**METHODICAL INSTRUCTION**
**FOR INDEPENDENT WORK OF STUDENTS**
**DURING PREPARATION TO PRACTICAL EMPLOYMENT**

<table>
<thead>
<tr>
<th>Academic discipline</th>
<th>Clinical anatomy and operative surgery</th>
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<tr>
<td><strong>Module No 1</strong></td>
<td>Clinical anatomy and operative surgery of areas and organs of head, neck, trunk and extremities</td>
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<tr>
<td><strong>Content module No.1</strong></td>
<td>Introduction to clinical anatomy and operative surgery. Clinical anatomy and operative surgery of the head and neck.</td>
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<tr>
<td><strong>Year</strong></td>
<td>II</td>
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<tr>
<td><strong>Faculty</strong></td>
<td>Foreign students training (medical)</td>
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</table>
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, throat and esophagus burns are a fairly common pathology; also dangerous injuries to large vessels and neck. 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 is foreseen.

2. Specific objectives.
1. To interpret 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 O. V. Vishnevsky.
5. To interpret the distribution of the neck to triangles.
6. To interpret the topographic anatomical relations of formations within the different layers of certain areas of the neck.
7. Explain the topography of the esophagus, thyroid and parotid glands.
8. Perform access to the cervical portion of the esophagus.
9. Perform subtotal subfascial resection of the thyroid gland according to A. V. Nikolaev.

3. Base knowledge, abilities, skills, necessary for study themes (interdiscipline integration).

<table>
<thead>
<tr>
<th>Names of previous disciplines</th>
<th>Got skills</th>
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<tbody>
<tr>
<td>History of medicine</td>
<td>To know the role of home scientists in development of operative surgery and topographical anatomy.</td>
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<tr>
<td>Anatomy of Human</td>
<td>Able to apply knowledge from the anatomy of the systems, organs within the limits of certain areas of body of man.</td>
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<tr>
<td>Histology</td>
<td>Able to synthesize micro- and macrostructure of organs and systems of human body, and also to understand intercommunication of structure and function.</td>
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<tr>
<td>Normal physiology</td>
<td>To know the mechanisms of adjusting of function of organism, work of the special systems of organism (circulation of blood, breathing, digestion, thermoregulation), and locomotorium.</td>
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<tr>
<td>General surgery</td>
<td>Able to plan operative intervention and determine motion of operative intervention.</td>
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<tr>
<td>Business Ukrainian</td>
<td>Able freely to own Ukrainian, correctly to conduct business professional documentation, freely to use professional terminology.</td>
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<tr>
<td>Foreign language</td>
<td>Able to use foreign literature during preparation to employments.</td>
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<tr>
<td>Philosophy</td>
<td>Able to inculcate methodology and dialectics of cognitive activity at the study of object.</td>
</tr>
<tr>
<td>Bases of justice</td>
<td>Able to use general legal principles for explanation of actions and acts of doctor.</td>
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4. Tasks for independent work to prepare for the lesson
4.1. List of the main terms, parameters, characteristics that should be learnt by the student while preparing for the lesson.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>1. Vagosympathetic blockade according to O. V. Vishnevsky</td>
<td>1. Type of local anesthesia, which performed to prevent the occurrence of pleuropulmonary shock in breast injuries and complex operations on the organs of the thoracic cavity.</td>
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<tr>
<td>2. Vagosympathetic blockade according to M. N. Burdenko</td>
<td>2. The vagosympathetic blockade, which belongs to the bloody interventions, because the skin of the anterior margin of the sternocleidomastoid muscle cleaves with a subcutaneous tissue and deeper layers of tissue.</td>
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4.2. 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 vascular-nerve bundle of the neck.
7. Signs of external and internal carotid arteries.
8. Branches of the external carotid artery that go within the carotid triangle.
9. The topography of the cervical part of the esophagus.
10. The topography of the thyroid gland and the parotid glands.
11. Features of operative access to the cervical part of the esophagus.
12. The technique of subtotal subfascial resection of the thyroid gland according to O. V. Nikolaev.
13. Errors and complications at subtotal subfascial resection of thyroid gland according to A.V. Nikolaev.
14. Aneurysms of the common carotid artery and the technique of operations with them.

