatic arch. The vessels (superficial temporal artery and its branches) are ligated. The skin flap is turned to the base. The temporal fascia is dissected as well as the temporal muscle along the fibers. The temporal bone is skeletonized (6x8 cm). In the center of the bone exposed from the periosteum, a hole is drilled using a large cutter. This hole is expanded to a size of 6x8 cm. The dura mater of the brain is dissected with cross-sectioned cut. Soft tissues, except the dura mater of the brain, are sutured tightly. It should be noted that before the dissection of the dura mater of the brain, usually the spinal puncture is

performed to reduce its tension. This reduces the possibility of a sharp prolapse of the brain, bleeding and other complications **(Fig. 17, 18).**

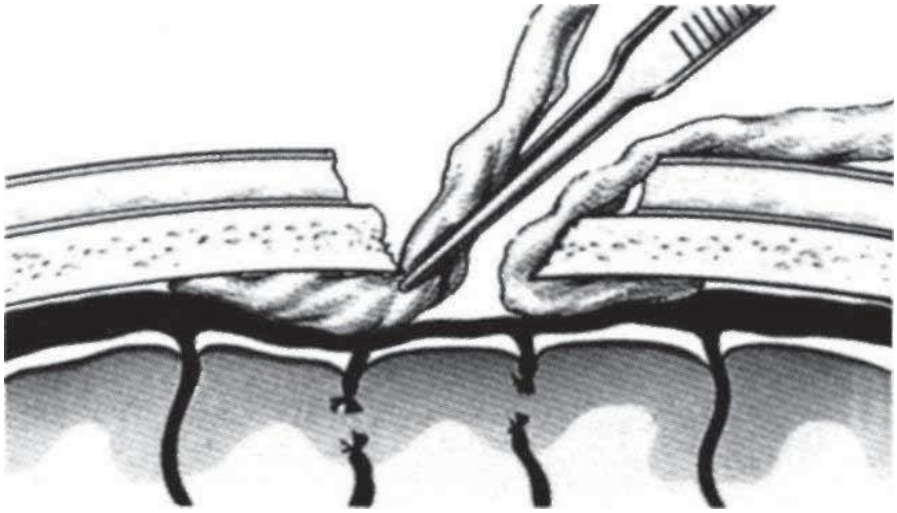

Fig.17. Tamponade of damaged sinus by drape (scheme)

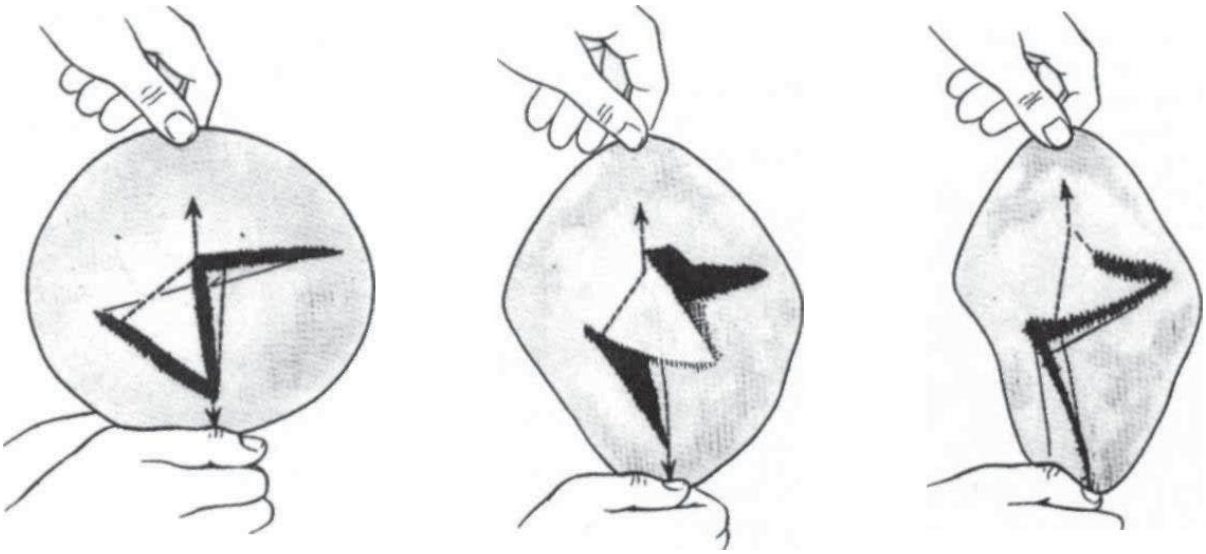

Fig.18. Skin plastic with asymmetric triangles by Limberg (scheme on a linen piece)

5. Materials for self-control
A. Tasks for self-control:

Task No.1. During the osteoplastic trepanation of the skull, the surgeon connects all the trepanation openings by a wire saw. What is the surgeon's mistake?

Task No.2. The surgeon connected the holes during conducting osteoplastic trepanation of the skull. While closing the defect, the bone flap prolapses and freely lies on the dura mater. What is the surgeon's mistake?

Task No.3. A sudden brain prolapse arises after the cut of a dura mater during decompressive trepanation of the skull according to Cushing. What should a surgeon do to prevent this complication?

Task No.4. After the osteoplastic trepanation of the skull, the surgeon separated the bone flap from the periosteum. What is the surgeon's mistake?

Task No.5. During the trepanation of the posterior cranial fossa, Cushing's crossbow cut was used. Does it correspond to the region of trepanation?

References

Basic literature

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5. Bernard C. Illustrated Manual of Operative Surgery and Surgical Anatomy / C.Bernard – 1991.-330 p.
6. Pemberton L.B. Workbook of Surgical Anatomy / L.B.Pemberton. – 1990. – 298 p.
7. Gliedman M.L. Atlas of Surgical Techniques / M.L.Gliedman. – New York etc., McGraw – Hill. – 1990. – 420 p.
8. Sabiston D.C. Atlas of General Surgery / D.C.Sabiston. – Philadelphia etc., Saunders. – 1994. – 220 p.
9. Chassin J.L. Operative Strategy in General Surgery / J.L.Chassin. – New York etc., Springer. – 1994. – 368 p.

Academic discipline	Clinical anatomy and operative surgery
Module No. 1	Clinical anatomy and operative surgery of areas and organs of head and neck, pectoral cavity, regions and organs of abdominal cavity.
Content module No.1	Introduction to clinical anatomy and operative surgery. Clinical anatomy and operative surgery of the head and neck.
Topic 6	Clinical anatomy of the lateral facial part. Division into regions. Lateral part of the face: parotidomasseteric region (parotid gland, facial nerve). Deep (submaxillary) area of the face. Spatium temporopterygoideum and spatium interpterygoideum according to M.I. Pirogov. Operations in purulent processes of the face.
Year	II
Faculty	Foreign students training (medical)

1. The relevance of the topic:

1. Surgical treatment of purulent mumps, inflammatory processes of the sinuses, phlegmons of the face regions, fractures and injuries of the facial bones requires the deep knowledge of the anatomical and physiological features of the facial part of the head. This section is important for dental students since maxillofacial surgeons provide the treatment of these pathological processes.
2. Surgical treatment of phlegmons of retropharyngeal space (spatium retropharyngeum) and parapharyngeal space (spatium parapharyngeum), cellular spaces of the deep part of the face requires knowledge of the anatomical and physiological features of these regions.

2. Specific objectives.

1. Determine the facial, cellular spaces of the lateral facial region and the ways of purulent − inflammatory processes development.
2. Determine the facial, cellular spaces of the deep face region and the ways of purulent-inflammatory processes development.
3. Explain the topographic anatomical features of the parotid gland and its ducts.
4. Analyze the topographical relationship within the studied regions.
3. Perform a layered tissues preparation of the lateral facial region.
4. Perform a layered tissues preparation of the deep face region.

3. Tasks for independent work to prepare for the lesson

3.1. List of the main terms, parameters, characteristics that should be learnt by the student while preparing for the lesson.

Term	Definition
Deep region of the face	The area of the facial part of the head, which is located behind the branch of the mandible and temporal muscle, in the area of attachment of this muscle to the coronary branch of the mandible.

Spatium temporopterygoideum	Space between the outer surface of the lateral pterygoid muscle and the inner surface of the temporal muscle.
Spatium interpterygoideum	Space between lateral and medial pterygoid muscles.
Spatium pterygomaxillarum	Space between the medial pterygoid muscle and the inner surface of the mandibular branch

3.2. Theoretic questions:

1. The boundaries of the facial region of the head.
2. The division into sections.
3. Buccal region. Borders, layers, blood supply, innervation, lymphatic drainage.
4. Parotid region. Borders, layers, blood supply, innervation, lymphatic drainage.
5. The topography of the parotid gland.
6. The topography of the duct of the parotid gland.
7. The topography of facial muscles.
8. The boundaries of the deep facial region.
9. Cellular spaces of the face, their connections, and ways of dissemination of infection.
10. Pterygopalatine fossa. It's boundaries, content.
11. Typical incisions in case of phlegmon of the facial deep region, parapharyngeal space and retropharyngeal space.

3.3. Practical skills acquired in class:

1. Layer-by-layer dissection of the masseteric and buccal regions and their formations.
2. Layer-by-layer dissection of the parotid area and its formations.
3. Layer-by-layer dissection of the deep face and its formations.
4. Perform typical incisions on the face with deep phlegmons of the face, retropharyngeal and parapharyngeal space.

4. The content of the topic:

The facial part of the head. General information.

On the skull students draw a line that separates cerebral part from the facial one. It passes from the bridge of the nose on the upper edge of the optic fossa, on the zygomatic bone, the zygomatic arch, through the external acoustic opening and on the anterior edge of the mastoid process.

Below the neck, the facial part is separated by a line that runs from the chin to the lower edge of the mandible body, its angle to the anterior edge of the mastoid process base.

Students determine that there are frontal and two lateral divisions of the face. In the anterior part there are the following regions: orbit, nasal part, infraorbital fossa,

oral region and mental region. In the lateral part − the parotid region with the retromandibular fossas, buccal region, and the deep part of the face.

In a practical lesson, for a more complete description of the topography of these regions, it is advisable to consider a number of characteristic for all facial regions of the head.

The face skin is thin, contains a lot of sweat and sebaceous glands. The teacher pays attention to the fact that at the occlusion of the excretory duct of the sebaceous gland forms an atheroma, and with inflammation of the hair follicles − boils.

The skin of the face has many sources of blood supply, so that face wounds, if they are not very contaminated, are resistant to infection and healed rapidly.

On the overwhelming part of the face there is a lot of subcutaneous tissue which can be a cause of the purulent infection and hematoma development on the face.

It is necessary to pay attention to the role of mimic muscles: they provide the function of the oral and orbital fissures, help to present a certain emotional state of a person (grief, illness, joy, care, etc.).

It is emphasized that mimic muscles, unlike chewing, usually do not have two fixing points. One margin of mimic muscles is attached to the bone and another – to the skin. There are also such muscles that are attached only to the skin. These include the orbicular muscle of eye (musculus orbicularis oculi) and orbicular muscle of mouth (musculus orbicularis oris).

Attention is drawn to the fact that on the face, unlike the skull, under the subcutaneous tissue there is a thin superficial face fascia. It forms fascial compartments for mimic muscles and vascular-nerve bundles in the subcutaneous fat layer.

Buccal region (regio buccalis)

On the corpses, preparations, slides, tables, the students first practically define the boundaries of the site: at the top − the lower edge of the orbit,
at the bottom − the lower edge of the body of the mandible, the front − the nasolabial and nasobuccal folds, behind − the front edge of the chewing muscles. Since the students have already theoretically acquainted with the layered topography of this region, they must confirm this at the lesson and under the supervision of the teacher perform a layer preparation.

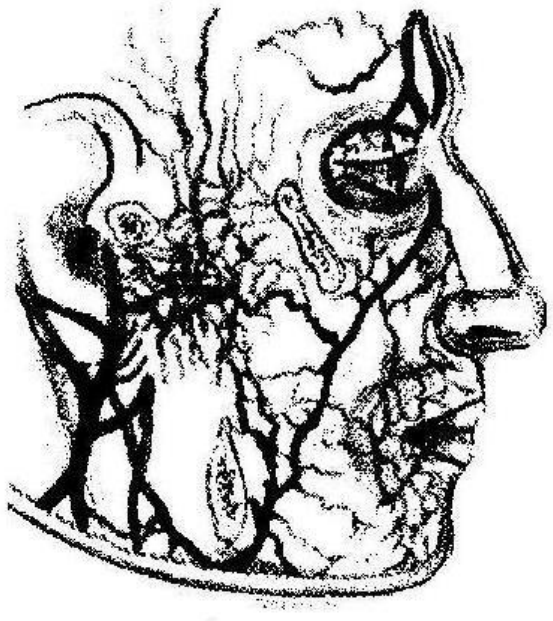


Fig.19. Differences in the structure of deep veins of the face:

A. Reticulation form of structure of the facial veins.

B. Disconnected form of the structure of the facial veins.

Pay attention that the skin of this region is thin, easily shifted, contains a lot of sebaceous and sweat glands. Subcutaneous tissue, unlike adjacent areas of the face, is sufficiently developed. It is adjacent to the buccal fat pad (corpus adiposum buccae). It is located below the zygomatic bone, between the chewing and cheek muscles and covered by skin and subcutaneous tissue. In the buccal fat pad, there are three branches: temporal, orbital and pterygopalatine. The inflammatory processes of the buccal fat pad are initially limited, but in case of purulent course may develop in adjacent areas (under the zygomatic arch, fossa temporalis and infratemporal fossa, on the orbit through the inferior orbital fissure).

The next layer is the fascia buccopharyngea that covers the cheek muscle. If you have prepared the tissues to the cheek muscle, you will see that the duct of the parotid gland penetrates this muscle and opens at the side of mouth vestibule at the level of 1-2 molars or between them. Inside the cheek muscle is covered by the mucous membrane of the mouth vestibule. The mucous membrane has a salivary papilla and deferential opening of parotid gland duct.

The facial artery passes in the thickness of the subcutaneous tissue near the anterior margin of m. masseter. It deflects in the medial direction and initially releases the branches to the lower and upper lip (a. labialis superior et a. labialis inferior), and then goes to the inner corner of the orbit, where it continues into the angular artery (a. angularis). The teacher draws the attention of students to the fact that the angular artery inosculates through the dorsal nasal artery (a. dorsalis nasi) with the ophthalmic artery (a. ophthalmica), a branch of the internal carotid artery. Students should pay attention to the anastomosis of the facial artery with such arteries: buccal (from the maxilla), transverse facial artery (a. transversa faciei) (from the superficial temporal artery) and infraorbital (from the maxillary artery). The facial artery is accompanied by the same name vein, which is located behind from the artery and is directed straight, and the facial artery has a twisting direction. The facial vein (v. facialis) inosculates with a deep venous rete of the face and optic veins. In case of thrombosis a retrograde blood flow and penetration of infection into the cavernous sinus are possible.

Infraorbital vascular-nerve bundle (a., v. et n. infraorbitales) is going out in loose tissues from under of the superior orbital margin through the foramen infraorbitalis, which is located 5-8 mm below the edge of the orbit.

The infraorbital nerve forms a small «goose's foot» (pes anserinus minor). Within the cheek area through the mental foramen, which is located on the anterior surface of the mandible body, there is a vascular-nerve bundle (a., v. et n. mentales).

The vascular-nerve bundle (buccal artery, the same name vein and the buccal nerve) and 2-3 small cheek lymph nodes are situated on the outer surface of the cheek muscle under the fat pad.

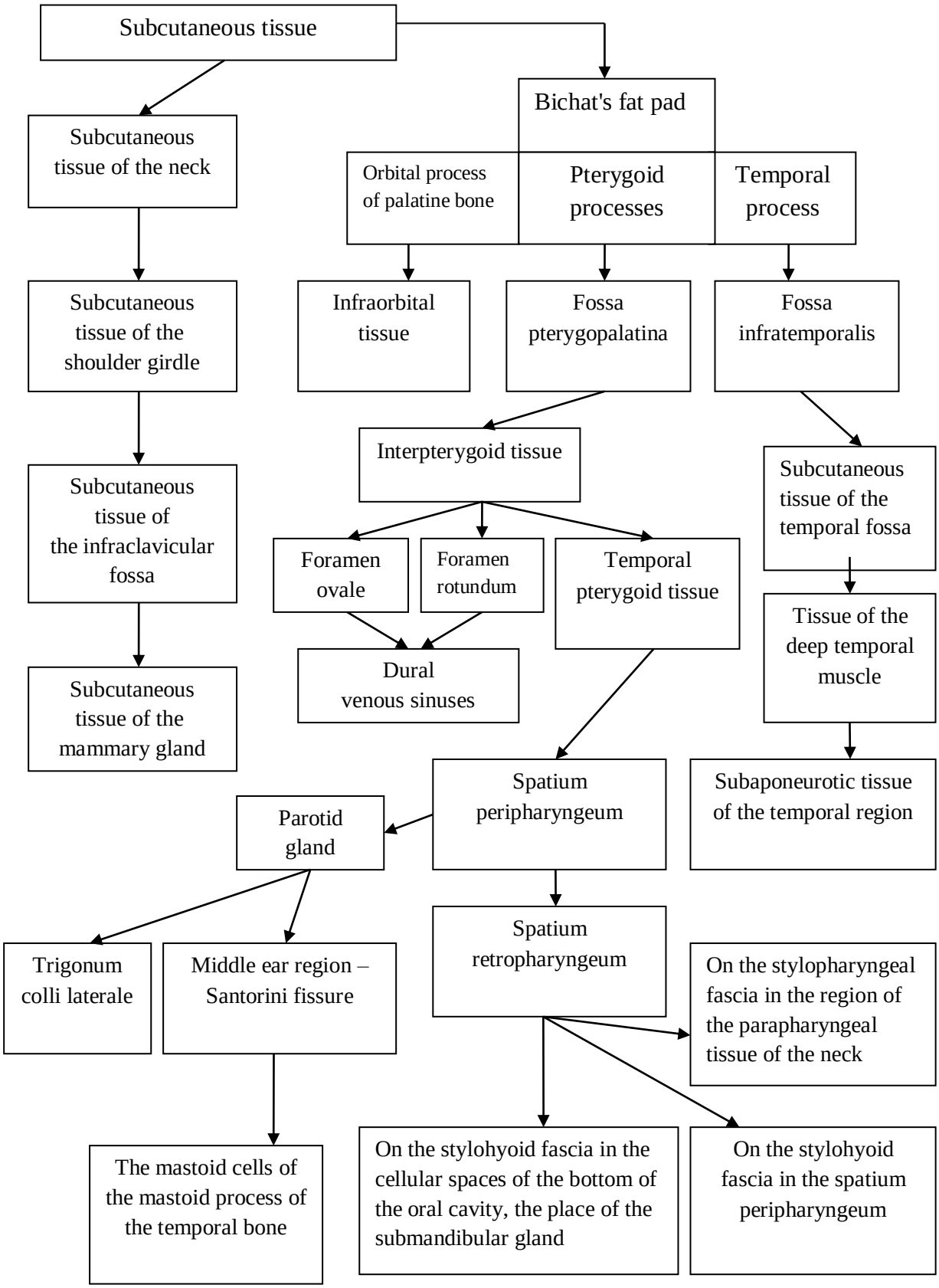
Sensitive innervation of the cheek area is provided by the branches of the trigeminal nerve: infraorbital, buccal, mental; motor innervation – by the branches of the facial nerve. Due to these branches, all mimic muscles are innervated, to which nerve branches approach from the depth of their surface. This should be taken into account for surgical interventions.

Table 1

The fasciae of the face

Name	Clinical and anatomical location	Fascial parts
Superficial fascia	Facial areas: regio orbitalis, regio infraorbitalis, regio zygomatica, regio nasalis, regio oralis, regio parotideomasseterica, regio buccalis, regio mentalis	For all mimic muscles, branches of the facial nerve II and III branches of the trigeminal nerve, subcutaneous vessels and facial nerves
Own fascia: a) its superficial leaf	Facial areas: regio orbitalis, regio infraorbitalis, regio zygomatica, regio nasalis, regio oralis, regio parotideomasseterica, regio buccalis, regio mentalis	For parotid gland, buccal fat pad (Bichat's fat pad), facial arteries and veins, their anastomoses with deep vessels
b) its deep leaf: fascia pterygoidea, fascia interpterygoidea, fascia styloidea	Deep part of the face, spatium peripharyngeum, spatium parapharyngeum,	For the vessels and nerves of the deep part of the face
c) leaf near the wall fascia prevertebralis	Spatium retropharyngeum	For lymph nodes: occipital, cervical lateral, deep occipital, deep retropharyngeal and pharyngeal
Visceral fascia and its leaf: fascia buccopharyngea, fascia pharyngobasilaris	Cavity of the nasopharynx and oral cavity	For Waldeyer-Pirogov tonsillar ring

Ways of spreading the purulent-inflammatory processes on the face:



Parotid region (regio parotideomasseterica)

Students on the corpse determine the boundaries of the region: at the top − zygomatic arch, below − the lower edge of the body of the mandible, the front − the

anterior edge of the masseter muscle, behind − the posterior edge of the mandible branch. Attention is drawn to the fact that the posterior edge of the parotid area is adjacent to the mandible fossa. After that, the teacher appoints surgeon, assistant and operating sisters who begin the preparation of this region. First of all, there are two horizontal cuts: one on the zygomatic arch, the other on the lower edge of the mandible body, and then both cuts are connected in the middle by longitudinal incision. During preparation, the skin, subcutaneous tissue with the surface fascia and the fascia parotideomasseterica, which encircles the parotid gland are dissected. Attention is paid on the fact that formations that pass through the thickness of the parotid salivary gland: the external carotid artery, its terminal branches, retromandibular vein, auriculotemporal and facial nerves. Students separate the formations passing through parenchyma of the gland: external carotid artery with its limit branch (a. temporalis superficialis), retromandibular vein (v. retromandibularis), auriculotemporal nerve (n. auriculotemporalis) and facial (n. facialis) nerves. At the same time they study the structure of the vascular-nerve bundle of the parotid gland. Thus, the external carotid artery approaches to glandula parotis from the posteriointernal surface of the gland, on the border between the lower and middle third of the branches of the mandible. In most cases, according to the observations of T, V. Zolotareva and G. M. Toporova (1968), it lies in the thickness of the gland.. The teacher points out that many branches of the parotid gland arteries leave numerous anastomosis to the facial, buccal, posterior superior alveolar artery, occipital and other arteries.

The external carotid artery in parenchyma glandula parotis is accompanied by retromandibular vein (v. retromandibularis). This is important to take into account during operation on the parotid gland since the bleeding from this vein is no less dangerous than that on the damaged external carotid artery.

The teacher emphasizes that different venous outflow from various localizations of glandular parts is not the same. Thus, from the upper parts of the gland, venous blood flows out into the transverse vein of the face, and from it − to the retromandibular vein; from the middle parts and lower parts − in the veins of the masseter muscle; from the anterior parts − to the anterior auricular vein; from parotid − to the posterior auricular vein.

The nerve fibers to the parotid gland leave the third branch of the trigeminal nerve in the auriculotemporal nerve; secretory fibers − from the auricular node. In addition, the parotid gland receives sympathetic fibers from the plexus surrounding the maxillary and superficial temporal arteries. Considering that, lymph vessels are additional pathways for the spread of infection, it is advisable to consider the links of the lymphatic vessels of the parotid gland with adjacent groups of lymph nodes. From the gland, lymph flows into the nodi lymphatici preauriculares, which lie in the front of the auricle and external acoustic meatus on the outer surface of the gland. T. V. Zolotareva and G. M. Toporov (1968) indicate that one part of these nodes are located from the outside of the fascia (fascia parotidea), and the another − under it, in the parenchyma of the gland.

Topography of the parotid gland

Since the parotid gland (glandula parotis) lies within the regio parotideomasseterica, then in the practical lesson its topography should be studied in detail.

The parotid gland in its transverse section has a triangular shape and its deep part is placed in a retromandibular fossa. In anteriorly this fossa is limited by the branch of the mandibular, at the top − by external acoustic meatus and temporomandibular joint, behind there are mastoid process and sternocleidomastoid muscle, and from the bottom by a fascia septum that delimits the parotid gland from the submandibular gland.

During preparation, students find that the anterior margin of the gland extends to the outer surface of the masseter muscle.

It is emphasized that the fascia on the outer surface of the gland is thickened and is defined as aponeurosis. However, it grows thinner in places where the gland is adjacent to the pharynx (pharyngeal process), and within the cartilaginous part of the acoustic meatus, where the Santorini fissures are located. Because of them, the infection can spread to the middle ear, which can be complicated with parotitis by purulent inflammation of the middle ear (otitis media). Furthermore, the parotid gland is covered with a thin capsule, which together with the fascia penetrates the parenchyma of the gland and divides it into particles. It is emphasized that such a relationship between the capsule and the parenchyma of the glands limits the spread of purulent process in the gland. The gland itself may have different size, additional particles. Sometimes it only fits the edge of m. masseter, and in some cases it reaches the anterior part of this muscle. Attention is paid to the topography of the parotid duct. It is formed in parenchyma with interlobular ducts. Proceeding from the parenchyma gland, the duct lies on the outer surface of the masseter muscle. At the front edge of this muscle, ductus parotideus penetrates the cheek muscle and opens onto the mucous membrane of the oral vestibule. The variability in the topography of the glandula parotis should be mentioned. For example, S. M. Kasatkin, S. V. Bilay and al. define such forms: straight, ascending, cranked, descending, S-shaped, double duct. L. O. Tsakadze (1952) recommends that the projection of the duct of the parotid gland is determined by applying of two lines: the upper passes between the lower edge of the external acoustic meatus and ala of the nose, and the lower one between the lower edge of the earlobe and the angle of the mouth. At a high position, this duct adjacent to the upper, and at low − to the bottom line (L. O. Tsakadze).

Topography of the maxillary artery and its branches

The study of the topography of the maxillary artery is important in practice since its branches are related to the blood supply to both deep and superficial facial parts.

Attention is drawn to the fact that the profound study of the surgical anatomy of the maxillary artery was made by S.I. Danilchenko (1996).

On preparations and tables, students determine that a. maxillaris, one of the largest branches of the external carotid artery, leaves it at the level of the neck of the mandible articular process. It is emphasized that the maxillary artery is located deeply, so approach to it is complicated and practically impossible, which makes it impossible to ligate artery during bleeding. So, with damage to the maxillary artery, the surgeon is usually forced to ligate the internal carotid artery.

In the topography of the maxillary artery, there are three groups of branches.

The first group includes the branches that depart from the main artery stem at the level of the neck of the articular process:

1) Deep auricular artery (a. auricularis profunda);
2) Tympanic artery (a. tympanica);
3) Middle meningeal artery (a. meningea media),
4) Inferior alveolar artery (a. alveolaris inferior).
The second pterygoid group of branches includes:
1) Two deep temporal arteries − the anterior and posterior;
2) Artery of the masseteric muscle (a. masseterica);
3) Two arteries of the pterygoid muscles (r. r. pterygoidei);
4) Cheek artery (a. buccalis);
5) Posterior superior alveolar artery (a. alveolaris superior posterior).
The third (spatium interpterygoideum) group includes:
1) Infraorbital artery (a. infraorbitalis);
2) Descending palatine artery (a. palatina descendens);
3) Sphenopalatine artery (a. sphenopalatina).

The teacher emphasizes that numerous anastomosis of the maxillary artery with facial artery have a practical significance.

Veins of the face and their ligaments.

On tables, atlases, slides, students study the veins of the face and the variability of their topography.

From the surface of the face (skin, subcutaneous tissue, mimic muscles) and partly from the organs, the venous blood flows out into the facial vein (v. facialis), which accompanies the same artery.

The sources of the formation of the facial vein are the following: angular vein (v. angularis), supratrochlear vein (v. supratrochlearis), supraorbital vein (v. supraorbitalis), palpebral veins (v. v. palpebrales), external nasal veins (v. v. nasales externae), labial veins (v.v. labiales), external palatine vein (v. palatina externa), deep facial vein (v. faciei profunda), mental vein (v. mentalis), and others. The teacher emphasizes that, according to L. G. Shchitova, anastomosis is located in the area of the root basis of the nose between the two facial veins. In addition, the facial vein at the medial angle of the orbit inosculates with a superior ophthalmic vein, and within the lower eyelid − with the lower eyelid vein. Anastomoses between the venous sinuses of the cranial cavity and facial veins are in the area of the forehead, dorsum and apex of nose, lips and chin. The teacher notes that from the deep part of the face (masseter muscles and organs), venous blood through the temporal (v. v. temporales), maxillary (v. v. maxillares) veins, transversy facial vein (v. transversa faciei), and sphenopalatine plexus flows into the retromandibular vein. Plexus venosus pterygoideus is a very important from a practical viewpoint. It is located in the spatium temporopterygoideum and at the expense of venous anastomosis binds facial vein and retromandibular vein. It is advisable to concentrate attention on sphenopalatine venous anastomosis with pharyngeal venous plexus, through the middle meningeal vein − with the veins of the cranial cavity, through the ophthalmic veins − with cavernous sinus. We emphasize that odontogenic inflammatory processes of the jaws and periarticular soft tissues by veins, and by their numerous anastomoses, can spread to the cavity of the orbit, cavernous sinus of the dura mater, which causes inflammatory processes of the meninges. It is important to remember that the facial and retromandibular veins behind the angle of the lower jaw are combined into a common trunk, which goes straight and down and on the neck covers

the place of division of the common carotid artery to the outer and inner. Such features of the topography complicate the ligation of the external carotid artery.

The common venous trunk falls into the internal jugular vein. M.A. Sresely (1957) in his studies found that the veins of the face are divided into superficial and deep. The superficial veins lie in the form of two layers: the first layer is located above the superficial fascia of the face in the subcutaneous tissue, the second − under it, and the deep veins of the face are represented mainly by the pterygoid plexus. Summing up, it should be emphasized that the structure of the veins of the face is very variable. The veins, like the arteries, have numerous anastomoses, due to which the superficial veins of the face are connected with the deep, the veins of the right half of the face − with the veins of the left half. The veins of the face through the orbit, as was already noted, are connected by anastomosis with intracranial veins and sinuses of the dura mater, mainly through the cavernous sinus (sinus cavernosus). So, the thrombophlebitis of the facial veins is very dangerous because the process can spread to the cavity of the skull and complicate the development of purulent inflammation of the sinuses and meninges (sinus thrombosis, meningitis).

Temporomandibular joint (articulatio temporomandibularis)

On the bone preparation of the skull with the lower jaw, a preparation of the temporomandibular joint with its ligaments, tables, slides, students study the structure of the joint. It is formed by connecting the head of the articular process of the mandible (caput mandiblae) with the mandibular fossa (fossa mandibularis). The top of the joint is covered with cartilage.

It should be noted that in the formation of the temporomandibular joint only the anterior-superficial part of the articular head is involved because only it connects the articular fossa.

The articular fossa resembles ellipsoid hollow. In the front, it is limited by the posterior surface of the articular tubercle of the temporal bone; behind – by the wall of the external acoustic meatus; anteriorly – by the bottom of fossa cranii media; inside – by the pterygoid process; from the outside – by crus posterior processus zygomatici.

The articular fossa is lined with connective tissue cartilage. In the posterior part of the external acoustic meatus, a thin bone plate separates it. So, the inflammatory processes from the external acoustic meatus can spread to the joint.

In the cavity of the joint between the articular head of the mandible and the articular fossa of the temporal bone an articular disk (discus articularis) is located. On the periphery, it is accreted with an articulate bag and divides the joint cavity into two divisions: the upper anterior, located between the articular fossa and the articular tubercle of the temporal bone, and the lower posterior, which is located between the connecting surface of the articular head and the lower underside of the disk. It should be remembered that the upper anterior and lower posterior segments of the cavity of the joint are not interconnected.

The joint capsule (capsula articularis) is a weekly tight bag that is attached to the edge of the articular cartilage. The front of the bag is thinner than the back. The joint capsule is more thickened in the outer parts, because the fibers entwined to the lateral joint ligament here (lig. laterale seu temporomandibulare). This ligament has

the form of a triangle whose apex is directed to the neck of the articular mandible process, and the base to the zygomatic process of the temporal bone.

There are also other ligaments that are not connected to the joint capsule; there are sphenomandibular ligament (lig. sphenomandibulare), which extends from the angular axis of the sphenoidal bone to the lingula of mandible (lingula mandibulare); stylomandibular ligament (lig. stylomandibulare), which extends from the styloid process to the angle of the mandibular. The joint capsule (capsula articularis) is a weekly tight bag that attaches to the edge of the articular cartilage. The front of the bag is thinner than the back. The joint capsule is more thickened in the outer parts, because the fibers entwined to the lateral joint ligament here (lig. laterale seu temporomandibulare). This ligament has the form of a triangle with the apex directed to the neck of the articular mandible process, and the base to the zygomatic process of the temporal bone.

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Knowledge of the topography of these ligaments is necessary for dental surgeons during surgical interventions on the temporomandibular joint. When the joint is removed, all ligaments should be stretched, a joint capsule is usually dissected in the anterior inward surface.

The temporomandibular joint has a form of a block; both joints function simultaneously and, therefore, constitute combined joints.

This joint can perform such movements: lifting and lowering of the mandible with simultaneous closing or opening of the mouth; mandible movements forward and backward; side movements to the right and to the left.

The teacher pays attention to the age-specific features of the temporomandibular joint. Thus, in children and adolescents, the articular head is covered with a thin layer of hyaline cartilage and perichondrium with developed cambium and fibrous layers. The articular fossa and articular tubercle are lined only with periosteum with quite pronounced cambium and fibrous layers.

The articular disk consists of a dense collagenous connective tissue. In older people, instead of cambium and fibrous layers, there are fibrous cartilage forms on the articular surfaces; the disk in its center is represented by cartilaginous tissue. Thus, in infancy and at the young age, during the inflammation process in the joint between the joint surfaces a bone intergrowth is formed, and in adults this intergrowth is more often formed by a connective tissue (G.I. Semenchenko).

Deep lateral area of the face (area according to M. I. Pirogov)

On preparations, skull, tables, slides, students study the boundaries of the site, muscles, cellular spaces, as well as the vessels and nerves contained in them. Pay attention to the course of the interpterygoid fascia and its placement in relation to the lingual and lower alveolar nerves.

Students analyze in detail the ways of combining temporopterygoid and interpterygoid spaces with adjacent areas of the face and neck and possible ways of spreading purulent processes to the cavity of the skull, pterygopalatine fossa, the

bottom of the oral cavity, parapharyngeal space, and others like that. The teacher draws attention to M.I. Pirogov contribution in describing the cellular spaces of the face **(Fig. 20)**.

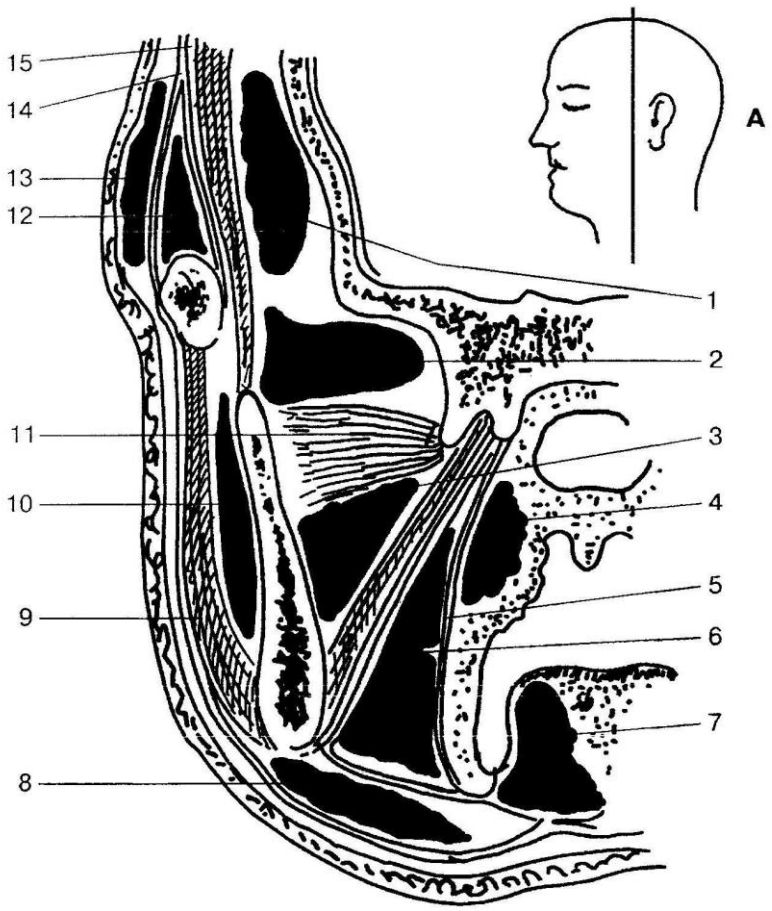


Fig.20. Clinical anatomy of the face phlegmon and bottom of the oral cavity:
1− deep temporal phlegmon;
2− infratemporal fossa phlegmon;
3 − interpterygoid phlegmonl;
4 − peritonsillar phlegmon;
5 − pharyngobasilar fascia;
6 − parapharyngeal phlegmon;
7 − phlegmon of the bottom of oral cavity;
8 − phlegmon of the submandibular gland;
9 − masseter muscle;
10 − submasseteric phlegmon;
11 − medial pterygoid muscle;
12 − temporal phlegmon;
13 − surface temporal phlegmon;
14 − temporal aponeurosis;
15 − temporal muscle.

The deep area of the face − intermaxillary region according to Pirogov − becomes accessible after removal of the mandibular branch, chewing muscle and zygomatic arch.

The intermaxillary region is limited outside by the branch of the lower jaw, anteriorly – by maxillary tuberosity, medially – by pterygoid processes of the sphenoid bone, from above – by the base of the skull. In the intermaxillary region, pterygoid muscles (lateral and medial) and temporal, located near their place of attachment to the mandibular coronoid process. Each pterygoid muscle is surrounded by a thin fascia plate. In addition, connective tissue plate − interpterygoid fascia or interpterygoid aponeurosis is placed between the pterygoid muscles. In the intermaxillary region two interaponeurotic cellular spaces are distinguished: temporomandibular and pterygoid. The first is placed between the lateral pterygoid muscle and the end part of the temporal muscle near its attachment to the mandibular coronoid process and has the form of sagittal cleft. The second is placed between the pterygoid muscles and has the form of triangular cleft. Both spaces are filled with soft connective tissue, which not only interconnects them but in different directions goes to adjacent areas (temporal area, pterygopalatine fossa, in the area of the fat pad of the cheek, parapharyngeal space). The temporopterygoid space is connected to the fat pad of the cheek and the pterygopalatine fossa. Through the pterygopalatine fossa, the temporopterygoid space is connected to the cavity of the skull through a round

hole, with orbit − through the inferior orbital fissure, with nasal cavity − through the pterygoid canal, and with the mouth through the greater palatine foramen.

In the temporopterygoid space there are: the maxillary artery with branches and numerous veins that form a pterygoid venous plexus. The pterygoid space interacts with temporopterygoid and parapharyngeal spaces and with the cavity of the skull through foramen ovale and foramen spinosum. In the interpterygoid space, in addition to the maxillary artery, its branches and venous plexus, the nerves − branches of the mandibular nerve, lingual and lower alveolar nerves pass. These nerves are separated from each other by an interpterygoid fascia. The presence of the fascia plate between the lingual and the lower alveolar nerves is of practical interest since it provides a topographic anatomical substantiation of the mandibular anesthesia and explains some failures in its implementation **(Fig. 21)**.

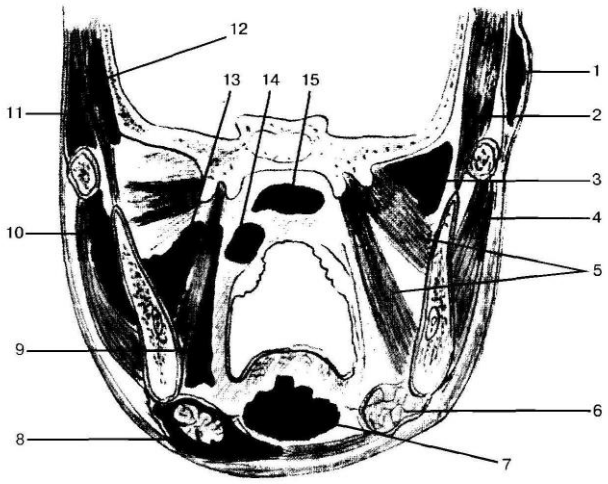


Fig.21. Topography of abscesses in cellular spaces

1− superficial abscess of the temporal region;
2 − temporal muscle;
3 − abscess of the infratemporal fossa;
4 − masseter muscle;
5 − pterygoid muscles;
6 − submandibular gland;
7 − abscess of the bottom of the oral cavity;
8 − purulent inflammation of the submandibular gland;
9 − phlegmon of the parafaringeal space;
10 − phlegmon of the submasseteric space;
11− phlegmon of interaponeurotic cellular tissue of the temporal region;
12 − phlegmon of a deep cellular space of the temporal region.

Typical cuts in purulent processes of parotid gland (parotitis)

On the lateral side of the face in case of purulent-inflammatory processes, the incisions should be made in the radial direction, taking into account the projections of the main branches of the facial nerve.

The teacher notes that after the opening of the skin with subcutaneous tissue to lay deeper into the adjacent tissues, it is necessary to use blunt instruments to prevent wounding of the vascular nerve formations at the site of the incision.

In order not to damage the main branch of the facial nerve, radial incisions must begin with a point located at a distance of 1.5 cm from the earlobe.

In case of phlegmons of the parotid area, it is necessary to retreat outward from the angle of the mandible and make a cut around the angle of the mandible. At the same time, it is necessary to dissect the skin with a subcutaneous tissue, and the fascia between the sternocleidomastoid muscle and the posterior margin of the branch of the mandible. To prevent the damage to the parenchyma of the parotid gland and the vascular nervous structures located in it, the wounds penetrate bluntly, stratifying the tissues.

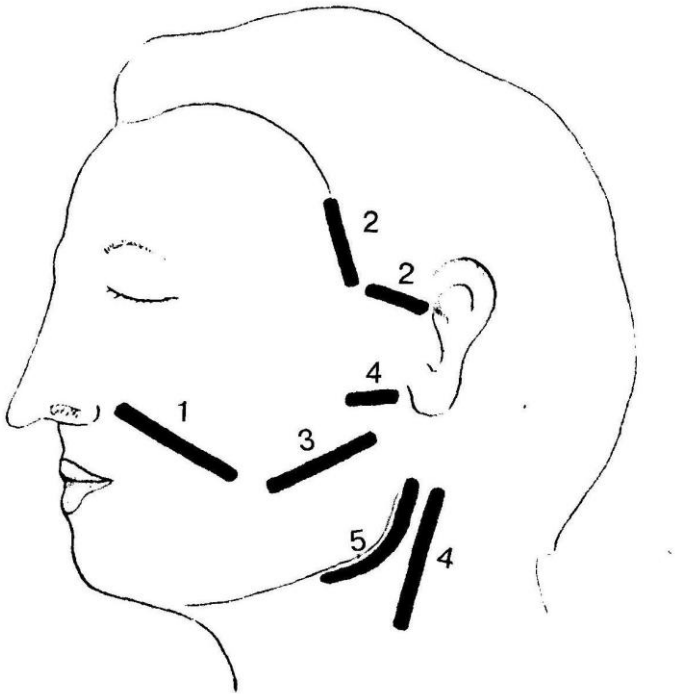


Fig.22. Cuts for opening of purulent-inflammatory processes on the face:
1− in case of phlegmons of the fatty body of the cheek;
2− in case of phlegmons of the temporal region;
3− in case of phlegmons of the chewing area;
4− in case of parotitis;
5− in case of phlegmons of the parapharyngeal space, the interpterygoid space and masticator space of the deep part of the face.