4.3. Practical skills acquired in class:
1. Implementation of cuts during purulent neck processes.
2. Isolation of external and internal carotid arteries.
3. Execution of a vagosympathetic blockade according to O. V. Vishnevsky.
4. Carry out the cervical portion of the esophagus.
5. To conduct resection of the thyroid gland according to A. V. Nikolaev.

5. The content of the topic:
Fascias of the neck
In the modern period, the requirements for surgical practice correspond to the classification of neck fascia according to V. M. Shevkunenko, according to which five fascias are located on the neck.

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 department 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 of the students 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, and from them, septums leave in the thickness of the muscles. A characteristic feature of the second fascia is the withdrawal of spurs from it 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 fascia. It 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 inception, 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, located antescalenum and interscalenum spaces. 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 interaponeuroticumsuprasternal 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 rear 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 vagina 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.

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 here are concentrated lymph nodes, unpaired thyroid plexus (plexus thyreoideus impar), from which begin the inferior thyroid veins. In this space, the lowest thyroid gland (a. thyreoidea ima) occurs 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 a 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 lies a retrovisceral space (spatium retroviscerale). 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, formed a narrow vascular gap, called the vasa nervorum, which reaches the outer base of the skull at the top, and then passes into the anterior mediastinum. It is essential, that 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 vagina of the vascular-nerve 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.
The dimensions and direction of the neck cuts depend on the indications in each case, also taking into account cosmetic requirements.
Depending on the location of the purulent process on the neck, the following cuts can be: transverse, oblique, vertical and combined.
When accessing the abscesses, which are localized within the spatium interaponeuroticum suprasternale, used a cross-section that connects the medial edges of sternocleidomastoid muscle in the suprasternal region.
In phlegmons of the previsceral space, performed a median neck incision, depending on the level of localization of the purulent process.
Access to the purulent cell of the vascular-nerve bundle is carried out along the anterior margin of m. sternocleidomastoideus, and at submandibular phlegmons - 1cm below the body of the mandible.

**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 benchmarks for operations on the larynx, thyroid gland, and trachea.
The larynx in the front 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 thyreoida), cricoid cartilage (cartilago cricoidea), arytenoid cartilages (cartilago aritenoida), corniculate cartilages (cartilago corniculata), and epiglottis.
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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, applied a cut of 4-6 cm in length. The skin dissected with a subcutaneous tissue and superficial fascia. On the course of the cut detected a v. mediana colli, which should be pushed aside and bound. Neck aponoeurosis 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 fix a trachea. The teacher draws attention to the fact that the working surface of the scalpel should be controlled. For this blade of the scalpel is pre-wrapped with sterile gauze, leaving a working surface of 1 cm long. This is a condition that is obligatory because with the free penetration of the scalpel blade into the tracheal lumen may be injured of its back wall and esophagus. 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, dissect 2-3 rings of the trachea. The tracheal wound expands with a tracheo extender and in its lumen immersed a tracheostomy cannula.

To prevent 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.

**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 dissect tissues, fascia including a second neck fascia. In this case, the venous arch (arcus venosus juguli), which 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 fibre 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 haemorrhage.

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 corner the wounds on the left the manipulation are dangerous, because there is a 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 vascular-nerve 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 or under a diphtheria pellicle;
- damage of 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 fibre, which contains numerous blood vessels that provide blood supply of 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 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 odd 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 vascular-nerve 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 department 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. In view of this access to the esophagus is carried on the neck on the left side of the anterior margin of the sternocleidomastoid muscle.

Between the trachea and the esophagus, the longitudinal grooves filled with cellulose 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.

From a practical point of view, it is important to remember that at the lower pole of the thyroid gland this groove crosses a. thyreoidea inferior. At operative access to the cervical esophagus to the left should remember these topographic anatomical features.

On the back of the esophagus, there is a loose fibre, 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.

An asymmetrical position of the common carotid arteries relative to the cervical part of the esophagus is noted. So, 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, as already noted, 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 during the 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 of the cervical portion of the esophagus, foreign bodies in it, tumours, cicatricial changes, congenital anomalies.

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 edge of the m. sternocleidomastoideus from the jugular notch to the level
of the upper edge of the thyroid cartilage. First, you should remove the skin with a subcutaneous tissue and the superficial fascia with the subcutaneous muscle of the neck. The front jugular vein (v. jugularis anterior) is ligated and dissected between ligatures. On a grooved probe cut the vagina of m. sternocleidomastoideus, hooks outwards pull out the muscle 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 corner of the wound, sometimes for better access, it is cut. This muscle should first be stitched in two places and cut off between two ligated ligatures. During the operation, dull hooks inside, and the vascular-nerve 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 colour and longitudinally directed muscle fibers.

From the anterior wall of the esophagus, carefully displaced a recurrent laryngeal nerve, 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 available for surgical intervention. If the purpose of the operation is to remove from the esophagus a foreign body, then on its wall impose two ligatures; the needle should not pierce its mucous membrane when sewing the wall of the 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 napkins to prevent the infection into the wound. The outer body from the esophagus wound is carefully removed. The wall of the esophagus is sewed by the layers. If the esophagus is exposed due to his injury, the seams are not injected, and the gastric probe is inserted into the lower edge of the wound, the tampon in the upper part. To the esophagus are brought tampons with antibiotics, and in some cases - a drainage tube. The skin is left open or put on several sutures.

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.

It consists in the subfascial removal of the gland without ligating of thyroid arteries along the length, and after the operation, there are no more than 3-6 grams of the mass of the gland.

At first, apply a quadrilateral incision that connects the medial edges of the sternocleidomastoid muscle. It is carried out so that the lowest point of it is somewhat higher than the jugular notch. Dissect skin with a subcutaneous tissue and superficial fascia. 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. A 0,25-0,5% solution of novocaine (a 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, capture 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, cut parietal leaf of the fourth fascia and bluntly (by tools and partial fingers) separate the parietal leaf of the fourth fascia 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 crosses, 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. Only the part of the gland that will be left after the operation is covered with visceral fascia, then it should be provided with a boat-shaped form. Those blood vessels that were previously pressed with clips are ligated with a catgut. At the same time, several vessels are tied up, reducing the number of ligatures in the wound. The coke of the right particle of the thyroid gland is covered with the edges of its outer capsule and impose seams.

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 cuticles of both thyroid lateral parts of the thyroid gland are covered with a capsule, the gland is covered with undamaged breast-thyroid muscles, and a 0.25-0.5% solution of novocaine is added again to the muscular layer and subcutaneous tissue. Then from under the blades of the operated remove the roller, thoracic-hyoid and thoracic-thyroid-like muscles are sewn. The cavity of the surgical wound is washed again with Novocaine solution. To the cuticle of the thyroid gland on both sides for one day bring turundy or strips of rubber and initially to the subcutaneous tissue, and after it - put on the skin catgut seams. Silk in this operation is not recommended.

6. Materials for self-control
A. Tasks for self-control:
Test №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 №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 №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 №4. In the patient, the inflammatory process from the previsceral space spread downwards. Where did he 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 №5. In the patient damaged an external carotid artery. To which cervical vertebra we pushed this artery to temporarily stop the bleeding?
   a) 2nd;
   b) 3rd;
   c) 4th;
   d) 5th;
   e) 6th.

Test №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 №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 №8. For the ligation of the tongue artery, the surgeon identified in the wound a Pirogov triangle. What kind of formation forms the front 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 №1.* Student, entering the Pirogov triangle during the preparation of the submandibular triangle, found in it a lingual vein, but could not detect the same name artery. How can he find it?

*Task №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 to make sure that this artery is an external carotid artery?