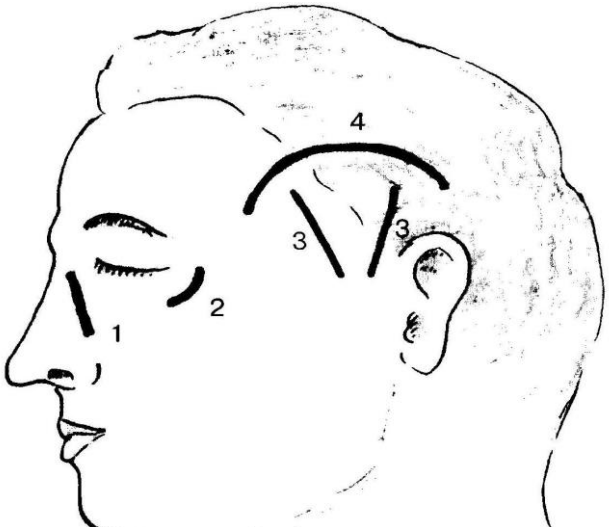


Fig.23. Facial cuts to reveal purulent-inflammatory processes around the orbital and temporal areas of the head:
1-2− in case of phlegmons of the orbital region
2-3− in case of deep phlegmons of the temporal region

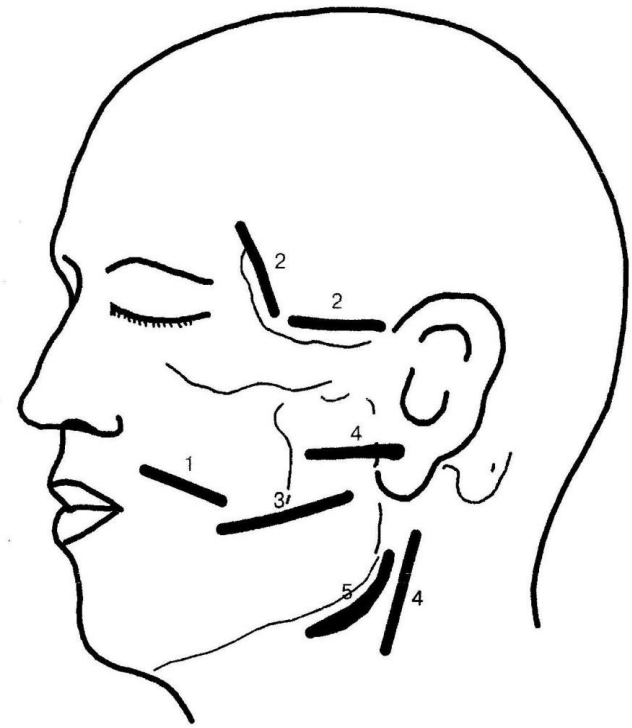


Fig.24. Cuts on the facial part of the head with suppurative and inflammatory processes:
1− cut of phlegmon in the buccal fat pad;
2− cuts of phlegmon of the temporal area, temporomandibular joint and subtemporal fossa;
3− section of phlegmon of the chewing area;
4− cuts of phlegmon of the parotid gland in case of parotitis;
5− section according to V.F.Voyno-Yasenetsky for the opening of the phlegmon of cellular spaces of the parapharyngeal, interpterygoid and masticator spaces.

Primary surgical treatment of wounds of maxillofacial area

Students consider the peculiarities of processing the operation field in the maxillofacial area. So, an alcoholic solution of iodine can change the color of the skin, chemically damage the mucous membrane, which is not desirable. It is necessary to pay attention to the sparing separation of the affected tissues. Blind suture is applied to insulated wounds if no more than 48 hours after the damage have passed. Students find out that on the face the sutures are applied with thin silk or synthetic material. Lamellar suture is used in secondary stitching.

5. Materials for self-control

A. Tasks for self-control:

Test No. 1. The patient was operated on the parotid region; parotid salivary gland and nerve passing through its stratum and accompanying superficial temporal artery were damaged. Which nerve has been damaged?
a) n. auriculotemporalis;
d) n. opticus;
c) n. hypoglossus;
d) n. glossopharyngeus;
e) n. lingualis.

Test No. 2. During the treatment of the cut wound in the lateral area of the face there was a bleeding from the parotid gland, damage to artery, which is a continuation of the external carotid artery. Which vessel has been damaged?
a) a. alveolaris inferior;
b) a. occipitalis;
c) a. auricularis posterior;
d) a. auricularis anterior;
e) a. temporalis superficialis.

Test No. 3. The patient has a cut wound at the anterior part of the masseter muscle. What muscle has been damaged in this case?
a) musculus pterygoideus lateralis;
b) musculus pterygoideus medialis;
c) musculus temporalis;
d) musculus buccinator;
e) musculus occipitofrontalis.

Test No. 4. The patient has a cut wound in the regio parotideomasseterica and regio buccalis on the left side. How should a doctor describe the localization of the wound with external reference points to determine the boundary between these sites?
a) On the line that connects the alae nasi and the angle of the mouth;
b) On the nasolabial and nasobuccal folds;
c) At the lower edge of the orbit;
d) At the anterior edge of the masseter muscle;
e) At the lower edge of the body of the mandible.

Test No. 5. The surgeon performs the primary surgical treatment of the wound in the buccal region. As a result of injuries, the buccal muscle is damaged. Which fascia that covers the outer surface of the muscle has also been damaged in this case?
a) fascia occipitalis;
b) fascia temporalis;
c) fascia parapharyngea;
d) fascia buccopharyngea;
e) fascia pterygoidea.

Test No. 6. In patient with phlegmon of the parotid salivary gland, the inflammatory process has spread due to the pharyngeal process of the gland. What cellular space has the pathological process spread?
a) spatium parapharyngeam anterior;
b) spatium parapharyngeum posterior;
c) spatium parapharyngeum;
d) spatium temporopterygoideum;
e) spatium interpterygoideum.

Test No. 7. In patient, the inflammatory process is localized in the spatium interpterygoideum of the deep facial part. Where can the pathological process spread in this case through the foramen ovale?
a) in the cavity of the skull;
b) in the orbit;
c) in the cavity of the nose;
d) in the cavity of the mouth;
e) on the neck.

Test No. 8. In patient, a furuncle with an abscess was formed in the left regio parotideomasseterica. During its opening, the surgeon damaged the branches of the facial nerve, resulting in disorders of the mimic muscles innervation. What section had to be performed by the surgeon?
a) arch like cut behind the furuncle;
b) longitudinal;
c) transverse;
d) radial from the base of the earlobe;
e) radial from the corner of the eye.

Test No. 9. The dentist temporarily stopped the bleeding from the buccal region by pressing the facial artery to the lower mandible. In what area of the mandible is the pulsating point of the artery, pressed by a doctor?
a) in the middle;
b) between the anterior and middle thirds;
c) between the middle and posterior thirds;
d) in the middle of anterior third;
e) in the middle of posterior third.

B. Tasks for self-control:

Task No.1. To remove the pus from the fat pad of the cheek, the surgeon made a cut on the anterior edge of the masseter muscle. Is this incision correct and what kind of structures will the surgeon deal with during his actions?

Task No. 2. Can the phlegmon of the parotid gland spread to the spatium peripharyngeum? If so, then how?

Task No. 3. The patient with furuncle of the upper lip was diagnosed with thrombosis of the cavernous sinus. Identify possible ways of spreading the infection to the cavernous sinus. What anatomical factors contribute to the spread of infection?

Task No. 4. For the drainage of purulent parotitis, the surgeon made five cuts, from the earlobe radially in the direction to the temporal region, zygomatic arch, nasal ala, the angle of the mouth, to the angle of the mandible and its edges. Is it correct?

Task No. 5. In patient with purulent parotitis, the symptoms of lowering the angle of the mouth, smoothing of the nasolabial and nasobuccal folds were observed. What caused these symptoms?

Task No. 6. What complications are possible during phlebitis of plexus venosus pterygoideus when treatment is started late? How to explain it from the topographic anatomical point of view?

Task No. 7. After the opening of the buccal region abscess, the smoothness of the nasobuccal fold was observed in patient. What caused such complication and how could it be avoided?

Task No. 8. Phlegmon in the infratemporal fossa developed in patient with facial injury. What cellular spaces can be involved in the inflammatory process?

Task No. 9. In the anterior part of the peripharyngeal space, bunches of pus were observed. Can pus spread to the posterior part of the peripharyngeal space and in retropharyngeal space?

Task No. 10. In patient with the deep phlegmon of the face, the surgeon performed incision parallel to the anterior edge of the masseter muscle. Is the surgeon's tactic correct?

Task No. 11. In child, the swelling of the posterior wall of the throat was detected on examination. Swallowing is difficult, the temperature is elevated. Before that, the patient had tonsillitis with severe course. What is your diagnosis? What treatment can be administered?

References

Basic literature

1. Tsyhykalo O.V. Topographic Anatomy and Operative Surgery / O.V.Tsyhykalo. – Vinnytsia, 2011. — 528 p.
2. Danilchenko S.I. Methodical Instruction For the 3st year students'of stomatological faculty self - preparation work (at class and at home) in studying operative surgery and toographical anatomy / S.I.Danilchenko, E.N.Pronina, O.Yu.Polovik. - Poltava, 2010. — 239 p.

Additional literature

1. Gray. H. F.R.S. Gray's anatomy / Henry F.R.S. Gray, R. A. Bolam. – London, 1994. – 1290 p.
2. McCraw J.B. Athlas of muscle and Musculocutaneous Flaps Head and Neck Reconstruction / John B McCraw, Phillip G Arnold. – Norfolk, Virginia, 1988. – 757 p.
3. Netter F. H. Atlas of Human Anatomy / Frank H.Netter. – East Hannover, New Jersey, 1990. – 592 p.
4. Hnatyuk M.S. Operative surgery and topographical anatomy (lectures) / M.S.Hnatyuk, O.B.Slabuj. – Temopil, 2004. – 212 p.
5. Bernard C. Illustrated Manual of Operative Surgery and Surgical Anatomy / C.Bernard – 1991.-330 p.
6. Pemberton L.B. Workbook of Surgical Anatomy / L.B.Pemberton. – 1990. – 298 p.
7. Gliedman M.L. Atlas of Surgical Techniques / M.L.Gliedman. – New York etc., McGraw – Hill. – 1990. – 420 p.
8. Sabiston D.C. Atlas of General Surgery / D.C.Sabiston. – Philadelphia etc., Saunders. – 1994. – 220 p.
9. Chassin J.L. Operative Strategy in General Surgery / J.L.Chassin. – New York etc., Springer. – 1994. – 368 p.

Academic discipline	Clinical anatomy and operative surgery
Module No.1	Introduction to clinical anatomy and operative surgery. Clinical anatomy and operative surgery of regions and organs of the head and neck.
Content module No.1	Clinical anatomy and operative surgery of regions and organs of the head
Topic 7	Clinical anatomy of the anterior part of the face. Operations in purulent processes of the face. Anterior facial part: the orbital region, the region of the nose, paranasal sinuses, the oral region, buccal region. Parapharyngeal and retropharyngeal cellular spaces. Operations on paranasal sinuses. Cuts in case of phlegmons of the face and pharyngeal abscesses. Primary surgical treatment of facial wounds.
Year	II
Faculty	Foreign students training (medical)

1. The relevance of the topic: often, injuries and purulent processes of the face involve the orbital region in the pathological process, as well as other adjacent regions. Purulent diseases of the orbit, the external nose, paranasal sinuses usually require surgical interventions, which are impossible without deep knowledge of the topographic anatomical features of the operated area. Knowledge of trepanation of paranasal sinuses techniques promotes timely and effective treatment of pathological processes in these areas and prevents the development of severe intracranial complications.

2. Specific objectives.

1. Explain the ways of spreading the purulent infection from the orbit, the external nose, paranasal sinuses.
2. Explain the topographic relationships of anatomical formations within the studied areas.
3. Carry out operative access to the frontal and maxillary sinuses.
4. Perform withdrawal of rubber drainage from the frontal sinus.
5. Form anastomosis of the maxillary sinus with the inferior nasal meatus.
6. Carry out the typical cuts at purulent processes of studied areas.
7. Explain the techniques of formation of migrating V.P. Filatov flap.

3. Tasks for independent work to prepare for the lesson

3.1. List of the main terms, parameters, characteristics that should be learnt by the student while preparing for the lesson.

Term	Definition
1. Killian's operation	1. Radical method of frontal sinus opening
2. Caldwell-Luc operation	2. Surgical operation on the opening of the maxillary sinus

3.2. Theoretic questions:

1. Borders, areas of the anterior part of the face.
2. Borders, layers of the orbit.
3. Borders, layers of the infraorbital region.
4. Borders, layers of the mental region.
5. The topography of branches of the facial nerve.
6. Connections of cellular spaces of the anterior part of the face and ways of infection penetration into the cavity of the dura mater.
7. Connections of superficial veins of the face with sinuses of the dura mater.
8. Principle of a cut in the presence of inflammatory processes in these areas.
9. The topography of the external nose.
10. The topography of the nasal cavity.
11. Topographic features of the maxillary sinus.
12. Indications for the maxillary sinus opening.
13. Connecting openings of paranasal sinuses and the nasal cavity.
14. Topographic features of frontal sinus.
15. The technique of frontal sinus autopsy.
16. The technique of maxillary sinus opening.
17. Complications that arise during the opening of the frontal and maxillary sinus.
18. The principle of conduction of cuts in case of purulent processes of the orbit and infraorbital region.
19. The technique of migrating V. P. Filatov flap formation.

3.3. Practical skills acquired in class:

1. Layer-by-layer preparation of orbit and nose areas.
2. Opening of the maxillary sinus according to Caldwell-Luc.
3. Opening of the frontal sinus according to Killian.
4. Carrying out the typical cuts on the face with phlegmons on the orbit and the infraorbital region.

4. The content of the topic:

The facial part of the head

On the preparations of head and skull, students determine the boundaries of lateral and anterior parts areas of the face, pointing to external landmarks: bone protuberances and innate folds, pay attention to individual differences in the areas of the face.

Orbital region (regio orbitalis)

On the bone preparation of the skull without vault, tables, eye moulage, slides, students study the orbit. First, they determine its boundaries. The region is represented by orbit with bony walls, which in its shape resembles a tetrahedral pyramid, which apex is directed to the Turkish saddle. Its walls have different thicknesses and superiorly separate the occipital hole from the anterior cranial fossa, posteriorly − from the maxillary sinus, interiorly − from the cavity of the nose and exteriorly − from the temporal fossa.

The occipital fossa is not closed; it is widely interconnected with other areas due to large and small openings that play an important role in spreading of purulent

processes both to and from the orbital fossa in adjacent areas. In orbital area, the outer part (area of eyelids) and the proper orbit are conditionally distinguished. The outer part is a complex of soft tissues that limit the orbit.

The cavity of the orbit with fascia of the eyeball is divided into bulbar and retrobulbar divisions. The outer part of the capsule is connected to the bony edges of the orbit.

Six muscles are attached to the eyeball providing its movement: four straight and two oblique. The muscle of the upper eyelid (m.levator palpebrae superioris) and the orbital muscle also belong to the muscles of the orbit.

Blood supply of the orbital fossa is provided by ophthalmic artery (a.ophtalmica), separated from the internal carotid artery. From the ophthalmic artery, 11-20 branches depart. The main of these are: lacrimal artery (a.lacrimalis), central retinal artery (a.centralis retinae), posterior ciliary arteries (aa.ciliares posteriores breves et longuae), muscular branches (rr.musculares), supraorbital artery (a .supraorbitalis), ethmoidal arteries (aa.ethmoidales), medial arteries of the eyelids (aa.palpebrales mediales superiores et inferiores), frontal arteries (a.frontales), dorsal artery of the nose (a.dorsalis nasi).

Venous blood from the orbit outflows mostly along the upper and lower orbital veins. These veins are represented basically by a single trunk, which through the superior orbital fissure flow into the cavernous sinus.

The nerves of the orbital fossa include: optic nerve (n.opticus) − a nerve of special sensitivity, the nerve of the eye (n.ophtalmicus) − sensitive and several motor nerves that innervate the muscles of the eye − oculomotor (n.oculomotorius), block (n. trochlearis) and abducens (n.abducens).

Lymph out of the facial fossa outflows firstly to the submandibular lymph nodes. The eyeball has no lymphatic vessels, but contains lymphatic spaces.

Submental space (regio submentalis)

This area anteriorly is limited by the pit-lobe fold, laterally – by nasolabial sulcus, and from below − by the lower margin of the mandible body.

The peculiarity of the layered structure of the region is the bond through connective tissue strands of the skin with deeper fascia and muscle layers. This provides a limited development of hematomas and inflammatory processes in the mental area. The muscle layer lies deeper, beneath it is a layer of loose tissue and periosteum of the lower jaw, which is loosely (with the exception of the attachment points of the muscles) connected with the bone.

In this area, through the foramen mentale which is projected at the level of the space between the 4th and 5th teeth of the mandible, the mental neurovascular bundle is located forming the terminal branches of the inferior alveolar arteries and nerves.

Nasal region (regio nasalis)

On the corpse and the human skull, students determine the boundaries of the nose: anteriorly, a horizontal line connecting the medial ends of the eyebrows, below, a horizontal line passing through the base of the skin of the nasal septum, on the sides, nasolabial sulcus. In this area a region of the outer nose and nasal cavity are determined.

External nose (nasus externus)

The upper narrow part of the nose is called the nose root (radix nasi), and the back of the nose extends downwards from it (dorsum nasi), which gradually passes to the tip of the nose (apex nasi). The lateral surfaces of the nose are convex, mobile and form the nose wings (alae nasi), the lower edges of which form paired formations − nostrils (nares).

The outer nose is formed by bones: two nasal bones (ossa nasales), nasal processes of the upper jaw, and also cartilages (cartilagines alares major et minor and cartilagines nasi laterales). Bones and cartilage of the outer nose are covered with soft tissues.

The entrance to the nose is limited inferiorly by the alveolar processes of the upper jaw forming the anterior nasal spine. These bones limit the pear-shaped aperture (apertura piriformis), which serves as the basis of the outer nose. The shape of the aperture also depends on the form of the nose.

External nose forms the following layers: skin, subcutaneous tissue, muscles, periosteum and perichondrium, mucous membrane. The peculiarity of the layered structure of the outer nose consists in the unlike development of these layers in various its parts.

Blood supply of the external nose is carried out by the branch of the facial artery and the branch of ophthalmic artery − a. dorsalis nasi. Venous blood from the nose flows out to the facial and the eye veins, and from it − to the cavernous sinus (sinus cavernosus); lymph outflows in the submandibular and partly in the parotid lymph nodes. Nose skin is innervated by nerves: n. infratrochlearis, n. ethmoidalis anterior, originating from I branch of the trigeminal nerve (n. ophthalmicus), and the infraorbital (infraorbitalis) that goes away from the second trigeminal nerve branch.

Nasal cavity (cavum nasi)

The nasal cavity due to the septum nasi, which is formed by the bony and cartilaginous parts, is divided into two parts.

The upper wall of the nasal cavity is bordered with the frontal sinus, the anterior cranial fossa and sinus sphenoidalis. These features should be taken into account in clinical practice because inflammatory processes and tumors from the nasal cavity can pass to the sinuses, middle cranial fossa and vice versa.

In the central part, the superior wall of the nasal cavity is formed by lamina cribrosa of the ethmoid bone, which is the weakest part of the superior wall of the nasal cavity.

The anterior part of the superior wall of the nasal cavity is formed primarily by the nasal bones, the posterior part of this wall – by the anterior part of the sphenoidal sinus.

The lower wall of the nasal cavity separates the nasal cavity from the oral one. It is formed by the palatine processes of the upper jaw, and behind – the horizontal plate of the palatine bone. These bones form the bottom of the nasal cavity and, fusing along the median line, form a bony crest (crista nasalis) connecting the edge of the vomer and cartilage of the nasal septum.

On the lateral wall, there are prominences formed by the nasal concha (conchae nasales), among which two upper are the processes of the ethmoid bone, and the lower one is an independent bone.

The nasal passages are formed between the nasal concha: the upper nasal passage (meatus nasi superior) is located between the upper and middle nasal conchas, the middle (meatus nasi medius) − between the middle and lower conchas, the lower (meatus nasi inferior) − between the lower concha and the bottom of the nasal cavity.

The paranasal sinuses open into nasal meatuses. At the sagittal head cutting, students find that the posterior and middle cells of the ethmoid labyrinth open in the upper nasal passage, and the sphenoid sinus opens in the upper nasal passage. It is emphasized that the middle nasal passage has the most complicated structure. It has openings of the frontal and maxillary sinus, as well as the anterior ethmoidal cells. If you raise the anterior part of the middle nasal concha, then under it on the lateral side of the middle nasal pass, a bulging of the ethmoid bone labyrinth, so-called bulla etmonidalis, is pulled out, and closer to the front the uncinate process (processus incinatus) of ethmoid bone is located, which is bent back and down. Between these formations there is infundibulum ethmoidale, the upper end of which is connected with the opening of frontal sinus (sinus frontalis). At the lower end there is aperture that is connected with the maxillary sinus (sinus maxillaris).

The inferior nasal concha is the greatest among all. Through it the medical instruments, catheters pass easily during the posterior tamponade of the nose as well as tampons. The nasolacrimal canal opens in the anterior part of inferior nasal concha.

The mucous membrane of the nasal cavity (membrana mucosi nasi) encloses the conchae and meatuses, penetrates through the openings in the paranasal sinuses, lining them from the inside.

The upper floor of the nasal cavity is defined as the olfactory zone, and the lower ones − as respiratory **(Fig. 25).**

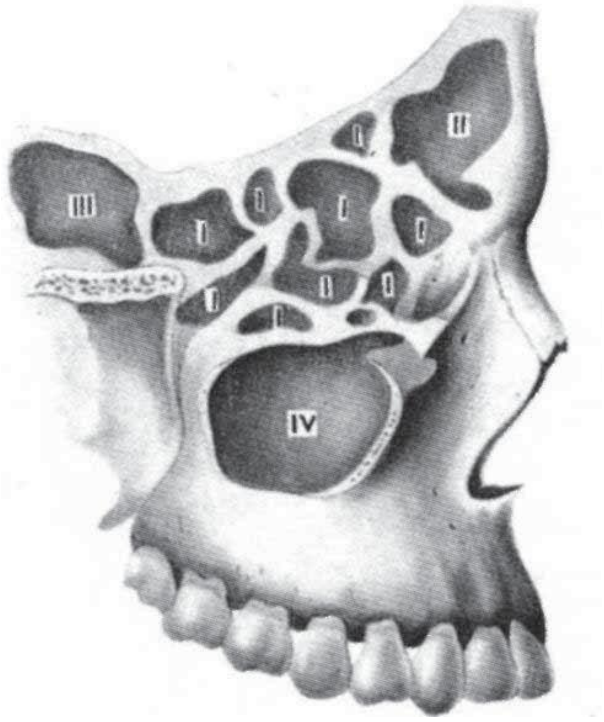


Fig. 25. Scheme of paranasal sinuses location:
I − cellulae ethmoidales;
II − sinus frontalis;
III − sinus sphenoidalis;
IV − sinus maxillaris.

Cuts

In cases when conservative treatment is ineffective, they use pricking of the infiltrate with antibiotic solutions and cuts. Incisions are made through the mucous

membrane or through the skin. Submandibular phlegmons are usually cut through intra-oral access. During the skin cuts, deep layers of hypodermic tissue and mimic muscles dissect bluntly, pushing the tissues with closed anatomical tweezers or blunted scissors, taking into account the topography of the branches of the facial nerve and the ducts of the parotid salivary gland. Parapharyngeal and retropharyngeal abscesses are more often opened through the mouth. Before opening the purulent focus, the abscess is punctured in the center of fluctuation. Purulent wound should be well drained until the complete suppression of purulent secretion.

Opening of the frontal sinus

The indication for the frontal sinus opening is purulent inflammation, cysts, extraneous bodies. The most common is the Ritter-Jansen method. The radical method of the frontal sinus opening by Killian is rarely used due to the difficulty. A skin cut is carried out along the eyebrow and downward along the lateral surface of the nose to the lower edge of the facial fossa.

Under the axial area of the cut, soft tissues are shifted to the upper wall of the orbit, the superciliary arch and the lateral wall of the nasal cavity. Then by a chisel and forceps the part of the upper wall of the orbit (lower wall of the frontal sinus) is removed to the superciliary arch. After opening the sinuses, the pathologically changed mucous membrane, pus and granulation are removed. The final stage of the operation is the resection of the upper part of the frontal process of the upper jaw and part of the nasal and lacrimal bones. This provides connection with the nasal cavity. On the way both the cells of the ethmoidal labyrinth, which are usually also affected, are destroyed at the same time. Via the cavity of the nose, the drainage tube for 3-4 weeks is introduced. The outer wound is sutured tightly. Repeatedly, the sinuses are washed out via the drainage.

The opening of the maxillary sinus according to Caldwell-Luc

The upper lip is hooked up and laterally. At the level of the transitional fold from the lateral incisor to the second molar, the mucous membrane is dissected to the bone with the periosteum. The mucous membrane is exfoliated up to the bone that is exposed in the area of the canine fossa. With the help of boron, chisel, and Vojacek chisel, the surgeon removes the anterior wall of the maxillary sinus. For a sufficient examination of the sinus, the trepanation opening expands in diameter to 1.5 cm. Using bone scraper, the mucous membrane is removed. After that, the surgeon destroys the lateral wall of the nasal cavity with a chisel at the level of the lower nasal passage with a straight bit and forms a quadrilateral connecting hole, directed to the base to the bottom. This patch is taken out by the surgeon through the created opening in the maxillary sinus and the tampon is pressed to the bottom of the sinus. At the end of the surgery, the surgeon places the interrupted sutures on the mucous membrane of the oral vestibule. From the nasal cavity through the formation of a connecting hole in the maxillary sinus, a drainage is introduced.

5. Materials for self-control

A. Tasks for self-control:

Test No. 1. In patient, the inflammatory process from the spatium temporopterygoideum spread to the nasal cavity. What is the pathway for the pathological process?
a) through the foramen sphenopalatinum;
b) through the canalis palatinus major;
c) through the canalis palatinus minor;
d) through the fissura orbitalis inferior;
e) through the canalis infraorbitalis.

Test No. 2. In patient, the inflammatory process from the spatium interpterygoideum spread to the cranial cavity. Through which openings of the skull, this space interacts with the cavity of the skull?
a) spinosum and rotundum;
b) lacerum and spinosum;
c) jugulare and rotundum;
d) ovale and spinosum;
e) jugulare and ovale.

*Test No. 3.*In the maxillofacial department, a time-urgent patient was diagnosed with "closed fracture of the mandible, complicated by the phlegmon of the oral cavity floor". What incision of the skin around the neck (in the submental triangle) is less traumatic and is usually used to open phlegmon?
a) transverse;
b) longitudinal along the middle line;
c) oblique;
d) arched;
e) angle.

Test No. 4. The patient presented with the inflammatory process on the face. Where are these processes the most dangerous in connection with the possibility of intracranial complications?
a) on the upper lip;
b) on the lower lip;
c) on the cheek;
d) in the parotideomasseteric region;
e) in the mental region.

B. Tasks for self-control:
Task No.1. Patient with the upper lip furuncle is diagnosed with thrombosis of the cavernous venous sinus. Determine the ways of spreading infection to this sinus and the anatomical factors contributing to the spread of infection.

Task No. 2. The patient with purulent parotitis had symptoms of lowering the angle of the mouth, smoothing of the nasolabial and nasobuccal folds. What caused these symptoms?

Task No. 3. In patient, the carbuncle of the upper lip is accompanied by high temperature, detected the condition of convergent strabismus. Establish the diagnosis. What is the reason of this symptom?

Task No. 4. The patient has a phlegmon of the oral cavity floor. What is the surgeon's tactic?

Task No. 5. The surgeon should perform a cut in cuspid region. How should it be done?

References

Basic literature

1. Tsyhykalo O.V. Topographic Anatomy and Operative Surgery / O.V.Tsyhykalo. – Vinnytsia, 2011. — 528 p.
2. Danilchenko S.I. Methodical Instruction For the 3st year students'of stomatological faculty self - preparation work (at class and at home) in studying operative surgery and toographical anatomy / S.I.Danilchenko, E.N.Pronina, O.Yu.Polovik. - Poltava, 2010. — 239 p.

Additional literature

1. Gray. H. F.R.S. Gray's anatomy / Henry F.R.S. Gray, R. A. Bolam. – London, 1994. – 1290 p.
2. McCraw J.B. Athlas of muscle and Musculocutaneous Flaps Head and Neck Reconstruction / John B McCraw, Phillip G Arnold. – Norfolk, Virginia, 1988. – 757 p.
3. Netter F. H. Atlas of Human Anatomy / Frank H.Netter. – East Hannover, New Jersey, 1990. – 592 p.
4. Hnatyuk M.S. Operative surgery and topographical anatomy (lectures) / M.S.Hnatyuk, O.B.Slabuj. – Temopil, 2004. – 212 p.
5. Bernard C. Illustrated Manual of Operative Surgery and Surgical Anatomy / C.Bernard – 1991.-330 p.
6. Pemberton L.B. Workbook of Surgical Anatomy / L.B.Pemberton. – 1990. – 298 p.
7. Gliedman M.L. Atlas of Surgical Techniques / M.L.Gliedman. – New York etc., McGraw – Hill. – 1990. – 420 p.
8. Sabiston D.C. Atlas of General Surgery / D.C.Sabiston. – Philadelphia etc., Saunders. – 1994. – 220 p.
9. Chassin J.L. Operative Strategy in General Surgery / J.L.Chassin. – New York etc., Springer. – 1994. – 368 p.

Academic discipline	Clinical anatomy and operative surgery
Module No.1	Clinical anatomy and operative surgery of areas and organs of head and neck, pectoral cavity, regions and organs of abdominal cavity.
Content module No.1	Introduction to clinical anatomy and operative surgery. Clinical anatomy and operative surgery of the head and neck.
Topic 8	Clinical anatomy of the neck segments. General overview. Neck borders. The division into sections. Fascia and interfacial spaces. Medial triangle of the neck. The suprahyoid region, submandibular and submental triangles. Submandibular salivary gland. Pirogov triangle. Infrahyoid region. Carotid triangle. Vessels and nerves. Sternocleidomastoid region. Cuts with phlegmon of the neck. Exposure of internal jugular vein, external and common carotid arteries. Vagosympathetic blockade according to O. V. Vishnevsky, M. N. Burdenko.
Year	II
Faculty	Foreign students training (medical)

1. The relevance of the topic: congenital cysts and fistulas of the neck, submandibular adenophlegmones, foreign bodies in the larynx, trachea, pharynx, cervical part of the esophagus, burns of the throat and esophagus are a fairly common pathology as well as dangerous injuries to large vessels and neck may cause severe emergency conditions. Successful treatment of these pathological processes is possible only based on thorough knowledge of the topographic anatomical features of the neck region, where the operation should be done**.**

2. Specific objectives.

1. To define topographic anatomical relations of neck formations and their significance for operative tasks within individual neck segments.
2. To explain the topographic anatomical features of access to the common and external carotid arteries.
3. To perform layered preparation of neck regions.
4. Explain the technique of vagosympathetic blockade according to Vishnevsky and Burdenko.
5. Explain the ways of abscesses and phlegmons development in the neck area and cuts in case of phlegmon.

3. Tasks for independent work to prepare for the lesson

3.1. List of the main terms, parameters, characteristics that should be learnt by the student while preparing for the lesson.

Term	Definition
Vagosympathetic blockade according to O. V. Vishnevsky	Type of local anesthesia, which is performed to prevent the occurrence of pleuropulmonary shock in breast injuries and complex operations on the organs of the thoracic cavity.
Vagosympathetic blockade according to M. N. Burdenko	The vagosympathetic blockade, which belongs to the bloody interventions, because the skin of the anterior margin of the sternocleidomastoid muscle cleaves with subcutaneous tissue and deeper layers of tissue.

3.2. Theoretic questions:

1. Borders, regions of the neck.
2. Triangles of the neck.
3. Submandibular triangle.
4. Pirogov triangle.
5. Carotid triangle.
6. The topography of the neurovascular bundle of the neck.
7. Signs of external and internal carotid arteries.
8. Branches of the external carotid artery located within the carotid triangle.
9. The technique of vagosympathetic blockade according to Vishnevsky and Burdenko.

3.3. Practical skills acquired in class:

1. Placement of cuts during purulent neck processes.
2. Isolation of external and internal carotid arteries.
3. Performing of a vagosympathetic blockade according to O. V. Vishnevsky.

4. The content of the topic:

Fascias of the neck

Nowadays, the requirements for surgical practice correspond to the classification of neck fascia according to V. M. Shevkunenko, who distinguished five fascias of the neck (**Fig. 26**).

The first fascia of the neck (fascia colli superficialis), is represented by a part of the general superficial subcutaneous fascia of the body. It completely covers the neck and in its anterior-lateral parts forms a fascia sheath for subcutaneous muscle (platysma).

The second fascia of the neck (also called the surface lamina of its own neck fascia (lamina superficialis colli propria), at the top it fixed to the lower edge of the body of the mandible, and below − to the anterior surface of the sternum and clavicles, as well as the first fascia. It covers the entire neck and forms fascia sheathes for the submandibular gland, sternocleidomastoid and trapezius muscles.

The teacher pays attention to the fact that the fascia sheathes m. sternocleidomastoideus and m. trapezius, on the anterior surface of the muscles, are

stronger than on the posterior one, and from them, septums leave in the thickness of the muscles. A characteristic feature of the second fascia is the deviation of deep processes to the transverse vertebrae processes, which serves as a barrier for infiltration between the anterior and posterior parts of the neck (M.I. Pirogov).

The third fascia of the neck (called a tracheal plate of its own neck fascia (lamina pretrachealis fasciae colli propriae)) is one of the strongest neck fascias. İt is considered as a tendon extension of the infrahyoid group of muscles: m. sternohyoideus, m. sternothyroideus, m. thyrohyoideus, m. omohyoideus. For these muscles, the third fascia forms fascia sheathes.

At its beginning, the third fascia of the neck is joined with the second, and along the midline line, they form a white line of the neck. It should be noted that the third fascia of the neck, 2-4 cm, not reaching to the sternum and clavicles, is separated from the second fascia and woven in the posterior surface of the sternum and clavicles, and a second fascia − in their anterior surface, which contributing to the formation of the interaponeurotical suprasternal space (spatium interaponeuroticum suprasternale). From this space behind the m. sternocleidomastoideus, depart saccus caecus retrosternocleidomastoideus Gruberi, also called lateral recesses (recessus laterales).

From the clinical point of view, it should be remembered that the interaponeurotical suprasternal space and blind Gruber bags are interconnected. That is why the purulent processes that occur in the spatium interaponeuroticum suprasternale can spread on the blind Gruber's bags.

The fourth fascia of the neck (fascia endocervicalis) covers all neck organs. It should be remembered that it consists of two leaves: parietal and visceral. The first surrounds all organs as a whole and forms a fascia sheath for the vascular-nerve bundle of the neck, and the second − each organ separately.

The fifth fascia of the neck (also known as the fascia praevertebralis) lies in front of the cervical vertebrae and the long muscles of the head and neck (m. longus capiti, m. longus colli), forming closed fascia sheaths for them. At the top it is fixed to the outer base of the skull, below it falls to the level of II-III thoracic vertebrae, on the side continues on the scalene muscles and the levator scapulae muscle (m. levator scapulae) and forms fascia sheaths for them.

Between the spurs of the fifth fascia, which cover the scalene muscles and the levator scapulae muscle, antescalenum and interscalenum spaces are located. They have a trunk of the brachial plexus, subclavian artery, and the same name vein.

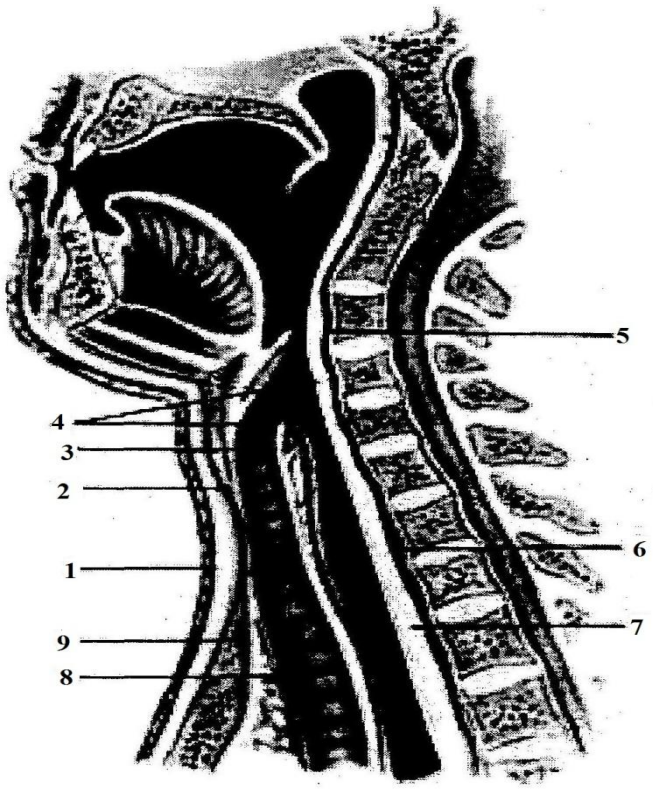
Behind the fascia praevertebralis, there is a prevertebral space (spatium praevertebrale) that lies in front of the vertebral bodies.

Fascial spaces of the neck

As it was already mentioned, between the second and third neck fascia, there is an interaponeuroticum suprasternal space (spatium interaponeuroticum suprasternale). In the front, a second fascia that attaches to the anterior surface of the sternum and the clavicles, and behind it is the third fascia attached to the posterior surface of these structures limits it. The interaponeurotic space is 2-4 cm above the sternum notch and is relatively close but through the opening in the back wall of the sheath of m. sternocleidomastoideus connects to the blind Gruber bags. Students, preparing a capsule of the submandibular gland, also find that this space is closed and inflammatory processes from it can spread to the cellular spaces of the bottom of the

oral cavity only through the duct of this gland. The second fascia of the neck forms a fascia sheath for the sternocleidomastoid muscle. If you enter a color solution under the fascia sheath of this muscle, it will spread only within the cellular space of the sternocleidomastoid muscle. This indicates that this space is also closed.

Fig. 26. Fascias and cellular spaces of the neck on sagittal plane:



1− fascia superficialis;
2 − lamina superficialis fasciae cervicalis;
3 − lamina pretrachealis fasciae cervicalis;
4 − fascia endocervicalis;
5 − lamina prevertebralis fasciae cervicalis;
6 − spatium prevertebrale;
7 − spatium retroviscerale;
8 − spatium pretracheale;
9 − spatium interaponevroticum suprasternale.

Between the leaves of the fourth fascia, in the space between the hyoid bone and the suprasternal notch, there is a previsceral space (spatium previscerale). The part, which corresponds to the topography of the neck part of the trachea, has a name of the pretracheal space (spatium pretracheale). From a practical point of view, it should be remembered that the lymph nodes, unpaired thyroid plexus (plexus thyreoideus impar) are located here, from which the inferior thyroid veins begin. In this space, the lowest thyroid gland (a. thyreoidea ima) is located in 12% of cases, which should be taken into account in operations on the thyroid gland.

The pretracheal space is separated from the anterior mediastinum by an unstable membrane at the level of the sternal manubrium. This membrane is formed on the posterior surface of the sternum, at the transition site of the parietal leaf of the fourth fascia, in the visceral leaf, which covers trachea. However, due to the fiber that surrounds the vessels, the pretracheal space is connected to the cellular tissue of the anterior mediastinum, which can be complicated by the anterior mediastinitis in the localization of purulent processes in it.

Between the visceral leaf of the fourth fascia and the fifth fascia a retrovisceral space (spatium retroviscerale) is located. It starts from the outer base of the skull and spreads to the diaphragm. This explains its connection with the mediastinum and the possible occurrence of posterior mediastinitis in purulent processes in the retrovisceral space of the neck.

There is also a separate space of the vascular-nerve bundle of the neck, which, as already noted, is wrapped by the parietal leaf of the fourth fascia. At the same

time, from each side of the neck, a narrow vascular gap is formed, called the vasa nervorum, which reaches the outer base of the skull at the top, and then passes into the anterior mediastinum.

In the lateral triangle of the neck, besides the trigonum omoclavicular, the fourth fascia is absent and, therefore, the fifth follows the second fascia in the trigonum omotrapezoideum. The cellular space of the lateral triangle of the neck in the front is limited to the sheath of the neurovascular bundle, and behind it − the edge of the trapezius muscle.

Typical cuts in phlegmons of the neck

The main requirement for neck cuts is to provide free access to organs, other structures (places of localization of the purulent process) and their safety for the vessels, nerves, and organs that lie deeper **(Fig. 27)**.

The dimensions and direction of the neck cuts depend on the indications in each case, also taking into account cosmetic requirements.

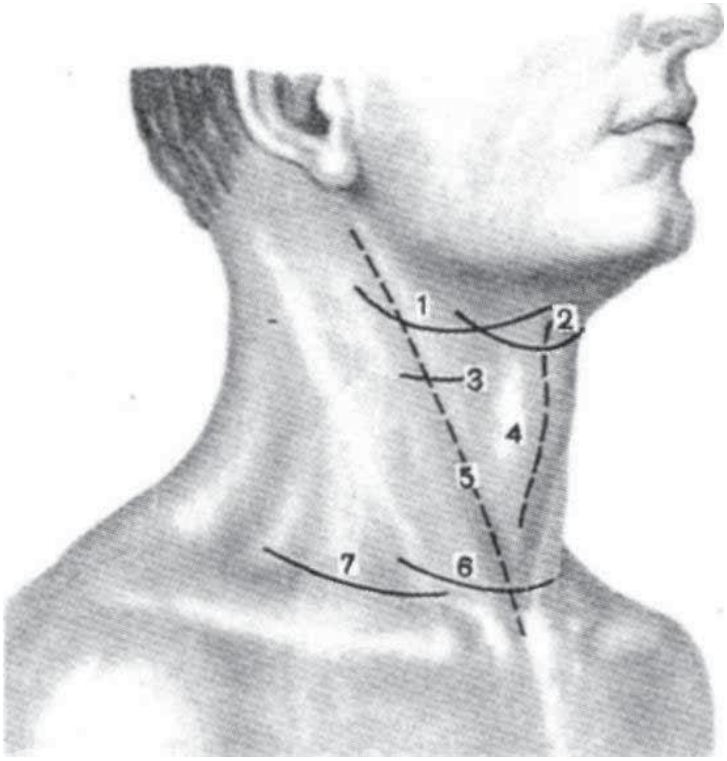


Fig. 27. Operative accesses on the neck:

1 − parallel edge of the lower jaw;
2 − sublingual to the pharynx;
3 − the cellule shaped to the upper thyroid artery;
4 − medial longitudinal;
5 − along the anterior edge of the sternocleidomastoid muscle;
6 − cellule shaped to the thyroid gland;
7 − parallel to the upper edge of the collarbone.