*Task №3.* At the lesson, the student persuaded the teacher that there are five fascias of the neck. Is this answer correct?

References

**Basic literature**


**Additional literature**

### Academic discipline
Clinical anatomy and operative surgery

<table>
<thead>
<tr>
<th>Module No. 1</th>
<th>Clinical anatomy and operative surgery of areas and organs of head, neck, trunk and extremities</th>
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</thead>
<tbody>
<tr>
<td>Content module No.2</td>
<td>Clinical anatomy and operative surgery of sites and organs of the trunk</td>
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</tbody>
</table>

**Topic 5**


<table>
<thead>
<tr>
<th>Year</th>
<th>II</th>
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<tbody>
<tr>
<td>Faculty</td>
<td>Foreign students training (medical)</td>
</tr>
</tbody>
</table>

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. To analyze the ways of spreading inflammatory processes within the chest.
   3. Explain how to perform cuts during abscesses of the mammary gland.
   4. Explain how to perform rib resection.
   5. Explain how to perform pleura puncture.
   6. Explain the topographic anatomy of the lungs.
   7. Explain the topographic anatomy of the mediastinum.
   8. Explain the methods of modern operations on the lungs, pleura, thoracic esophagus, heart.

3. **Base knowledge, abilities, skills, necessary for study themes (interdiscipline integration).**
<table>
<thead>
<tr>
<th>Names of previous disciplines</th>
<th>Got skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>History of medicine</td>
<td>To know the role of home scientists in development of operative surgery and topographical anatomy.</td>
</tr>
<tr>
<td>Anatomy of Human</td>
<td>Able to apply knowledge from the anatomy of the systems, organs within the limits of certain areas of body of man.</td>
</tr>
<tr>
<td>Histology</td>
<td>Able to synthesize micro- and macrostructure of organs and systems of human body, and also to understand intercommunication of structure and function.</td>
</tr>
<tr>
<td>Normal physiology</td>
<td>To know the mechanisms of adjusting of function of organism, work of the special systems of organism (circulation of blood, breathing, digestion, thermoregulation), and locomotorium.</td>
</tr>
<tr>
<td>General surgery</td>
<td>Able to plan operative intervention and determine motion of operative intervention.</td>
</tr>
<tr>
<td>Business Ukrainian</td>
<td>Able freely to own Ukrainian, correctly to conduct business professional documentation, freely to use professional terminology.</td>
</tr>
<tr>
<td>Foreign language</td>
<td>Able to use foreign literature during preparation to employments.</td>
</tr>
<tr>
<td>Philosophy</td>
<td>Able to inculcate methodology and dialectics of cognitive activity at the study of object.</td>
</tr>
<tr>
<td>Bases of justice</td>
<td>Able to use general legal principles for explanation of actions and acts of doctor.</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
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<tbody>
<tr>
<td>Mastectomy</td>
<td>Removal of the mammary gland.</td>
</tr>
<tr>
<td>Resection of the rib</td>
<td>Removal of a part of a rib for various medical reasons.</td>
</tr>
</tbody>
</table>
4.2. Theoretic questions:
1. Borders of the chest, divided into sections.
2. Conditional limits for determining the projection of the chest cavity.
3. Front and upper chest area.
5. Topography of intercostal intervals.
6. Cuts during mastitis.
8. Resection of the rib.
10. Sinuses of pleura and their topography.
11. Puncture of pleura.
12. Pneumothorax.
14. Surgical anatomy of the lungs, anatomical features of the division of lungs into particles and segments.
15. The concept of the gates and the roots of the lungs. Surgical anatomy of the lung root.
16. Definition of the concept of "mediastinum", the division of the mediastinum into the upper, lower, front, back, middle.
17. Bodies located in the mediastinum.
18. Surgical anatomy of the thymus gland, upper vena cava, artery of the aorta and its branches, diaphragmatic nerves.
20. Surgical anatomy of the thoracic duct, odd and crescent veins, sympathetic trunk, the formation of intestinal nerves, the surgical anatomy of the aorta.
21. Anatomical and physiological substantiation of surgical access to the lungs, heart, and esophagus.
22. The main stages of pulmonectomy and resection of the lungs.
23. Surgical anatomy of the heart (skeletonopy, synthopy, blood supply, innervation, pathways of venous and lymphatic outflow). Congenital and acquired heart defects.
24. Anatomical and physiological substantiation of surgical access to the heart.
25. Pericardial puncture.
26. Stitching the wounds of the heart.
27. Mitral commissurotomy.
28. Aortocoronary shunting.

4.3. Practical activities performed in class:
1. Carry out cuts in mastitis.
2. Carry out rib resection.
3. Carry out the closure of pneumothorax.
4. To sew up a heart wound.
5. Perform a mitral commissurotomy.
5. Content of the topic.

During the interview, the instructor verifies knowledge of musculoskeletal markers and their projection on the chest, muscle layers, the structure of the fasciating cases of the muscles and cellular spaces of the chest, the topography of the vessels and nerves, as well as the location of the regional lymph nodes of the mammary gland. In the process of work, the teacher conducts the analysis of students with topographic preparations, paying attention to important topographic-anatomical ratios of organs and vascular-nerve branches.

**Mammary gland**

Placed 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 particles. From each particle in the radial direction to the nipples goes a milk duct. These ducts open on a nipple of 8-10 holes, pre-forming the expansion — milk 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 of 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 net. 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.

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. 38. Radical mastectomy.**

a - ellipsoid skin cut with detachment of hypodermic fatty tissue; the dotted line is marked by the opening of the surface thoracic fascia; b - section of the tendon of the large thoracic muscle; c - the large thoracic muscle is lowered, scissors cross the tendons of the small thoracic muscle.
Operations involving mastitis and subpectoral phlegmon. The teacher emphasizes the need for economical, 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 cut 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, stopping on the removal of regional lymph nodes (Fig. 40).
Layers, topography of the vertebral vascular-nerve 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 an oblique resection of 7 and 8 ribs. Pay attention to the difference in the technique of resection of the rib, depending on the evidence (removal of damaged edges, access to the chest cavity, plastic surgery (thoracoplasty, etc.) (Fig. 41, 42).

**Fig. 41. Resection of the rib.**

- a - branch of the curved raspatory of the periosteum on the outer surface of the rib;
- b - a branch of the periosteum from the inner surface of the ribs by the Doyen raspatory;
- c - cut the edge of the rib removed by the edge scissors;
- d - diagnostic puncture of the pleural cavity through the digestive bed of the resected rib;
- e - wound suturing after resection of the rib and drainage of the pleural cavity.

**Fig. 42.** Sealing the wounds of the chest wall with the help of septum seams, exciting adjacent edges (a). Scheme of the course of the thread (b).

**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.

Heart is a muscular organ that is located in the middle mediastinum. Its base is directed upwards and somewhat backwards, 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 pleura 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 abdominal cavity.

**Pneumothorax**

Pneumothorax occurs in the presence of penetrating wounds of the chest wall. According to their nature they can be:
open, when 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 – an oilcloth padding or piece of cellophane film that is tightly fixed to the chest.

**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 10th 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 first 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 upper 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- front 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 upper vena cava. These veins can be studied by the students in 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 he goes between the azygos vein and the 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.

Breast part of aorta
The thoracic part of the aorta is bordered: in the front - with the left bronchus and pericardium, on the right - with the esophagus, on the left - with the mediastinal pleura, behind - with the hemiazygos vein and spine. In the lower part, the thoracic aorta in the front borders with the esophagus, on the right - with an azygos vein and mediastinal pleura, to the left - with the 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 knots, which are interconnected. From the sympathetic trunks, branches go to the nerve glands of the aorta, esophagus, lungs, and large and formed a small internal nerve.

Stitching the wounds of the lungs
After thoracotomy with resection of the ribs on the corpse (or on an isolated lung preparation), students perform a resection of the lung segment or cut off part of their parenchyma with subsequent suturing.