Depending on the location of the purulent process on the neck, the following cuts can be distinuished: transverse, oblique, vertical and combined.

When accessing the abscesses, which are localized within the spatium interaponeuroticum suprasternale, a cross-section that connects the medial edges of sternocleidomastoid muscle in the suprasternal region is used.

In case of phlegmons of the previsceral space, a median neck incision is performed, depending on the level of the purulent process localization.

The access to the purulent cell of the neurovascular bundle is carried out along the anterior margin of m. sternocleidomastoideus, and at submandibular phlegmons − 1cm below the body of the mandible **(Fig. 28)**.

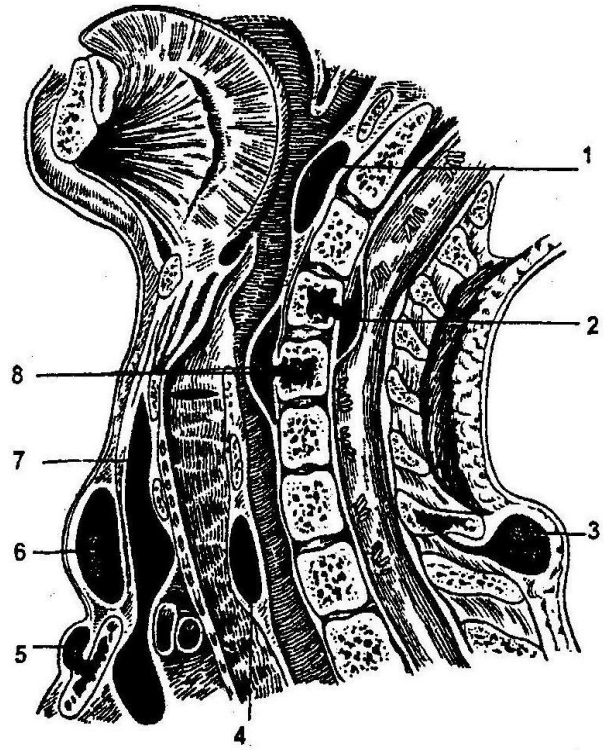


Fig. 28. Schematic representation of neck abscesses:
1 − retropharyngeal abscess;
2 − intraspinal (extradural) abscess;
3 − abscess in the posterior part of neck, coming out of the vertebra;
4 − abscess between the trachea and esophagus;
5 − pre-sternal abscess;
6 − abscess in spatium interaponevroticum suprasternale;
7 − deep abscess in spatium praeviscerale, which spreads to the anterior mediastinum;
8 − abscess between the vertebra and esophagus (as a result of the lesion of the vertebra).

The middle triangle of the neck, formed by the lower edge of the mandible and the anterior-internal edges of the sternocleidomastoid muscles should be distinguished. It has two medial triangles of the neck.

Medial triangle of the neck

It is formed medially by the medial line of the neck, the edge of the lower jaw on the top and the outside of the anterior-inner margin of the sternocleidomastoid muscle. The horizontal plane that passes through the large horns of the hyoid bone, the anterior segment of the neck is divided into the suprahyoid and infrahyoid regions of the neck.

Suprahyoid region of the neck

It has a submandibular triangle and mental triangle. The submandibular triangle is formed from the top of the lower jaw and the anterior and posterior abdomen of the digastric muscles on the sides.

The submandibular triangle. Post-preparation of the suprahyoid region. The patch of the skin is cut within a section of 3 cm wide, with the outside of the base (to the sternocleidomastoid muscle). Layers of the region. Skin, features of its structure. Subcutaneous tissue, structural features (age and sex related). Surface vessels, nerves. Surface fascia, its connection with subcutaneous muscle. The second fascia of the neck. It course within the submandibular triangle. A capsule of the submandibular salivary gland.

The gland has an irregular shape, consists of 10-12 lobes, has an anterior process, its excretory duct lies between the maxillo-sublingual and m. hyoglossus and opens to the sublingual papilla along with the duct of the hyoid gland.

The capsule of the gland is formed by splitting its own (second) fascia of the neck. In the bed of the submandibular salivary gland, there is a facial artery and facial vein. Submandibular lymph nodes are located above, in the thickness and under the surface plate of the second fascia of the neck. The gland is pulled upward (to the

lower jaw), and students begin to prepare the deep layers of this region. Here is a triangle of M.I. Pirogov. It is formed by the sublingual nerve (from above), from below − the tendon of the digastric muscle and the free edge of the mylohyoid muscle in the front. Its bottom is the hyoglossus muscle, where a tongue vein is located. Under the indicated muscle a tongue artery is located.

The position of the patient and his head during the operation: the patient lies on the back, the head is thrown back and turned to the side opposite to the surgical intervention. Pay attention to the placement of the tongue artery and veins that occur in different anatomical layers. Students impose a ligature on the tongue artery.

Infrahyoid region

Boundaries. The teacher points out the practical significance of a carotid tubercle in the temporary arrest of hemorrhage from the carotid artery. The value of a carotid triangle in operations on the neck.

Layer preparation of the region. The patch is cut within the region without reaching the transverse thumb to the median line of the neck. The base of the patch is located near the anterior margin of the sternocleidomastoid muscle.

Carotid triangle of the neck

It is limited superiorly by posterior belly of the digastric muscle, externally − sternocleidomastoid muscle, from below (from the inside) − upper belly of the omohyoid muscle. In this triangle, there is a neurovascular bundle of the neck surrounded by a parietal leaf of the fourth fascia of the neck. It consists of a common carotid artery, which at the level of the upper edge of the thyroid cartilage is divided into the external and internal carotid arteries, the internal jugular vein (lies most superficially and laterally) and the vagus nerve (between the artery and vein, near their posterior surfaces). The position of the common carotid artery is important for endovascular interventions on the vessels of the brain. The external carotid artery is medial, and the internal at the place of division − is lateral. The latter has no branches on the neck, while the external carotid artery gives the upper thyroid, upper laryngeal, ascending pharyngeal, lingual, facial and other arteries. The ultimate branch of the external carotid artery is the superficial temporal artery, the pulse on which palpates in front of the tragus.

Region of the sternocleidomastoid muscle

Students study the layered topography of this site using the method of preparation. In this case, 3 cm wide flap should be located in the lower sections of the site. The base of the flap should be at the posterior edge of the sternocleidomastoid muscle. In front, it is located on 1 transverse finger from the midline of the neck. During preparation, the teacher draws attention to such features of the site as: the location of the superficial fascia with the subcutaneous neck muscle located between its leaves, the features of the location of the superficial veins and their difference, the localization of the main branches of the cervical plexus. After opening the second fascia with the Kocher probe, they penetrate between the fascia and the muscle, noting that the intercellular space of the sternocleidomastoid muscle is closed.

When preparing, students push the muscle with blunt hooks and under the deep leaf of the second fascia detect the vascular-nerve bundle of the neck, surrounded by a parietal leaf of IV fascia of the neck (neurovascular sheath). Pay attention to the

features of the relationship of the neurovascular bundle at different levels of the site: upper, middle and lower third of the sternocleidomastoid muscle.
During preparation, it is necessary to allocate a number of deep lymph nodes and to determine the ways of lymph flow.

On the preparation, students find a place of division of the common carotid artery into the external and internal carotid arteries and the cervical branch of the sublingual nerve. Determine the position of the internal jugular vein and the vagus nerve.

At the beginning of the first hour, the teacher draws student's attention to the anatomical and physiological substantiation of surgical interventions on the neck, surgical accesses to the neck, indications, and techniques of the vagosympathetic blockade according to Vishnevsky. Consider the indications and technique of exposure of the carotid arteries and the external jugular vein.

Vagosympathetic blockade according to Vishnevsky

Pay attention to the position of the corpse on the operating table, the place of injection, direction, and depth of needle advance. Students in a "Records" type syringe collect 20 ml of a tinted solution and in the injection point (the intersection of the external jugular vein with the posterior margin of the sternocleidomastoid muscle), pushing the needle toward the bone. In order to verify the correctness of the execution of the vagosympathetic blockade according to Vishnevsky, students should be offered to shift the tissues to the pre-cut edge of the sternocleidomastoid muscle. If students see that the needle is behind the common carotid artery and the vagus nerve, it should be determined that the administered solution of novocaine will be infiltrated and block the placement of the vagus and sympathetic nerves **(Fig. 29)**.

Fig.29. Blockade technique according to Vishnevsky

In cellular tissue located behind the sheath of the neurovascular bundle, 40-50 ml of 0.25% solution of novocain is injected. A symptom of a proper blockade is hyperemia of the face and eye sclera and Claude-Bernard-Horner syndrome (narrowing of the pupil, narrowing of the eye, enophthalmos (sinking of eyeball).
When conducting a blockade according to Burdenko, the neurovascular bundle is exposed and 2 cm^3 of 2% novocain solution is introduced endo-neurally.

Exposure of external and common carotid arteries

During the exposure of the carotid arteries, the teacher sets the following tasks for the students:
1. Be able to provide the correct position of the body on the operating table.
2. Be able to draw up a projection line for access to both external and common carotid arteries.

3. Be able to determine the layers of the tissues.
4. Be able to determine the differences between the external and internal carotid arteries.

When exposed to the arteries the patient lays on the back, a roller is placed under the girdle of the upper limb, the head is thrown back and turned to the side opposite to the surgical intervention. The incision is carried out along the anterior edge of the sternocleidomastoid muscle. The skin, subcutaneous tissue, the first fascia with the subcutaneous muscle of the neck, the second fascia, which forms the sheath for the sternocleidomastoid muscle are cut. The muscle is pulled outward, cut the back wall of its sheath and the parietal leaf of the fourth fascia. The neurovascular bundle is exposed. As noted above, the placement of bundle formation is: a vein, a nerve, an artery (in the direction from the lateral side to the medial and into the depths).

In case of external carotid artery exposure, it is necessary to distinguish it from the internal (see above). If necessary, the ligature should be applied above the place of the superior thyroid artery.

Caring out the exposure of carotid arteries, the teacher draws attention to the need for the upper cervical loop preservation **(Fig. 30)**.

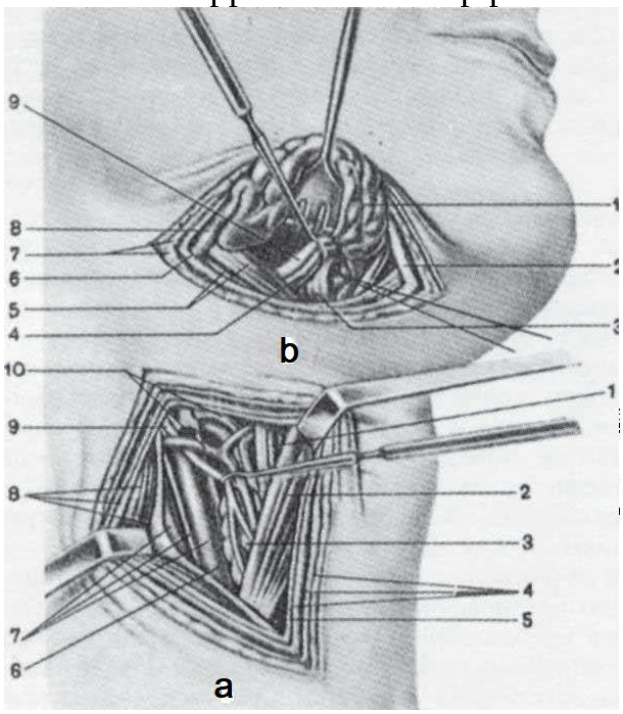


Fig.30. Exposure of the common carotid (a) and lingual (b) arteries

a: 1 − m. thyrohyoideus; 2 − superior belly of the omohyoid muscle; 3 − thyroid gland; 4 − the first fascia of the neck and platysma; 5 − the second fascia of the neck; 6 – neurovascular bed, formed by the inner (fourth) fascia of the neck; 7 − common carotid artery, vagus nerve and internal jugular vein; 8 − sternocleidomastoid muscle and its compartment, formed by its own (second) fascia of the neck; 9 − upper radix of the cervical loop (lower branch of the sublingual nerve − XII pairs); 10 − a. et v. thyroidea superior;

b: 1− submandibular gland; 2 − the second fascia of the neck; 3 − m.hyoglossus; 4 − v. lingualis; 5 − posterior belly of musculus digastricus and m.stylohyoideus; 6 − vena facialis; 7 − superficial (first) fascia of the neck and subcutaneous muscle of the neck (platysma); 8 − vena retromandibularis; 9 − hypoglossal nerve (XII pair); tongue artery is ligatured.

5. Materials for self-control

A. Tasks for self-control:

Test No. 1. During the primary surgical treatment of the wound on the neck, the surgeon determined the damage to the muscle, which attaches to the hyoid bone with its transient tendon. What muscle is damaged?

a) m. omohyoideus;
b) m. mylohyoideus;
c) m. digastricus;
d) m. hypoglossus;
e) m. sternohyoideus.

Test No. 2. During the ligation of the tongue artery in the Pirogov triangle, the surgeon damaged the nerve, resulting in disturbances of the motor innervation of the tongue. What nerve is damaged?

a) n. lingualis;
b) n. laryngeus recurrens;
c) n. glossopharyngeus;
d) n. hypoglossus;
e) n. vagus.

Test No. 3. The doctor performs palpation in the left lateral triangle of the neck. Which formation limits this triangle from below?

a) venter inferior musculus omohyoideus;
b) venter posterior musculus digastricus;
c) os hyoideum;
d) incisura jugularis sterni;
e) clavicula.

Test No. 4. In the patient, the inflammatory process from the previsceral space spread downwards. Where did it get?

a) In the spatium parapharyngeum;
b) In the spatium retropharyngeum;
c) In the anterior mediastinum;
d) In the posterior mediastinum;
e) In the tela subserosa.

Test No. 5. In patient, an external carotid artery is damaged. To which carotid tubercle of the cervical vertebra can you press this artery to temporarily stop bleeding?

a) 2nd;
b) 3rd;
c) 4th;
d) 5th;
e) 6th.

Test No. 6. The surgeon performs access to the common carotid artery. In what direction is it necessary to remove the sternocleidomastoid muscle?
a) Inside and forward;
b) Out and back;
c) Inside and back;
d) Outward and forward;
e) Up.

Test No. 7. The surgeon mistakenly ligatured the internal carotid artery instead of the external carotid artery in the carotid triangle. What is the difference between the ligatured artery and the external carotid?
a) Does not have branches;
b) Has branches;
c) Placed more medially;
d) Placed more superficially;
e) Placed more ahead.

Test No. 8. For the ligation of the tongue artery, the surgeon identified Pirogov triangle in the wound. What kind of formation forms the anterior wall of this triangle?
a) n. lingualis;
b) n. hypoglossus;
c) n. mandibularis;
d) tendo intermedius musculus digastricus;
e) m. mylohyoideus.

B. Tasks for self-control:
Task No. 1. Student, entering the Pirogov triangle during the preparation of the submandibular triangle, determined a lingual vein in it, but could not detect the same name artery. How can he find it?

Task No. 2. During conducting resection of the lower jaw, the surgeon, first of all, exposed the bifurcation of the common carotid artery in the carotid triangle. How can the external carotid artery be determined?

Task No. 3. At the lesson, the student answered that there were five fascias of the neck. Is this answer correct?

References

Basic literature

1. Tsyhykalo O.V. Topographic Anatomy and Operative Surgery / O.V.Tsyhykalo. – Vinnytsia, 2011. — 528 p.
2. Danilchenko S.I. Methodical Instruction For the 3st year students'of stomatological faculty self - preparation work (at class and at home) in studying operative surgery and toographical anatomy / S.I.Danilchenko, E.N.Pronina, O.Yu.Polovik. - Poltava, 2010. — 239 p.

Additional literature

1. Gray. H. F.R.S. Gray's anatomy / Henry F.R.S. Gray, R. A. Bolam. – London,

1994. – 1290 p.
2. McCraw J.B. Athlas of muscle and Musculocutaneous Flaps Head and Neck Reconstruction / John B McCraw, Phillip G Arnold. – Norfolk, Virginia, 1988. – 757 p.
3. Netter F. H. Atlas of Human Anatomy / Frank H.Netter. – East Hannover, New Jersey, 1990. – 592 p.
4. Hnatyuk M.S. Operative surgery and topographical anatomy (lectures) / M.S.Hnatyuk, O.B.Slabuj. – Temopil, 2004. – 212 p.
5. Bernard C. Illustrated Manual of Operative Surgery and Surgical Anatomy / C.Bernard – 1991.-330 p.
6. Pemberton L.B. Workbook of Surgical Anatomy / L.B.Pemberton. – 1990. – 298 p.
7. Gliedman M.L. Atlas of Surgical Techniques / M.L.Gliedman. – New York etc., McGraw – Hill. – 1990. – 420 p.
8. Sabiston D.C. Atlas of General Surgery / D.C.Sabiston. – Philadelphia etc., Saunders. – 1994. – 220 p.
9. Chassin J.L. Operative Strategy in General Surgery / J.L.Chassin. – New York etc., Springer. – 1994. – 368 p.

Academic discipline	Clinical anatomy and operative surgery
Module No.1	Clinical anatomy and operative surgery of areas and organs of head and neck, pectoral cavity, regions and organs of abdominal cavity.
Content module No.1	Introduction to clinical anatomy and operative surgery. Clinical anatomy and operative surgery of the head and neck.
Topic 9	Clinical anatomy of the neck organs. Neck organs: cervical part of trachea and esophagus, providing blood supply and innervation. Branches of cervical plexus. Lateral triangle of the neck. Spatium antescalenum, spatium interscalenum, and spatium scalenovertebrale. Tracheostomy. Complications and errors in tracheostomy. Intubation. Operations on the cervical part of the esophagus. Subtotal subfacial resection of the thyroid gland according to O. B. Nikolaev.
Year	II
Faculty	Foreign students training (medical)

1. The relevance of the topic: the volume of surgical interventions on the thyroid gland and the cervical portion of the esophagus is quite significant, it is impossible to conduct them without deep knowledge of the topographic anatomical features of these organs, their interrelationships with adjacent formations.

2. Specific objectives.

1. To interpret the topographic anatomical relations of formations within the different layers of certain areas of the neck.
2. Explain the topography of the esophagus, thyroid and parotid glands.
3. Perform access to the cervical portion of the esophagus.
4. Perform subtotal subfascial resection of the thyroid gland according to A. V. Nikolaev.

3. Tasks for independent work to prepare for the lesson

3.1. List of the main terms, parameters, characteristics that should be learnt by the student while preparing for the lesson.

Term	Definition
Resection of the thyroid gland	Partial removal of the thyroid gland
Strumectomy	Resection of the thyroid gland
Tracheotomy	The incision of the trachea

3.2. Theoretic questions:

1. The topography of the cervical part of the esophagus.
2. The topography of the thyroid gland and the parotid glands.
3. Features of operative access to the cervical part of the esophagus.
4. The technique of subtotal subfascial resection of the thyroid gland according to O. V. Nikolaev.
5. Errors and complications at subtotal subfascial resection of thyroid gland according to A.V. Nikolaev.
6. Aneurysms of the common carotid artery and the technique of operations with them.
7. Operations with phlebectasia of jugular veins.

3.3. Practical skills acquired in class:

1. Carry out the exposure of the internal jugular vein, external and common carotid arteries.
2. Carry out the cervical portion of the esophagus.
3. To conduct resection of the thyroid gland according to A. V. Nikolaev.

4. The content of the topic:

Larynx

The larynx in its shape resembles a tube, which contains vocal cords. It connects the laryngopharynx with the trachea. Cricoid cartilage is a basis of the larynx skeleton and is located at the level VI of the cervical vertebrae.

Above the front part of the cricoid cartilage there is a thyroid cartilage, is a ligament associated with the thyroid cartilage that connects the thyroid cartilage with the hyoid bone.

Thyroid cartilage with its incision, as well as the anterior surface of the thyroid cartilage are important landmarks for operations on the larynx, thyroid gland, and trachea.

The larynx anteriorly is covered by the prelaryngeal muscles, and on the sides adjoining the lateral parts of the thyroid gland. The laryngopharynx lies behind the larynx. The larynx at the expense of the epiglottis reaches the root of the tongue and below passes into the trachea.

The entrance to the larynx is limited by the epiglottis, on the sides − with arytenoid folds, and behind − the arytenoid cartilages with an incision between them.

The laryngeal skeleton consists of five large cartilages: thyroid cartilage (cartilago thyreoidea), cricoid cartilage (cartilago cricoidea), arytenoid cartilages (cartilago aritenoidea), corniculate cartilages (cartilago corniculata), and epiglottis.

The entrance to the larynx is limited by the epiglottis, on the sides − with arytenoid folds, and behind − the arytenoid cartilages with an incision between them.
The laryngeal skeleton consists of five large cartilages: thyroid cartilage (cartilago thyreoidea), cricoid cartilage (cartilago cricoidea), arytenoid cartilages (cartilago aritenoidea), corniculate cartilages (cartilago corniculata), epiglottis.

On sagittal sawing the larynx is defined in its cavity three surfaces:

1. The vestibule of the larynx − it's a gap between the epiglottis and the false vocal cords (plica vestibularis), folds of the mucous membrane lying on the lateral sides of

the larynx. The cleft between the vestibule is called the front vestibule − rima vestibuli;
2. Intraligamental space is placed between the front vestibule and the vocal folds. On the lateral surfaces of the larynx, there are laryngeal ventricles (ventriculi laryngis) between these ligaments; the bottom of each of them is directed upwards. In these ventricles, there are a large number of mucous glands, which contributes to constant smearing of the mucus of vocal folds. Between the true vocal cords is a rima glottidis − the narrowest place of the larynx;
3. The subligamental space is the space under the vocal folds.

On the tables, slides, students find that the blood supply of the larynx extends from the upper laryngeal artery (a branch of the external carotid artery) and the lower artery of the same name (a. laryngea inferior), a branch from the thyrocervical trunk (truncus thyrocervicalis). The veins go parallel to the arteries. The innervations of the larynx provide by branches of the vagus and sympathetic nerves.
The lymph outflows from the larynx to the nodi lymphatici cervicales profundi, nodi lymphatici prelaryngei, nodi lymphatici pretracheales and nodi lymphatici paratracheales, which should be remembered for the presence of tumors of the larynx.

Trachea

It is noted that the trachea is a direct extension of the larynx. In the cervical region, it consists of 6-8 cartilage rings, but when thrown back the head, their number increases.
On the back surface, the cartilage C-shaped rings are connected by a connective tissue membrane with non-striated muscle, which is of practical importance for the painless displacement of the trachea when filling the esophagus with food.

The initial department of the trachea, which is clearly visible on the anatomical preparations, is covered in front by the isthmus of the thyroid gland, and on the sides − by its lateral parts. Below the isthmus of the thyroid gland, there is a pretracheal space (spatium pretracheale), which contains venous plexus, lymph nodes, and sometimes an additional thyroid-artery. These features should be taken into account when performing the upper tracheostomy.

Behind the back wall of the trachea is an esophagus, to the upper department adjoin the lateral parts of the thyroid gland, and to the lower − the common carotid artery.

The cervical part of the trachea supplies by branches of the thyroid arteries. The outflow of lymph from the trachea is carried out in the nodi lymphatici paratracheales, and from them − into the nodi lymphatici cervicales profundi.

Tracheostomy

The main indications for tracheostomy are as follows: acute asphyxia, trachea obstruction during the inflammatory process, the presence of foreign bodies, laryngeal injuries, craniocerebral traumas, neurosurgery operations, after severe surgical interventions, when respiratory failure occurs, asphyxia in the drowning man, initial pulmonary edema, and also with a preventive aim, when a patient is expected to have a very complicated operation.

Upper tracheostomy (tracheostomia superior)

The patient is placed on the back, a cushion is placed under the shoulder blades, and the head is placed in the middle position and thrown back.

The surgeon is on the right side of the patient, the assistant is on the left side.

From the upper edge of the thyroid cartilage on the midline of the neck, a cut of 4-6 cm in length is applied **(Fig. 31)**. The skin is dissected with a subcutaneous tissue and superficial fascia. On the course of the cut, v. mediana colli is detected, which should be pushed aside and bound. Neck aponeurosis cut through a trench probe, and m. sternohyoideus and m. sternothyroideus are swiping sideways by hooks. The connection that captures the thyroid gland isthmus, drawn down with blunt hooks, during this exposed the tracheal rings. By two blunt sharp hooks trachea is fix. The teacher draws attention to the fact that the working surface of the scalpel should be controlled. For this, a blade of the scalpel is pre-wrapped with sterile gauze, leaving a working surface of 1 cm long. This is obligatory condition because with the free penetration of the scalpel blade into the tracheal lumen, its back wall and esophagus may be injured. By dissecting the rings, the surgeon must direct the scalpel blade up from the isthmus of the thyroid gland and its numerous vessels. Depending on the diameter of the cannula, 2-3 rings of the trachea are dissected. The tracheal wound expands with a tracheal extender and in its lumen immersed a tracheostomy cannula **(Fig. 32)**.

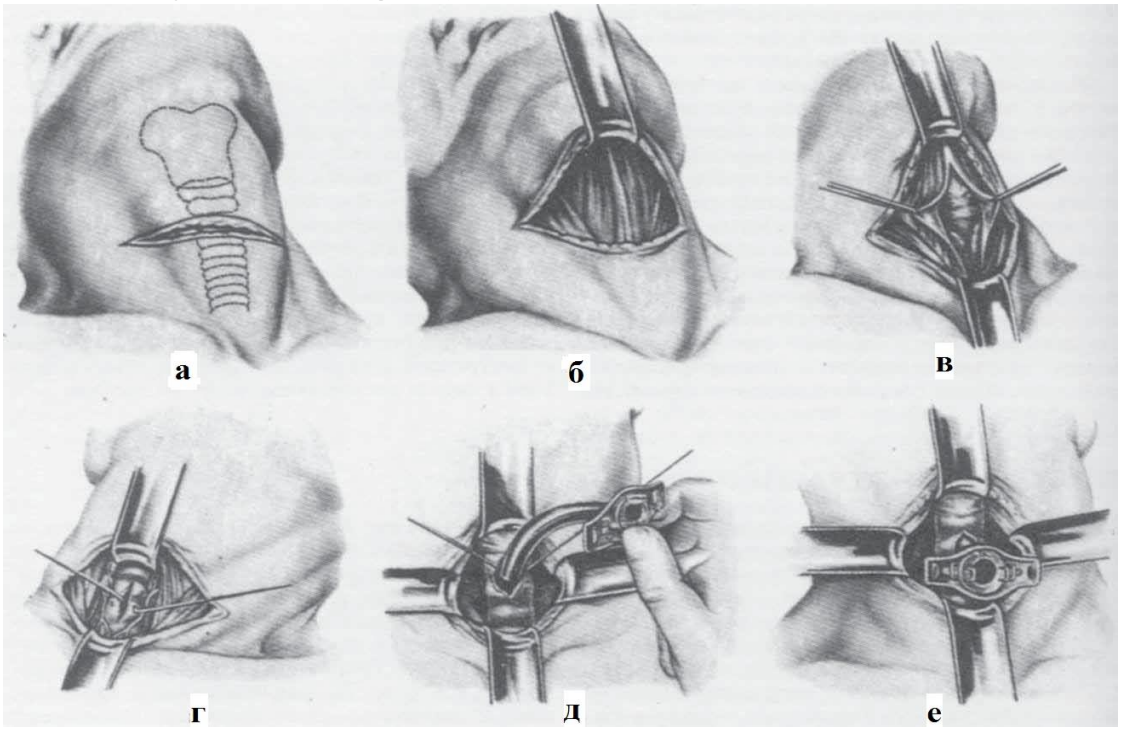


Fig. 31. Upper tracheostomy

а − a cut of the skin, subcutaneous tissue and subcutaneous muscle with a superficial (first) fascia of the neck;

б − white neckline;

в − the white line is dissected: visible the arch of the cricoid cartilage, the first semicircle of the trachea and the isthmus of the thyroid gland;

г − an isthmus of the thyroid gland is pulled down, the trachea is fixed by the sharp, single-tooth hooks and dissecting with a longitudinal incision;

д − put off a tracheotomy cannula (its shield in the sagital plane);

е − cannula introduced (its shield in the front plane).

To prevent the damage to the cartilage rings with the insertion of the cannula into the lumen of the trachea its shield must first be in the sagittal plane, and when the end of the cannula reaches the lumen of the trachea, it is transferred to the front plane of the cannula and dip down to and until the shield reaches the level of the skin.With the correct introduction of the cannula into the lumen of the trachea, breathing becomes whistling and even. During the operation, stop the bleeding and apply 2-3 sutures on the wound. To the ears of the cannula tied gauze strips, round them around the neck and tied.

Individual surgeons do not cut the tracheal rings, but the membrane between them cut by the method of Vojachek.

Take into account that children have a small cannula diameter, in pediatric surgery this method is not implemented because you can completely cut the trachea.

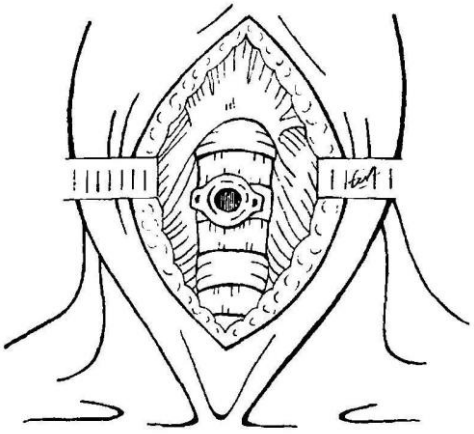


Fig. 32. Deepening of the cannula into the lumen of the trachea

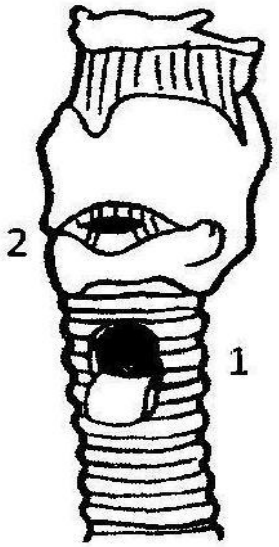
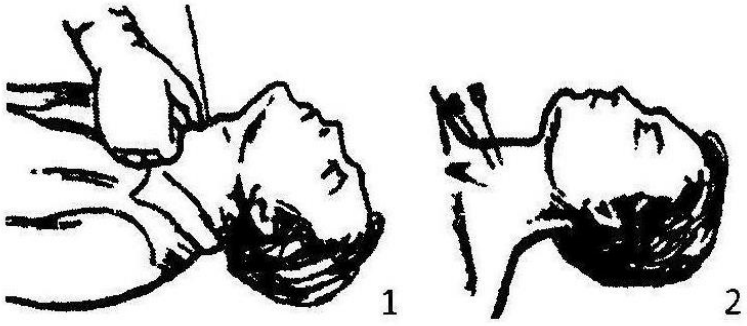


Fig. 33. Tracheostomy according to Bjork and conicotomy

Tracheostomy − an operation of laying an aperture (stoma) on the trachea (1);

Conicotomy − an operation of laying a hole (stoma) on the throat by dissecting the cricothyroid membrane of the larynx (2).

Fig. 34. Conicocentesis



The lower tracheostomy (tracheostomia inferior)

At the lower tracheostomy, the surgeon stands to the left of the patient. A section of 6-8 cm in length is held up on the midline of the neck from the jugular notch.

Just like the previous operation, at first, on the cut line, the tissues, fascia including a second neck one are dissected. In this case, the venous arch (arcus venosus juguli), is drawn back downwards and continues to protect by dull hooks. The next fascia of the neck is cut through the probe and its edges with the long muscles are separated with hooks. The fiber that lies in front of the trachea is stratified by blunt hooks and leads to the lowest thyroid vessels (a. et v. thyroidea ima) as they cause a severe hemorrhage.

Further conducting of the lower tracheostomy does not technically different from the previous operation. It should be remembered that in children the lower tracheostomy is more frequent, therefore, in the lower angle the wounds on the left the manipulation are dangerous, because there is v. brachiocephalica sinistra which rises high, with strong dislocation of the neck it can protrude over the sternal notch and be damaged during the lower tracheostomy.

Possible complications for non-compliance with the requirements of tracheostomy techniques:

− injuries of the neurovascular bundle of the neck;

− subcutaneous emphysema in the presence of a hole in the trachea greater than the diameter of the cannula;

− necrosis of the rings of the trachea as a result of their bending in the formation in the trachea of the opening less than the diameter of the cannula;

− aspiration pneumonia, which occurs as a result of blood flow into the lumen of the trachea caused by insufficient hemostasis;

− asphyxia caused by the introduction of a tube under exfoliated mucous membrane of the trachea;

− damage to the esophagus wall, which occurs during deep scabbard blade immersion into the lumen of the trachea.

Thyroid gland (glandula thyreoidea)

It consists of two lateral particles and an isthmus. Externally, the gland is covered with a visceral leaf of the fourth fascia of the neck (fascia endocervicalis), which is tightly bound to the parenchyma of the gland and repeats all its contours, as well as the parietal leaf of the fourth fascia. Between these leafs fascia, endocervicalis is a concentrated stratum of loose fiber, which contains numerous blood vessels that provide blood supply to the thyroid gland. Due to fascia induration, formed a number of connections that fix the gland: from the cartilago cricoidea to the isthmus of the thyroid gland approaching a middle bundle, and from the lateral parts of the gland approaching cartilago thyroidea and cartilago cricoidea. These features should be taken into account in operations; in particular, for the mobilization of the gland, it is necessary to cross the link that captures the isthmus of the gland.

The thyroid gland in the front is covered by the infrahyoid muscles (m. sternohyoideus, m. sternothyroideus, m. thyrohyoideus and m omohyoideus), the common carotid arteries and internal jugular veins adjoin to and from the side.

Thyroid gland envelops the larynx, the trachea, and from the left adjoins to the esophagus.

Blood supply of the thyroid gland is carried out by the upper (from the external carotid artery) and the lower (from the subclavian artery) thyroid arteries, and in 10% of cases − the lowest thyroid artery (a. thyroidea ima).

The arteries of the thyroid gland form two collateral paths: intraorgan and extraorgan. It is indicated that intraorgan collateral tract is formed due to the upper and lower thyroid arteries, and the extraorgan − due to anastomosis with the arteries of the pharynx, larynx, esophagus, trachea and adjacent muscles.

On the entire surface of the gland, there are numerous venous plexuses. The sympathetic trunk, the upper and turning laryngeal nerves, provides its innervation.

Lymph from the upper poles of the thyroid gland escapes into the lymph nodes of the neurovascular bundle of the neck, and from the lower ones − in the pretracheal lymph nodes.

Parathyroid glands (glandula parathyreoidea)

Four epithelial bodies resembling millet mainly represent these glands.

Parathyroid glands lay on the posterior surface of the lateral part of the thyroid gland. They are connected with the parietal leaf of the fourth fascia of the neck.

Attention is drawn to the fact that the upper pair of pterygoid glands lies at the level of the cartilago cricoidea of the larynx, and the lower one − 1-1.5 cm above the lower edge of the lateral part of the thyroid gland. Sometimes parathyroid glands may be located in the visceral fascial membrane of the gland or directly in its parenchyma. These features should be taken into account when conducting surgery on the thyroid gland.

Esophagus (esophagus)

The esophagus is a direct extension of the pharynx. It has three divisions: cervical, thoracic and abdominal. The total length of the esophagus is 25 cm on average. Its origin is projected to level VI of the cervical vertebra or the posterior edge of the cricoid cartilage. In the initial part of the esophagus, there is a first physiological narrowing up to 1.5 cm in width. The length of the cervical part (pars cervicalis) is 4-6 cm. At the neck, the esophagus deviates to the left, since trachea lies in front of it.

Between the trachea and the esophagus, the longitudinal grooves filled with celllar tissue pass on both sides. They have turning laryngeal nerves. The right (n. laryngealis recurrens dexter) is adjacent to the back wall of the trachea, and the left − to the anterior wall of the esophagus.

On the back of the esophagus, there is a loose tissue, which extends upward for the throat, and below − in the posterior mediastinum. It should be remembered that the upper part of the cervical part of the esophagus adjoins the lateral parts of the thyroid gland, and to the lower one − the common carotid arteries.

The right common carotid artery passes 1-1.5 cm outside of the esophagus, and the left − only 0.3-1.5 cm from it.

The branches of the recurrent laryngeal and sympathetic nerves provide the cervical portion of the esophagus blood supplying by the branches from the lower thyroid arteries, and its innervations. The lymph from cervical portion of the

esophagus goes into the lymph nodes that lie in the tracheo-esophageal grooves, as well as in the deep cervical lymph nodes, which lie along the internal jugular vein.

At the site of the fusion of the internal jugular and subclavian veins, there is a lymph node, which increases in case of cancer of the lower part of the esophagus and the initial part of the stomach.

Access to the cervical esophagus

Basic indications for surgical interventions on the cervical portion of the esophagus: injuries to the cervical portion of the esophagus, foreign bodies in it, tumors, cicatricial changes, congenital anomalies **(Fig.35, 36)**.

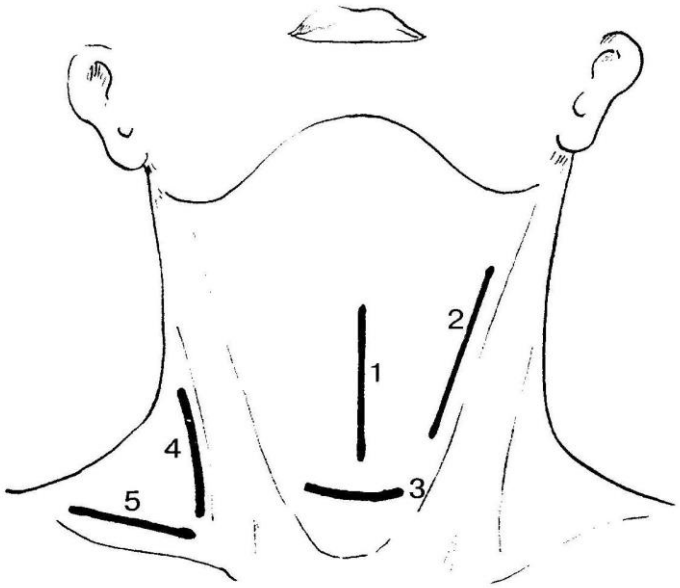


Fig. 35. Cuts for the disclosure of infectious and inflammatory processes on the neck:

1 − in case of phlegmon of the pretracheal space;
2 − with adenophlegmons of the sternocleidomastoid muscle;
3 − for phlegmons of the suprasternal space;
4 − with phlegmons of retrovisceral space;
5 − with phlegmons of the lateral neck triangle.

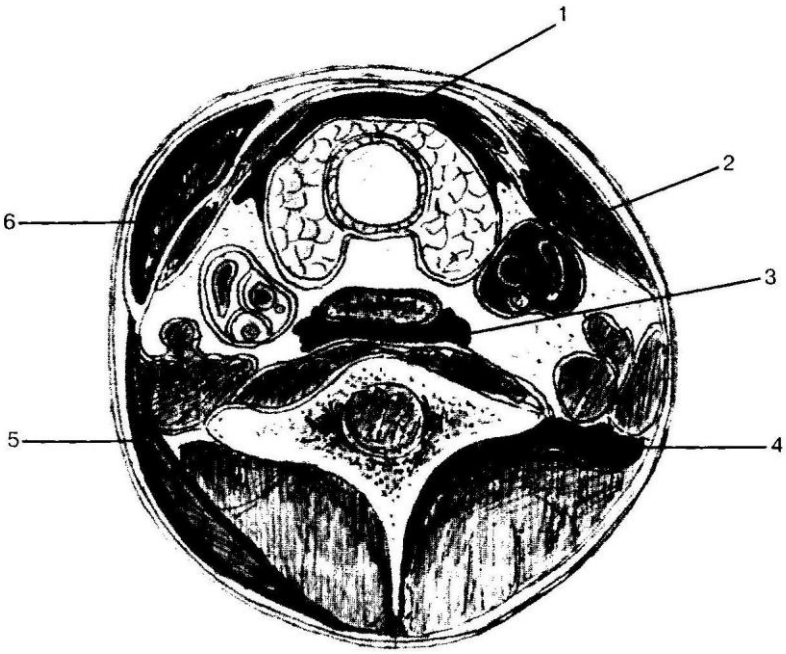


Fig. 36. Neck phlegmons:

1 − previsceral space;
2 − perichoroidal space;
3 − retrovisceral space;
4 − posterior part of the neck;
5 − bed of the trapezius muscle;
6 − bed of the sternocleidomastoid muscle.

Since the esophagus in the cervical part is tilted to the left of the median line of the neck, then operational access is advisable to spend on the anterior margin of m.

sternocleidomastoideus to the left. The surgeon is on the left of the patient. The skin is cut along the anterior margin of m. sternocleidomastoideus from the jugular notch to the level of the superior margin of the thyroid cartilage. First, you should remove the skin with subcutaneous tissue and the superficial fascia with the subcutaneous muscle of the neck. The anterior jugular vein (v. jugularis anterior) is ligated and dissected between ligatures. On a grooved probe the sheath of m. sternocleidomastoideus is cut, with hooks the muscle is pulled out outwards and the grooved probe clears the back wall of the indicated muscle along with the third fascia. The omohyoid muscle, which is detected during the operation, is captured and retracted to the outer angle of the wound, sometimes for better access, it is cut. This muscle should first be sutured in two places and cut off between two ligatures. During the operation, dull hooks inside, and the neurovascular bundle together with m. sternocleidomastoideus pull the thyroid gland − outside. The esophagus lies on the spine and goes beyond the trachea. It starts at the level VI of the cervical vertebra, with reddish color and longitudinally directed muscle fibers.

From the anterior wall of the esophagus, recurrent laryngeal nerve is carefully displaced, since the surgical field crosses the lower thyroid artery, then two ligatures are applied to it and cut this vessel between them. In such conditions, the esophagus becomes accessible for surgical intervention. If the purpose of the operation is to remove a foreign body from the esophagus, then on its wall two ligatures are imposed; the needle should not pierce its mucous membrane when suturing the wall of esophagus. The esophagus wall, due to the tension of these ligatures, is removed from the wound and cut off between them. In this case, the operating field around the wall wound of the esophagus is carefully placed with sterile drapes to prevent the infection into the wound. The outer body of the esophagus wound is carefully removed. The wall of the esophagus is sutured by the layers. If esophagus is exposed due to its injury, the sutures are not placed, and the gastric probe is inserted into the lower edge of the wound, the tampon − in the upper part. The tampons with antibiotics are placed to esophagus, and in some cases − a drainage tube. The skin is left open or several sutures are placed.

Subtotal resection of thyroid gland according to A. V. Nikolaev

The most commonly used thyroid gland surgery is a subtotal subfascial resection method according to A. V. Nikolaev (**Fig. 37**). It consists in the subfascial removal of the gland without ligating of thyroid arteries along the length, and after the operation, no more than 3-6 grams of the mass of the gland are left.

At first, a quadrilateral incision that connects the medial edges of the sternocleidomastoid muscle is done. It is carried out so that the lowest point of it is somewhat higher than the jugular notch. The skin with a subcutaneous tissue and superficial fascia is dissected. Blunt hooks stretch up and down the edges of the wounds. Those vessels that lie between the first and second fascia are captured by the clips and dissected. Solution of 0.25-0.5% novocaine (hydraulic method) is introduced into the thickness of the fascia, which facilitates safe dissection of the second and third neck fascia. In this case, the infrahyoid muscles are exposed in the wound (mm. sternohyoidei, sternothyreoidei and omohyoidei). The thoracic-sublingual muscles that lie medially, thicken bluntly by a probe, are captured with clips and cut.

Under the parietal leaf of the fourth fascia, a solution of novocaine is introduced, resulting in the formation of another novocaine infiltrate. It spreads under the fascia capsule of the thyroid gland and blocks those nerves that fit into it. Due to the presence of the created novocaine depot, the surgeon seizes painlessly into the wound and removes every particle of the gland. To extract the particle of the gland, the edges of the sternothyroideal muscle must be pulled to the side, parietal leaf of the fourth fascia is cut and bluntly (by tools and fingers) the parietal leaf of the fourth fascia is separated from the visceral. After that, it becomes possible to extract the particle of the gland into the wound. During the operation, the surgeon provides for the release of both poles of the right particle of the gland from the fascia capsule. At the same time on these poles, there is only an internal (own) capsule. At the vessels of the visceral capsule, the surgeon imposes clips and cleans them. The leaf of the visceral fascia gradually lay back to those areas where resection of the part of the gland is foreseen. After that, the isthmus of the gut is cut, and the blood vessels are captured by clamps. The next stage of the operation is the removal of the fraction of the gland from the side of the trachea. Those blood vessels that were previously pressed with clips are ligated with catgut. At the same time, several vessels are ligated, reducing the number of ligatures in the wound. The rest of the right particle of the thyroid gland is covered with the edges of its outer capsule and sutures are placed.

The resulting wound is thoroughly washed with novocaine, and the muscle and subcutaneous tissue are once again injected with novocaine solution. The left lobe begins to be emitted from its lower pole. The further tactics of the surgeon do not differ from the surgical techniques on the right particle. After the both thyroid lateral parts of the thyroid gland are covered with a capsule, the gland is covered with undamaged thyroid muscles, and 0.25-0.5% solution of novocaine is added again to the muscular layer and subcutaneous tissue. The cavity of the surgical wound is washed again with novocaine solution. Catgut sutures are placed on the skin. Silk is not recommended in this operation.

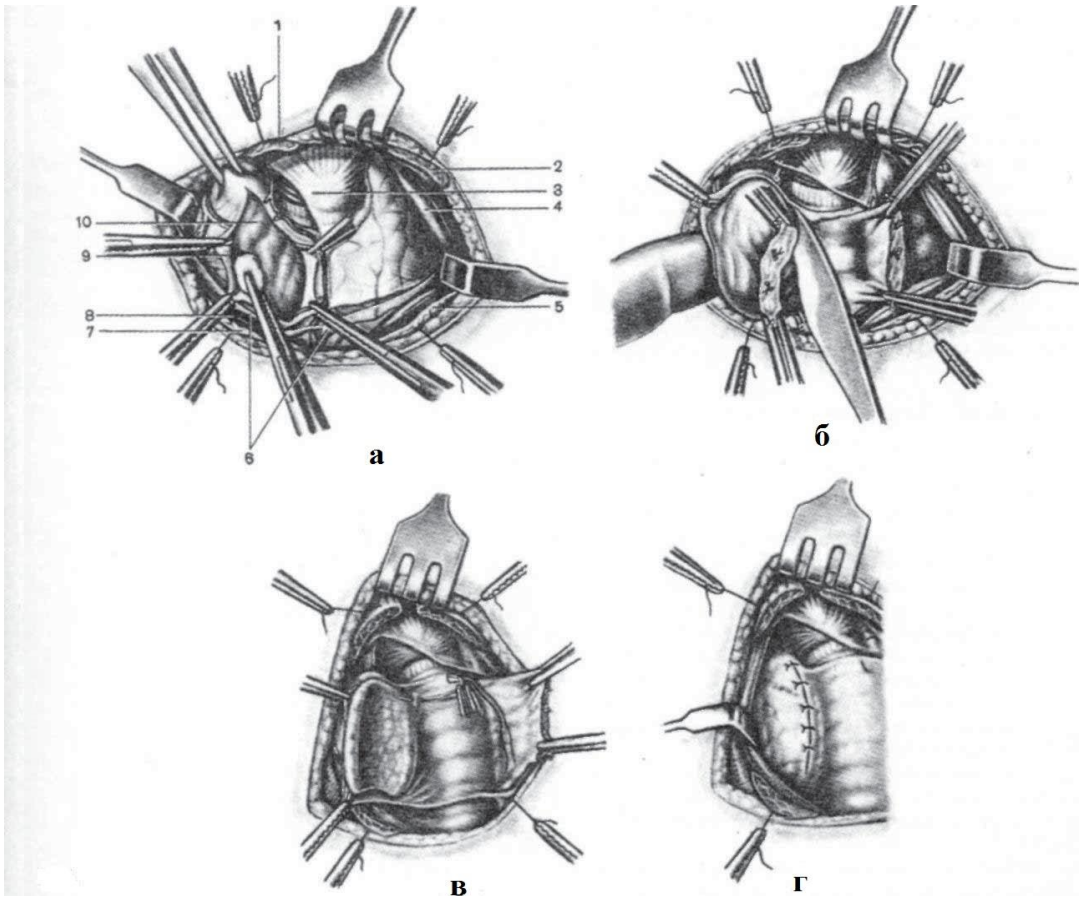


Fig. 37. The technique of thyroidectomy

а − the right lobe of the thyroid gland is shifted into the wound, its outer capsule is dissected and shifted to the line of the cut off of the lateral lobe; vessels are captured by clamps: 1, 2, 5, 7 − ends of dissected sternocleidomastoid muscles; 3, 6 − the edges of the dissect parietal leaf of the endocervical (fourth) fascia; 4, 8 − sternocleidomastoid muscles; 9 − external facial capsule of the thyroid gland, formed by the visceral leaf of the endocervical (fourth) fascia of the neck; 10 − own capsule of the right lobe of the thyroid gland; б − dissect off of the right lobe of the thyroid gland, fixed in the wound by finger; в − the overlap of catgut sutures on the edge of the fascial capsule of the right lobe; г – sutures on the capsule are placed.

5. Materials for self-control

A. Tasks for self-control:

Test No. 1. The patient has a combined wound of trachea and isthmus of the thyroid gland. At the level of which rings of the trachea is the isthmus usually placed?

a) 1-2;
b) 2-3;
c) 3-4;
d) 4-5;
e) 5-6.

Test No. 2. Cricothyrotomy was performed as an urgent help to a patient with mechanical asphyxia. What shold be done in this case?

a) dissection of the trachea;
b) put a tracheal fistula;
c) dissection of the ligamentum conicum;
d) punction of the ligamentum conicum;

e) applying a fistula to the larynx.

Test No. 3. The surgeon performs the lower tracheostomy. In what direction from the isthmus of the thyroid gland should dissection of trachea be performed?
a) up;
b) down;
c) outside;
d) in the middle;
e) to the front.

Test No. 4. The surgeon performs subtotal, subfascial resection of the thyroid gland. What formations, located extracapsularly, can be damaged?
a) recurrent laryngeal nerves;
b) vagus nerves;
c) common carotid artery;
d) internal jugular veins;
e) parotid glands.

Test No. 5. The surgeon completed tracheostomy. What were his actions on patient's trachea in this case?
a) dissects;
b) sutures;
c) removes;
d) puts a fistula;
e) fixes.

Test No. 6. What parathyroid glands should be remembered during the resection of the thyroid gland ?
a) Left, middle, right;
b) Upper, middle, lower;
c) Front, middle, back;
d) Front and rear;
e) Upper and lower.

Test No. 7. What complications can develop with the bilateral trauma of n. laryngeus inferior (n. laryngeus reccurens) during thyroid gland surgery?
a) asphyxia and death;
b) paresis of the vocal cavity (aphonia);
c) disruption of swallowing;
d disruption of cough reflex;
e) hypoparathyreosis.

Test No. 8. During the strumectomy, the ligation of numerous thyroid gland vessels is performed. In what layer is the venous plexus of the gland located?
a) between the visceral leaf of the fourth fascia of the neck and its own capsule;
b) between visceral and parietal leaves of the fourth fascia of the neck;
c) in the previsceral space;

d) in retroviscral space;
e) under its own capsule.

Test No. 9. The physician, providing the urgent help in case of mechanical asphyxia, performed a cutting puncture of the ligamentum conicum. The doctor palped two larynx cartilages to determine the puncture site. Below which of these cartilages was a puncture?
a) cartilago thyroidea;
b) cartilago cricoidea;
c) cartilago arytenoidea;
d) cartilago cuneiformis;
e) cartilago corniculata.

Test No. 10. The surgeon dissected the first ring of the trachea and introduced tracheostomy cannula into it. On wich cartilage of the larynx, will a cannula be introduced in this case?
a) cartilago thyroidea;
b) cartilago cricoidea;
c) cartilago arytenoidea;
d) cartilago cuneiformis;
e) cartilago corniculata.

B. Tasks for self-control:
Task No. 1. For the esophagus exposure, the student decided to perform access at the posterior margin to the right of the sternocleidomastoid muscle. Is the student's tactic correct?

Task No. 2. Performing strumectomy, the surgeon separated the part of the gland from the trachea throughout its length. The patient had a huskiness voice. What is the surgeon's mistake?

Task No. 3. The patient with "nodular euthyroid goiter" was recommended the removal of the thyroid gland. What muscle covers the front surface of this gland?

Task No. 4. The patient revealed a foreign body in the cervical part of the esophagus, which is not removed by esophagoscopy. What is the tactics of a surgeon? How is esophagus distinguished from other neck organs? How to protect the wound after removing the foreign body from the esophagus?

Task No. 5. During the surgery on the neck, the surgeon accidentally cut the external jugular vein. Trying to stop the bleeding, he captured the proximal end of the vein with a clamp. Is it correct? What is your tactic?

Task No. 6. By binding the external carotid artery, surgeon exposed the part of this artery from the bifurcation to the point of departure from a. carotis externa of the superior thyroid artery. Has the surgeon correctly identified the place for ligature?

Task No. 7. The patient complaints of pulsating swelling on the neck, deterioration of vision. Near the anterior margin of m. sternocleidomastoideus, slightly above the collarbone, palpated pulsating tumor is determined, above it − systolic noise. The face of the patient from the localization of a tumor is hyperemic, with narrowed pupil, narrowed orbital fissure, and sunken eye. The surgeon diagnosed aneurysm of the common carotid artery. What is the connection between the general carotid aneurysm and the Claude-Bernard-Horner syndrome?

References

Basic literature

1. Tsyhykalo O.V. Topographic Anatomy and Operative Surgery / O.V.Tsyhykalo. – Vinnytsia, 2011. — 528 p.
2. Danilchenko S.I. Methodical Instruction For the 3st year students'of stomatological faculty self - preparation work (at class and at home) in studying operative surgery and toographical anatomy / S.I.Danilchenko, E.N.Pronina, O.Yu.Polovik. - Poltava, 2010. — 239 p.

Additional literature

1. Gray. H. F.R.S. Gray's anatomy / Henry F.R.S. Gray, R. A. Bolam. – London, 1994. – 1290 p.
2. McCraw J.B. Athlas of muscle and Musculocutaneous Flaps Head and Neck Reconstruction / John B McCraw, Phillip G Arnold. – Norfolk, Virginia, 1988. – 757 p.
3. Netter F. H. Atlas of Human Anatomy / Frank H.Netter. – East Hannover, New Jersey, 1990. – 592 p.
4. Hnatyuk M.S. Operative surgery and topographical anatomy (lectures) / M.S.Hnatyuk, O.B.Slabuj. – Temopil, 2004. – 212 p.
5. Bernard C. Illustrated Manual of Operative Surgery and Surgical Anatomy / C.Bernard – 1991.-330 p.
6. Pemberton L.B. Workbook of Surgical Anatomy / L.B.Pemberton. – 1990. – 298 p.
7. Gliedman M.L. Atlas of Surgical Techniques / M.L.Gliedman. – New York etc., McGraw – Hill. – 1990. – 420 p.
8. Sabiston D.C. Atlas of General Surgery / D.C.Sabiston. – Philadelphia etc., Saunders. – 1994. – 220 p.
9. Chassin J.L. Operative Strategy in General Surgery / J.L.Chassin. – New York etc., Springer. – 1994. – 368 p.

Academic discipline	Clinical anatomy and operative surgery
Module No.1	Clinical anatomy and operative surgery of areas and organs of head and neck, pectoral cavity, regions and organs of abdominal cavity.
Content module No.2	Clinical anatomy and operative surgery of sites and organs of the chest cavity
Topic 10	Clinical anatomy and operative surgery of the walls of the chest, mammary gland. Layers of soft tissues. Mammary gland: blood supply, innervation, lymphatic drainage. Intercostal intervals (arteries, veins, nerves). Breast surgery. Resection of the rib.
Year	II
Faculty	Foreign students training (medical)

1. Relevance of the topic:
Injuries of the chest, common diseases of the mammary gland, resection of damaged ribs, as well as healthy ones for operative access to thoracic organs, require knowledge of topographic anatomy of the chest, study of various surgical accesses and techniques.

2. Specific objectives:
1. Explain the surgical accesses and techniques for carrying out of surgical interventions on the chest wall.
2. Analyze the ways of inflammatory processes spreading within the chest.
3. Explain how to perform cuts in case of abscesses of the mammary gland.
4. Explain how to perform rib resection.

3. Tasks for independent work to prepare for the lesson
3.1. List of the main terms, parameters, characteristics that should be learnt by the student while preparing for the lesson.

Term	Definition
Mastectomy	Removal of the mammary gland.
Resection of the rib	Removal of a part of a rib for various medical reasons.

3.2. Theoretic questions:
1. Borders of the chest, divided into sections.
2. Conditional limits for determining the projection of the chest cavity.
3. Anterior and superior chest area.
4. The topography of the mammary gland and ways of lymph flow. Blood supply and innervation.
5. The topography of intercostals spaces.
6. Cuts in case of mastitis.

7. Radical removal of the mammary gland.
8. Resection of the rib.

3.3. Practical activities performed in class:
1. Carry out cuts in mastitis.
2. Carry out rib resection.

4. Content of the topic:

Mammary gland

Breasts are located on the anterior chest wall of 3 to 6 ribs, medially extends to the parasternal, and outside − the anterior axillary line. The gland consists of 15-20 lobules. From each lobule in the radial direction to the nipples goes a breast duct. These ducts open on a nipple of 8-10 holes, pre-forming the expansion – breast sinuses.

The gland is surrounded by a capsule, which forms a superficial fascia. The capsule fixes the gland to the clavicle and deep layers of the chest wall, forming ligaments that support the mammary gland.

Blood supply to the gland is carried out by the intervertebral, internal thoracic and lateral thoracic arteries.

The gland is innervated by the branches of the intervertebral, supraclavicular and anterior chest nerves.

Lymphatic vessels form a deep and superficial rete. Anastomosis between lymphatic vessels is well developed. Lymph nodes collecting lymph from different parts of the mammary gland are regional. From the lateral quadrants, the lymph outflow is carried out into the lymph nodes of the axillary fossa, from the upper ones to the subclavian and supraclavicular lymph nodes, from the internal lymph nodes.

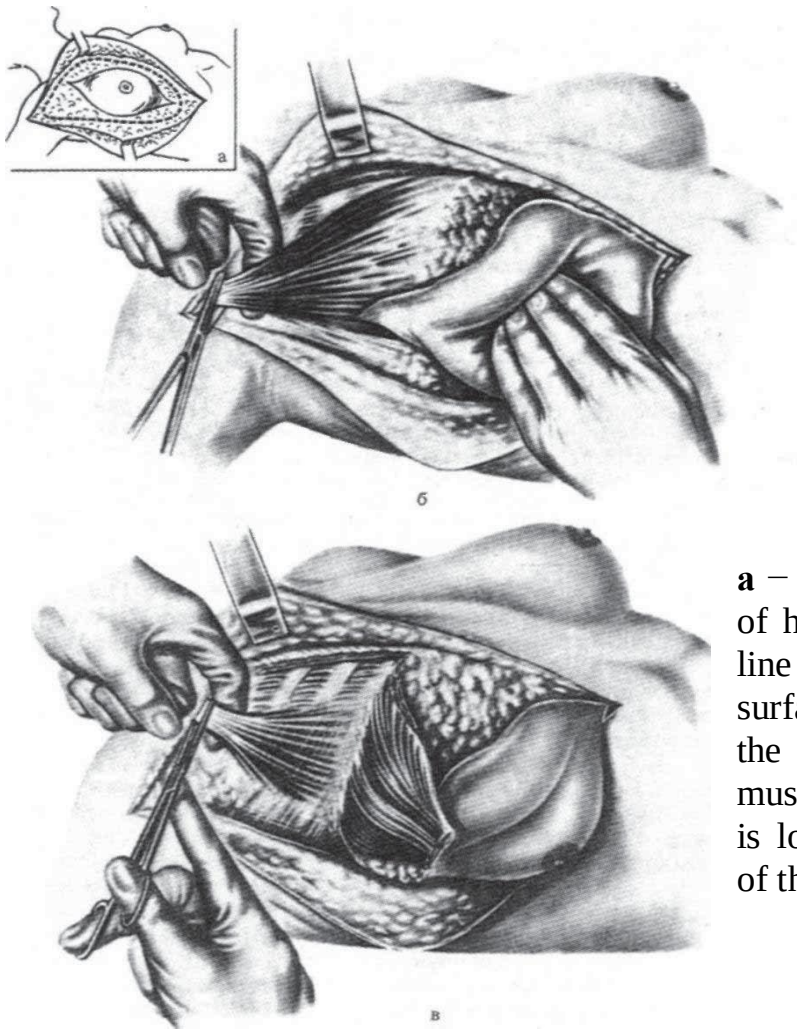


Fig. 38. Radical mastectomy
а − ellipsoid skin cut with detachment of hypodermic fatty tissue; the dotted line is marked by the opening of the surface thoracic fascia; **б** − section of the tendon of the large thoracic muscle; **в** − the large thoracic muscle is lowered, scissors cross the tendons of the small thoracic muscle.

The teacher draws the attention of students to the ways of dissemination of metastases in malignant tumors of the mammary gland and the necessity of obligatory extensive removal of the lymph nodes of the axillary fossa, the subscapular and subclavian nodes during a radical operation for breast cancer **(Fig. 38, 39).**

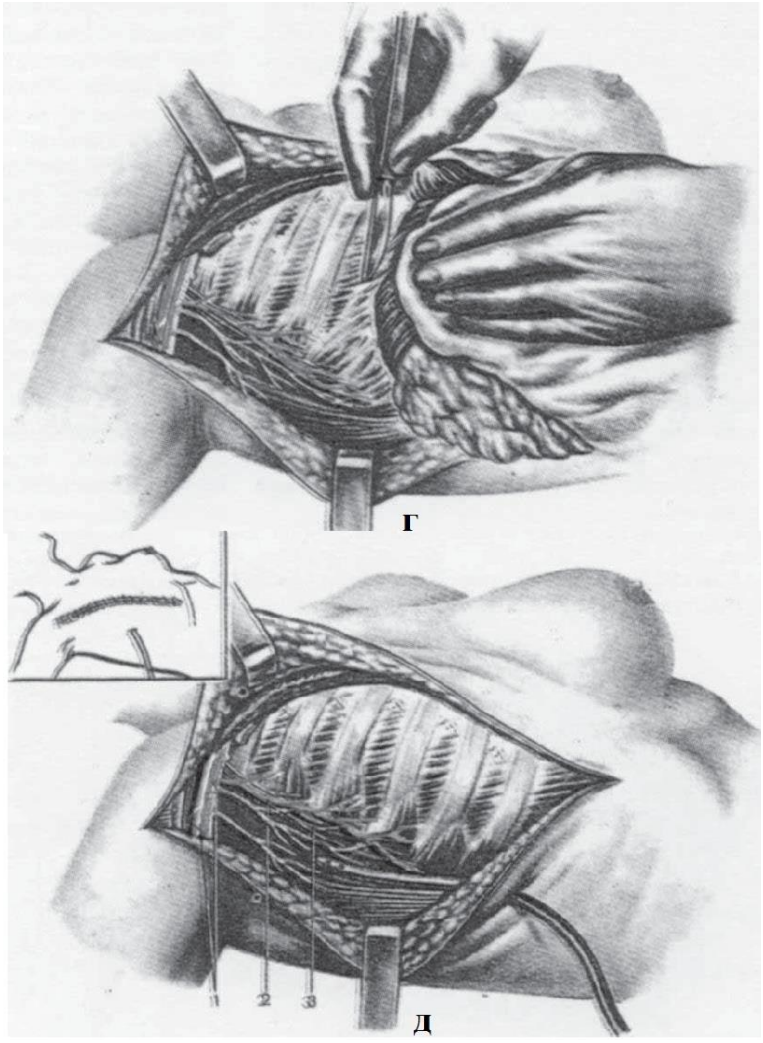


Fig. 39. Radical mastectomy (continuation).
г − fatty tissue with lymph nodes in the course of subclavian vessels and in the area of the axillary cavity are removed; the cut off of the muscles and mammary gland from the chest wall is carried out; **д** − appearance of a wound after removal of a mammary gland; drainage was introduced into the wound: **1** − a. to v.axillares; **2** − a.thoracica lateralis; **3** − n.thoracicus longus.

Operations in case of mastitis and subpectoral phlegmon

The teacher emphasizes the need for sparing, but sufficiently deep cuts (radial ─ with single abscesses and semicircular under the gland ─ with retroammary and abscesses of the deep parts of the lower part of the mammary gland).

Cuts in subpectoral phlegmons

Theoretically, the cuts are performed along the lower-outer edge of the large thoracic muscle (the opening of spaces ahead and behind the coraco-clavicular-thoracic fascia). The teacher conducts the analysis of sectoral resection of the

mammary gland, radical mastectomy, the removal of regional lymph nodes **(Fig. 40).**

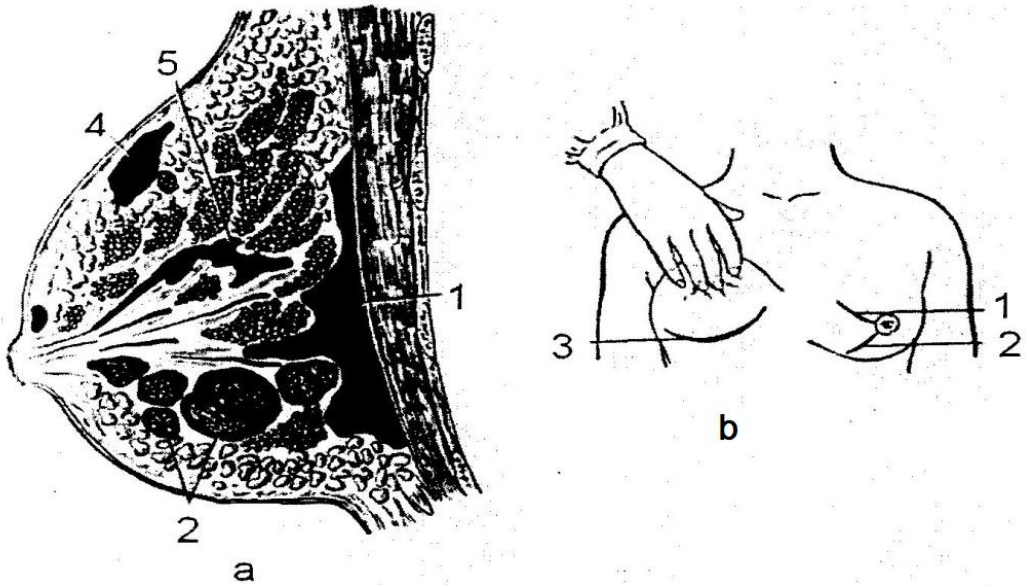


Fig.40. Different types of purulent mastitis and cuts with it:
A − types of mastitis: **1** − retromammary; **2** − interstitial; **3** − subareolar;
4 − anteammarine; **5** − parenchymatous;
b − cuts: 1,2 − radial; 3 − under the mammary gland.

Intercostal spaces

Layers, topography of the vertebral neurovascular bundle. The topography of the internal thoracic artery, its placement relative to the internal thoracic fascia.

Resection of the rib

Indication. Anesthesia. The position of the patient during surgery. Students conduct oblique resection of 7 and 8 ribs. Pay attention to the difference in the technique of resection of the rib, depending on the indications (removal of damaged edges, access to the chest cavity, plastic surgery (thoracoplasty, etc.) **(Fig. 41, 42).**

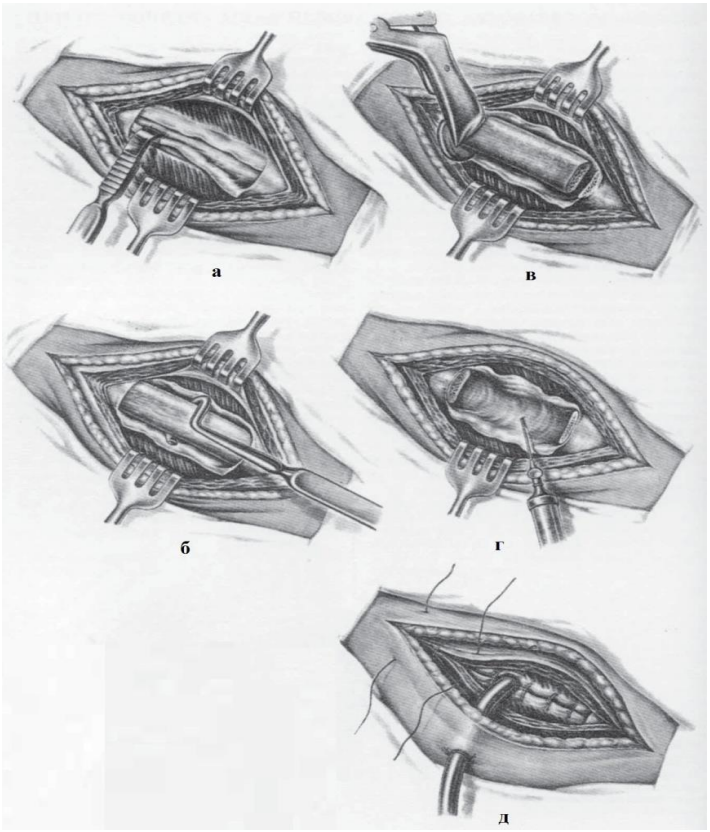


Fig. 41. Resection of the rib.

а − branch of the curved raspatory of the periosteum on the outer surface of the rib;
б − a branch of the periosteum from the inner surface of the ribs with Doyen raspatory;
в − cut the edge of the rib removed by the edge scissors;
г − diagnostic puncture of the pleural cavity through the periosteal bed of the resected rib;
д − wound suturing after resection of the rib and drainage of the pleural cavity.

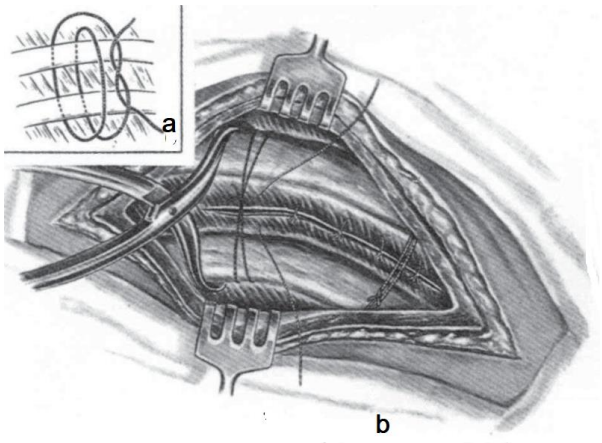


Fig. 42. Suturing the wounds of the chest wall with sutures, involving adjacent edges (a). Scheme of the suturing (b).

5. Materials for self-control

A. Tasks for self-control:

Test No.1. Primary surgical debridement of penetrating chest wound is carrying out. Especially carefully the surgeon places sutures, which should provide hermetic state for:

a) pleura;
b) endothoracic fascia;
c) intercostal muscles;
d) superficial muscles;
e) skin and subcutaneous tissue.

Test No.2. Surgeon performs pleural puncture for exudative pleuritis. During procedure the intercostal nerve was damaged. Where is it necessary to perform a puncture of the thorax to prevent this complication:

a. along the upper edge of the rib located below;
b. along the lower edge of the rib located above;
c. in the middle between the lower margins of ribs;
d. in the middle between the upper margins of ribs;
e. in the upper part of intercostal space.

Test No.3. Patient with pneumonia two weeks later complained of heaviness and moderate pain in the right subcostal area, shortness of breath, weakness. Chest x-ray examination determined accumulation of fluid in the pleural cavity over the dome of diaphragm. In what pleural sinus does fluid accumulate more often?

a) costal diaphragmatic;
b) costal mediastinal;
c) diaphragmatic mediastinal;
d) vertebral mediastinal;
e) costal vertebral.

Test No.4. Patient K. was taken to the surgical department from the scene of traffic accident with a closed chest trauma and right side fracture of rib. The patient was diagnosed right-sided pneumothorax; he was urgently indicated drainage of pleural cavity. Choose the place of pleural puncture:

a) in 2nd intercostal space along the medioclavicular line;
b) in 6th intercostal space along the posterior axillary line;
c) in 7th intercostal space along the scapular line;
d) in the projection of pleural sinus;
e) in the place of greatest dullness, which is determined by percussion.

B. Tasks for self-control:

Task No.1. When puncturing the left subclavian vein, the transparent opalescent fluid was taken with the syringe when plunger moved backwards. What error was made while performing the puncture?

Task No.2. Performing the puncture of the pleural cavity in 7th intercostal space along the anterior axillary line near the lower margin of the rib the surgeon received blood in the syringe in patient with suspected pleural empyema and established diagnosis ─ hemothorax. What is the surgeon's mistake?

Task No.3. During the puncture of pleural cavity using thick needle with a wide lumen without syringe, the patient with pleural empyema experienced accelerated breathing and loss of consciousness. What explains this complication?

References

Basic literature

1. Tsyhykalo O.V. Topographic Anatomy and Operative Surgery / O.V.Tsyhykalo. – Vinnytsia, 2011. — 528 p.
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9. Chassin J.L. Operative Strategy in General Surgery / J.L.Chassin. – New York etc., Springer. – 1994. – 368 p.

Academic discipline	Clinical anatomy and operative surgery
Module No.1	Clinical anatomy and operative surgery of areas and organs of head and neck, pectoral cavity, regions and organs of abdominal cavity.
Content module No.2	Clinical anatomy and operative surgery of sites and organs of the chest cavity
Topic 11	Pleura, pleural cavity. Puncture of the pleural cavity. Pneumothorax. Surgery in case of pneumothorax.
Year	II
Faculty	Foreign students training (medical)

1. Relevance of the topic:
Injuries of the chest, common diseases of the mammary gland, resection of damaged ribs, as well as healthy ones for operative access to thoracic organs, require knowledge of topographic anatomy of the chest, study of various surgical accesses and techniques.

2. Specific objectives:
1. Explain surgical accesses and techniques for carrying out of surgical interventions on chest wall.
2. Explain how to perform pleura puncture.
3. Explain how to carry out the primary surgical debridement of penetrating wounds of the chest wall. Explain how to perform surgical access to the heart.

3. Tasks for independent work to prepare for the lesson
3.1. List of the main terms, parameters, characteristics that should be learnt by the student while preparing for the lesson.

Term	Definition
Pleural puncture	Puncture of pleura for diagnostic or therapeutic purposes.
Pneumothorax	Accumulation of air in the pleural cavity and increased pressure in it.

3.2. Theoretic questions:
1. Borders of pleura.
2. Sinuses of pleura and their topography.
3. Puncture of pleura.
4. Pneumothorax.
5. Methods for closing of open pneumothorax.

3.3. Practical activities performed in class:
1. Carry out a puncture on cadaver.

2. Carry out the closure of pneumothorax.

4. Content of the topic:

The skin on the anterior surface of the chest is thinner, more movable than on posterior one; in the sternum area, it is not so movable.

Subcutaneous tissue is well marked. Superficial fascia of the breast, which forms mammary gland capsule, follows subcutaneous tissue.

The proper fascia of the chest in the anterior part forms fascial compartments for the large thoracic and serratus anterior muscles. Its deep plate forms a fascial compartment for m. pectoralis minor.

The deep layer of the thorax includes: sternum, 12-pairs of ribs with their cartilages, 12 thoracic vertebrae, intercostal muscles, blood vessels, and nerves.

Intercostal spaces form a complex of formations represented by intercostal muscles, blood vessels, lymphatic vessels and lymph nodes.

While prosecting intercostal spaces from the outside, it can be determined that external intercostal muscles, mm. intercostales extemi, are directed from up to down and back to front. After their dissection, a thin layer of cellular tissue becomes visible, where the intercostal neurovascular bundle is located. It consists of intercostal vein that is located higher, intercostal artery that lies beneath the vein, and intercostal nerve, which is located at the lowest position.

Pleura consist of two leaves (parietal and visceral), between which the slit-like pleural cavity is located.

Parietal pleura has three surfaces: rib, diaphragmatic and mediastinal. Portion of parietal pleura, located above the clavicle, is called the pleural dome. It stretches 2−3 cm above the clavicle and reaches a line that passes along the level of VII cervical or I thoracic vertebra behind.

It is important to determine the presence of pleural sinuses (sinuses where accumulation of pleural effusion, blood or pus occur in case of pleura or lung diseases. Costodiaphragmatic recess is one of the largest sinus (recessus costodiaphragmaticus), formed at the point of costal pleura transition into diaphragmatic one. The deepest point of this sinus is at the level of middle axillary line in the space between VII−X ribs; its length is 6−8 cm.

Each lung consists of apex, surface (costal, diaphragmatic, mediastinal), lung hilus, lobes: three − on the right, two − on the left; segments: 10 segments are in the right lung, 9 segments are in the left one.

Each lung includes major bronchi (branching of the trachea at the level of V−VI thoracic vertebrae), which are further divided into bronchi of II and III order.

The order of bronchi and vessels location in the root of the right lung: bronchus, arteries, veins − BAV (from up to down); in the root of the left lung: arteries, bronchi, veins (ABV).

Blood supply of the lung is provided by two systems: 1) bronchial arteries and veins, 2) pulmonary arteries and veins.

The heart is a muscular organ that is located in the middle mediastinum. Its base is directed upwards and somewhat backward, and its apex is forward, down and left. The heart is located in the pericardial cavity (cavitas pericardialis).

Access to the organs of the chest cavity

Currently, domestic and foreign thoracic surgery has achieved success, which provides wider use of surgical interventions both on the chest wall and organs of the thoracic cavity.

Thoracotomy means incision of the thoracic wall to provide further operations on thoracic organs, for evacuation of pus from the pleural cavity, etc. The incisions are carried out through ribs or intercostal spaces. Thoracic surgery most commonly uses anterior- or posterior lateral access.

Medial (split-sternum) thoracotomy is widely used for free access to thoracic organs, but sometimes sternum is dissected transversely.

Puncture of pleura

Indications: anesthesia, position of the patient during surgery. Students carry out puncture of pleura in the eighth and ninth intercostal spaces, between the scapular and middle axillary lines, along the upper margin of the rib **(Fig. 43).**

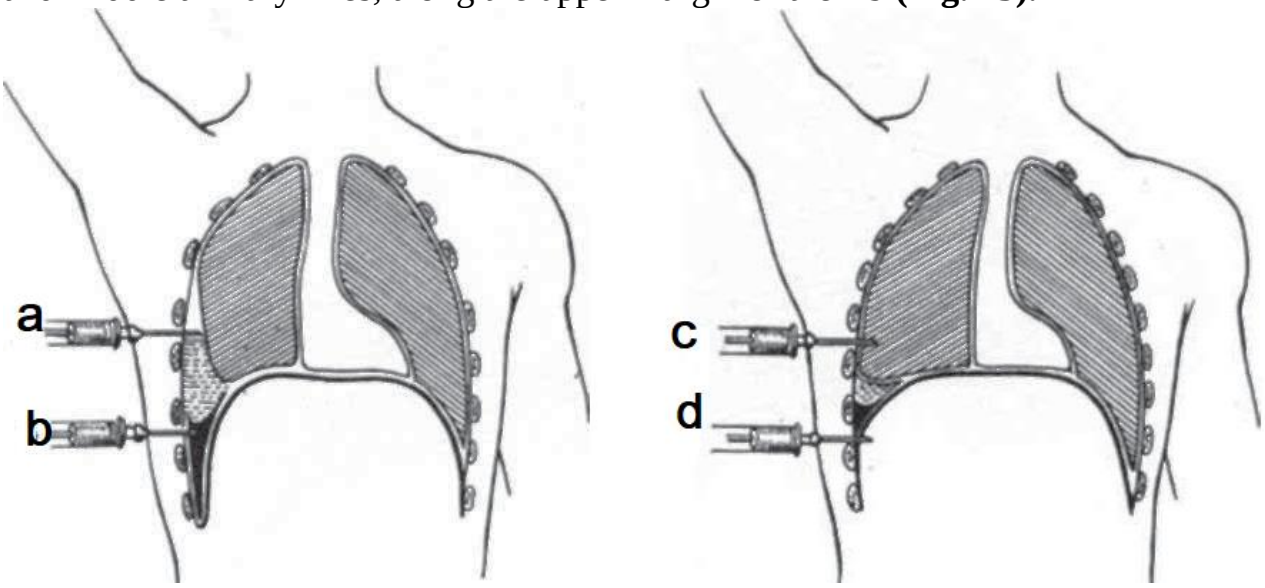

Fig.43. Puncture of the pleural cavity and possible complications.
a − needle passed into the pleural cavity above effusion;
b − needle passed into commissure between the pleura leaves of costodiaphragmatic sinus; c − needle passed above effusion into the lung tissue; d − needle passed through the lower part of costodiaphragmatic sinus into the abdominal cavity.

Pneumothorax

Pneumothorax occurs in the presence of penetrating wounds of the chest wall. According to their nature, they can be: open, when a constant connection between the pleural cavity and external environment presents; closed, when the air enters into pleural cavity single-shot, with subsequent closure of the pleural defect with a patch of soft tissues; valvular, when the air enters through the place of damage into the pleural cavity but does not flow in the opposite direction.

The first medical aid in case of open pneumothorax is applying of occlusive (tight) bandage on the wound. First, a sterile gauze pad is applied on the wound of the chest wall, and then − oilcloth padding or piece of cellophane film that is tightly fixed to the chest.

5. Materials for self-control

A. Tasks for self-control:

Test No.1. Primary surgical debridement of penetrating chest wound is carrying out. Especially carefully the surgeon puts sutures, which should provide hermetic state for:

a) pleura;
b) endothoracic fascia;
c) intercostal muscles;
d) superficial muscles;
e) skin and subcutaneous tissue.

Test No.2. A surgeon performs pleural puncture for exudative pleuritis. During procedure, the intercostal nerve was damaged. Where it is necessary to perform a puncture of the thorax to prevent this complication:

a) along the upper edge of the rib located below;
b) along the lower edge of the rib located above;
c) in the middle between the lower margins of ribs;
d) in the middle between the upper margins of ribs;
e) in the upper part of intercostal space.

Test No.3. Patient with pneumonia two weeks later complained of the feeling of heaviness and moderate pain in the right subcostal area, shortness of breath, weakness. Chest x-ray examination determined accumulation of fluid in the pleural cavity over the dome of the diaphragm. In what pleural sinus does fluid accumulate more often?

a) costal diaphragmatic;
b) costal mediastinal;
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e) costal vertebral.

Test No.4. Patient K. was taken to the surgical department from the scene of traffic accident with a closed chest trauma and right side fracture of the rib. The patient was diagnosed right-sided pneumothorax; he was urgently indicated drainage of the pleural cavity. Choose the place of pleural puncture:

a) in 2nd intercostal space along the medioclavicular line;
b) in 6th intercostal space along the posterior axillary line;
c) in 7th intercostal space along the scapular line;
d) in the projection of pleural sinus;
e) in the place of greatest dullness, which is determined by percussion.

B. Tasks for self-control:

Task No. 1. When puncturing the left subclavian vein the transparent opalescent fluid was taken with the syringe when plunger moved backwards. What error was made while performing the puncture?

Task No.2. Performing puncture of the pleural cavity in 7th intercostal space along the anterior axillary line near the lower margin of the rib the surgeon received blood in the syringe in the patient with suspected pleural empyema and established diagnosis ─ hemothorax. What is the surgeon's mistake?

Task No.3. During puncture of the pleural cavity using a thick needle with a wide lumen without a syringe, the patient with pleural empyema experienced accelerated breathing and loss of consciousness. What explains this complication?

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Module No. 1	Clinical anatomy and operative surgery of areas and organs of head and neck, pectoral cavity, regions and organs of abdominal cavity.
Content module No.2	Clinical anatomy and operative surgery of sites and organs of the chest cavity
Topic 12	Clinical anatomy of the thoracic cavity. Lungs. Mediastinal organs. Surgical access to the lungs. Lung resection. Removal of lung lobe, removal of lung segment. Topography of the thoracic part of the esophagus.
Year	II
Faculty	Foreign students training (medical)

1. Relevance of the topic: thoracic surgery, which is rapidly developing in connection with surgical treatment of diseases of the lungs, heart, esophagus, requires detailed knowledge of the thoracic cavity topography, the study of operative access and operative techniques for operations on them.

2. Specific objectives:

1. Explain the topographic anatomy of the lungs.
2. Explain the topographic anatomy of the mediastinum.
3. Explain the methods of modern operations on the lungs, pleura, thoracic esophagus.

3. Tasks for independent work to prepare for the lesson

3.1. List of the main terms, parameters, characteristics that should be learnt by the student while preparing for the lesson.

Term	Definition
Mediastinum	Complex of bodies and neurovascular formations, which are located between both mediastinal pleurae and surrounded with the significant amount of friable fat.
Lung's gate	Place where a bronchial tube, pulmonary arteries and veins, bronchial vessels, nerves enter and leave.
Pneumonectomy	Removal of a lung.
Lobectomy	Removal of lung lobe.

3.2. Theoretic questions:

1. Surgical anatomy of the lungs, anatomical features of the division of lungs into

lobes and segments.
2. The notion of the gates and the roots of the lungs. Surgical anatomy of the lung root.
3. Definition of the concept "mediastinum", the division of mediastinum into the upper, lower, front, back, middle.
4. Organs located in mediastinum.
5. Surgical anatomy of the thymus gland, superior vena cava, artery of the aorta and its branches, diaphragmatic nerves.
6. Surgical anatomy of the thoracic esophagus. Determination of access to the esophagus at different levels. Partition of the esophagus. Modern possibilities of the esophagoplasty.
7. Surgical anatomy of the thoracic duct, azygos and hemiazygos veins, sympathetic trunk, the formation of intestinal nerves, the surgical anatomy of the aorta.
8. Anatomical and physiological substantiation of surgical access to the lungs, heart, and esophagus.
9.The main stages of pulmonectomy and resection of the lungs.