Pericardium
It is the reserved sack consisting of parietal and visceral sheets. A visceral sheet covers a cardiac muscle and densely soldered with it. The exception is made only by small part on the back surface of the mediastinum, between the mouths of veins. The visceral sheet does not present and thus, this area remains out of cavity of the pericardium. A parietal sheet above the foundation of heart passes to the large vessels (eventual part of the upper hollow vein, aorta, and pulmonary trunk. Here befits a visceral sheet, the therefore transferred vessels lie in a pericardium.

In the places of transition of visceral sheet of pericardium in parietal one, bosoms appear, from which most large are: transversal sinus transversus pericardii, oblique sinus obliquus pericardii, front lower sinus pericardii anterior inferior.
Transversal and oblique bossons are disposed on a back surface. A transversal bosson at the front is limited by a pericardium surrounding the initial parts of ascending part and pulmonary trunk, behind by a visceral sheet, covering right and left auricles, ears of auricles and front left the surface of the upper hollow vein. This bosson is reserved from above and from below, and behind an aorta and pulmonary trunk is reported with the cavity of pericardium. Therefore in this through motion it is possible to enter an index finger, going round an ascending aorta and pulmonary trunk into a coronary shirt, not unsealing a pericardium that is used for operative interferences.

An oblique bosson is located in lower part of back part of pericardium between the rights and left connecting folds of the pericardium. At the front, it is limited by the visceral sheet of the back surface of left auricle, behind - the back wall of the pericardium, on the left - lower hollow vein.

The front lower bosson is disposed in that place, where a pericardium calls at a corner between a diaphragm and front pectoral wall.

Except for the transferred bossons between the parietal and visceral sheets of pericardium a few such deepening’s appear is volvulus of upper hollow vein, retroaortal, pulmonary vessels and other

It should be noted that a front lower bosson, where at the wounds or diseases of heart a blood can be saved, exudates and other, is most vast it has the important value during conducting of puncture of the pericardium.

Surgical anatomy of heart

A heart (cor) is located in front mediastinum together with a pericardium on the tendon center of the diaphragm. The form of it is individually changeable and depends on age, floor and build. Three months children heart has a spherical form, that related to the relatively largenesses of auricles and right ventricle, and to six-year-old age, it takes shape of heart of the grown man. The position of the heart in a pectoral cavity depends on the form of the thorax. So, people with a short thorax it is in transversal position and the form of it is rounded or three-cornered-angular. At a long and narrow thorax, a heart occupies the vertical position and has a cone-shaped form.

A heart in relation to the middle sagittal plane of thorax occupies asymmetric position: the one-third of its mass is disposed on the right, and two third - on the left. The longitudinal axis of the heart is located in oblique direction: foundation of it is directed in a right side, up and back, and apex to the left, downward and in front of.

A heart has three surfaces: front (thoraco-costal), lower (diaphragmal) and back (vertebral).

The front surface of adjoins to the breastbone to the costal cartilages and dissociated from them by a pericardium. It is formed by small part of right auricle, front wall of right ventricle, edge and apex of left ventricle, and also ears of heart.

On the front surface of heart two furrows are selected: coronary and front longitudinal. A coronary furrow dissociates auricles from ventricles and in it pass right and left coronary arteries. A front longitudinal furrow is located along interventricular partition, it is filled by the descending branch of the left coronary artery and large vein of the heart. The back (vertebral) surface of the heart is executed, mainly, by a left auricle, ventricle, and also insignificant part of right auricle. This surface joins to the organs of the back mediastinum. On it well circuit back interprecardiac furrow which is the freely looked over between the mouths of hollow and right pulmonary veins. The basic trunk of the same
name artery and surrounding branch of left coronary artery beds in a coronary furrow (sulcus coronarius).

If to study a heart from the side of the back interventricular furrow, the descending branch of the right coronary artery and middle vein of heart pass in it.

The lower (diaphragmal) surface of heart is executed, mainly, left and partly right ventricle of the heart, and also the small part of right auricle.