3.3. Practical activities performed in class:

1. Carry out a puncture on a cadaver.
2. Carry out the closure of pneumothorax.
3. Carry out suturing of the heart wound.

4. Content of the topic:

Posterior mediastinum

In the posterior mediastinum, there is an esophagus, a lower part of the aorta, azygos and hemiazygos veins, a lower segment of the vagus nerves and a chest duct. In the study of esophageal surgery, attention should be drawn to its bends in the thoracic region: the first one is traced to the level of the third thoracic vertebra, at the level of the 4th vertebra, the esophagus occupies a median position and then again deviates to the right, and at the level of the 10-th thoracic vertebra shifts to the left. By studying the narrowing of the thoracic part of the esophagus, it is necessary to find them at the level of the 4th thoracic vertebra (corresponding to the aortic arch) and at the level of the 11th thoracic vertebra, a placement of the esophagus in the same name aperture in the diaphragm.

Relatively to the thoracic aorta, the esophagus is on the right, and then ahead of it. The thoracic part of the esophagus is supplied with branches of the thoracic aorta, intervertebral and bronchial arteries; venous outflow is carried out on azygos and hemiazygos veins, in thyroid veins in the superior vena cava and in the gastric veins in the portal vein system **(Fig.44).**

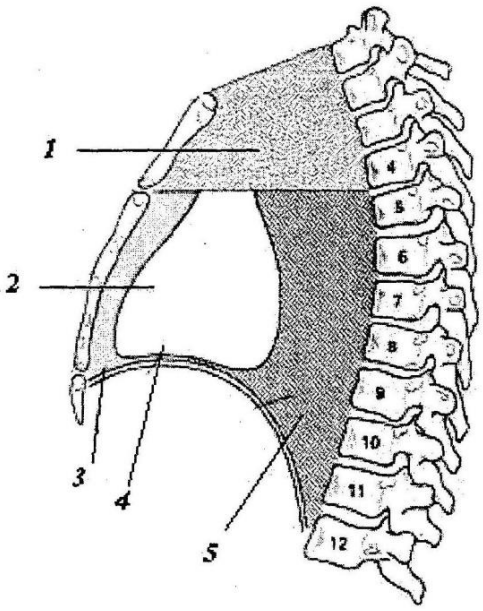

Fig.44. Mediastinal structure (schematically):

1 − upper mediastinum;
2 − heart;
3 − anterior mediastinum;
4 − middle mediastinum;
5 − posterior mediastinum.

Azygos and hemiazygos veins

The azygos vein is to the right of the esophagus, the hemiazygos is to the left. The hemiazygos vein is poured into azygos and the latter − into the superior vena cava. These veins can be studied by the students on the preparation.

Thoracic duct

It starts at the level of 1-2 lumbar vertebrae. In the thoracic cavity, the duct enters through the aortic aperture of the diaphragm, behind and to the right of the aorta. Then it goes between azygos vein and thoracic part of the aorta, the front of which covers the esophagus. At the level of the fifth thoracic vertebra, the chest duct gradually deviates to the left of the median line of the body and goes to the point of fusion of the left jugular and subclavian veins, forming the left venous angle.

Thoracic portion of aorta

The thoracic part of the aorta is bordered: in the front − with the left bronchus and pericardium, on the right − with esophagus, on the left − with mediastinal pleura, behind − with hemiazygos vein and spine. In the lower part, the thoracic aorta in the front borders with esophagus, on the right − with azygos vein and mediastinal pleura, to the left − with mediastinal pleura, and behind the thoracic duct and spine.

Vagus nerves and sympathetic trunks

The right vagus nerve enters the thoracic cavity in the front of the subclavian artery, which gives a turning branch that rises to the neck and is called a turning laryngeal nerve. Actually, the vagus nerve follows the right bronchus and at the level of the 5th thoracic vertebra, approaches the esophagus, placed on its back wall. The left vagus nerve enters the thoracic cavity between the left subclavian and the left carotid artery, then intersects the anterior artery of the aorta and also gives the turning

laryngeal nerve that returns to the neck. The left vagus nerve at the level of 7-8 thoracic vertebra joins the esophagus, placed on its front wall.

Sympathetic trunks consist of nodes located on the sides of the bodies of the thoracic vertebrae at the edges of the ribs. Each trunk contains 10-11 nodes, which are interconnected. From the sympathetic trunks, branches go to the nerve glands of the aorta, esophagus, lungs, and form a small internal nerve.

5. Materials for self-control

A. Tasks for self-control:

Test No. 1. Primary surgical debridement of penetrating chest wound is carrying out. Especially carefully the surgeon puts sutures, which should provide hermetic state for:

a) pleura;
b) endothoracic fascia;
c) intercostal muscles;
d) superficial muscles;
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d) in the projection of pleural sinus;
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B. Tasks for self-control:

Task No. 1. When puncturing the left subclavian vein the transparent opalescent fluid was taken with the syringe when plunger moved backward. What error was made while performing the puncture?

Task No. 2. Performing the puncture of the pleural cavity in 7-th intercostal space along the anterior axillary line near the lower margin of the rib the surgeon received blood in the syringe in the patient with suspected pleural empyema and established diagnosis – hemothorax. What is the surgeon's mistake?

Task No. 3. During the puncture of the pleural cavity using a thick needle with a wide lumen without syringe, the patient with pleural empyema experienced accelerated breathing and he lost consciousness. What explains this complication?

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9. Chassin J.L. Operative Strategy in General Surgery / J.L.Chassin. – New York etc., Springer. – 1994. – 368 p.

Academic discipline	Clinical anatomy and operative surgery
Module No. 1	Clinical anatomy and operative surgery of areas and organs of head and neck, pectoral cavity, regions and organs of abdominal cavity.
Content module No.2	Clinical anatomy and operative surgery of sites and organs of the chest cavity
Topic 13	Clinical anatomy of the thoracic cavity. Cardiac and pericardial topography. Surgical access to the heart. Congenital and acquired heart defects, surgical treatment of them. Mitral commissurotomy. Aortocoronary shunting. Heart transplantation.
Year	II
Faculty	Foreign students training (medical)

1. Relevance of the topic: the rapid development of thoracic surgery associated with surgical treatment of diseases of the lungs, heart, esophagus, requires detailed knowledge of the topography of the chest, study of operative access and surgical procedures during operations on them.

2. Specific objectives:

1. Explain the topography of the heart and great vessels.
2. To analyze modern approachers in heart operations in case of congenital and acquired defects, with ischemic heart disease.
3. Explain how to perform surgical access to the heart.
4. Explain how to perform heart exposure and suturing of heart wounds.
5. Explain how to perform mitral commissurotomy.

3. Tasks for independent work to prepare for the lesson

3.1. List of the main terms, parameters, characteristics that should be learnt by the student while preparing for the lesson

Term	Definition
Mitral commissurotomy	Extension of the left atrioventricular opening in case of its stenosis.
Pericardium puncture	Puncture of pericardium for diagnostic and therapeutic purposes.

3.2. Theoretic questions:

1. Surgical anatomy of the heart (skeletotopy, syntopy, blood supply, innervation, pathways of venous and lymphatic outflow). Congenital and acquired heart defects.

2. Anatomical and physiological substantiation of surgical access to the heart.
3. Pericardial puncture **(Fig. 45)**.
4. Suturing the wounds of the heart.
5. Mitral commissurotomy.
6. Aortocoronary shunting.
7. Principles of heart transplantation.

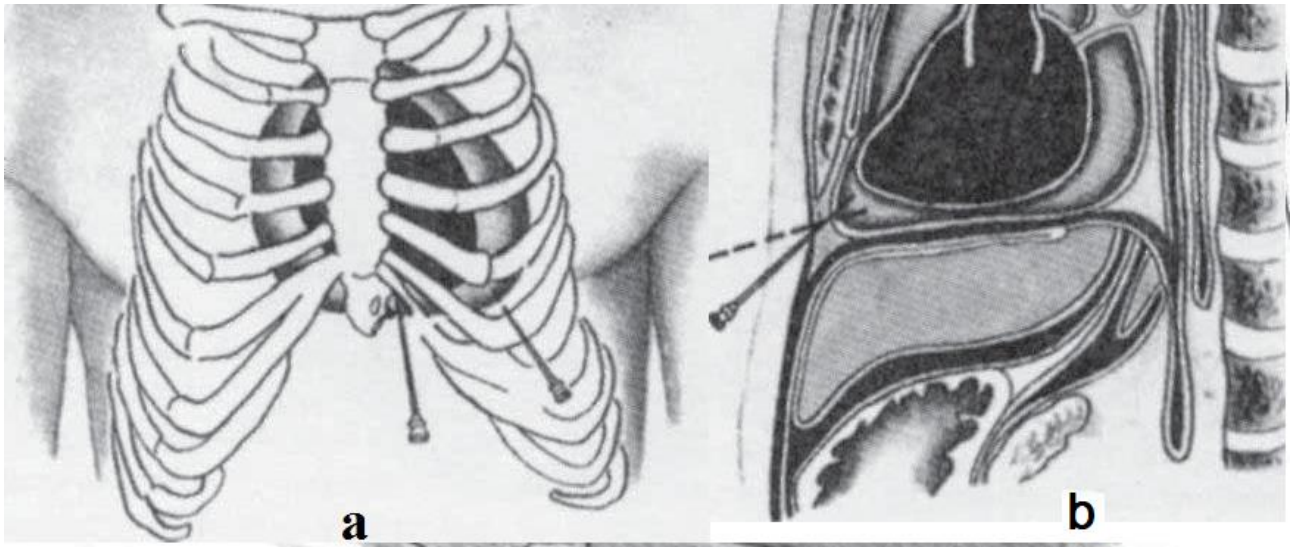

Fig.45. Puncture of pericardium.
a – anterior view;
b − sagittal cut.

3.3. Practical activities performed in class:

1. Suturing a heart wound.
2. Perform a mitral commissurotomy.

4. Content of the topic:

On the heart preparation, students prepare the right and left coronary arteries, which originate from the first branches of the ascending part of the aorta. The veins of the heart merge into the ultimate sinus, which enters the right atrium. From the arch of the aorta the right brachiocephalic trunk extends, which is divided into the right common carotid and right subclavian artery. To the left of the arch of the aorta independently branch the left common carotid and left subclavian artery extend.

On preparations, students study the pulmonary trunk, which originates from the right ventricle. The pulmonary veins leave two trunks from each lung and go to the left atrium. Students study defects of the heart and major vessels.
Then, on an isolated heart, students with an atraumatic needle place 2-3 sutures to the wound of the heart.

Mitral commissurotomy is carried out using valvulotome. After anterior-lateral thoracotomy in the 4-th intercostal space, the pericardium behind the diaphragm nerve is separated from the initial pulmonary trunk to the left ventricle top. On the basis of the auricle of the left atrium the clamping of Satinsky is imposed and over it a purse-string suture. The top of the auricle is cut with scissors. The index finger is inserted into the left atrium, removing the clamp of Satinsky. After the revision of the

left atrioventricular hole, the commissures of the valve are separated by a finger **(Fig. 46).**

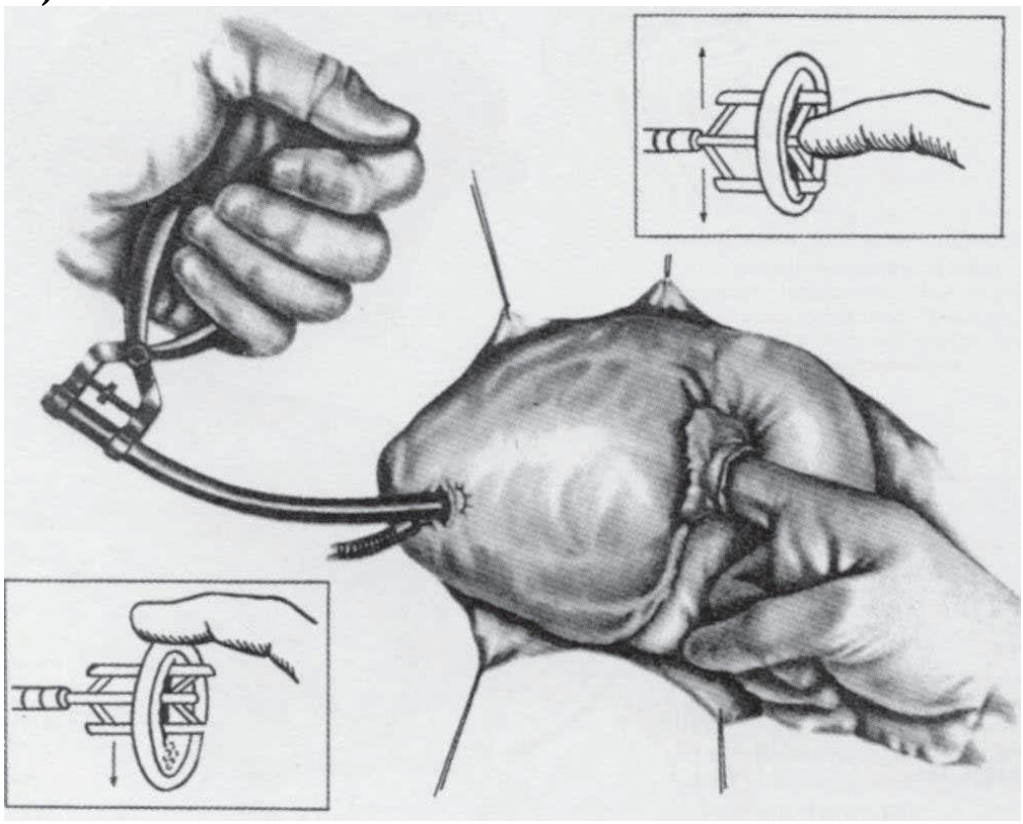

Fig. 46. Mitral commissurotomy. Location of the dilator and its branch at the moment of widening of the left venous opening

Aortocoronary shunting is performed in case of ischemic heart disease. Using a large subcutaneous vein a shunt between the aorta and the coronary artery is placed, bypassing the place of occlusion of the last. Usually, two or three shunts (on the right, left coronary arteries, anterior interventricular branch of the left coronary artery) are superimposed **(Fig.47, 48)**.

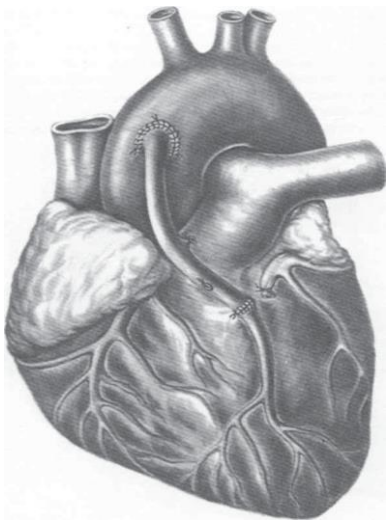

Fig.47. Schematic image of reconstructed anterior interventricular artery

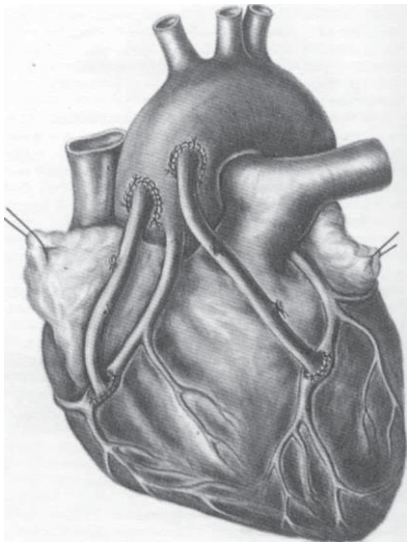

Fig.48. Schematic image of double aortocoronary shunting

The first transplant of the heart was made on December 3, 1967, by C. Barnard. The technique was developed by Shamui and consists in transferring the heart of the donor to the preserved recipient atriums. More than 5,000 heart transplants have been performed in all developed countries of the world.

5. Materials for self-control

A. Tasks for self-control:

Test No.1. Primary surgical debridement of penetrating chest wound is carrying out. Especially carefully the surgeon places sutures, which should provide hermetic state for:

a) pleura;
b) endothoracic fascia;
c) intercostal muscles;
d) superficial muscles;
e) skin and subcutaneous tissue.

Test No.2. A surgeon performs pleural puncture for exudative pleuritis. During the procedure the intercostal nerve was damaged. Where is it necessary to perform a puncture of the thorax to prevent this complication:

a) along the upper edge of the rib located below;
b) along the lower edge of the rib located above;
c) in the middle between the lower margins of ribs;
d) in the middle between the upper margins of ribs;
e) in the upper part of intercostal space.

Test No.3. Patient with pneumonia two weeks later complained of heaviness and moderate pain in the right subcostal area, shortness of breath, weakness. Chest x-ray examination determined accumulation of fluid in the pleural cavity over the dome of diaphragm. In what pleural sinus does fluid accumulate more often?

a) costal diaphragmatic;
b) costal mediastinal;
c) diaphragmatic mediastinal;
d) vertebral mediastinal;
e) costal vertebral.

Test No.4. Patient K. was taken to the surgical department from the scene of traffic accident with a closed chest trauma and right side fracture of the rib. The patient was diagnosed right-sided pneumothorax; he was urgently indicated drainage of the pleural cavity. Choose the place of pleural puncture:

a) in 2nd intercostal space along the medioclavicular line;
b) in 6th intercostal space along the posterior axillary line;
c) in 7th intercostal space along the scapular line;
d) in the projection of pleural sinus;
e) in the place of greatest dullness, which is determined by percussion.

B. Tasks for self-control:

Task No.1. When puncturing the left subclavian vein the transparent opalescent fluid was taken with the syringe when plunger moved backwards. What error was made while performing the puncture?

Task No.2. Performing the puncture of the pleural cavity in 7-th intercostal space along the anterior axillary line near the lower margin of the rib the surgeon received blood in the syringe in the patient with suspected pleural empyema and established diagnosis – hemothorax. What is the surgeon's mistake?

Task No.3. During the puncture of the pleural cavity using a thick needle with a wide lumen without syringe, the patient with pleural empyema experienced accelerated breathing and loss of consciousness. What explains this complication?

References

Basic literature

1. Tsyhykalo O.V. Topographic Anatomy and Operative Surgery / O.V.Tsyhykalo. – Vinnytsia, 2011. — 528 p.
2. Danilchenko S.I. Methodical Instruction For the 3st year students'of stomatological faculty self - preparation work (at class and at home) in studying operative surgery and toographical anatomy / S.I.Danilchenko, E.N.Pronina, O.Yu.Polovik. - Poltava, 2010. — 239 p.

Additional literature

1. Gray. H. F.R.S. Gray's anatomy / Henry F.R.S. Gray, R. A. Bolam. – London, 1994. – 1290 p.
2. McCraw J.B. Athlas of muscle and Musculocutaneous Flaps Head and Neck Reconstruction / John B McCraw, Phillip G Arnold. – Norfolk, Virginia, 1988. – 757 p.
3. Netter F. H. Atlas of Human Anatomy / Frank H.Netter. – East Hannover, New Jersey, 1990. – 592 p.
4. Hnatyuk M.S. Operative surgery and topographical anatomy (lectures) / M.S.Hnatyuk, O.B.Slabuj. – Temopil, 2004. – 212 p.
5. Bernard C. Illustrated Manual of Operative Surgery and Surgical Anatomy / C.Bernard – 1991.-330 p.
6. Pemberton L.B. Workbook of Surgical Anatomy / L.B.Pemberton. – 1990. – 298 p.
7. Gliedman M.L. Atlas of Surgical Techniques / M.L.Gliedman. – New York etc., McGraw – Hill. – 1990. – 420 p.
8. Sabiston D.C. Atlas of General Surgery / D.C.Sabiston. – Philadelphia etc., Saunders. – 1994. – 220 p.
9. Chassin J.L. Operative Strategy in General Surgery / J.L.Chassin. – New York etc., Springer. – 1994. – 368 p.

Academic discipline	Clinical anatomy and operative surgery
Module No. 1	Clinical anatomy and operative surgery of the sites of the head, neck, chest cavity and abdominal cavity.
Content module No.3	Clinical anatomy and operative surgery of areas and organs of abdomen cavity.
Topic 14	Clinical anatomy and operative surgery of the anterior wall of the abdomen. Division on regions. Layer structure, blood supply, innervation, lymphatic outflow. Surgical accesses to the organs of the abdominal region, their anatomical and physiological substantiation. Classification of hernias.
Year	II
Faculty	Foreign students training (medical)

1. Relevance of the topic: abdominal injuries, accompanied by damages to the small intestine, atresia, bowel necrosis as complications of intestinal obstruction require emergency surgery. Therefore, mastering the technique of intestinal sutures, skills in suturing the intestine wound, carrying out its resection and applying enteroanastomosis are of great importance, as they are necessary interventions which often used in surgical practice.

2. Specific objectives:

1. Analyze the layer by layer topography of anterolateral abdominal wall, age and gender related characteristics of blood supply, innervation, lymph flow.
2. Explain how the weak areas of anterolateral wall are formed (white line, umbilical ring).
3. Analyze rational access to the organs of the abdominal cavity.
4. Explain how to perform the most common operations on the liver and extrahepatic biliary tracts.

3. Tasks for independent work to prepare for the lesson

3.1. List of the main terms, parameters, characteristics that should be learnt by the student while preparing for the lesson

Term	Definition
Hernia	Displacement and protrusion of the abdominal organs under the skin through the weak areas of muscular aponeurotic layer of the anterolateral abdomen wall.
Laparatomy	Surgical incision of anterolateral abdomen wall.

3.2. Theoretic questions:

1. Where are the upper, lower and lateral sides of the abdomen located?
2. Name the abdominal areas.
3. Where are the projections of the appendix, gallbladder, pyloric and cardiac parts of the stomach, spleen, liver, loops of the small and large intestines, bladder located?
3. What are the structural peculiarities of the the navel area, the white line of the abdomen?
5. What are the structural features of the direct abdominal muscle sheath at different levels (above and below the umbilical ring)?
6. Where are the muscle nerves of the anterior-lateral wall of the abdomen located?
7. How do nerves and vessels pass to the direct abdominal muscle?
8. What is the most efficient access through the sheath of the direct abdominal muscle?
9. What are the advantages and disadvantages of the surgical access to the appendix? Evaluate the cuts according to Volkovich-Diakonov and Lenander (para-rectal incision).
10. Give a comparative characteristic of longitudinal and transverse sections.
11. Give the definition of "hernia".
12. What types of hernias do you know?

3.3. Practical activities performed in class:

1. Determine the borders of the abdomen, its area, external landmarks, projections of organs.
2. Substantiate and carry out the rational access to the organs of the abdominal cavity.

4. Content of the topic:

On palpation, a xiphoid process and the edges of the costal arches are defined, which are the upper boundary of the anterolateral abdominal wall; crests of the iliac bones, inguinal folds, pubic tubercles and the upper edge of the symphysis of the pubis form the lower boundary of the abdominal wall; the vertical line, drawn from the edge of the XI rib to the crest of the iliac bone, is the lateral border.

There are two horizontal lines: the upper one, which connects the lower points of the X ribs, and the lower − between two iliac bones; as well as two vertical in the outer edges of the rectus abdominis muscles. As a result, the stomach is divided into 9 sections, among which 3 are paired (hypochondriac, lateral, inguinal) and 3 unpaired (supraperitoneal, umbilical, pubic). Pay attention to the contours of the abdomen in relation to the constitution of man.

Determine the external landmarks: navel, white line and indicate projections: the appendix (McBurney's point, Lanz's point), gallbladder (Kehr's point), stomach, liver, spleen, large and small intestine.

Then proceed to the preparation and analysis of layer topography. For this purpose, the following sections of the skin are performed: the upper one − on the upper edge of the IX rib, the bottom − on the inguinal folds, the vertical − on the white line, bypassing the navel to the left. First, the skin is separated from the subcutaneous tissue. Pay attention to the tendon membranes, which connect it with a white line. Emphasize their role in the spread of purulent-inflammatory processes.

Superficial vessels and nerves are revealed in the subcutaneous tissue: the branches of the lower intercostal arteries and nerves (VI-XII), the superficial epigastric artery, the superficial iliac circumflex artery and the skin branches of the iliohypogastric nerve and ilioinguinal nerve.

The muscle preparation begins from the lateral abdominal wall by separating the muscles from the ribs. First, separate the external abdominal oblique muscle, then the internal abdominal oblique muscle from the transverse abdominal oblique muscle.

Pay attention to the fact that the intercostal nerves (VII-X pairs) lie under the perimysium of the transverse muscle; XI and XII intercostal and iliohypogastric nerves lie under the perimysium of the internal oblique muscle. Intercostal arteries are similarly located.

For the preparation of the rectus abdominis muscle, a cut of the anterior wall of its sheath from the edge of the rib arch to the pubic bone is performed. The top and the bottom of the vertical section complement by horizontal section. Pay attention to the fusion of the sheath with the muscle at the level of the tendon membrane and the presence of intercostal vein, artery, and nerve that pass through them. By shifting the rectus abdominis muscle to the median line, expose the branches VI-XII of the intercostal nerves, which pass through it in the oblique-transverse direction; pay attention to the presence of the cellular gap along the length of the sheath of the rectus abdominis muscle, through which abscesses and hematomas can spread. Emphasize that for the blockade of the nerve trunks a solution of novocain is introduced into the retromuscular gap. Pay attention to the semicircular line on the posterior wall of the sheath of the rectus abdominis muscle.

Between the inner edges of the direct muscles, the white abdominal line, the placement of the tendon bundles are examined. The possibility of herniation is considered. The umbilical ring structure is studied in detail. It is determined after the removal of fibrous tissue; it is cut up and down, exposing the obstructive vessels and the urinary duct of the posterior part of the anterior abdominal wall. Then the transverse fascia and parietal peritoneum are examined. The students emphasize the presence of visceral space, its clinical significance.

The surgical accesses to the organs of the abdominal cavity is studied and performed. Under the guidance of a teacher, students independently master the technique of median, paramedial, transrectal, pararectal, oblique, transverse, and combined incisions.

More detailed analysis of the oblique cross-section according to Volkovich-Diakonov (through McBurney's point) is carried out, considering its physiological features.

Studying the abdominal linea alba, it is noted that it has spaces through which vessels and nerves pass along with fiber. In some cases, these spaces can become hernial gates, through which the peritoneal cell and parietal peritoneum protrude, forming hernias of the white abdominal line.

5. Materials for self-control

A. Tasks for self-control:

Test No.1. During the medial laparotomy, the surgeon damaged the round ligament of the liver. What vessel could be damaged at the same time?

a) umbilical artery;
b) umbilical vein;
c) inferior epigastric vein;
d) superior epigastric vein;
e) portal vein.

Test No.2. Above what formation is the peritoneum fold which passes from the navel down along the medial line located?
a) umbilical vein;
b) umbilical artery;
c) inferior epigastric vein;
d) superior epigastric vein;
e) urachus

Test No.3. The doctor performs palpation of caecum. On which area of the anterior-lateral wall of the abdomen is it mainly projected?
a) left side;
b) right side;
c) regio inguinalis sinistra;
d) regio inguinalis dextra;
e) regio suprapubica.

Test No.4. The surgeon dissected the white abdominal line within the epigastrium. What are the features of the white line in this area compared to the lower abdomen?
a) thin, narrow;
b) thin, wide;
c) thick, narrow;
d) thick, wide;
e) absent.

Test No.5. The patient has an injury of the anterior-lateral abdominal wall. In what tissue layer damage is the wound of the anterior-lateral abdominal wall considered to be permeable?
a) deep layer of superficial fascia;
b) walls of the hollow internal organs;
c) muscle-aponeurotic layer;
d) interior abdominal fascia;
e) parietal peritoneum.

Test No.6. The surgeon performed the access to the stomach from the tip of the xiphoid process vertically downwards within the epigastric region. How is this type of laparotomy called?
a) middle;
b) upper middle;
c) medium middle;
d) upper transverse;
e) transrectal.

B. Tasks for self-control:

Task No. 1. The patient was hospitalized in surgical department with a closed abdominal trauma. The midline laparotomy was performed for revision of the abdominal cavity organs. What are the landmarks for midline laparotomy? Name all tissues that were cut by the surgeon. From which side is umbilicus more often bypassed and why?

Task No. 2. When operating a seven-year-old child with a strangulated umbilical hernia, the surgeon made vertical access to the hernial sac, expanding the hernial gates. At the same time, the hernial bag itself fit to the abdominal cavity. The surgeon carried out the plastic hernial gates according to Sapezhko and closed the surgical wound in a layer. What is the surgeon's mistake?

Task No.3. A patient with penetrating wound of the abdominal cavity in the navel region was hospitalized in the surgical department. What are the damaged layers of the abdominal wall?

Task No. 4. A patient with penetrating wound of the abdominal cavity in the regio inguinalis sinistra was hospitalized. What are the damaged layers of the abdominal wall?

Task No. 5. A patient aged 28 years was taken to the surgical department by ambulance. Two hours ago, she felt severe pain in the right inguinal region. The patient is overweight. The diffuse pain in the abdominal wall region was determined, mainly around the navel and in the right inguinal region, as well as a slight protective tension of the muscles, weak irritation of the peritoneum. Temperature was 38 ° C. Vomiting occured. Pulse was within 80-90 / min. On vaginal examination, the sharp pain in the right uterine appendages was observed. The third month of menstruation delay was registered. What diagnosis should a surgeon make? What incision should he perform to enter the abdominal cavity?

References

Basic literature

1. Tsyhykalo O.V. Topographic Anatomy and Operative Surgery / O.V.Tsyhykalo. – Vinnytsia, 2011. — 528 p.
2. Danilchenko S.I. Methodical Instruction For the 3st year students'of stomatological faculty self - preparation work (at class and at home) in studying operative surgery and toographical anatomy / S.I.Danilchenko, E.N.Pronina, O.Yu.Polovik. - Poltava, 2010. — 239 p.

Additional literature

1. Gray. H. F.R.S. Gray's anatomy / Henry F.R.S. Gray, R. A. Bolam. – London, 1994. – 1290 p.
2. McCraw J.B. Athlas of muscle and Musculocutaneous Flaps Head and Neck Reconstruction/John B McCraw, Phillip G Arnold. – Norfolk, Virginia, 1988.– 757 p.
3. Netter F. H. Atlas of Human Anatomy / Frank H.Netter. – East Hannover, New

Jersey, 1990. – 592 p.
4. Hnatyuk M.S. Operative surgery and topographical anatomy (lectures) / M.S.Hnatyuk, O.B.Slabuj. – Temopil, 2004. – 212 p.
5. Bernard C. Illustrated Manual of Operative Surgery and Surgical Anatomy / C.Bernard – 1991.-330 p.
6. Pemberton L.B. Workbook of Surgical Anatomy / L.B.Pemberton. – 1990. – 298 p.
7. Gliedman M.L. Atlas of Surgical Techniques / M.L.Gliedman. – New York etc., McGraw – Hill. – 1990. – 420 p.
8. Sabiston D.C. Atlas of General Surgery / D.C.Sabiston. – Philadelphia etc., Saunders. – 1994. – 220 p.

Academic discipline	Clinical anatomy and operative surgery
Module No.1	Clinical anatomy and operative surgery of the areas of the head, neck, chest cavity and abdominal cavity.
Content module No.3	Clinical anatomy and operative surgery of the areas and organs of the abdominal cavity.
Topic 15	Inguinal region. Inguinal canal, surgery of inguinal hernias. Operative treatment of congenital, strangulated and moving hernias.
Year	II
Faculty	Foreign students training (medical)

1. Relevance of the topic: in order to understand the mechanism of the inguinal hernia occurrence, it is necessary to study the anatomical-physiological, age-related, and gender-related characteristics of the inguinal area structure. Choose the method for inguinal canal plastic repair.

2. Specific objectives:

1. Explain anatomy of the inguinal area: boundaries, external landmarks, layer topography.
2. To analyze the anatomy of the inguinal space as a weak place of the muscular-aponeurotic layer.
3. Explain the anatomy of the posterior surface of the anterior abdominal wall and the inguinal area (fossas and folds of the peritoneum).
4. Explain the surgical anatomy of oblique and straight hernias.
5. Explain how to apply the most common surgical methods of hernia and plasty of the inguinal canal.

3. Tasks for independent work to prepare for the lesson

3.1. List of the main terms, parameters, characteristics that should be learnt by the student while preparing for the lesson

Term	Definition
Removal of hernias according to Bassini	Surgical method for inguinal hernias treatment with plastic of the posterior wall of the inguinal canal.
Removal of hernias according to Girard-Spasokukotsky	Surgical method for inguinal hernias treatment with plastic of the anterior wall of the inguinal canal.
Removal of hernias according	Surgical method for the inguinal hernias

to Martynov	treatment, which forms a duplicate aponeurosis of the external abdominal oblique muscle, for which the upper flap of aponeurosis is attached to the inguinal ligament and is applied to the lower flap on top of it (without muscle stitching).

3.2. Theoretic questions:

1. What are inguinal triangle and inguinal space?
2. Where are the surface and deep inguinal rings located?
3. What forms the folds and fossa on the inner surface of the anterior abdominal wall?
4. Where is spermatic cord located in relation to hernial bag in case of straight and oblique inguinal hernias? What anatomical formations form spermatic cord?
5. How is the skin cut performed in case of straight and oblique inguinal hernias?
6. How are the plastics of inguinal canal according to Girard-Spasokukotsky, Kimbarovsky, Martynov, Bassini carried out?
7. Is it possible to operate the primary form of hernia (in a child) without the opening of inguinal canal?

3.3. Practical activities performed in class:

1. Determination of the inguinal area borders, external and internal landmarks and projections: pubic tubercle, superficial inguinal ring, inguinal groove, edges of the internal oblique and transverse muscles.
2. Treatment of hernial bag and plastic of the inguinal canal walls in various ways: Girard-Spasokukotsky, Martynov, Bassini and their modifications (Kimbarovsky's sutures).

4. Content of the topic:

At the beginning of the lesson, the teacher checks the correct understanding of the topic and tasks of practical classes by students through oral questioning and self-training of students.

Then a group of students under the control of a teacher begins to review the material: on the tables, the skeleton and the corpse determine the borders of the inguinal area, find external landmarks: the anterior superior iliac spine, pubic tubercle, symbiosis of pubis, inguinal ligament, external edge of the direct muscle of the abdomen. Then they determine the projection of the inguinal triangle, limited from the bottom by the inguinal ligament, medially – by the outer edge of the direct muscle of the abdomen and from above – by a horizontal line drawn through the point located on the border of the middle and outer third of the inguinal ligament. Within this triangle the inguinal canal and its surface and deep rings are located.

Then they begin to prepare the walls of the inguinal canal and spermatic cord. For this, medially from the pubic tubercle, a place of the spermatic cord output − the superficial inguinal ring is determined. From it, an aponeurosis of the external oblique abdominal muscle (anterior wall of the inguinal canal) is cut 5-6 cm upwards. The edges of aponeurosis are retracted up and down, the lower edge of the internal oblique and transverse abdominal muscles (the upper wall of the inguinal canal) is

detected. Spermatic cord is separated and pulled down. They uncover the inguinal ligament in the form of a groove (the lower wall of the inguinal canal). The fascia plate is stretched between the inguinal ligament and the posterior surface of the transverse abdominal muscle − the posterior wall of the inguinal canal − formed by transverse fascia.

Pay attention to the fact that the area of transverse fascia is not covered by muscles, has a triangular or oval shape and is called the inguinal interspace. Consider the relationship between the width of the inguinal space and the degree of muscle development (the form of the inguinal gap). The place in the transverse fascia, where the spermatic cord enters the inguinal canal, is called the deep inguinal ring. It usually corresponds to the lateral inguinal fossa.

From the abdominal cavity on the peritoneum of the anterior abdominal wall the medial and lateral inguinal fossas are determined. They compare projections of the inguinal fossas of the peritoneum with superficial and deep inguinal rings.

The teacher focuses on the features of the ilioinguinal nerve topography, which lies on the superior wall of the inguinal canal and on the elements of the spermatic cord. These data should be taken into account during the hernia resection. Students determine the elements of surgical anatomy of hernia: hernial orifices, hernia sacs, hernial content. In this connection, a variety of inguinal hernias are discussed: straight, oblique, congenital, acquired, slipped and strangulated. Special attention is paid to the characterization of straight and oblique inguinal hernias. They emphasize the differences in the location of the hernial orifices, the relation of the hernial sac and the elements of the spermatic cord, connection with the congenital developmental anomalies (congenital inguinal hernia) **(Fig.49)**.

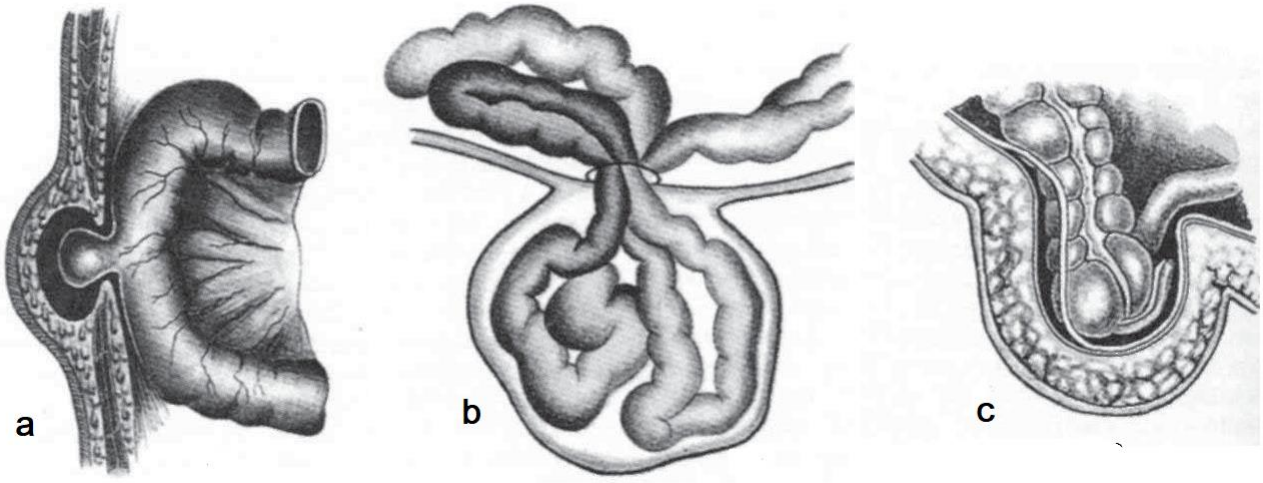

Fig.49. Types of hernias

a − parietal strangulated intestinal; b − retrograde (reverse) strangulated; c − retroperitoneal slipped hernia of the cecum.

Then a group of students was divided into surgical teams, which carry out simulation operation on hernia. They substantiate the access and emphasize the need to cut the inguinal canal along its length and discuss the stages of the surgical method: treatment of hernial bag and hernial orifices plasty according to Girard-Spasokukotsky, Martynov, Bassini. The contribution of prominent surgeons in the study of surgical treatment of hernias (Spasokukotsky, Bobrov, Krymov, Martynov, Kimbarovsky, Kukudjanov) was focused on.

The possibility of surgery on hernia removal without cutting of the inguinal canal in the initial forms of hernia in children (according to Ru, Opel, Krasnobaev) was also discussed.

Operation on inguinal hernias

Removal of hernias according to Bassini

The patient's position is on the back. Sometimes with large hernias − Trendelenburg position is possible. Anesthesia is local. Transverse cut in length 8-12cm is performed. Almost parallel to the inguinal ligament on the largest outgrowth of the hernial sac the skin with a subcutaneous tissue and superficial fascia is dissected. The dissected blood vessels (superficial epigastric artery and external pudendal artery) are ligated. Through the probe introduced into the outer opening of the inguinal canal, the aponeurosis of the external oblique abdominal muscle is dissected. Its ends are separated in sides, the hernial sac is removed, and then the plastic of the posterior wall of the inguinal canal is performed. The spermatic cord is raised on a gauze band, and the lower edge of the internal oblique and transverse muscles is sutured to the inguinal ligament.

Sutures applied on the upper corner of the wound should not compress the spermatic cord. A spermatic cord is put on the formed muscular bed, on top of which the edge of the dissected aponeurosis of the external oblique muscle of the abdomen is stitched, the skin is sutured.

Removal of hernias according to Girard-Spasokukotsky

Unlike Bassini method, the Girard method is aimed at the plastic of the anterior wall of the inguinal canal.

The lower edges of the internal oblique and transverse muscles are applied to the inguinal ligament above the spermatic cord. From above, the upper edge of the aponeurosis of the abdominal external oblique muscle is sutured to the inguinal ligament, after which the lower one is applied to it and fixed with several stitches. As a result, a duplicate of the aponeurosis of the external oblique abdominal muscle forms in the area of the inguinal triangle.

In the modification of Spasokukotsky, the upper edge of the aponeurosis flap of the external oblique abdominal muscle, the edge of the internal oblique and transverse abdominal muscles are sutured, and then from the top (duplicate), the lower edge of the aponeurosis flap of the external oblique abdominal muscle is applied. According to Martynov method, a duplicate of the aponeurosis of the external oblique abdominal muscle is formed, for which the upper flap of aponeurosis is applied to the inguinal ligament and the lower flap is placed on top of it (without muscle stitching) **(Fig. 50, 51, 52, 53).**

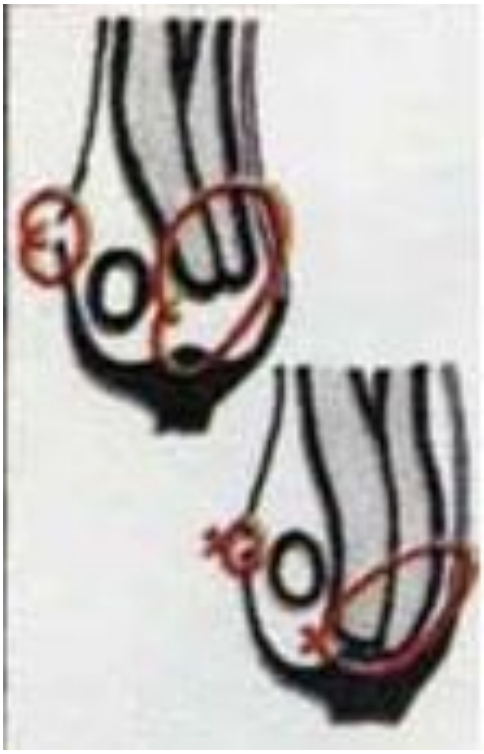

Fig.50. Inguinal canal plastic according to Bassini

Fig.51. Inguinal canal plastic according to Girard

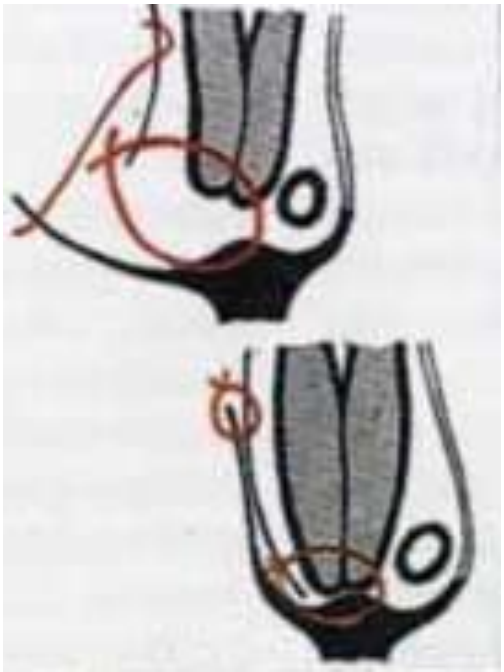

Fig. 52. Inguinal canal plastic according to Girard-Spasokukotsky

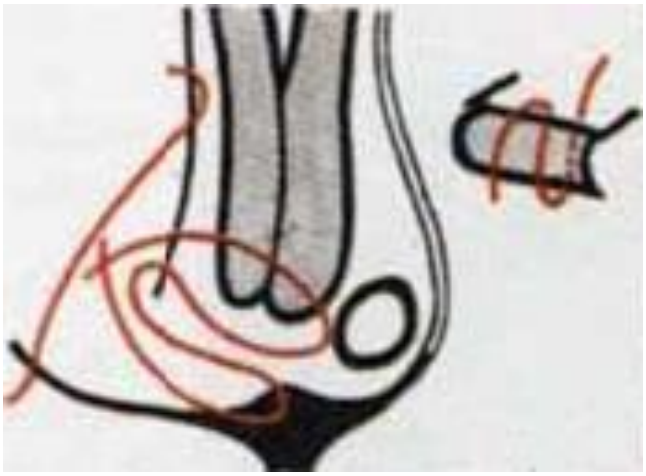

Fig. 53. Inguinal canal plastic according to Kimbarovsky

5. Materials for self-control
A. Tasks for self-control:

Test No.1. During inguinal hernia surgery, the surgeon drew the contents of the inguinal canal. What is the content of this canal in men?
a) inguinal ligament;
b) spermatic cord;
c) inferior epigastric artery;
d) round ligament of liver;
e) round ligament of uterus.

Test No. 2. What fold of the peritoneum is located above the inferior epigastric artery?
a) middle;
b) medial;
c) lateral;
d) upper;
e) lower.

Test No. 3. A patient was presented with hernia of the medial inguinal fossa. What type of hernia is observed in this situation?
a) oblique;
b) supravesical;
c) straight inguinal;
d) congenital inguinal;
e) femoral.

Test No. 4. The surgeon performs the plasty of the inguinal canal in relation to the oblique inguinal hernia. The deep inguinal ring is moderately enlarged. Which wall of the inguinal canal should be strengthened in this case?
a) anterior;
b) posterior;
c) superior;
d) inferior;
e) superior and inferior.

B. Tasks for self-control:
Task No.1. Performing surgical intervention in case of oblique hernia, the surgeon cut the skin, subcutaneous tissue, fascia. What layers of the abdominal wall should the surgeon cut to expose a hernial bag?

Task No.2. The patient on the second day after the operation on the leftsided inguinal hernia felt pain along the spermatic cord. The left half of the scrotum is enlarged, cyanotic. Determine the course of this complication. What are your recommendations?

Task No.3. Performing operative intervention in case of the strangulated inguinal hernia, the surgeon and anesthetist conducted premedication and anesthesia. The surgeon exposed the hernial sac by layer-by-layer dissection of the tissues, cut it, but did not reveal the contents of the hernial sac. What mistake did the surgeon make?

Task No. 4. During the operation of herniation in a patient aged 12 years, it was determined that testicle was inside the hernia sac. Determine what hernia developed in the patient. Explain the mechanism of its origin. What are the features of operative approach?

Task No. 5. During the operation for a strangulated hernia, two loops of the small intestine were revealed in the hernial sac. After opening the occlusive ring, they were recognized as viable (pink, peristaltic, the vessels of the mesentery pulsate) and were embedded in the peritoneal cavity. Treatment of the hernial bag and plastic of the hernial gates were carried out. The next day, the patient developed the signs of peritonitis. What mistake did the surgeon make? What types of hernia strangulation do you know?

References

Basic literature

1. Tsyhykalo O.V. Topographic Anatomy and Operative Surgery / O.V.Tsyhykalo. – Vinnytsia, 2011. — 528 p.
2. Danilchenko S.I. Methodical Instruction For the 3st year students'of stomatological faculty self - preparation work (at class and at home) in studying operative surgery and toographical anatomy / S.I.Danilchenko, E.N.Pronina, O.Yu.Polovik. - Poltava, 2010. — 239 p.

Additional literature

1. Gray. H. F.R.S. Gray's anatomy / Henry F.R.S. Gray, R. A. Bolam. – London, 1994. – 1290 p.
2. McCraw J.B. Athlas of muscle and Musculocutaneous Flaps Head and Neck Reconstruction / John B McCraw, Phillip G Arnold. – Norfolk, Virginia, 1988. – 757 p.
3. Netter F. H. Atlas of Human Anatomy / Frank H.Netter. – East Hannover, New Jersey, 1990. – 592 p.
4. Hnatyuk M.S. Operative surgery and topographical anatomy (lectures) / M.S.Hnatyuk, O.B.Slabuj. – Temopil, 2004. – 212 p.
5. Bernard C. Illustrated Manual of Operative Surgery and Surgical Anatomy / C.Bernard – 1991.-330 p.
6. Pemberton L.B. Workbook of Surgical Anatomy / L.B.Pemberton. – 1990. – 298 p.
7. Gliedman M.L. Atlas of Surgical Techniques / M.L.Gliedman. – New York etc., McGraw – Hill. – 1990. – 420 p.
8. Sabiston D.C. Atlas of General Surgery / D.C.Sabiston. – Philadelphia etc., Saunders. – 1994. – 220 p.
9. Chassin J.L. Operative Strategy in General Surgery / J.L.Chassin. – New York etc., Springer. – 1994. – 368 p.

Academic discipline	Clinical anatomy and operative surgery
Module No.1	Clinical anatomy and operative surgery of the sites of the head, neck, chest cavity and abdominal cavity.
Content module No.3	Clinical anatomy and operative surgery of the sites and organs of the abdominal cavity.
Topic 16	Femoral canal. Operations involving femoral hernia. Operative treatment of strangled femoral hernia. Possible complications. Hernia of the white abdominal line, umbilical hernia.
Year	II
Faculty	Foreign students training (medical)

1. Relevance of the topic: the treatment of femoral hernia requires the study of the anatomical features of the proximal femur, muscle and vascular lacunae, femoral canal. It is necessary for the method choice of surgical treatment in case of femoral hernias.

2. Specific objectives:

1. To analyze the anatomy of the femoral canal, which is formed as a result of the passage of the femoral hernia, its inner ring and oval hole, the walls of the femoral canal.
2. Explain the surgical anatomy of the hernia of the abdominal linea alba and umbilical ring.
3. Explain how to perform the most common methods of femoral hernia surgery.
4. Explain how to perform surgical interventions on the hernia of the white abdominal line and umbilical ring.

3. Tasks for independent work to prepare for the lesson

3.1. List of the main terms, parameters, characteristics that should be learnt by the student while preparing for the lesson

Term	Definition
Closure of hernial gates by Cooper's method	Closure of the hernial gates of the femoral hernia by suturing the inguinal ligament to the pectineal ligament.
Removal of hernia according to Rudzi-Paralavecho	Surgical method of treating femoral hernia from inguinal access.
Removal of hernia according to Bassini	Surgical method of treating femoral hernia with femoral access.

Removal of hernia according to Lexer	Surgical method for treating small umbilical hernia in children when the umbilical ring is stitched with a purse-string suture.

3.2. Theoretic questions:

1. How are muscular and vascular lacunae formed?
2. What anatomical formations are limited by the internal opening of the femoral canal?
3. Name the walls of the femoral canal in the formation of a hernia.
4. How can femoral hernia be distinguished from an inguinal hernia? What is the classification of femoral hernias?
5. What are the operational accesses that can be performed during removal of femoral hernias?
6. How is a plastic of hernial gates according to Cooper-Bassini performed?
7. How is a plastic of hernial gates according to Rudzi-Paralavecho performed?
8. Describe the operations of umbilical hernia (methods of Sapezhko, Lekser, and Meyo).

3.3. Practical activities performed in class:

1. To prepare the space under the inguinal ligament.
2. Plastic of the femoral canal by femoral and inguinal ways (Cooper, Bassini, Rudzi, Paralavecho).
3. Carrying out operations for umbilical hernia (methods of Sapezhko, Lekser, and Meyo).

4. Content of the topic:

On the tables, skeletons and corpse students are studying the external guidelines of the femoral canal. Then begin the preparation of the corpse. First, make a longitudinal section of the skin on the front of the thigh length of 10-12 cm, then horizontal, parallel and below the inguinal ligament. Make it to the medial side and expose subcutaneous tissue with a large subcutaneous vein and its branches, tracing the course of this vein until it passes under the surface leaf of a wide fascia of the thigh. Find, that the fascia in this place is loose and has a number of openings for the passage of small blood and lymph vessels; it is called cribriform fascia (Hesselbach's fascia). Dissect this fascia leaf and open the place of falling of a large subcutaneous vein into the femoral vein (hidden hole). Outside of the femoral vein, the femoral artery is located. Both vessels lie in the lateral part of the vascular lacunae. The space in the vascular lacunae, which is located inwards from the vessels and in particular from the vein, is called (in the formation of a hernia) the inner ring of the femoral canal.

The inner ring of the femoral channel is limited: the front and the upper part − the inguinal ligament, medial − lacunar ligament and lateral − femoral vein. The walls of the femoral canal during the passage of a hernia: the outside − the femoral vein, in front − the surface leaf of a wide fascia, behind − a deep leaf of the same fascia.

Conditionally, the outer ring of the femoral canal is represented by an oval fossa, in which the sickle edge and two horns are distinguished − the upper and lower

ones, which are formed by a wide fascia. As noted above, in this place, a large subcutaneous vein enters into the femoral vein, covered with a cribriform fascia. Two operative accesses are used for hernial gates plastic regarding a femoral hernia. The first one is femoral when the treatment of the hernial sac and the closure of the hernial gates are carried out from the front of the thigh; the second is inguinal when these stages of the operation are carried out through the inguinal canal, reinforcing it at the end of the operation.

At the femoral access, attention is drawn to the need for careful treatment of the large subcutaneous vein, to the lymph nodes and femoral vessels (arteries and veins), in order to avoid their damage. Emphasize that the technique of processing a hernial sac does not differ from the same for inguinal hernias. The hernial gate is closed by suturing the inguinal ligament to the pectineal ligament (Cooper's method). For this purpose, pull the femoral vein outwards and apply 2-3 silk sutures using abruptly curved needles. The superficial leaf of a wide fascia, which restricts a hidden hole (sickle edge), is stitched with several sutures to the fascia of the pectineus muscle (the method of Bassini).

For inguinal access (Rudzi-Paralavecho method), the incision over the inguinal ligament is performed, revealing the inguinal canal, separating the spermatic cord and pushing it aside. Longitudinally dissect the posterior wall of the inguinal canal (transverse fascia), pull up the upper edge of the transverse fascia, penetrate into the subserous layer of peritoneum and find there a neck of the hernial sac. The hernial sac is removed from the inguinal canal and treated in the usual way − cut between the two tweezers closer to the bottom, then cut along the sac. The entrails, contained in the sac, are examined and, if they are not changed, set them to the abdominal cavity. Empty hernial sac is pulled out, sutured at the neck, banded on both sides and cut off. Then make plastic of the hernial gates.

To this end, the inguinal and pectineal ligaments are freed from the fiber and by two or three silk sutures stitching the inguinal ligament to the pectineal ligament (Rudzi method); if along with the inguinal ligament the lower edges of the internal oblique and transverse abdominal muscles are also sutured to the pectineal ligament (the method of Paralavecho), then simultaneously with the closure of the femoral ring the inguinal canal is fixed.

In case of strangulated femoral hernia, lacunar ligament is usually dissected. It is necessary to remember about the possibility of abnormal withdrawal of the obturator artery. Usually, the obturator artery originates from the internal iliac artery; but in 28-30% of cases, it may go away from the lower peritoneum artery or from the external iliac artery, located in such cases behind the lacunar ligament. The venous ring is surrounded by vessels: on the upper part of the inguinal ligament − the inferior epigastric artery, outside − the femoral vein, and behind the lacunar ligament − the obturator artery. Such location of vessels is called "the crown of death", since the dissecting of the strangulating ring (lacunar) can lead to lethal bleeding.

During the operations on umbilical hernia, the incision is performed along the white abdominal line or transverse, evading the hernial protrude from below.

The skin is prepared carefully from the hernial sac and the hernial gates formed by the edge of the umbilical ring are exposed. Finally, isolate and treat the hernial sac. Next, the umbilical ring is cut down along the white abdominal line (according to Sapezhko) or in the transverse direction (according to Meyo). Apply interrupted

stitches to aponeurotic patch, suturing them in the form of duplicates. In children with small umbilical hernias, the umbilical ring is sutured with a purse-string suture (according to Lekser). Above the tight purse-string suture the separate interrupted stitches are applied.

5. Materials for self-control

A. Tasks for self-control:

Test No.1. The patient has hernial protrusion from the outer edge of the left direct muscle of the abdomen 4 cm below the navel level. In what "weak" place did hernia develop in this case?

a) umbilical ring;
b) white line;
c) semilunar line;
d) arcuate line;
e) inguinal gap.

Test No.2. The surgeon performed plasty of the umbilical ring according to Mayo-Diakonov. What suture was used by a surgeon in this case to strengthen the umbilical ring?

a) purse-string suture;
b) suture according to Multanovsky;
c) simple continuous;
d) simple interrupted suture;
e) radial.

Test No.3. The surgeon performed the plasty of the umbilical ring according to Sapezhko. It was accompanied by diastase of the abdominal muscles. In what direction should the umbilical ring dissected in this case?

a) longitudinally;
b) transversal;
c) oblique from left to right
d) oblique from right to left
e) radial.

Test No.4. The surgeon stitched a white abdomen line after the upper middle laparotomy. What suture can be used rationally to prevent the formation of postoperative hernia?

a) simple nodal;
b) P-like;
c) suture according to Multanovsky;
d) simple continuous;
e) purse-string suture.

B. Tasks for self-control:

Task** No.**1. **The** patient with closed trauma of abdomen was admitted to the surgical department. The middle laparotomy for the revision of organs of abdominal

region was performed. Specify the landmarks for middle laparotomy. Why must a surgeon do a cut on the left of belly-button?

Task** No.**2. Operating a seven year old child with umbilical hernia, a surgeon performed the vertical access to the hernia sack, extending a hernia gate. Thus, a hernia sack was spontaneously set in abdominal region. A surgeon performed the plastic of hernia gate on Sapezhko and closed an operating wound. What is the error of surgeon?

Task** No.**3. Patient with the penetrable wound of abdominal region in a left inguinal region was admitted to the surgical department. Determine the layers of damaged abdominal wall.

References

Basic literature

1. Tsyhykalo O.V. Topographic Anatomy and Operative Surgery / O.V.Tsyhykalo. – Vinnytsia, 2011. — 528 p.
2. Danilchenko S.I. Methodical Instruction For the 3st year students'of stomatological faculty self - preparation work (at class and at home) in studying operative surgery and toographical anatomy / S.I.Danilchenko, E.N.Pronina, O.Yu.Polovik. - Poltava, 2010. — 239 p.

Additional literature

1. Gray. H. F.R.S. Gray's anatomy / Henry F.R.S. Gray, R. A. Bolam. – London, 1994. – 1290 p.
2. McCraw J.B. Athlas of muscle and Musculocutaneous Flaps Head and Neck Reconstruction / John B McCraw, Phillip G Arnold. – Norfolk, Virginia, 1988. – 757 p.
3. Netter F. H. Atlas of Human Anatomy / Frank H.Netter. – East Hannover, New Jersey, 1990. – 592 p.
4. Hnatyuk M.S. Operative surgery and topographical anatomy (lectures) / M.S.Hnatyuk, O.B.Slabuj. – Temopil, 2004. – 212 p.
5. Bernard C. Illustrated Manual of Operative Surgery and Surgical Anatomy / C.Bernard – 1991.-330 p.
6. Pemberton L.B. Workbook of Surgical Anatomy / L.B.Pemberton. – 1990. – 298 p.
7. Gliedman M.L. Atlas of Surgical Techniques / M.L.Gliedman. – New York etc., McGraw – Hill. – 1990. – 420 p.
8. Sabiston D.C. Atlas of General Surgery / D.C.Sabiston. – Philadelphia etc., Saunders. – 1994. – 220 p.
9. Chassin J.L. Operative Strategy in General Surgery / J.L.Chassin. – New York etc., Springer. – 1994. – 368 p.

Academic discipline	Clinical anatomy and operative surgery
Module No. 1	Clinical anatomy and operative surgery of the sites of the head, neck, chest cavity and abdominal cavity.
Content module No.3	Clinical anatomy and operative surgery of the sites and organs of the abdominal cavity.
Topic 17	Clinical anatomy of the abdominal cavity. Placement of the peritoneum relative to the abdominal organs. Canals, anguli, peritoneal bursae and their significance. Ways of inflammatory processes spreading.
Year	II
Faculty	Foreign students training (medical)

1. Relevance of the topic: acute peritonites currently remain the most common cause of lethal cases due to acute surgical abdominal diseases. Acute inflammatory diseases, traumatic lesions, neoplasms, defects of development are rather common pathologies of the abdominal cavity. Timely topical diagnoses and their successful treatment are possible only in case of detailed knowledge of topographic anatomy of the peritoneum and organs of the abdominal cavity.

2. Specific objectives:

1. To explain the topography of the peritoneum, its organs (connection of the greater and lesser omenta, canals, sinuses, anguli).
2. To analyze the ways of purulent process spreading in the abdominal cavity, the formation of ulcers with limited peritonitis. To substantiate the possibility of internal hernias formation.

3. Tasks for independent work to prepare for the lesson

3.1. List of the main terms, parameters, characteristics that should be learnt by the student while preparing for the lesson

Term	Definition
Abdominal cavity	Space that is limited by the anterior-lateral wall of the abdomen; posteriorly – by a lumbar area; superiorly – by diaphragm; from below it passes into the cavity of a small pelvis. The abdominal cavity consists of a cavity of the peritoneum and retroperitoneal space.
Peritoneal cavity	Space limited by the serous membrane – peritoneum.

3.2. Theoretic questions:

1. Topography of the peritoneum and its location relative to the organs of the peritoneal cavity.
2. Explain the terms "abdominal cavity", "peritoneal cavity".

3. What peritoneal bursae are located in the upper floor of the peritoneal cavity, their topography.
4. How is the omental foramen formed, what is its practical significance?
5. How are right and left side canals, right and left mesentery sinuses formed? Their practical significance.

3.3. Practical activities performed in class:

1. Revision of the organs of the upper floor of the peritoneal cavity.
2. Revision of the hepatic, pregastric, omental bursae, mesentery sinuses, right and left mesenteric canals.
3. Isolation of the abdominal trunk.
4. Isolated elements of the hepatoduodenal ligament.

4. Content of the topic:

The skin of the anterolateral abdomen wall is elastic, it can significantly dilate under physiological conditions (pregnancy) and pathological processes in the abdominal cavity (ascites, tumors, accumulation of blood and pus). Subcutaneous fatty tissue of the anterolateral abdomen wall is well developed. Superficial neurovascular formations pass between the leaves of the superficial (subcutaneous) fascia. The proper fascia of the abdomen is a thin fibrous layer, intertwined in the inguinal ligament. The external oblique abdominal muscle (m.obliquus extemus abdominis) occupies a superficial position among the muscles of the anterolateral abdomen wall. It arises from VII−VIII ribs and lumbar fascia. Its fibers are directed forward and downward and are attached to external margin of iliac wing. The last part of this muscle passes into aponeurosis, which forms the axillary ligament and linea alba of the abdomen. It should be noted that aponeurosis m. obliquus extemus adominis in the medial part of the inguinal ligament divides into two parts and forms external opening of the inguinal canal. The internal oblique abdominal muscle (m. oliquus internus abdominis) has a fan-like direction of the muscle fibers, directed from below upwards and medialwards. The aponeurosis of this muscle, when approaching the rectus abdominis muscle (m. rectus abdominis), divides into two parts, that along with aponeurosis of the external oblique abdomen muscle form the sheath of this muscle. The lower part of m. obliquus internus abdominis adjoins to the inguinal ligament, with which it is not fused. The lower fibers of the internal oblique muscle form levator of testicle (m. cremaster). The deepest position is occupied by the transverse abdominal muscle (m. transversus abdominis), which is one of the thinnest muscles in the anterolateral abdomen wall. Its fibers have transverse direction and pass into the aponeurosis, which forms the sheath posterior wall of rectus abdominis muscle and its linea alba. The transition line of muscle fibers m. transversus abdominis is called a semilunar one. The lower fibers of this muscle also run parallel to the inguinal ligament and participate in formation of m. cremaster.

Rectus abdominis muscle (m. rectus abdominis) is located on the anterior abdomen wall. Its fibers arise from the anterior surface of the cartilaginous part of V, VI and VII ribs and xiphoid process of the sternum, have a vertical direction and are attached below to the pubic bone by the tendons between symphysis and pubic tuberculum (tuberculum pubicum). Rectus abdominal muscle is enveloped by sheath, which at different levels of the anterolateral abdomen wall has its own features. So,

above umbilicus in front it is formed by aponeurosis of external oblique muscle and superficial layer of the inner oblique muscle of the abdomen, behind − deep leaf of the inner oblique and transverse abdominal muscles, below umbilicus by 4−5 cm in front − aponeuroses of the external and internal oblique abdominal muscles, posterior − only transverse fascia that is a part of the intra-abdominal fascia. Between the inner margins of the rectus abdominal muscles the linea alba of the abdomen is located. Above and within the umbilicus, it is represented by a wide aponeurotic plate, and below umbilicus this line gradually narrows to a few millimeters and is a dense cord that attaches to the pubic symphysis.These features of linea alba topography of the abdomen are very significant. Thus, the incisions along the linea alba of abdomen above umbilicus can be performed without opening the sheath of rectus abdominal muscles, but below umbilicus it is necessary to incisure the sheath. When examining linea alba of the abdomen, students find out, that it is fixed to the xiphoid process of the sternum at the top, and to the pubic symphysis − below. Peritoneum is a serous membrane lining the inner surface of the abdominal wall and covers the organs located in the abdominal cavity. Parietal and visceral sheets of peritoneum can be distinguished. The first is much thicker and denser than the second one.

Cavity of the abdomen (cavitas abdominalis) anteriorly and laterally is bounded by the anterolateral wall of the abdomen; posteriorly − by the lumbar region; above − the diaphragm; below it passes into the small pelvis cavity. Cavity of the abdomen includes the peritoneum cavity and retroperitoneal space.

Peritoneum cavity is bounded by the serous membrane − peritoneum. It contains all the organs enveloped by peritoneum. Peritoneum consists of two sheets: parietal and visceral. The first one is lining the abdomen wall from the inside, the second covers abdominal organs, they form a single unit, as they pass from each other. About 30 ml of serous fluid always present between the sheets of peritoneum.

Organs of the abdominal cavity relative to the peritoneum can be located intraperitoneally, mesoperitoneally and retroperitoneally. Most of these organs are enveloped by the peritoneum from all sides (stomach, jejunum, caecum, transverse colon, sigmoid colon, spleen), that is, lie intraperitoneally. If the organs are covered with peritoneum on three sides (liver, gallbladder, ascending and descending parts of the colon, part of the duodenum and rectum), then they belong to mesoperitoneally located organs. Retroperitoneally placed organs located behind the peritoneum (part of the duodenum, pancreas, kidneys, ureters, abdominal aorta and inferior vena cava). The transverse colon with its mesentery divides the abdominal cavity into two parts: the upper and lower. Outwardly, this line corresponds to a horizontal line drawn through the ends of X ribs (linea bicostarum). The upper part includes three bursae: hepatic, pregastric and omental.

Hepatic bursa (bursa hepatica) is located between the right lobe of the liver, diaphragm and anterior wall of the abdomen.

Pregastric bursa (bursa praegastrica) is located in front of the stomach and is limited to the right by the left lobe of the liver, and to the left – by the spleen.

Omental bursa (bursa omentalis) − is a slit-like space, that is bounded by stomach with its ligaments anteriorly, to the left − spleen with its ligaments, from below − by the left part of the transverse colon with its mesentery and posteriorly – by peritoneum of posterior abdominal wall which covers the pancreas, left kidney with the adrenal gland (glandula suprarenalis), aorta and inferior vena cava. Omental

bursa adjoins to the caudate lobe of the liver from above. It is connected with the general abdominal cavity through omental foramen (foramen epiploicum Winslowi), which has a width of 3−4 cm, and in the presence of adhesions may be absent.

Omental foramen anteriorly is bounded by hepatic-duodenal ligament, posteriorly – by the lower hollow vein with peritoneum, which envelops it, from above – by the lobus caudatus of the liver, and from below – by the initial part of the duodenum. The lower part of the abdomen includes two lateral canals and right and left mesenteric sinuses.

The right lateral canal (canalis lateralis dexter) is medially bounded by the ascending part of the colon, and laterally by the lateral wall of the abdomen, **the left one (canalis lateralis sinister)** is bounded by the descending part of the colon on the right, and by the lateral wall of the abdomen – on the left. These canals are connected with the upper part of the abdominal cavity at the top, but the left canal is shorter because it is bounded by the phrenicocolic ligament (lig. phrenicocolicum); in the lower part the canals are connected with the small pelvis cavity. Inflammatory processes can spread both into the upper part of the abdominal cavity and to the small pelvis cavity along the lateral canals.

The right mesenteric sinus (sinus mesentericus dexter) is bounded above by the mesentery of the transverse colon, on the right − by the ascending colon, on the left and below − by the mesentery of the small intestine, and anteriorly − by the greater omentum. The left mesenteric sinus (sinus mesentericus sinister) is also bounded above by the mesentery of the transverse colon, on the right – by the mesentery of the small intestine, on the left − by the descending colon, and anteriorly – by the greater omentum. The right mesenteric sinus connects with the left fissura, which is between the initial part of the small intestine and the mesentery of the transverse colon. The left sinus, unlike the right one, opens into the cavity of the pelvis below, which can provoke the spread of pus and blood to this area. Recesses in the peritoneal cavity usually arise at the places of the peritoneal transition from the walls of the peritoneal cavity to the organs or from one organ to another.

The duodenojejunal recess arises at the point of the transition of duodenum into the jejunum. Hernias that can occur in this recess are called Treitz hernia and are usually diagnosed as intestinal obstruction. There are also the superior and inerior ileocecal recesses. They are formed at the points of transition from ileum to cecum. Retrocecal recess can be seen by raising the initial part of the caecum. Intersigmoid recess is bounded by the mesentery of sigmoid colon and parietal peritoneum. Stomach is located in the epigastric region, mainly in the left hypochondrium.

The following parts of the stomach can be distinguished:

1. The cardia (adjacent to the entrance of the stomach esophagus along the small curvature up to 5 cm in length).
2. The fundus (on the left of the cardia and above the level of the cardial incisure).
3. The body − between the cardia and fundus above and the antrum below.
4. Antral part (between the body and pylorus).
5. The pylorus (it includes sphincter).

Greater and lesser curvatures of the stomach can be distinguished. The wall of the stomach consists of serous, subserous, muscular, submucosal and mucous membranes. The muscular membrane has three layers: longitudinal, circular, oblique.

The mucous membrane has longitudinal folds, which along the lesser curvature form a path with little submucosal layer.

Stomach ligaments are hepatogastric, gastrophrenic, gastrosplenic, gastroduodenocolic and gastropancreatic.

The blood supply is provided by the branches of abdominal aorta along the lesser stomach curvature − left, right gastric, common hepatic branch, short branches that extend from the splenic artery. The left gastroomental artery extends from the splenic artery, and inosculates along the greater curvature of the stomach with the right gastroomental artery, which extends from the gastroduodenal artery. Venous outflow passes through the system of the portal vein.

Surgical accesses to the organs of the abdominal cavity

In abdominal surgery, operations on the anterolateral wall of the abdomen and organs of the abdominal cavity require substantiation of surgical access.

The teacher draws the student's attention that performing any incisions the surgeon should minimize injuries of the neurovascular formations and muscles of the surgical area.

Muscle fibers should not be dissected; if possible, they are incised along the muscle bundles. This prevents atrophy of muscle elements in the postoperative period. In case of surgery on the anterolateral abdomen wall, the length of the incision should be sufficient and does not restrict the surgeon's actions during surgery.

Incision on the anterolateral wall of the abdomen can be:

longitudinal (midline incision − laparotomia mediana), which is carried out along linea alba of the abdomen bypassing umbilicus on the left to prevent damage of the round ligament of liver (lig. teres hepatis). Laparotomy can be upper, middle and lower. The midline incision is used quite often. It provides wide access to the organs of the abdominal cavity, while minimally damaging muscles, neurovascular formations and, if necessary, it is easy to expand both up and down;

paramedian, which is performed along the medial margin of the rectus abdominis muscle. First, the external sheath layer of m. rectus abdominis is incised, and the muscle is exposed by hooks. After this, the inner sheet of the sheath of this muscle along with the parietal peritoneum is incised. After surgery a fairly firm scar is formed, but the length of such incision is limited, which significantly complicates the operation;

transrectal, which differs from the previous one, because after incision of the external sheet of rectus abdominis muscle sheath it is necessary to dissect it along the muscle bundles, that can lead to injuries of nerves leading to m. rectus abdominis and hernias in the postoperative period;

pararectal, which is carried out along the external margin of the rectus abdominis muscle of the abdomen. After dissection of the external sheet of the sheath m. rectus abdominis the external margin of this muscle is pulled medially with blunt, and then incise the inner margin of the muscle sheath along with the peritoneum. This incision was widely used in aperedectomy (Lenander access). One of its disadvantages is that intercostal nerves are damaged (T. Zolotariova), and this can lead to muscle atrophy;

oblique incisions in the epigastric abdomen are carried along the margin of the rib arcs, and in the hypogastric − parallel to the inguinal fold or at a certain angle to it. Such incisions are used for access to the liver, gall bladder, spleen, vermiform appendage as well as in herniotomy, etc.;

transverse incisions are performed on rectus abdominis muscles. In this case, nerve trunks are not damaged; sufficient access to the organs of the abdominal cavity is provided. But these incisions are rarely used in surgical practice, because certain difficulties in suturing can occur as well as their separation;

combined (thoracoabdominal) incisions provide wide access to the organs of the abdominal cavity. They are performed in gastrectomy, splenectomy, liver resection and other operations; angular incisions are used when it is necessary to continue previous incision in another direction at an angle (access to the liver, spleen, etc.).

5. Materials for self-control

A. Tasks for self-control:

Test No. 1. For a revision of the omental bursa and examination of the posterior wall of the stomach, the surgeon proposed to access the front wall of the omental bursa in the safest area for the section. What ligament was suggested by the surgeon to dissect?

a) lig. duodenorenale;
b) lig. gastrolienale;
c) lig. gastrocolicum;
d) lig. hepatogastricum;
e) lig. hepatoduodenale.

Test No.2. In patient, the pathological content from the right lateral canal got into the subdiaphragmal space. To which part of the abdominal cavity does this space belong?

a) bursa hepatica;
b) bursa omentalis;
c) bursa praegastrica;
d) sinus mesentericus sinister;
e) sinus mesentericus dexter.

Test No. 3. The surgeon examines the left lateral canal of the abdominal cavity. How is this canal limited from the medial side?

a) colon ascendens;
b) mesocolon transversum;
c) colon descendens;
d) mesenterium;
e) caecum.

Test No. 4. During surgery, the surgeon performed a revision of the upper floor of the abdominal cavity. The peritoneum covers the patient's stomach on all sides. What organ of the upper level of the abdominal cavity is also located intraperitoneally?

a) spleen;

b) gallbladder;
c) liver;
d) sigmoid colon;
e) duodenum.

Test No. 5. Patient aged 40 years was hospitalized in surgical department and diagnosed with "spleen rupture". In what anatomical formation will the blood be accumulated?
a) bursa hepatica;
b) bursa omentalis;
c) bursa praegastrica;
d) excavatio rectovesicalis;
e) sinus mesentericus dexter.

Test No. 6. A patient was hospitalized with perforated ulcer on the posterior wall of the stomach. Through which element in the peritoneum can surgeon get access to the damaged wall while making incision?
a) through the small omentum;
b) through the falciform ligament;
c) through the gastrosplenic ligament;
d) through the ligamentum falciforme hepatis;
e) through the big omentum.

Test No. 7. A patient was hospitalized with perforated ulcer on the posterior wall of the stomach. What part of the peritoneum should the surgeon carefully inspect during surgery?
a) bursa omentalis;
b) bursa hepatica;
c) bursa praegastrica;
d) canalis lateralis sinister;
e) sinus mesentericus dexter.

Test No. 8. In patient after the operation (suturing of permeable wound of the small intestine) an interosseous abscess was formed which ruptured into the right paramesenteric gutter. Where can purulent exudate spread?
a) stay within the sinuses;
b) get into the cavity of a small pelvis;
c) infiltrate into the retrocecal recess;
d) sinus mesentericus dexter;
e) recessus intersigmoideus.

Test No. 9. The patient has a perforated ulcer of the posterior wall of the stomach. In what anatomical formation will the blood and stomach contents get?
a) bursa omentalis;
b) bursa praegastrica;
c) sinus mesentericus dexter;
d) sinus mesentericus sinister;

e) bursa hepatica.

Test No.10. In patient with destructive appendicitis a subdiaphragmatic abscess was formed as a complication. In what peritoneum formation is it localized?
a) bursa hepatica;
b) bursa praegastrica;
c) bursa omentalis;
d) sinus mesentericus dexter;
e) sinus mesentericus sinister.

B. Tasks for self-control:

Task No. 1. Patient 53 years, operated on perforated ulcers of the stomach. During the revision of the peritoneal cavity, no perforation was detected. In the right side canal the contents of the stomach was revealed. What should the surgeon do?

Task No. 2. A patient 65 years old presented with a bloody vomiting. In anamnesis − alcoholic cirrhosis of the liver. The patient has a diagnosis: bleeding from varicose veins of the esophagus. What topographic and anatomical features of the venous system of the organs of the upper floor of the peritoneal cavity lie at the basis of the occurrence of this complication?

Task No. 3. The abscess is located in the left mesenteric sinus. Name all possible complications of this process.

References

Basic literature

1. Tsyhykalo O.V. Topographic Anatomy and Operative Surgery / O.V.Tsyhykalo. – Vinnytsia, 2011. — 528 p.
2. Danilchenko S.I. Methodical Instruction For the 3st year students'of stomatological faculty self - preparation work (at class and at home) in studying operative surgery and toographical anatomy / S.I.Danilchenko, E.N.Pronina, O.Yu.Polovik. - Poltava, 2010. — 239 p.

Additional literature

1. Gray. H. F.R.S. Gray's anatomy / Henry F.R.S. Gray, R. A. Bolam. – London, 1994. – 1290 p.
2. McCraw J.B. Athlas of muscle and Musculocutaneous Flaps Head and Neck Reconstruction / John B McCraw, Phillip G Arnold. – Norfolk, Virginia, 1988. – 757 p.
3. Netter F. H. Atlas of Human Anatomy / Frank H.Netter. – East Hannover, New Jersey, 1990. – 592 p.
4. Hnatyuk M.S. Operative surgery and topographical anatomy (lectures) / M.S.Hnatyuk, O.B.Slabuj. – Temopil, 2004. – 212 p.
5. Bernard C. Illustrated Manual of Operative Surgery and Surgical Anatomy / C.Bernard – 1991.-330 p.
6. Pemberton L.B. Workbook of Surgical Anatomy / L.B.Pemberton. – 1990. – 298 p.
7. Gliedman M.L. Atlas of Surgical Techniques / M.L.Gliedman. – New York etc., McGraw – Hill. – 1990. – 420 p.
8. Sabiston D.C. Atlas of General Surgery / D.C.Sabiston. – Philadelphia etc., Saunders. – 1994. – 220 p.

Academic discipline	Clinical anatomy and operative surgery
Module No. 1	Clinical anatomy and operative surgery of the sites of the head, neck, chest cavity and abdominal cavity.
Content module No.3	Clinical anatomy and operative surgery of the sites and organs of the abdominal cavity.
Topic 18	Clinical anatomy of the abdominal cavity. Topography of the stomach, liver, gallbladder, biliary tract. Blood supply, innervation, lymphatic drainage.
Year	II
Faculty	Foreign students training (medical)

1. Relevance of the topic: diseases and injuries of the stomach, liver, extrahepatic biliary tract (especially cholecystitis) are frequent pathologies and require surgical treatment. Timely diagnosis and successful surgical treatment are provided by detailed knowledge of the topography of these upper organs of the abdominal cavity.

2. Specific objectives:

1. To explain the topography of blood supply, innervation, ways of lymph drainage of the stomach, liver, gallbladder and extrahepatic bile ducts.
2. To analyze the topographical substantiation of operations on the stomach, liver and extrahepatic bile ducts.

3. Tasks for independent work to prepare for the lesson

3.1. List of the main terms, parameters, characteristics that should be learnt by the student while preparing for the lesson

Term	Definition
Calot triangle	Topographic landmark for ligation of the gallbladder artery during operations. Its sides: the hepatic and gallbladder ducts and the right side of the proper hepatic artery.
Portacaval anastomosis	Anastomoses between the portal and caval veins.

3.2. Theoretic questions:

1. Stomach structure, its skeletotopy and syntopy.
2. General structure of the liver, its syntopy.
3. Ligaments of the liver.
4. Lobes and segments of the liver, their practical significance,
5. How is the blood supply to the liver performed? What are its venous and lymphatic outflows?

6. How is the portal vein formed? What are the features of its location in relation to other elements of the hepatoduodenal ligament?
7. How is Calot triangle formed? What is its practical significance?
8. What ducts form extrahepatic biliary tracts? Parts of the common bile duct.
9. How is temporarily bleeding arrest from liver parenchyma performed?

3.3. Practical activities performed in class:

1. A layer preparation of the stomach wall, liver ligaments, porta hepatis, extrahepatic biliary tract.
2. Temporary cessation of hemorrhage in case of liver injury by pressing the elements of the hepatoduodenal ligament.
3. To isolate and ligate the cystic artery in the Calot triangle.
4. To isolate the common bile duct along the entire length.
5. To isolate the elements of the hepatoduodenal ligament.

4. Content of the topic:

Surgical anatomy of the stomach

Stomach is located in the epigastric region, mainly in the left hypochondrium. The following parts of the stomach can be distinguished:

1. The cardia (adjacent to the entrance of the stomach esophagus along the small curvature up to 5 cm in length).
2. The fundus (on the left of the cardia and above the level of the cardial incisure).
3. The body − between the cardia and fundus superior, and the antrum inferior.
4. Antral part (between the body and pylorus).
5. The pylorus (it includes sphincter).

There are greater and lesser curvatures of the stomach. The wall of the stomach consists of serous, subserous, muscular, submucosal and mucous membranes. The muscular membrane has three layers: longitudinal, circular, oblique. The mucous membrane has longitudinal folds, which along the lesser curvature form a path with little submucosal layer.

Stomach ligaments are hepatogastric, gastrophrenic, gastrosplenic, gastroduodenocolic and gastropancreatic.

The blood supply is provided by the branches of abdominal aorta along the lesser stomach curvature − left, right gastric, general hepatic branch, short branches, that extend from the splenic artery. The left gastro-omental artery extends from the splenic artery, and inosculates along the greater curvature of the stomach with the right gastro-omental artery, which extends from the gastroduodenal artery. Venous outflow passes through the system of the portal vein.

Blood supply of the stomach is carried out by the system of the celiac trunk. The left gastric artery passes along the small curvature of the stomach. Towards it, the right gastric artery passes and departs from the proper hepatic artery. Arteries anastomose between themselves and form the arterial arch of the lesser curvature of the stomach. Along the greater curvature of the stomach, the left and right gastroepiploic arteries are located. The first originates from the splenic artery, and the second − from the gastroduodenal artery. The blood supply of the stomach is

provided by 2-7 branches extending from the splenic artery and, passing through the gastrosplenic ligament, reach the greater curvature of the stomach and its fundus.

Veins of stomach: the left gastric falls in a portal vein. Left gastroomental − in a splenic vein. Right gastric − in a portal vein. Right gastroomental − in a portal vein.

The veins of the abdominal part of esophagus (outflow into the superior vena cava) are widely anastomized with the veins of the cardiac part of the stomach (outflow into the portal vein). These are the so-called portocaval anastomoses, which increase significantly with liver cirrhosis. Bleeding from these varicose veins is very difficult to arrest. Mortality during the first bleeding amounts to 30-40%.

The lymphatic vessels of the stomach flow into the regional lymph nodes located on the lesser and greater curvature of the stomach.

The innervation of the stomach is carried out by sympathetic and parasympathetic nerves. The majority of the sympathetic nerve fibers goes to the stomach from the abdominal plexus. The right and left wandering trunks provides stomach with parasympathetic nerve fibers. Branches from these trunks go to other organs of the peritoneal cavity. The number of branches on the anterior wall of the stomach is greater than on the posterior one. Knowledge of the stomach innervation is important for sparing operations − vagotomies.

Surgical anatomy of the liver, gallbladder and bile ducts

The liver consists of two lobes: right and left, which are divided along the diaphragm surfaces by a falciform ligament of the liver, on the visceral surface − by the left longitudinal fissure, in the anterior part of which the round ligament of the liver is located, and in the posterior part − obliterated venous duct. Parallel to the left fissure of the liver, the right one is located, in the anterior part of which there is the gallbladder and in the posterior − the inferior vena cava. Between two longitudinal grooves, the deep transverse fissure – the porta of the liver is located. As a result, two more parts are distinguished on the visceral surface: the anterior – quadrate and the posterior − caudate. The liver occupies mesoperitoneal position in relation to the peritoneum; on its posterior part, which is adjacent to the diaphragm, the peritoneum is absent. The fibrous membrane of the liver is under its serous membrane.

Nowadays, due to the successful development of liver surgery, its segmental structure is considered. A bipartite separation of the liver was proposed in accordance with the blood supply zones of the right and left hepatic arteries. These two parts are divided into 8 Couinaud segments.

The features of the circulatory system of the liver lies in the fact that the blood is supplied by two vessels: proper hepatic artery and the portal vein. Venous outflow from the liver is carried out by the system of the hepatic veins (3-4 veins), which flow into the inferior vena cava.

The nerve branches that come from the abdominal plexus, from the vagus nerves and the right phrenic nerve are involved in the innervation of the liver. At the porta of the liver, they form the anterior and posterior nerve plexuses. Lymphatic drainage is carried out in the gastric, abdominal, lumbar, aortic and diaphragmatic lymph nodes.

Gallbladder is located on the visceral surface of the liver. It consists of the fundus, body and neck, which passes into the cystic duct. The blood supply of the gallbladder is provided by the cystic artery, which often departs from the right branch

of the proper hepatic artery being located in the Calot's triangle (sides of the triangle: hepatic and cystic ducts and the right branch of the proper hepatic artery).

The common hepatic duct, cystic and common bile duct belong to the extrahepatic bile ducts. The length of the common hepatic duct is 3-4 cm, the cystic duct is up to 3 cm. When merging, they form the common bile duct, which has an average length of 5-8 cm and is conventionally divided into 4 parts: supraduodenal, retroduodenal, retropancreatic, intraduodenal.