There are three walls in a right auricle: lateral, medial and diaphragmal. Upper and lower hollow veins fall in it. Thus, a mouth by the upper flap of the vein is located on the border of the place of transition of the lateral wall of right auricle in medial one, and mouth by the lower flap of vein - between lateral and diaphragmal walls.

There is a coronary sine on the border of interprecardiac partition and the lower wall of auricle. The surface of right auricle not on all areas even. So, in the places of inflow in it of upper and lower hollow veins surface of auricle even, and on all the other extent it uneven, because determining its relief muscular trabecule, auricles present on the internal surface of the front part. On interprecardiac partition, there is an oval pit with the expressly limited edges, and the bottom of it is thinned and represented as a membrane. In obedience to information of literature at a 30% adult population between right and left auricles there is a crack which reports them between itself. Between a right auricle and ventricle there is the atrioventricular foramen, the diameter of which on the average is equal 2.6-6.0 sm. Its center 4-5 costal cartilages are mapped at level on the right on a middle sternal line.

A right ventricle (ventriculus dexter) on the form reminds a wrong trihedral pyramid foundation of which is facing to the auricle, and top - downward. Three walls are selected in it: front, internal (partition) and lower (diaphragmal).

In a right ventricle distinguish two parts: front and back. A front part corresponds to the arterial cone - place of forming of pulmonary trunk. On the border of Its transition in a pulmonary artery is present opening through which the outflow of blood is from the cavity of right ventricle. The back part of right auricle is the area of influx of blood, because through the right vein opening it is reported with an auricle. On the circumference of fibrous ring a three-folding valve which hinders to the reverse outflow of blood is located. It is formed by partition or mesial, front and back leaves the free edges of which are turned in the cavity of right ventricle. To the leaves motions go from 3-4 papillary muscles. Each of papillary muscles by chords is related to two neighboring leaves. Sometimes tendons filaments walk straight away from myocardium of ventricles.

The right arterial foramen in relation to a middle line is mapped on 1- 2 sm left it at the level of lower edge of rib, the diameter of it is equal 2-3 sm. On the perimeter of foramen a right precardiac-ventricular (three-folding) valve is disposed (valvula atrioventricularis dextra, seu valvula tricuspidalis).

A left auricle lies back from a pulmonary trunk and aorta. It form a left ear, actually auricle and sine of pulmonary veins. Left ear on the sizes some less than right, the latticework of muscular cross-beams is developed insignificantly in it. A foramen diameter is 1,0-1, 5 sm. On the dorsal wall of left auricle the mouths of four pulmonary veins are opened. At the nonclosure of the oval foramen on the surface of interprecardiac partition is present valve.

The left atrioventricular foramen is located between a left auricle ventricle, the diameter of it makes 2-3 sm. It is filled by a left precardiac-ventricular (mitral) valve (valvula atrioventricularis sinistra, seu valvula mitralis) consisting of two leaves. Front
from them some anymore back. Thus chords bind a front leaf to anterolateral, and back - with posteromesial papillary muscles.

A left ventricle (ventriculus sinister) is had by three walls: front, back and mesial - partition. On the form it a cone and apex of heart reminds corresponds to the anteroinferior part, where its cavity broadens, and taking oval form. Three layers of muscles are selected in a left ventricle: outward, middle and deep. Both in by a right and left ventricles of fibre of outward and deep layers are general, and a middle layer surrounds every ventricle individually. The fibres of outward and deep layers have oblique direction. So, on the front surface of heart muscular bunches are sent from right to left, and on back - in retrograde. The fibres of deep layer go from an apex before foundation hearts, middle layer is sent circular, this layer is more developed, that conditioned by the presence of thicker wall of left ventricle.

The left atrioventricular foramen is mapped on level 3 ribs left middle line of breastbone on Ism. An aortic valve is a semilunar three-folding valve. In its selected: right, left and back leaves. The mouths of coronary arteries are located above the right and left leaves of aortic valve.