The latter obliquely penetrates the posterior wall of the duodenum and opens to the major duodenal papilla. In 80% of cases, the end sections of the common bile duct and pancreatic duct merge to form the hepatopancreatic ampulla, and the smooth muscle fibers surrounded by it form the sphincter of the ampoule (Oddi).

During the surgery on the stomach and duodenum, the supra- and retroduodenal parts of the common bile duct are most often damaged.

5. Materials for self-control

A. Tasks for self-control:

Test No. 1. In case of gastric cancer, hematogenous metastasis occurred through the portal vein. Which organ will be affected by metastasis?

a) left lung;
b) right lung;
c) spleen;
d) liver;
e) ren.

Test No. 2. When removing part of the stomach, the surgeon performed its mobilization along the greater curvature. What ligament should the surgeon cut in this situation?

a) lig. hepatoduodenale;
b) lig. gastrophrenicum;
c) lig. gastrolienale;
d) lig. hepatogastricum;
e) lig. gastrocolicum.

Test No. 3. For the temporary bleeding arrest from the liver, the surgeon introduced an index finger to the omental foramen. Behind what ligament is this foramen located?

a) lig. hepatorenale;
b) lig. hepatogastricum;
c) lig. gastrocolicum;
d) lig. gastrolienale;
e) lig. hepatoduodenale.

Test No. 4. During surgery on the abdominal cavity, the surgeon separated it's upper floor from the lower one by the formation that covers the front of the loop of the small intestine, begins with a large curvature of the stomach and grows with the anterior wall of the transverse colon. Which of the above-mentioned formations was used by a surgeon in this case?

a) mesocolon transversum;
b) omentum minus;
c) omentum majus;
d) lig. gastrocolicum;
e) mesenterium.

Test No. 5. The patient was admitted to the hospital with a stomach injury. During surgery, the surgeon revealed the damage to the posterior wall of the stomach. Through which opening of the omental bursa did the doctor examine the posterior wall of the stomach?
a) omental;
b) hepatic;
c) pancreatic;
d) abdominal;
e) mesenterial.

B. Tasks for self-control:
Task No. 1. In patient aged 48 years old, during surgery for intra-abdominal bleeding, a wound on the diaphragmatic surface of the right lobe of the liver was revealed. What method should be used to stop the bleeding temporarily?

Task No. 2. The patient was hospitalized to the clinic whith acute pancreatitis. The complex of therapeutic measures did not have an effect. Resolved to operate the patient. On revision, swelling of the pancreas is detected. The total bile duct is sharply enlarged. The gall bladder is tense and not evacuate. What is the reason of this symptoms? What is the surgeon's tactic?

Task No. 3. A patient was hospitalized with a cirrhosis of the liver. Sharply enlarged spleen, venous stasis, plethora are detected. What way can the flow of venous blood from the spleen be performed?

References

Basic literature

1. Tsyhykalo O.V. Topographic Anatomy and Operative Surgery / O.V.Tsyhykalo. – Vinnytsia, 2011. — 528 p.
2. Danilchenko S.I. Methodical Instruction For the 3st year students'of stomatological faculty self - preparation work (at class and at home) in studying operative surgery and toographical anatomy / S.I.Danilchenko, E.N.Pronina, O.Yu.Polovik. - Poltava, 2010. — 239 p.

Additional literature

1. Gray. H. F.R.S. Gray's anatomy / Henry F.R.S. Gray, R. A. Bolam. – London, 1994. – 1290 p.
2. McCraw J.B. Athlas of muscle and Musculocutaneous Flaps Head and Neck Reconstruction / John B McCraw, Phillip G Arnold. – Norfolk, Virginia, 1988. – 757 p.
3. Netter F. H. Atlas of Human Anatomy / Frank H.Netter. – East Hannover, New

Jersey, 1990. – 592 p.
4. Hnatyuk M.S. Operative surgery and topographical anatomy (lectures) / M.S.Hnatyuk, O.B.Slabuj. – Temopil, 2004. – 212 p.
5. Bernard C. Illustrated Manual of Operative Surgery and Surgical Anatomy / C.Bernard – 1991.-330 p.
6. Pemberton L.B. Workbook of Surgical Anatomy / L.B.Pemberton. – 1990. – 298 p.
7. Gliedman M.L. Atlas of Surgical Techniques / M.L.Gliedman. – New York etc., McGraw – Hill. – 1990. – 420 p.
8. Sabiston D.C. Atlas of General Surgery / D.C.Sabiston. – Philadelphia etc., Saunders. – 1994. – 220 p.
9. Chassin J.L. Operative Strategy in General Surgery / J.L.Chassin. – New York etc., Springer. – 1994. – 368 p.

Academic discipline	Clinical anatomy and operative surgery
Module No.1	Clinical anatomy and operative surgery of the sites of the head, neck, chest cavity and abdominal cavity.
Content module No.3	Clinical anatomy and operative surgery of the sites and organs of the abdominal cavity.
Topic 19	Clinical anatomy of the abdominal cavity. Topographic anatomy of the small and large intestines, pancreas and spleen. Syntopy, blood supply, innervation and lymphatic drainage of these organs.
Year	II
Faculty	Foreign students training (medical)

1. Relevance of the topic: acute and chronic pancreatitis, congenital and acquired diseases of the small and large intestines, Hirschsprung's disease, atresia, mega-and dolichocolon, congenital and acquired intestinal obstruction, diverticulum of the ileum (Meckel diverticulum), acute appendicitis, etc., injuries and neoplasms of the abdominal cavity are common pathologies requiring surgical intervention. Diagnosis and treatment require the profound knowledge of the features of structure and topography of these organs.

2. Specific objectives:

1. Explain the topography of the duodenum, jejunum and ileum, cecum, appendix, the topography of the ascending, transverse, descending, sigmoid colon, pancreas.
2. To analyze the topographical substantiation of operations on the intestines, pancreas.

3. Tasks for independent work to prepare for the lesson

3.1. List of the main terms, parameters, characteristics that should be learnt by the student while preparing for the lesson

Term	Definition
O. P. Hubarev method	Method for the search of the initial part of the colon without removing the intestine from the abdominal cavity: the first fixed loop of the small intestine is located to the left of the spine, at the base of the periosteum of the transverse colon, at the level of the second lumbar vertebra to the left.
Intestinal atresia	Congenital intestinal obstruction

3.2. Theoretic questions:

1. How is the peritoneum located relatively to the parts of the duodenum, their skeletotopia?
2. How to conduct a pancreas revision?
3. What are the differences between the small and large intestines and location of peritoneum relative to them?
4. How to determine the initial and final sections of the small intestine?
5. How to determine location of appendix?
6. How to determine the ascending and descending parts of the loop of the small intestine?
7. What parts of the colon are used to perform colostomy and why?
8. How is the root of the mesentery of the small intestine located?
9. Meckel diverticulum. It's practical value.
10. How is the blood supply to the small and large intestines performed? What features of their blood supply have a great practical importance? Venous outflow from the small and large intestines.
11. The topography of the spleen, its ligaments.
12. Blood supply and innervations of the spleen.

3.3. Practical activities performed in class:

1. Examination of the pancreas.
2. Examination of the organs of the lower floor of the abdominal cavity.
3. Determination of the initial part of the small intestine.
4. Determination of the end part of the small intestine.
5. Determination of the ascending and descending sections of the small intestine loop.
6. To master the method of appendix detection.
7. Delivering cecum and appendix into the wound.

4. Content of the topic:

The ligament apparate of the duodenum, the placement of its parts with respect to the elements of the hepatoduodenal ligament are studied. Consider the synthopy of the intestine, the placement of its parts in relation to the head of the pancreas, the place of falling of the total bile duct and the duct of the pancreas into the intestine. Determine the possibility of mobilization of the duodenum by cutting the peritoneum along its outer edge, examining the gastroduodenal arteries, the sources of their formation, and especially location along the intestinal inner semi-circle. Pay attention to venous and lymphatic outflows, innervation of the duodenum.

The small intestine is up to 5 m long and consists of the duodenum (27 − 30 cm), jejunum (2 m), ileum (3 m).

Jejunum that starts from Treitz ligament and the ileum to the transition into colon, covered with the peritoneum on all sides, except for a narrow strip where the mesenterium sheets are attached. The presence of mesenterium causes considerable mobility of the small intestine. The length of the mesenterium along the length of the intestine is not the same, the mobility of the intestine depends on it. The least mobile guts are located at the beginning of the jejunum next to Treitz ligament, at the final part of the ileum, in the ileocecal angle.

The cecum is covered with the peritoneum from all sides, the transverse colon

and the sigmoid colon have long mesenteries, which means they have considerable mobility. Least moving parts of the colon are ascending and descending, that are covered with the peritoneum only anteriorly. However, in 16.7% of cases in men and in 11.7% in women the ascending part of the colon is covered by the peritoneum on all sides.

The blood supply of the small intestines is carried out by the system of the superior mesenteric artery, which extends from the abdominal aorta at the level of the 1st lumbar vertebra. When passing from the lower margin of the pancreas, the artery lies down along the anterior surface of the lower horizontal part of the duodenum that can lead to tightening of this section and cause obstruction.

The superior mesenteric artery has numerous branches (up to 20 and more), among which the main are: small intestinal, middle, right colonic and ileocecal.
The following branches arise from the inferior mesenteric artery:

1. left colon artery, which supplies the left transverse colon, the splenic angle and descending colon;
2. artery of the sigmoid colon;
3. superior rectal artery.

The veins of the small intestine flow into the superior mesenteric, the main tributary of the portal vein. The veins of the large intestines accompany arteries in the form of unpaired trunks and belong to the portal vein system. Nerves of the small intestine are the branches of the superior mesenteric, colonic − the branches of the superior and inferior mesenteric plexuses.

Meckel's diverticulum is a slight bulge in the small intestine present at birth and a vestigial remnant of the omphalomesenteric duct. It is the most common malformation of the gastrointestinal tract.

The majority of cases with Meckel's diverticulum are asymptomatic (called a silent Meckel's diverticulum).

The most common symptoms are painless rectal bleeding, melaena-like black stools, followed by intestinal obstruction, volvulus. Sometimes, Meckel's diverticulitis may present with all the features of acute appendicitis.

The jejunum and ileum are supplied by the superior mesenteric artery. The veins have a similar course and arrangement to the arteries. The lymphatics of the small intestine are arranged in two sets, those of the mucous membrane and those of the muscular coat.

The nerves of the small intestines are derived from the plexuses of sympathetic nerves around the superior mesenteric artery. From this source they run to the myenteric plexus (Auerbach’s plexus) and the plexus of the submucosa (Meissner’s plexus).

The **large intestine** extends from the end of the ileum to the anus. It is about 1.5 meters long. It is divided into the cecum, colon, rectum, and anal canal.

The **cecum** (intestinum caecum) is the large blind pouch situated below the illeocecal valve. The cecum lies quite free in the abdominal cavity and performes a considerable amount of movement, so that it may become herniated down the right inguinal canal. The cecum is conical and the appendix rises from its apex.

The **appendix** is a blind-ended tube connected to the cecum. It’s a lymphoid organ, assisting with the maturation of B lymphocytes and in the production of the class of antibodies known as immunoglobulin A antibodies.

The colon is divided into four parts: **ascending, transverse, descending and sigmoid**.

The **ascending colon** is the first section of the large intestine. The ascending colon goes upwards through the abdominal cavity.

The main functions of the colon: to remove the water and nutrients from waste material and recycle it. The waste material moved into the cecum and then to the ascending colon. The useless waste material is moved upwards toward the transverse colon by the action of peristalsis.

The **transverse colon** (colon transversum) is the longest and most movable part of the colon which goes from the hepatic flexure to the splenic flexure. It's the most mobile part of the intestine and the most sensitive place to ischemia due to the middle colic artery, and inferior mesenteric artery.

The **descending colon** is the part of the colon from the splenic flexure to the beginning of the sigmoid colon. The function of the descending colon is to store the feces into the rectum. There is a very dense flora in this region.

The **sigmoid colon** is located after the descending colon and before the rectum. It has an S-shaped structure.

The **rectum** is the last section of the large intestine. It stores the formed feces before their release through the anal canal.

Then students study **spleen**. It is located in the upper left quadrant of the abdomen, behind − the left kidney and the left adrenal gland. Below, the spleen is adjacent to the tail of the pancreas and splenic flexure of the colon, the inner surface of the spleen reaches the bottom of the stomach. The spleen is covered by peritoneum on all sides, it is moveable.

Blood supply of the spleen is carried out by the spleen artery, which departs from the abdominal trunk. Spleen vein has a diameter twice as large and forms a portal vein behind the head of the pancreas with the upper mesenteric vein. Abdominal, left diaphragmatic and left suprarenal plexus are involved in innervation of the spleen. Regional lymph nodes are spleen nodes located at the gates of the organ.

5. Materials for self-control

A. Tasks for self-control:

Test No.1. During an appendectomy, the surgeon deliver into the wound a part of the gut that had a gray-blue color, muscle bands and weakly marked mesentery, without fat additions. What part of the colon did the surgeon deliver to the wound?

a) cecum;
b) colon ascendens;
c) colon transversum;
d) colon descendens;
e) colon sigmoideum.

Test No. 2. During child appendectomy, appendix was detected in the right hypochondrium. What features of the anatomical structure of the child digestive tract have caused such a high location of this organ?

a) short ascending colon;

b) retrocecal placement of the appendix;
c) large liver size;
d) presence of mesentery of the cecum;
e) short mesentery of the small intestine

Test No. 3. In patient aged 50 years, presented with pancreatitis surgeon performs the resection of the pancreas tail. In this case it should be considered that the pancreas is located relative to the peritoneum:
a) extraperitoneal;
b) mesoperitoneal;
c) intraperitoneal;
d) parenteral;
e) intramural.

Test No. 4. A patient aged 50 was hospitalized with suspected gallbladder inflammation. The fibrogastroscopy of the gastrointestinal tract with a mandatory examination of the major duodenal papilla was performed. In what part of the duodenum is this papilla located?
a) descending;
b) ascending;
c) lower horizontal;
d) upper horizontal;
e) ampulla.

Test No. 5. In the mucous membrane of the gut the surgeon discovered the accumulation of lymphoid nodules (Peyer plaques). What part of intestine was examined by a surgeon?
a) ileum;
b) jejunum;
c) caecum;
d) duodenum;
e) rectum.

Test No. 6. During the surgical treatment of phlegmonous pancreatitis, purulent effusion in the omental bursa was revealed. It is known that the pancreas is one of the walls of bursa. What wall is it?
a) rear;
b) front;
c) lateral;
d) top;
e) lower.

B. Tasks for self-control:
Task No. 1. In patient with a typical clinical course of acute appendicitis during the operation surgeon did not reveal a wormlike process. What should a surgeon do in this situation?

Task No. 2. In patient at the end of the operation, conducted on acute appendicitis, the ligature slipped off the mesentery of the appendix. The attempt to apply the clamp again failed. What should a surgeon do for bleeding arrest?

Task No. 3. Patient, who was operated on destructive appendicitis 5 days ago, felt pain in the right hypochondrium, which was exacerbated by breathing. The liver reached 6 cm from the rib arch. What complication developed in this case? What is the tactics of a surgeon?

Task No. 4. On the second day after surgical treatment of acute phlegmonous appendicitis, the general condition of patient aged 61 years was getting worse. Fever (the temperature increased to 39.6 C), pain in the right hypochondrium were observed. On palpation, the enlarged and painful liver was detected. During the next 2 days, manifestations of fever persisted, yellowish of sclera appeared. X-ray changes in the chest and abdominal cavities were not detected. What complication did the patient have? What is the cause of complication?

Task No. 5. After 5 days of performed splenectomy the symptoms of acute pancreatitis appeared. What features of the spleen topography caused the occurrence of this complication?

References

Basic literature

1. Tsyhykalo O.V. Topographic Anatomy and Operative Surgery / O.V.Tsyhykalo. – Vinnytsia, 2011. — 528 p.
2. Danilchenko S.I. Methodical Instruction For the 3st year students'of stomatological faculty self - preparation work (at class and at home) in studying operative surgery and toographical anatomy / S.I.Danilchenko, E.N.Pronina, O.Yu.Polovik. - Poltava, 2010. — 239 p.

Additional literature

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2. McCraw J.B. Athlas of muscle and Musculocutaneous Flaps Head and Neck Reconstruction / John B McCraw, Phillip G Arnold. – Norfolk, Virginia, 1988. – 757 p.
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6. Pemberton L.B. Workbook of Surgical Anatomy / L.B.Pemberton. – 1990. – 298 p.
7. Gliedman M.L. Atlas of Surgical Techniques / M.L.Gliedman. – New York etc., McGraw – Hill. – 1990. – 420 p.
8. Sabiston D.C. Atlas of General Surgery / D.C.Sabiston. – Philadelphia etc., Saunders. – 1994. – 220 p.
9. Chassin J.L. Operative Strategy in General Surgery / J.L.Chassin. – New York etc., Springer. – 1994. – 368 p.

Academic discipline	Clinical anatomy and operative surgery
Module No.1	Clinical anatomy and operative surgery of the sites of the head, neck, chest cavity and abdominal cavity.
Content module No.3	Clinical anatomy and operative surgery of the sites and organs of the abdominal cavity.
Topic 20	Intestinal sutures. Stitching the wounds of the small intestine. Resection of the small intestine. Types of intestinal anastomoses: "end to end", "side to side", enteroanastomosis, "end to side"
Year	II
Faculty	Foreign students training (medical)

1. Relevance of the topic: abdominal injuries accompanied by damage to the small intestine, atresia, and necrosis as complications of intestinal obstruction require emergency surgery. Therefore, mastering the technique of placing intestinal sutures, the ability to suture the intestinal wound, to perform resection and form enteroanastomosis are necessary skills in surgical interventions that are often used in the practice of surgeons.

2. Specific objectives:

1. To analyze the technique of placin the intestinal sutures.
2. To explain how to form enteroanastomosis.
3. To explain how to perform intestinal wound surgery and bowel resection surgery.

3. Tasks for independent work to prepare for the lesson

3.1. List of the main terms, parameters, characteristics that should be learnt by the student while preparing for the lesson

Term	Definition
Intestinal sutures	Sutures used to stitch the hollow organs of the gastrointestinal tract
Enteroanastomosis	Intestinal anastomosis
Intestinal resection	Removing the part of the intestine

3.2. Theoretic questions:

1. What types of intestinal sutures do you know?
2. Advantages and disadvantages of different types of intestinal sutures.
3. What are the indications for the small intestine resection? Stages of operation depending on the size of the resected area.
4. Types of the intestinal anastomoses, technique of their formation and anatomical-physiological indications for choosing the method of operation. Possible

complications.

3.3. Practical activities performed in class:

1. Placing of intestinal sutures.
2. "End to end" and "side to side" anastomosis formation.

4. Content of the topic:

The small intestine is up to 5 m long and consists of duodenum (27 − 30 cm), jejunum (2 m) and ileum (3 m).

Jejunum that starts from Treitz ligament and the ileum to the transition into colon, covered with the peritoneum on all sides, except for a narrow strip where the mesenterium sheets are attached. The presence of mesenterium causes considerable mobility of the small intestine. The length of the mesenterium along the length of the intestine is not the same, the mobility of the intestine depends on it. The least mobile guts are located at the beginning of the jejunum next to Treitz ligament, at the final part of the ileum, in the ileocecal angle **(Fig. 54).**

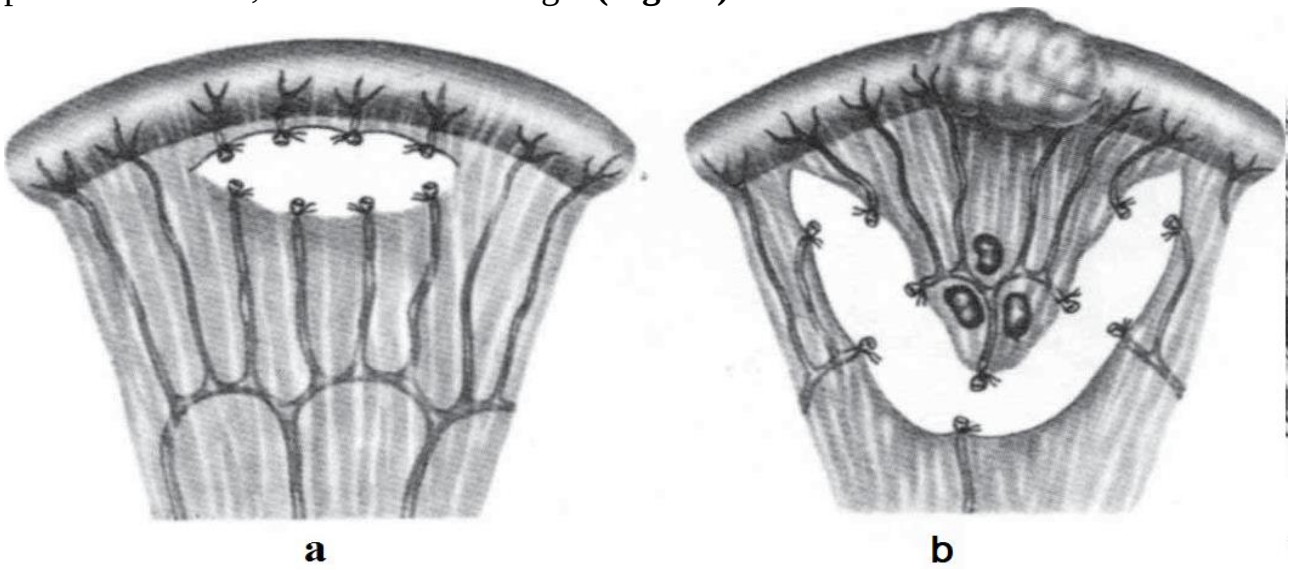

Fig. 54. Mobilization of the part of the small intestine
a − parallel separation of mesentery;
b − cuneiform separation.

Cecum is covered with the peritoneum from all sides; the transverse colon and the sigmoid colon have long mesenteries, that means that they have considerable mobility. Least moving parts of the colon are ascending and descending, that are covered with the peritoneum only anteriorly. However, in 16.7% of cases in men and in 11.7% in women the ascending part of the colon is covered by the peritoneum on all sides.

The blood supply of the small intestines is carried out by the system of the superior mesenteric artery, which extends from the abdominal aorta at the level of the 1st lumbar vertebra. When passing from the lower margin of the pancreas, the artery lies down along the anterior surface of the lower horizontal part of duodenum, which can lead to tightening of this section and cause obstruction.

The superior mesenteric artery has numerous branches (up to 20 and more), among which the main are: small intestinal, middle, right colonic and ileocecal.
The following branches arise from the inferior mesenteric artery:

1. left colon artery, which supplies the left transverse colon, the splenic angle and descending colon;
2. artery of the sigmoid colon;
3. superior rectal artery.

The veins of the small intestine flow into the superior mesenteric, the main tributary of the portal vein. The veins of the large intestines accompany arteries in the form of unpaired trunks and belong to the portal vein system. Nerves of the small intestine are the branches of the superior mesenteric, colonic − the branches of the superior and inferior mesenteric plexuses.

Colon consists of cecum, ascending, transverse colon, descending and sigmoid. The large intestine is 4-5 times shorter than the small one. The wall of the large intestine consists of three layers: inner membrane − the mucous layer, middle − the muscle layer with fibers of longitudinal direction and are grouped into three bands, external – the serous layer (peritoneum). Large intestines have characteristic signs: epiploic appendages, protrusions and muscle bands.

The blood supply of the right half of the large intestine is provided by the vessels that extend from the superior mesenteric artery (a.ilecolica, a.colica dextra, a.colica media). The left half of the large intestine is provided with blood by the inferior mesenteric artery. Blood outflows along the mesenteric veins into the upper and lower mesenteric veins.

Intestinal sutures

The term "intestinal sutures" combines all the sutures that are used in surgical practice when suturing the hollow organ of the gastrointestinal tract (esophagus, stomach, small and large intestines).

Principal requirements for intestinal sutures technique include **(Fig.55)**:

− compliance with strict asepsis and antiseptics, thorough haemostasis, minimal traumatization of tissues, especially mucous and submucosal layers;

− safe hermic condition, which is provided by wide contact of serous surfaces and other layers of the esophagus, stomach, intestine walls;

− use of resorbable material (catgut, biofil) when placing buried sutures on the edges of the wound as well as non-resorbable − when placing sutures on the serous-muscular layer;

− intestinal sutures should be placed by using a round (taper) surgical needle.

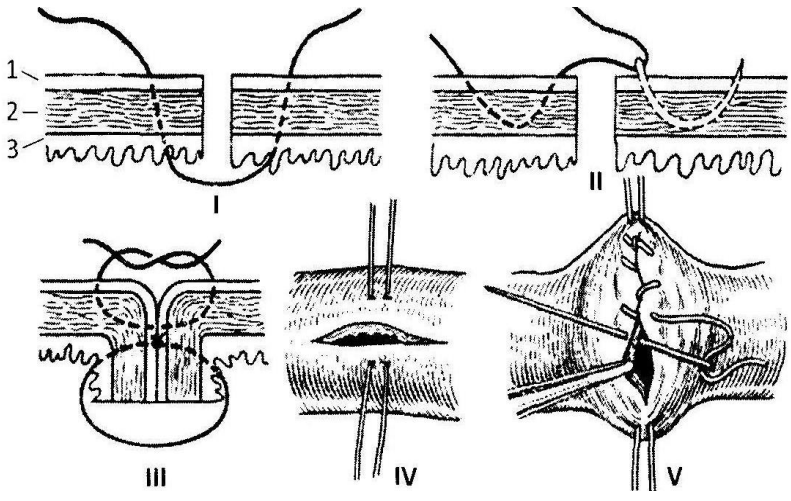

Fig. 55. Intestinal suture
I − according to Jolly: 1 − serous membrane; 2 − muscle layer; 3 − mucous membrane
II − according to Lambert; III − Albert double row stitch; IV and V − stitching of the intestinal wound. The superimposed holders for the transformation of the longitudinal wound into the transverse are performed using Schmiden suture.

Histologically, four layers of the digestive tract wall can be distinguished: mucosal, submucosal, muscular and serous.

From the surgical point of view, there are two coverings in the wall of the digestive tract: the inner (mucosal-submucosal layer) and the external (muscular-serous layer). In surgical practice, the term "through-and-through sutures" exists. It is the suture when surgical needle simultaneously pierces all layers of the intestine. When connecting the walls of the dissected hollow organs of the digestive tract during the operation or in the acute trauma, two layer suture is most often placed: the first row of sutures (internal) passes through all layers of the organ, and the second (external) through the external covering (muscular serous layer).

One of the through-and-through sutures, widely used in surgical practice, is blanket continuous catgut suture. The technique of its application includes several stages, namely, firstly the needle pierces the mucous membrane, then the submucosal layer and serous membrane are pierced on one side, and serous membrane, muscular, submucosal layers and mucous membrane – on other side.

Tightening (glover's) suture differs from through-and-through one. While placing glover's suture, the needle first pierces the mucous membrane and then serous one. After each stitch the ligature is tightened and the organ wall is retracted, which results in connection of the wall surfaces.When the second row of sutures is placed on the organs of the gastrointestinal tract, they are considered aseptic (clean), because the mucous membrane is not pierced, and only the serous-muscular layer is sutured. Aseptic sutures by their technique can be both interrupted and continuous.

Albert suture is often used to perorm the inner infected suture. According to this technique all layers of the organ wall are pierced by the needle. These sutures are "dirty". Infection can get from a lumen of intestines, stomach into abdominal cavity along the ligature. When suturing a wound of the stomach or intestine wall it is necessary to place one more row of serous-muscular sutures (Lambert suture) after Albert suture. Schmieden suture is placed on the posterior wall of anastomosis of the blanket continuous catgut suture, and tightening glover's suture − on the anterior one. Over this suture the serous-muscular row of sutures with the interval which should be no more than 3−5 mm is placed.

In the stump formation and immersion as well as when inserting the tube into the lumen of the intestine, a purse-string or Z-shaped sutures are used. The purse-string suture is placed in a circle. It is used in immersing the stump of appendix, duodenum, jejunum or ileum as well as suturing of small stab wounds of the stomach or intestine. After suturing the edges of the ligature are tightened and tied. The stump is deepened and peritonized.

Z-shaped suture is additional; it is placed over the purse-string suture for safe hermetic condition. Four pricks are used at four angles of the imaginary quadrum to the depth of the serous-muscular layer that finally forms a suture in the form of the letter "Z".

Intestinal resection

Students are distributed into surgical teams. Each team performs simulation resection and anastomoses "side to side", "end-to-end" or "end-to-side" on the cadaver or on separate segments of the small intestine with the mesenterium.Thus, it

is necessary to pay attention to compliance with strict asepsis, therefore, the operation is performed on the abdominal cavity organ, carefully insulated with drapes from it. The use of appropriate instruments (intestinal forceps, anatomical tweezers, round needles, etc.) is very important. Vessel ligation during immobilization of the intestine is carried out closer to it. In case of malignant tumors it is performed farther, but distal to the first-order arcades to prevent necrosis of the intestine. Management of the ends of the intestinal segments, between which anastomosis "side to side" or "end-to-end" will formed is very important. When "side to side" anastomosis is performed the stump is formed in two ways: by ligation and immersing it in purse (for peritonization) or by suturing the lumen of the intestine with a two layer suture. The isoperistaltic placement of the stumps in "side to side" anastomosis as well as features of its application (with elastic intestinal forceps or ligature holders) are important.

In case of "end-to-end" anastomosis, the stump is not formed, but the clamp along which the resection is performed is placed obliquely to increase the diameters of the segments that should be sutured. While forming this anastomosis, continuous suture should not be used, which can lead to narrowing of the anastomosis. Other stages of both anastomoses formation are similar.

Anastomosis "side to side" should begin with applying of a silky interrupted serous-muscular or serous-serous Lambert suture closer to the mesenterium. The incision of the intestine that is 7−8 cm long on the surfaces facing each other is larger than the diameter of the intestine, and is performed 0.5 cm from the first row of the sutures. The second row of catgut sutures is applied through all layers according to Jolly or Pirogov on the posterior, and according to Schmieden to the anterior part of anastomoses. After anastomosis formation, it is necessary to check its patency.

The end-to-end type of anastomosis is placed similarly: on the inner part – according to Jolli suture, Schmieden suture – on the anterior part. The operation is completed by applying a circular seroserous suture.

5. Materials for self-control

A. Tasks for self-control:

Test No.1. For the intestinal suturing, the surgeon used the needle holder. Which fingers of the surgeon should be in the rings of this tool to ensure its optimal fix in the hand?

a) 1st and 2nd;
b) 1st and 3rd;
c) 1st and 4th;
d) 1st and 5th;
e) 2nd and 4th.

Test No. 2. The surgeon uses jejunum to form anastomosis. How is this intestine usually covered by the peritoneum?

a) intraperitoneal;
b) mesoperitoneal;
c) extraperitoneal;
d) retroperitoneal;

e) first, intra-, then - extraperitoneal.

Test No. 3. The surgeon placed a single-layer interrupted serous-muscular suture catching the submucosal layer with the taper needle on the external margin of the anastomosis. Knots were tied in the lumen of the hollow organ. The distance between the stitches is 1 cm. What requirement for intestinal sutures was inored?
a) aseptic;
b) hemostaticity;
c) impermeability;
d) passage of the organ;
e) relative automaticity.

Test No. 4. During the resection of the small intestine, the surgeon formed an intestinal "side to side" anastomosis with two-layer sutures. What anastomosis wall should be formed first?
a) anterior;
b) posterior;
c) superior;
d) inferior;
e) it does not matter.

B. Tasks for self-control:

Task No. 1. While suturing longitudinal wound of the small intestine, surgeon placed one row of seroserous sutures longitudinally, drying the peritoneal cavity, closed the wound of the abdominal wall layer by layer. Are there any mistakes in the surgeon's actions?

Task No.2. When resecting the small intestine and placing end-to-end interstitial anastomosis, surgeon incised the loop of the intestine transversely. What is the surgeon's mistake, what complications can be expected after anastomosis?

References

Basic literature

1. Tsyhykalo O.V. Topographic Anatomy and Operative Surgery / O.V.Tsyhykalo. – Vinnytsia, 2011. — 528 p.
2. Danilchenko S.I. Methodical Instruction For the 3st year students'of stomatological faculty self - preparation work (at class and at home) in studying operative surgery and toographical anatomy / S.I.Danilchenko, E.N.Pronina, O.Yu.Polovik. - Poltava, 2010. — 239 p.

Additional literature

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2. McCraw J.B. Athlas of muscle and Musculocutaneous Flaps Head and Neck Reconstruction / John B McCraw, Phillip G Arnold. – Norfolk, Virginia, 1988. – 757 p.

3. Netter F. H. Atlas of Human Anatomy / Frank H.Netter. – East Hannover, New Jersey, 1990. – 592 p.
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5. Bernard C. Illustrated Manual of Operative Surgery and Surgical Anatomy / C.Bernard – 1991.-330 p.
6. Pemberton L.B. Workbook of Surgical Anatomy / L.B.Pemberton. – 1990. – 298 p.
7. Gliedman M.L. Atlas of Surgical Techniques / M.L.Gliedman. – New York etc., McGraw – Hill. – 1990. – 420 p.
8. Sabiston D.C. Atlas of General Surgery / D.C.Sabiston. – Philadelphia etc., Saunders. – 1994. – 220 p.

Academic discipline	Clinical anatomy and operative surgery
Module No.1	Clinical anatomy and operative surgery of the sites of the head, neck, chest cavity and abdominal cavity.
Content module No.3	Clinical anatomy and operative surgery of the sites and organs of the abdominal cavity.
Topic 21	Educational operation "Intestinal resection"
Year	II
Faculty	Foreign students training (medical)

1. Relevance of the topic: abdominal injuries accompanied by damages to the small intestine, atresia, bowel necrosis as a complication of intestinal obstruction require emergency surgery. Therefore, mastering the technique of intestinal sutures, skills in suturing the intestine wound, carrying out its resection and applying enteroanastomosis are of great importance, as they are necessary interventions which often used in the practice of surgeons.

2. Specific objectives

1. Explain the use of special surgical instruments for abdominal surgery.
2. Analyze the technique of intestinal sutures applying.
3. Explain how to form enteroanastomosis.
4. Explain how to perform suturing of intestinal wounds and intestinal resection.

3. Tasks for independent work to prepare for the lesson

3.1. List of the main terms, parameters, characteristics that should be learnt by the student while preparing for the lesson

Term	Definition
Intestinal sutures	Stitches used for suturing the hollow organs of the gastrointestinal tract.
Enteroanastomosis	Intestinal anastomosis.
Intestinal resection	Removal of the part of intestine.

3.2. Theoretic questions:

1. What types of intestinal sutures do you know?
2. Advantages and disadvantages of various types of intestinal sutures.

3. What are the indications for the small intestine resection? Stages of the operation depending on the size of the resected area.
4. Types of interintestinal anastomoses, technique of their formation and anatomical and physiological substantiation for the choice of operation method. Complications that can occur.
5. Technique for accessing the vermiform process according to Volkovich-Diakonov.
6. Technique for appendectomy.

3.3. Practical activities performed in class:
1. Application of intestinal sutures.
2. Formation of "end to end" and "side by side" anastomoses.

4. Content of the topic:

Intestinal sutures

The term "intestinal sutures" combines all the sutures that are used in surgical practice when suturing the hollow organ of the gastrointestinal tract (esophagus, stomach, small and large intestines).

Principal requirements for intestinal sutures technique include:
− compliance with strict asepsis and antiseptics, thorough hemostasis, minimal traumatization of tissues, especially mucous and submucosal layers;
− a safe hermetic condition, which is provided by wide contact of serous surfaces and other layers of the esophagus, stomach, intestine walls;
− use of resorbable material (catgut, biofil) when placing buried sutures on the edges of the wound as well as non-resorbable − when placing sutures on the serous-muscular layer;
− intestinal sutures should be placed by using a round (taper) surgical needle.

Histologically, four layers of the digestive tract wall can be distinguished: mucosal, submucosal, muscular and serous.

From the surgical point of view, there are two coverings on the wall of the digestive tract: the inner (mucosal-submucosal layer) and the outer (muscular-serous layer). In surgical practice, the term "through-and-through sutures" exists. It is the suture when surgical needle simultaneously pierces all layers of the intestine. When connecting the walls of the dissected hollow organs of the digestive tract during the operation or in the acute trauma, two-layer suture is most often placed: the first row of sutures (internal) passes through all layers of the organ, and the second (external) through the external covering (muscular serous layer).

One of the through-and-through sutures, widely used in surgical practice, is blanket continuous catgut suture. The technique of its application includes several stages, namely, firstly the needle pierces the mucous membrane, then the submucosal layer and serous membrane are pierced on one side, and serous membrane, muscular, submucosal layers, and mucous membrane – on another side.

Tightening (glover's) suture differs from through-and-through one. While placing glover's suture, the needle first pierces the mucous membrane, and then serous one. After each stitch, the ligature is tightened and the organ wall is retracted, which results in connection of the wall surfaces.When the second row of sutures is placed on the organs of the gastrointestinal tract, they are considered aseptic (clean),

because the mucous membrane is not pierced, and only the serous-muscular layer is sutured. Aseptic sutures by their technique can be both interrupted and continuous.

Albert suture is often used to perform the inner infected suture. According to this technique, all layers of the organ wall are pierced by the needle. These sutures are "dirty". Infection can get from a lumen of intestines, stomach into the abdominal cavity along the ligature. When suturing a wound of the stomach or intestine wall, it is necessary to place one more row of serous-muscular sutures (Lambert suture) after Albert suture. Schmieden suture is placed on the posterior wall of anastomosis of the blanket continuous catgut suture, and tightening glover's suture − on the anterior one. Over this suture, the serous-muscular row of sutures with the interval which should be no more than 3-5 mm is placed.

In the stump formation and immersion as well as when inserting the tube into the lumen of the intestine, a purse-string or Z-shaped sutures are used. The purse-string suture is placed in a circle. It is used in immersing the stump of appendix, duodenum, jejunum or ileum as well as suturing of small stab wounds of the stomach or intestine. After suturing, the edges of the ligature are tightened and tied. The stump is deepened and peritonized.

Z-shaped suture is additional; it is placed over the purse-string suture for a safe hermetic condition. Four pricks are used at four angles of the imaginary quadrum to the depth of the serous-muscular layer that finally forms a suture in the form of the letter "Z".

Intestinal resection

Students are distributed to surgical teams. Each team performs simulation resection and anastomoses "side to side", "end-to-end" or "end-to-side" on the cadaver or on separate segments of the small intestine with the mesenterium.Thus, it is necessary to pay attention to compliance with strict asepsis, therefore, the operation is performed on the abdominal cavity organ, carefully insulated with drapes from it. The use of appropriate instruments (intestinal forceps, anatomical tweezers, round needles, etc.) is very important. Vessel ligation during immobilization of the intestine is carried out close to it. In case of malignant tumors, it is performed farther, but distal to the first-order arcades to prevent necrosis of the intestine. Management of the ends of the intestinal segments, between which anastomosis "side to side" or "end-to-end" will be placed is very important. When "side to side» anastomosis is performed, the stump is formed in two ways: by ligation and immersing it in purse (for peritonization) or by suturing the lumen of the intestine with a two-layer suture. The isoperistaltic placement of the stumps in "side to side" anastomosis as well as features of its application (with elastic intestinal forceps or ligature holders) are important.

In case of "end-to-end" anastomosis, the stump is not formed, but the clamp along which the resection is performed is placed obliquely to increase the diameters of the segments that should be sutured. While forming this anastomosis, continuous suture should not be used, that can lead to narrowing of the anastomosis. Other stages of both anastomoses formation are similar.

Anastomosis "side to side" should begin with applying of a silky interrupted serous-muscular or serous-serous Lambert suture closer to the mesenterium. The incision of the intestine that is 7-8 cm long on the surfaces facing each other is larger

than the diameter of the intestine and is performed 0.5 cm from the first row of the sutures. The second row of catgut sutures is applied through all layers according to Jolly or Pirogov on the posterior, and according to Schmieden to the anterior part of anastomoses. After anastomosis formation, it is necessary to check its patency.

The end-to-end type of anastomosis is formed similarly: on the inner part – according to Jolli suture, Schmieden suture – on the anterior part. The operation is completed by applying a circular seroserous suture.

5. Materials for self-control

A. Tasks for self-control:

Test No.1. For applying the intestinal suture, surgeon used Hegar needle holder. What surgeon's fingers should be in the rings of this instrument to provide optimal fixation in the hand?

a) first and second;
b) first and third;
c) first and fourth;
d) first and fifth;
e) second and fourth.

Test No.2. The surgeon used jejunum to form anastomosis. How is this gut usually covered by the peritoneum?

a) intraperitoneally;
b) mesoperitoneally;
c) extraperitoneally;
d) retroperitoneally;
e) first intra-, then – extraperipherally.

Test No.3. The surgeon placed a single-layer interrupted serous-muscular suture catching the submucosal layer with the taper needle on the external margin of the anastomosis. Knots were tied in the lumen of the hollow organ. The distance between the stitches is 1 cm. What requirement for the intestinal sutures was ignored?

a) asepticity;
b) hemostaticity;
c) hermeticity;
d) organ patency;
e) relative automaticity.

Test No.4. The surgeon used a single layer interrupted seroserous suture to form anastomosis. How is this suture called?

a) Pirogov suture;
b) Schmieden suture;
c) Lambert suture;
d) Reverdin suture;
e) Czerny suture.

Test No. 5. When resecting the small intestine, surgeon formed intestinal "side to side" anastomosis with two layer suture. What wall of anastomosis should be formed first?
a) anterior;
b) posterior;
c) superior;
d) inerior;
e) it does not matter.

B. Tasks for self-control:

Task No. 1. While suturing longitudinal wound of the small intestine, surgeon placed one row of seroserous sutures longitudinally, drying the peritoneal cavity, closed the wound of the abdominal wall layer by layer. Are there any errors in the surgeon's actions?

Task No. 2. When resecting the small intestine and placing end-to-end interstitial anastomosis, surgeon incised the loop of the intestine transversely. What is the surgeon's error, what complications can be expected after anastomosis?

References

Basic literature

1. Tsyhykalo O.V. Topographic Anatomy and Operative Surgery / O.V.Tsyhykalo. – Vinnytsia, 2011. — 528 p.
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3. Netter F. H. Atlas of Human Anatomy / Frank H.Netter. – East Hannover, New Jersey, 1990. – 592 p.
4. Hnatyuk M.S. Operative surgery and topographical anatomy (lectures) / M.S.Hnatyuk, O.B.Slabuj. – Temopil, 2004. – 212 p.
5. Bernard C. Illustrated Manual of Operative Surgery and Surgical Anatomy / C.Bernard – 1991.-330 p.
6. Pemberton L.B. Workbook of Surgical Anatomy / L.B.Pemberton. – 1990. – 298 p.
7. Gliedman M.L. Atlas of Surgical Techniques / M.L.Gliedman. – New York etc., McGraw – Hill. – 1990. – 420 p.
8. Sabiston D.C. Atlas of General Surgery / D.C.Sabiston. – Philadelphia etc., Saunders. – 1994. – 220 p.
9. Chassin J.L. Operative Strategy in General Surgery / J.L.Chassin. – New York etc., Springer. – 1994. – 368 p.

Academic discipline	Clinical anatomy and operative surgery
Module No.1	Clinical anatomy and operative surgery of the sites of the head, neck, chest cavity and abdominal cavity.
Content module No.3	Clinical anatomy and operative surgery of the sites and organs of the abdominal cavity.
Topic 22	Stomach operations. Incision, stitching. Stomach fistula, gastrointestinal anastomoses. Principles of stomach resection, organ-preserving operations (vagotomy), drainage operations.
Year	II
Faculty	Foreign students training (medical)

1. Relevance of the topic: such diseases as burns, inoperable tumors of the esophagus and pyloric part of the stomach, extraneous bodies, etc. need surgical methods of treatment. The different types of vagotomy are widel used. True ulcers of the stomach, its tumors require resection of the stomach. Detailed knowledge of the topographical and anatomical features of the stomach structure, the use of surgical intervention technique significantly improves the results of treatment of these types of pathology.

2. Specific objectives:

1. Explain the technique of gastrostomy, gastrectomy, resection of the stomach, organ-preserving operations.
2. Explain how to perform such operations as gastrostomy, gastrectomy, resection of the stomach, organ- preserving operations.

3. Tasks for independent work to prepare for the lesson

3.1. List of the main terms, parameters, characteristics that should be learnt by the student while preparing for the lesson

Term	Definition
Tube fistula	More often, one of the stages of the patient's preparation for a plastic surgery on the esophagus and its injuries, placed for a short time, is closed independently.
Lip – like fistula	A fistula, which is placed for a long period, more often with inoperable tumors of the esophagus, is closed only through operations.
Stomach resection	Removal of the stomach

Vagotomy	The operation which includes the intersection of the trunk of the vagus nerve or its branches leading to the stomach.
Pyloroplasty	Operation of stomach drainage which is performed in motility disorders after various types of vagotomy.

3.2. Theoretic questions:

1. Accesses to the organs of the abdominal region.
2. Types of intestinal sutures, technic of their stitching.
3. Basic advantages and disadvantages of different types of intestinal sutures.
4. Technic of resection of small intestine with anastomoses “side in a side” and “end to end”.
5. Advantages and disadvantages of existing types of intestinal anastomoses.
6. Possible complications after the resection of the small intestine.
7. Types of stomach resections.
8. Types of gastroenteroanastomosis.
9. Types of gastrostomy. The technique of introduction.
10. Vagotomy.

3.3. Practical activities performed in class:

1. To master the technique of layer section of stomach wall during conducting of gastrotomy.
2. To conduct Witzel gastrotomy, gastropexia.
3. To place intestinal sutures, stitching the wall of duodenum in case of introduction of fistula between stomach and duodenum (Billroth I method), stomach and jejunum (Billroth II method) in modification of Hofmeister-Finsterer.
4. To perform a vagotomy.

4. Content of the topic:

Principles of stomach surgery

Gastrostomy is carried out to form a temporary or permanent anastomosis in case of esophagus obstruction to provide patient’s nutrition. It is used in case of thoracic esophagus injuries, the presence of gastroesophageal fistula, disorders of the esophageal patency in case of its atresia, scarry strictures after chemical burns, malignant tumors of the esophagus.

Gastrostomy by Witzel method

Group of students that includes surgeon, assistant and scrub nurse conducts a layered dissection of the abdominal wall and exteriorization of the anterior stomach wall through the surgical wound using upper midline laparotomy. Along the longitudinal axis of the stomach in the middle between the greater and lesser curvatures of the stomach, closer to cardia, a rubber tube that is 0.8 cm in diameter is placed so that its end is directed towards the entrance of the stomach. Two folds

which cover the tube are formed by the anterior wall of the stomach. These folds are sutured together with 6-8 interrupted serous-muscular sutures. Within the last suture, the opening in the wall of the stomach is carried out around which a semipurse-string suture is placed. The end of the tube is inserted into this opening, and the tube is sutured with catgut sutures along the wall of the stomach. The site of the opening is peritonized with two-three sutures, which were placed after the introduction of the rubber tube into the cavity of the stomach. After that, the anterior wall of the stomach is sutured to the parietal peritoneum. The wound of the abdominal cavity is sutured layer by layer. Nutrition of the patient in the postoperative period is carried out through a tube that was withdrawn from the abdominal cavity to the anterior wall of the abdomen through contraincision.

Toprover gastrostomy

Surgical access does not differ from the previous operation. Through the opening is performed in the anterior wall of the abdomen, the anterior wall of the stomach is pulled in the form of a cone **(Fig. 56)**.

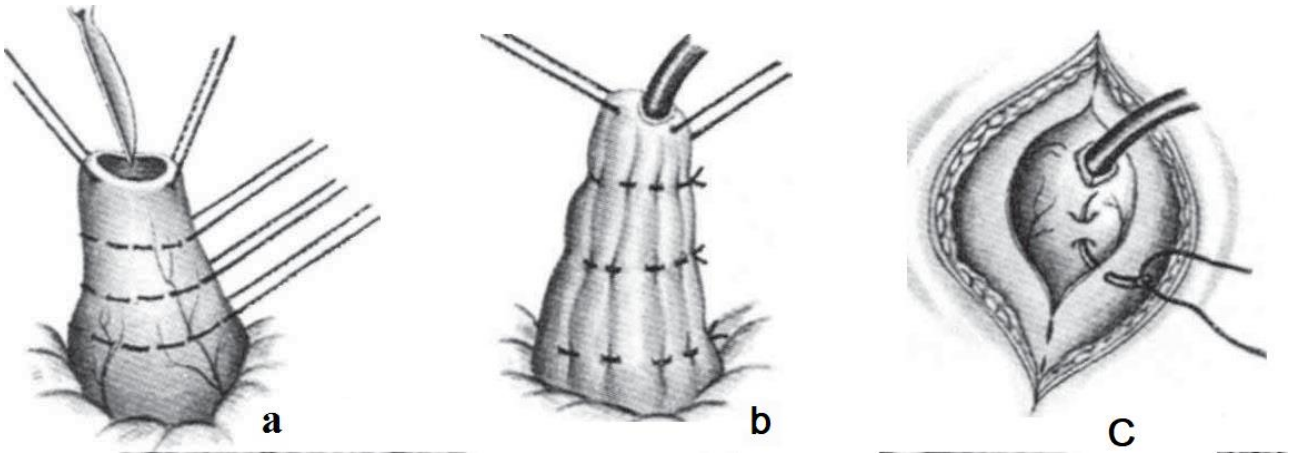

Fig. 56. Toprover gastrostomy:
a − formation of a cone from the anterior wall of the stomach and placing three purse-string sutures; b − general view of the cone, after tied sutures and a rubber tube inserted into the lumen of the stomach; c − fixation of the cone to the parietal peritoneum.

Two silk ligatures are placed on the top of this cone at the distance 2 cm from each other and one purse-string suture is placed 1.5-2 cm below them, in 1.5 cm − the second, and after 1.5 cm − the third. All sutures are not tightened, but are temporarily fixed with clamps. At the top of the cone, between the holders, the wall of the stomach is incisured, where a rubber tube that is 0.8-1.0 cm in diameter is inserted. The purse-string sutures are sequentially placed, starting from the first, tightened and tied. This surgical technique provides formation of an artificial canal in the gastric wall. Along the level of the lower purse-string suture, the stomach wall is sutured to the parietal peritoneum, along the level of the second one − to the rectus abdominis muscle and its sheath. On the last segment the sheath incision is sutured with silk interrupted sutures. Along the level of the first purse-string suture, the wall of the stomach is sutured to the skin so that the mucous membrane of the stomach, that protrudes, is attached to the skin and it can be sutured to it to form a constant lip-shaped fistula.

Gastrectomy

Principles of stomach resection according to Billroth-I and Billroth-II in modification of Hofmeister-Finsterer and possible resection volumes for various types of organ pathology are presented **(Fig. 57).**

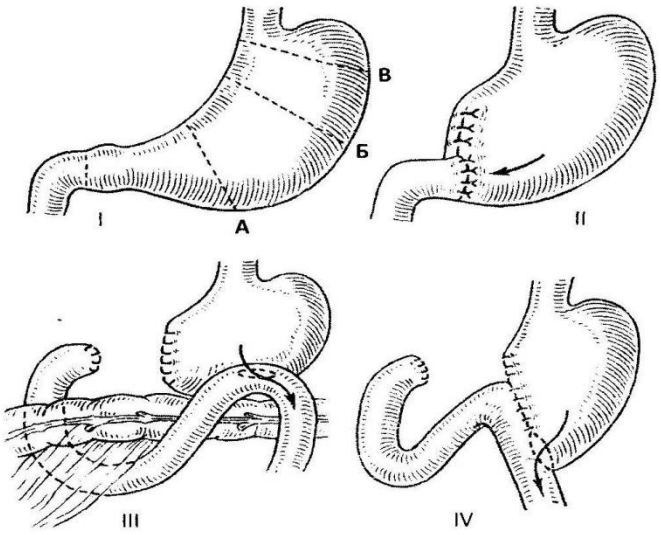

Fig.57. Resection of the stomach:
I− borders of resection:
А− one-third;
Б − two thirds;
В− subtotal;
II − scheme of resection according to Billroth I;
III − scheme of resection according to Billroth II;
IV – Billroth II in modification of Hofmeister-Finsterer.

When resectioning the stomach according to Billroth-I method the end-to-end anastomosis is performed with mobilization of the duodenum by Kocher method.

In case of stomach resection according to Billroth-II method in the modification of Hofmeister-Finsterer, attention is focused on suturing of the duodenum stump. This stage of the operation is very important, because the development of duodenal fistulas and peritonitis, dangerous for the patient, is possible.

Gastrotomy

Features: **removal of** foreign bodies from the stomach, examination of mucous membrane of stomach, retrograde bougienage and sounding of esophagus.

Position of patient: lying on back, in some cases, a roller is underlaid under the back.

Anaesthetizing: endotracheal anesthesia with muscle relaxant.

Operative access: upper middle laparotomy.

Technique of operation: after the layer section of tissues, including peritoneum, the abdominal region is carefully surrounded by sterile drapes which prevent entering the stomach content after dissecting its anterior wall. The section of stomach wall can be carried out depending on the purpose of operation: examination of mucous membrane, searching for bleeding ulcer and other. During the operation a longitudinal cut is conducted, in case of foreign body removal it is enough to perform a small transverse section.

At the beginning of operation the serous and muscular membranes of stomach are dissected, large bleeding vessels are ligated. Mucous membrane is taken by pincers and 1.5-2 cm dissection is performed between them. The content of the stomach is removed through the opening. The necessary manipulations are performed in the abdominal cavity with the following two-layer wound suturing: the first row of

continuous sutures is placed with catgut through all abdominal wall. It is important to remember that before placing the second row of sutures it is necessary to change all surgical drapes, instruments, repeatedly wash the hands. After it, the second row of sutures is placed.

Surgical drapes, instruments, blood are removed from the abdominal region, stomach is immersed in it; on peritoneum, continuous catgut sutures are placed; the cut margins of abdominal linea alba are stitched with silk sutures; a hypodermic layer is sutured with thin catgut; the skin is stitches with silk sutures.

5. Materials for self-control

A. Tasks for self-control:

Test No.1. For applying the intestinal suture, surgeon used Hegar needle holder. What surgeon's fingers should be in the rings of this instrument to provide optimal fixation in the hand?
a) first and second;
b) first and third;
c) first and fourth;
d) first and fifth;
e) second and fourth.

Test No.2. The surgeon used jejunum to form anastomosis. How is this gut usually covered by the peritoneum?
a) intraperitoneally;
b) mesoperitoneally;
c) extraperitoneally;
d) retroperitoneally;
e) first intra-, then – extraperipherally.

Test No.3. The surgeon placed a single-layer interrupted serous-muscular suture catching the submucosal layer with the taper needle on the external margin of the anastomosis. Knots were tied in the lumen of the hollow organ. The distance between the stitches is 1 cm. What requirement for the intestinal sutures was ignored?
a) asepticity;
b) hemostaticity;
c) hermeticity;
d) organ patency;
e) relative automaticity.

Test No.4. The surgeon used a single layer interrupted seroserous suture to form anastomosis. How is this suture called?
a) Pirogov suture;
b) Schmieden suture;
c) Lambert suture;
d) Reverdin suture;
e) Czerny suture.

Test No.5. When resecting the small intestine, surgeon formed intestinal "side to side" anastomosis with two layer suture. What wall of anastomosis should be formed first?
a) anterior;
b) posterior;
c) superior;
d) inferior;
e) it does not matter.

B. Tasks for self-control:

Task No.1. While suturing longitudinal wound of the small intestine, surgeon placed one row of seroserous sutures longitudinally, drying the peritoneal cavity, closed the wound of the abdominal wall layer by layer. Are there any mistakes in the surgeon's actions?

Task No. 2. When resecting the small intestine and placing end-to-end interstitial anastomosis, surgeon incised the loop of the intestine transversely. What is the surgeon's error, what complications can be expected after anastomosis?

References

Basic literature

1. Tsyhykalo O.V. Topographic Anatomy and Operative Surgery / O.V.Tsyhykalo. – Vinnytsia, 2011. — 528 p.
2. Danilchenko S.I. Methodical Instruction For the 3st year students'of stomatological faculty self - preparation work (at class and at home) in studying operative surgery and toographical anatomy / S.I.Danilchenko, E.N.Pronina, O.Yu.Polovik. - Poltava, 2010. — 239 p.

Additional literature

1. Gray. H. F.R.S. Gray's anatomy / Henry F.R.S. Gray, R. A. Bolam. – London, 1994. – 1290 p.
2. McCraw J.B. Athlas of muscle and Musculocutaneous Flaps Head and Neck Reconstruction / John B McCraw, Phillip G Arnold. – Norfolk, Virginia, 1988. – 757 p.
3. Netter F. H. Atlas of Human Anatomy / Frank H.Netter. – East Hannover, New Jersey, 1990. – 592 p.
4. Hnatyuk M.S. Operative surgery and topographical anatomy (lectures) / M.S.Hnatyuk, O.B.Slabuj. – Temopil, 2004. – 212 p.
5. Bernard C. Illustrated Manual of Operative Surgery and Surgical Anatomy / C.Bernard – 1991.-330 p.
6. Pemberton L.B. Workbook of Surgical Anatomy / L.B.Pemberton. – 1990. – 298 p.
7. Gliedman M.L. Atlas of Surgical Techniques / M.L.Gliedman. – New York etc., McGraw – Hill. – 1990. – 420 p.
8. Sabiston D.C. Atlas of General Surgery / D.C.Sabiston. – Philadelphia etc., Saunders. – 1994. – 220 p.
9. Chassin J.L. Operative Strategy in General Surgery / J.L.Chassin. – New York etc., Springer. – 1994. – 368 p.

Academic discipline	Clinical anatomy and operative surgery
Module No.1	Clinical anatomy and operative surgery of the sites of the head, neck, chest cavity and abdominal cavity.
Content module No.3	Clinical anatomy and operative surgery of the sites and organs of the abdominal cavity.
Topic 23	Operations on the liver and biliary tract, liver wound suturing, liver suture. Cholecystectomy, choledochotomy. Access to the pancreas. Removal of the spleen.
Year	II
Faculty	Foreign students training (medical)

1. Relevance of the topic: penetrating injuries and closed abdominal injuries with damage to the liver, extrahepatic biliary tract, spleen, anomalies of these organs, as well as surgical diseases of the liver and extrahepatic biliary tract, pancreas, and spleen are common in medical practice. Knowledge of the anatomical and physiological features of the structure of the named organs will provide the deeper understanding of the pathological processes origin and their complications, qualified first and specialized medical care.

2. Specific objectives:

1. To analyze surgical accesses to the liver and extrahepatic bile ducts, pancreas, spleen, possible errors and complications during surgery and ways to avoid them.
2. Explain how to perform the most common operations on the liver and extrahepatic biliary tract, spleen.
3. Explain how to perform cholecystectomy and splenectomy.

3. Tasks for independent work to prepare for the lesson

3.1. List of the main terms, parameters, characteristics that should be learnt by the student while preparing for the lesson

Term	Definition
Cholecystectomy	Removal of the gallbladder
Splenectomy	Removal of the spleen
Resection of the liver	Removing the part of the liver

3.2. Theoretic questions:

1. Indications for operations on the liver and extrahepatic biliary tract.
2. Indications for the spleen removal.
3. How is the liver wound sutured?
4. How is resection of the liver performed?

5. How are retrograde and anthrageal cholecystectomy performed?
6. How is choledochotomy performed?
7. What is the approach to the pancreas?
8. What is the sequence of processing the vessels of the splenic hilum in case of its removal?

3.3. Practical activities performed in class:

1. Performing surgical access to the liver, extrahepatic biliary tract, pancreas, spleen.
2. Suturing of hepatic wound.
3. Ligation of the bladder artery and neck of the gall bladder, isolation of the gallbladder from its bed.
4. Resection of the common bile duct.
5. Ligation of the splenic hilum vessels and their separation.

4. Content of the topic:

Operations on the liver and gallbladder

In case of open and closed liver injuries, gunshot wounds, the upper median laparotomy is performed. This incision can be supplemented by transverse incisions to the right and to the left. Surgical debridement of the liver injury is carried out. For this purpose, the edges of the wound with the damaged tissue should be removed. Bleeding in the wound is arrested by vasoligation, suturing, biological tamponade. Bile leakage is eliminated by ligation, suturing of intrahepatic bile ducts. In significant ruptures of the liver lobe, it is resected, in marginal wounds ─ wedge resection is performed. It should be noted that surgical treatment of liver injuries includes firstly bleeding arrest and removal of the damaged tissue almost until complete liver resection.

The surgeon connects wound edges after removing the damaged area and sutures with simple knot stitches. The stitches are performed with round curved needle, the prick in the parenchyma is made 2−3 cm from the wound edge. To prevent complications, capping is performed using a cap or segment of the falciform ligament of the liver separated from the diaphragm. The surgeon also applies a special Kuznetsov-Pensky suture using a blunt needle and double thread. The stitches of the thread are looped one after the other, compressing the vessels of the damaged area of the liver. Applying of P-shaped sutures **(Fig. 58)** and X-shaped suturing of vessels is possible.

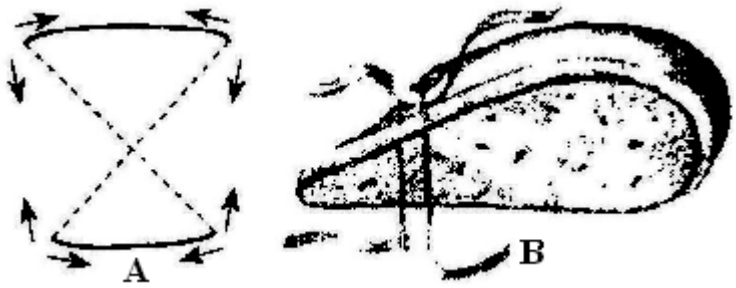

Fig.58. The most common sutures on the liver:
A−X-shaped suture; B− suture with applying synthetic materials

The surgical team conducts margin resection of the liver. Apply P-shaped sutures or Kuznetsov-Pensky sutures. Retreating 0.5 cm ectad applied sutures, the damaged area of the liver is cut off with the scalpel. Large vessels and bile ducts are sutured and ligated. Several drainage tubes are introduced into the wound **(Fig. 59, 60).**

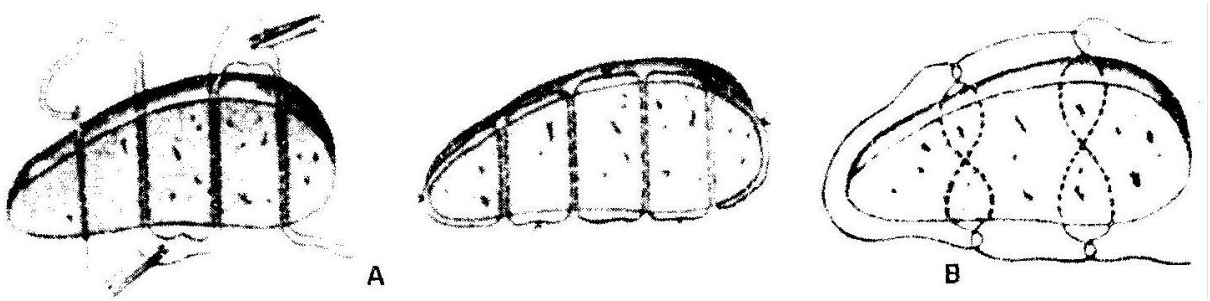

Fig.59. Hemostatic sutures on the liver:
A− Kuznetsov-Pensky suture; B – Labbock suture

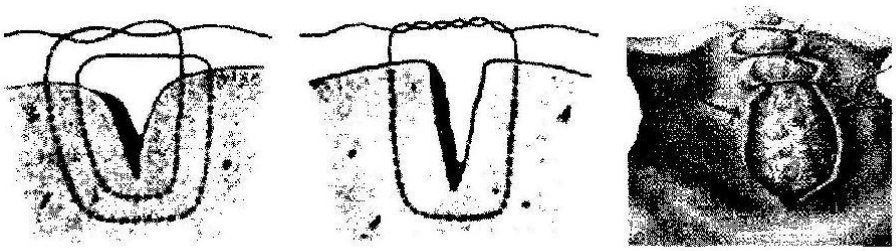

Fig.60. Types of sutures on the liver. The technique of applying a simple interrupted suture on the liver

Retrograde cholecystectomy (removal of the gallbladder from neck to fundus). Two fenestrated forceps are placed on the gallbladder, one − at the fundus, another − at the neck. The neck of the bladder is strained and incision along the right side of the hepatoduodenal ligament is performed, exposing the cystic duct. The duct is cut between the forceps and a double ligature is applied to its stump. Pulling the bladder by the neck, the bladder artery is exposed and after identifying carefully, it is cut between the forceps and the stump is ligatured. Further, the gallbladder is isolated from the hepatic bed. For this purpose, a serous membrane is cut with the scalpel along the right and left margins of the gallbladder, connecting incisions at the fundus of the bladder. Using scissors and drape the bladder is pulled out from its bed. The bed of the bladder is peritonized with a running suture. The wound of the anterior abdominal wall is sutured tightly.

Antegrade cholecystectomy is possible, that is removal of the bladder from the fundus to neck. It is carried out in cases with technical difficulties in exposing the bladder neck and the cystic artery (cicatricial and infiltrative changes, adhesive process, various variants of the bladder neck position, the bladder duct and cystic artery position).

The operation is performed by opening the common bile duct, which is carried out in case of obstructive jaundice, calculi in hepatic and bile ducts, a great number of small calculi in the gallbladder, and pathological changes in the major duodenal papilla. The length of the incision of the common bile duct wall is 1 cm. The incision is performed longitudinally between two holders, on the anterior wall of the duct,

closer to its external margin, at a distance of 0.5 cm from the duodenum margin. The probe is introduced through the major duodenal papilla. If the probe does not pass into the duodenum, it should be opened, the papilla is examined and, if necessary, sphincterotomy should be performed.

5. Materials for self-control
A. Tasks for self-control:

Test No.1. The surgeon removed the gallbladder using low-traumatic operative access without damaging intercostal neurovascular bundles. What kind of laparotomy did he use?
a) according to Shalimov;
b) upper medial;
c) middle medial;
d) oblique subcostal;
e) angular.

Test No.2. The surgeon applied Kuznetsov-Pensky suture on the liver. What needle should be used for this purpose?
a) blunt needle and double thread;
b) blunt needle with a single thread;
c) taper needle with single thread;
d) single-thread cutting needle;
e) cutting needle with double thread

Test No.3. The surgeon performs retrograde cholecystectomy. What bile duct should be ligated?
a) right hepatic;
b) left hepatic;
c) common hepatic;
d) common bile;
e) cystic

Test No.4. In surgical intervention in case of hepatic duct calculi the surgeon must identify a common hepatic duct. Between the sheets of what ligament is it located?
a) hepatoduodenal;
b) hepatogastric;
c) hepatorenal;
d) round liament of liver;
e) venous ligament

Test No.5. During cholecystectomy (removal of the gallbladder), performed from the fundus, concrements (gallstones) can move along a wide cystic duct to other parts of the bile passages. What area should be examined?
a) Ductus choledochus;
b) Ductus hepaticus communis;
c) Ductus hepaticus dexter;

d) Ductus hepaticus sinister;
e) Ductulus billifer

B. Tasks for self-control:

Task No.1. While examining the abdominal cavity organs, the surgeon has determined that traumatic rupture of the right liver lobe is the source of internal bleeding. What are the further tactical measures of the surgeon in this case?

Task No. 2. While examining the abdominal cavity of the patient after blunt abdominal trauma, the surgeon has determined a massive bleeding from the liver. How can bleeding be arrested in this case?

References

Basic literature

1. Tsyhykalo O.V. Topographic Anatomy and Operative Surgery / O.V.Tsyhykalo. – Vinnytsia, 2011. — 528 p.
2. Danilchenko S.I. Methodical Instruction For the 3st year students'of stomatological faculty self - preparation work (at class and at home) in studying operative surgery and toographical anatomy / S.I.Danilchenko, E.N.Pronina, O.Yu.Polovik. - Poltava, 2010. — 239 p.

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Academic discipline	Clinical anatomy and operative surgery
Module No.1	Clinical anatomy and operative surgery of the sites of the head, neck, chest cavity and abdominal cavity.
Content module No.3	Clinical anatomy and operative surgery of the sites and organs of the abdominal cavity.
Topic 24	Operation on the colon. Removal of appendix. Ways to process the appendix stump. Retrograde removal of the appendix. Formation of the fistula. Hemicolectomy (principles of surgery).
Year	II
Faculty	Foreign students training (medical)

1. The relevance of the topic: among all diseases of the large intestine, a significant part is the pathology, which is not subject to conservative methods of treatment and requires operative correction, namely, acute appendicitis, Hirschsprung's disease in children and idiopathic megacolon in adults, non-specific ulcerative colitis, and tumors of the colon. Nearly one million appendectomies are performed annually in case of acute appendicitis.

2. Specific objectives:
1. Explain the general principles of operations on the colon.
2. Explain how to perform appendectomy.

3. Tasks for independent work to prepare for the lesson

3.1. List of the main terms, parameters, characteristics that should be learnt by the student while preparing for the lesson

Term	Definition
Appendectomy	Removal of the appendix
Intestinal resection	Removal of intestine

3.2. Theoretic questions:
1. Technique for access to the appendix according to Volkovich-Diakonov.
2. The technique of appendectomy.
3. Methods of processing the appendix stump.
4. Indications and technique imposition of enterocutaneous fistula.
5. Principles of large intestine resection.

3.3. Practical activities performed in class:
1. Access to the appendix according to Volkovich-Diakonov.
2. Mobilization and removal of the appendix.
3. Processing of the appendix stump by purse-stringing method.

4. Formation of transverse colon stoma.

4. Content of the topic:

Appendectomy. Section of the abdominal wall according to Volkovich-Diakonov. Spare separation of the fibers of the internal oblique and transverse abdominal muscles is performed. At the intersection of the peritoneum, it is necessary to raise it, so as not to injure the adjacent organs. Look for an ileocecal angle, determine the characteristic features of the large intestine. The base of the appendix is always located on the free bands of the colon, on the posterior-medial edge of the intestine, 2-2.5 cm from the ileocecal angle. The appendix usually goes down and medially. The surgeon conducts the mobilization of appendix, cuts off its mesentery and ligaturing the mesentery vessels, often stitches it. Dissecting the appendix between the ligature and the clamp, cauterize with a spirituous solution of iodine of the appendix stump, tied with a catgut thread, and immersed in the purse-string suture. There are other ways of processing the appendix − without lacing with immersion in the purse-string suture. The wound of the anterior-lateral wall of the abdomen is sutured tightly layer-by-layer **(Fig. 61)**.

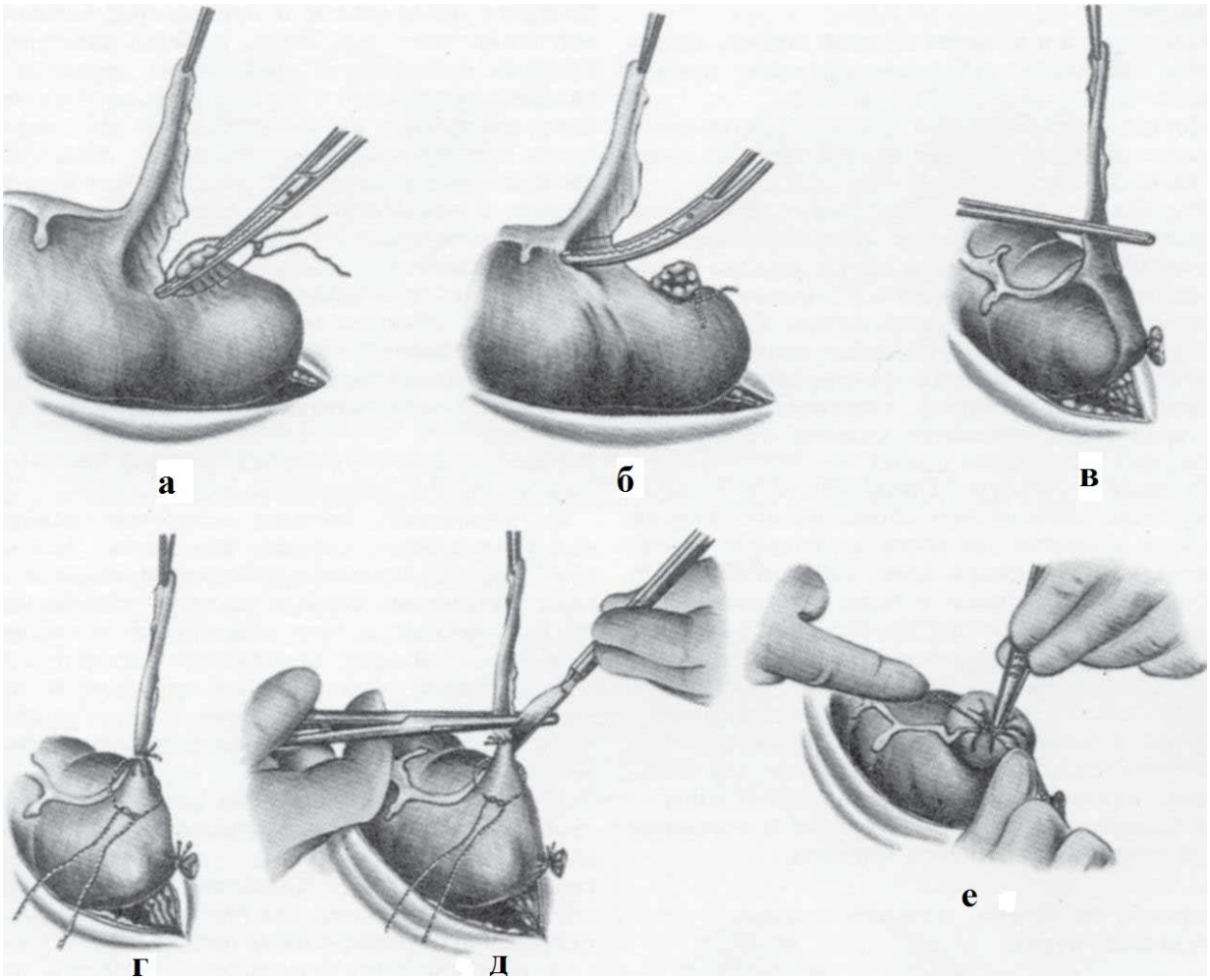

Fig. 61. Appendectomy (stages of surgery):
а, б − ligation of the vessels and cut off the appendix mesentery;
в, г, д, е − the technique of removing the appendix by the ligature-invagination method.

During intestinal obstruction in case of necessity of urgent removal of intestinal contents (if it is impossible to carry out a radical operation), form a enterocutaneous fistula. The operation can be performed in any moving segment of the colon − caecostomy, transversostomy, sigmoidostomy.

Make a section of the anterior-lateral wall of the abdomen and stitch parietal peritoneum to the edges of the cutting skin. In the wound, the part of the colon is introduced and its wall is sutured along the entire circumference of the wound to the parietal peritoneum and transverse fascia. After the formation of adhesions between the parietal and visceral peritoneum in 3-4 days, the lumen of the intestine is cut longitudinally and sutured to the edges of the skin wound.

Resection of the large intestine, general rules: thorough mechanical cleansing of the gut before surgery; resection in those places where the colon has a peritoneum; the intention to remove gut areas with disturbed blood circulation; the continuity of the colon is restored by "end-to-end" anastomosis.

5. Materials for self-control

A. Tasks for self-control:

Test No.1. For applying the intestinal suture, surgeon used Hegar needle holder. What surgeon's fingers should be in the rings of this instrument to provide optimal fixation in the hand?
a) first and second;
b) first and third;
c) first and fourth;
d) first and fifth;
e) second and fourth.

Test No.2. The surgeon used jejunum to form anastomosis. How is this gut usually covered by the peritoneum?
a) intraperitoneally;
b) mesoperitoneally;
c) extraperitoneally;
d) retroperitoneally;
e) first intra-, then – extraperipherally.

Test No.3. The surgeon placed a single-layer interrupted serous-muscular suture catching the submucosal layer with the taper needle on the external margin of the anastomosis. Knots were tied in the lumen of the hollow organ. The distance between the stitches is 1 cm. What requirement for the intestinal sutures is ignored?
a) asepticity;
b) hemostaticity;
c) hermeticity;
d) organ patency;
e) relative automaticity.

Test No.4. The surgeon used a single layer interrupted seroserous suture to form anastomosis. How is this suture called?
a) Pirogov suture;
b) Schmieden suture;
c) Lambert suture;
d) Reverdin suture;
e) Czerny suture.

Test No.5. When resecting the small intestine, surgeon formed intestinal side to side anastomosis with two layer suture. What wall of anastomosis should be formed first?
a) anterior;
b) posterior;
c) superior;
d) inerior;
e) it does not matter.

B. Tasks for self-control:

Task No.1. While suturing longitudinal wound of the small intestine, surgeon placed one row of seroserous sutures longitudinally, drying the peritoneal cavity, closed the wound of the abdominal wall layer by layer. Are there any mistakes in the surgeon's actions?

Task No.2. When resecting the small intestine and placing end-to-end interstitial anastomosis, surgeon incised the loop of the intestine transversely. What is the surgeon's mistake, what complications can be expected after anastomosis?

References

Basic literature

1. Tsyhykalo O.V. Topographic Anatomy and Operative Surgery / O.V.Tsyhykalo. – Vinnytsia, 2011. — 528 p.
2. Danilchenko S.I. Methodical Instruction For the 3st year students'of stomatological faculty self - preparation work (at class and at home) in studying operative surgery and toographical anatomy / S.I.Danilchenko, E.N.Pronina, O.Yu.Polovik. - Poltava, 2010. — 239 p..

Additional literature

1. Gray. H. F.R.S. Gray's anatomy / Henry F.R.S. Gray, R. A. Bolam. – London, 1994. – 1290 p
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3. Netter F. H. Atlas of Human Anatomy / Frank H.Netter. – East Hannover, New Jersey, 1990. – 592 p.
4. Hnatyuk M.S. Operative surgery and topographical anatomy (lectures) / M.S.Hnatyuk, O.B.Slabuj. – Temopil, 2004. – 212 p.
5. Bernard C. Illustrated Manual of Operative Surgery and Surgical Anatomy / C.Bernard – 1991.-330 p.

6. Pemberton L.B. Workbook of Surgical Anatomy / L.B.Pemberton. – 1990. – 298 p.
7. Gliedman M.L. Atlas of Surgical Techniques / M.L.Gliedman. – New York etc., McGraw – Hill. – 1990. – 420 p.
8. Sabiston D.C. Atlas of General Surgery / D.C.Sabiston. – Philadelphia etc., Saunders. – 1994. – 220 p.
9. Chassin J.L. Operative Strategy in General Surgery / J.L.Chassin. – New York etc., Springer. – 1994. – 368 p.

Academic discipline	Clinical anatomy and operative surgery
Module No. 1	Clinical anatomy and operative surgery of the sites of the head, neck, chest cavity and abdominal cavity.
Topic 25	Final module control of theoretical and practical training of students
Year	II
Faculty	Foreign students training (medical)

4. The content of the topic:

Theoretical questions for the final module control

1. Contents and tasks of the course of clinical anatomy.
2. Classification of surgical interventions.
3. Principles and stages of surgical interventions.
4. Topographic anatomy of the fronto-parieto-occipitalis region. Borders, layered structure, cellular spaces, blood supply, innervation, lymphatic drainage. Cellular spaces.
5. Topographic anatomy of the mastoid region. Layer structure, blood supply, innervation, lymphatic drainage. Trepanation of the Chipault triangle.
6. Topographic anatomy of the parotid region.
7. Arterial blood supply to the facial part of the head.
8. Topographic anatomy of the deep region of the face.
9. Venous systems of the craniocerebral and facial sections of the head, their connection.
10. Topographic anatomy of the temporal region. Borders, layered structure, blood supply, innervation, lymphatic drainage.
11. Scheme of cranio-cerebral topography of Kronlein-Briusova and Yehorov. Major grooves and gyri of the brain. Topographic anatomy a.meninga media. Arterial circle of the brain.
12. Meninges of the brain. Meningeal spaces. Dura mater, its sinuses and processes.
13. Topographic anatomy of the trigeminal nerve and its branches.
14. Topographic anatomy of the facial nerve and its branches.
15. Phlegmons of the face. Cuts in inflammatory processes on the face.
16. Primary surgical treatment of maxillofacial wounds.
17. Principles of primary surgical treatment of craniocerebral wounds.
18. Trepanation of the skull. Principles of decompressive and bone-plastic surgery.
19. Topographic anatomy of cellular spaces of the neck.
20. Topographic anatomy of the carotid triangle of the neck.
21. Topographic anatomy of the thyroid gland.
22. Topographic anatomy of the larynx.
23. Neck fascias according to Shevkunenko. Neck triangles.
24. Features of primary surgical treatment of neck wounds.

25. Operative access to carotid arteries in the carotid triangle.
26. Upper and lower tracheotomy.
27. Subtotal, subcapsular strumectomy according to A. V. Nikolaev. Indications, technique of operation.
28. Topographic anatomy of intercostal spaces.
29. Topographic anatomy of the mammary gland.
30. Topographic anatomy of the scapula area. Collateral blood flow at the level of the scapula.
31. Topographic anatomy of the mediastinum, its divisions (front, back, middle). Relation of organs to the mediastinum.
32. Topographic anatomy of the heart and its vessels. Features of the topography in children.
33. Surgical anatomy of congenital defects of the heart and large vessels. Principles of surgical treatment.
34. Topographic anatomy of the lungs. Segmental and partial structure.
35. Mastites and their operative treatment.
36. Operations with benign and malignant tumors of the mammary gland.
37. Resection of the rib.
38. Pneumothorax. Methods of treatment.
39. Operations with benign and malignant tumors of the mammary gland.
40. Principles of operations on the lungs − lung suturing, segmental resection, lobectomy, pulmonectomy.
41. Suture of the heart. Indications, technique of surgery performing.
42. Endocoronary interventions. Coronary artery bypass grafting.
43. Topographical anatomy of the anterior-lateral wall of the abdomen. Layers, blood supply.
44. Topographical anatomy of the inner surface of the anterior abdominal wall. Folds and fossae of the peritoneum.
45. Topographic anatomy of the inguinal canal. Gender-related features of the inguinal channel and its contents.
46. The concept of a hernia. Classification of hernia.
47. Surgical anatomy of oblique, straight, sliding and congenital inguinal hernias.
48. Surgical anatomy of femoral hernia.
49. Surgical accesses to the organs of the abdominal cavity, their topographical anatomical substantiation.
50. Operations involving direct inguinal hernia.
51. Surgery for oblique inguinal hernias.
52. Operations involving femoral hernia.
53. Operations involving umbilical hernia and white line abdominal hernia.
54. Topographic anatomy of the peritoneum. The course of the peritoneum. Relation of organs to the peritoneum.
55. Channels, sinuses and bags of the abdominal cavity, their practical significance.
56. Topographic anatomy of the stomach.
57. Topographic anatomy of the liver.
58. Topographic anatomy of the gallbladder and bile ducts.
59. Topographic anatomy of the pancreas.
60. Topographic anatomy of the small intestine. Meckel diverticulum.

61. Topographic anatomy of the large intestine.
62. Theoretical foundations and techniques of intestinal sutures. Stitching intestinal wounds.
63. Resection of the intestine. Types of intestinal anastomosis.
64. Topographic anatomy of the spleen. Spleen ligament attachments. Blood supply, innervation, lymphatic drainage.
65. Appendectomy. Technique of conducting, principles of appendiceal stump formation.
66. Principles of operations with stomach stitching.
67. Gastrostomy, types.
68. Gastroenterostomy. Types. Preventive measures to avoid the formation of the wrong circle.
69. Principles of stomach resection, types, modifications.
70. Principles and types of vagotomy. Drainage operations.
71. Methods and techniques of cholecystectomy.

Practical skills for module control

1. The technique of primary surgical treatment of wounds.
2. The technique of venepuncture.
3. The technique of venesection.
4. The technique of external carotid artery ligation.
5. The technique of common carotid artery ligation.
6. The technique of tracheostomy.
7. The technique of vagosympathetic blockade according to O. V. Vishnevsky.
8. The technique of pleural puncture.
9. The technique of herniation by Spasokukotsky-Girard method.
10. The technique of hernia removal according to Bassini.
11. The technique of hernia removal according to Martynov.
12. The technique of appendectomy.
13. The technique of cholecystostomy.
14. The technique of anterior gastrointestinal anastomosis.
15. The technique of rectal gastrointestinal anastomosis.
16. The technique of intestinal anastomosis "side-to-side".
17. The technique of intestinal anastomosis "end to end".
18. The technique of gastrostomy by Witsel.
19. The technique of gastrostomy by Kader.
20. The technique of gastrostomy by Toprover.
21. The technique of stitching a wound of a stomach.
22. The technique of stitching a wound of the small intestine.
23. The technique of stitching a wound of the colon.
24. Kuznetsov-Pensky's suture technique.

References

Basic literature

1. Tsyhykalo O.V. Topographic Anatomy and Operative Surgery / O.V.Tsyhykalo. – Vinnytsia, 2011. — 528 p.

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6. Pemberton L.B. Workbook of Surgical Anatomy / L.B.Pemberton. – 1990. – 298 p.
7. Gliedman M.L. Atlas of Surgical Techniques / M.L.Gliedman. – New York etc., McGraw – Hill. – 1990. – 420 p.
8. Sabiston D.C. Atlas of General Surgery / D.C.Sabiston. – Philadelphia etc., Saunders. – 1994. – 220 p.
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Educational edition

Bilash Serhiy Mykhaylovych
Pronina Olena Mykolayivna
Koptev Mykhaylo Mykolaiovych

Clinical Anatomy and Operative Surgery of areas and organs of head, neck, chest and abdomen

Manual for the second (master's) level of higher education in the field of knowledge 22 "Health care" specialty 222 "Medicine"

Technical editor − R.P. Borovyk
Computer layout − A.I. Kushpil'ov

Signed for print
Format 60 × 90/16. No. 447
Paper offset. Digital printing. Cond. pr. sheets 7.0
Edition. 400 copies

The manufacturer: copy salon «Kopir service»;
Poltava, st. Gogol 18a
Certificate of making a subject of publishing business
to the state register of publishers, manufacturers and distributors of publishing products,
series BO1 № 596813 dated February 9, 2006