Interventricular partition (septum interventriculare) is the well expressed muscular layer which divides the cavities of ventricles between it pretty. Interventricular partition appears due to the muscular layers of both ventricles. In upper part of interventricular partition a membranous part is more thinned, and on all the other part the thickness of this partition almost corresponds to the thickness of wall of left ventricle.

At correction (corrections) of defects of interventricular partition, violation of rhythm of heart is one of the heaviest complications of operation. It arises up in connection with the damage of elements of the conducting system of heart.

Conducting system of heart both morphologically and functionally is specific neuron - muscular formation of heart, passing outgoing impulses to the cages of myocardium.

The conducting system of heart consists of sinus-precardiac and precardiac-ventricular nodes, precardiac-ventricular bunch right and left feet of Gys and fibres of Purkinje.

In lower part of interprecardiac partition under endocard there is a sinus-precardiac node. Downward from a node foundation of mesial leaf of three-folding valve (valvula tricuspidalis)is located, up is oval pitback is mouth of vein sine. The precardiac-ventricular bunch of Gys is under endocard of membranous part of interventricular partition. Length of bunch of Gys makes about 8 mm.

In area of upper edge of interventricular partition the bunch of Gys divides by right and left legs, which head for the apex of heart on the proper sides and it is divided on the shallow fibres of Purkinje, being the terminals parts of the atrioventricular system.

Blood supply of heart is carried out, mainly, by coronary arteries (a. a. coronaria dextra et sinistra). They more frequent walk away from an ascending aorta, sometimes - from the branches of mediastinal and bronchial arteries and are basic sources.

Left coronary artery (a. coronaria sinistra) blood supply left half of heart and two third of interprecardiac partition. After an output from under a pulmonary trunk a left coronary artery divides by a rounding and front-descending interventricular artery which passes on an interventricular furrow and achieves the apex of heart. A rounding branch passes on the dorsal surface of heart on a coronary furrow, where divides by three left ventricular branches.
At foundation of right ear (auricula dextra) a right coronary artery (a. coronaria dextra) which blood supply of it’s disposed. After it passes to the coronary furrow, where it is divided on dextroventricular branches back interventricular branch. The last is sent on an of the same name furrow to the apex of heart.

Right coronary artery blood supply region of right half of heart and back third of interventricular partition.

There is three blood supply of heart: right, left and equivalent. At the last both coronary arteries are developed identically. At a right-side type primary participation in blood supply of heart accepts a. coronaria dextra, and at left-side - a. coronaria sinistra.

During treatment of coronary insufficiency knowledge as blood supply of heart can help a surgeon in the choice of the proper surgical tactic during operation on an occasion ischemic heart trouble (IHT).

From a heart a vein blood outflow on a large vein which falls in a coronary sine. On front and dextroventricular veins a blood disembogues directly in a right auricle. Middle and small veins, head for a coronary sine and fall in it, and a coronary sine is opened on the back surface of right auricle.

In innervation of heart take part to the branch of wandering, diaphragmatic and recurrent nerves branch of sympathetic boundary trunk. Two extracardial interlacements appear due to the transferred nerves, the nervous endings of which bed in structural formations of heart.

Pectoral part of trachea, bifurcation tracheas, main bronchial tubes.
The pectoral part of trachea is disposed in top mediastinum. The bifurcation tracheas and main bronchial tubes are located in middle mediastinum. The high bound of pectoral part of trachea corresponds jugular undercuts of breastbone at the front and 2nd to the pectoral vertebra behind, low bound of trachea in the comer of breastbone in 2nd intercostals, and behind 4-5 pectoral vertebrae are mapped to the intravertebral cartilage. Thereon level a trachea divides by right and left main bronchial tubes, forming bifurcation. Projection of bifurcation trachea on 5-6 pectoral vertebrae.

At the level of high bound of pectoral part of trachea in front of from it located brachiocephalic trunk and left general sleepy to the artery. In front of from a bifurcation trachea and partly right main bronchus passes right pulmonary artery downward from bifurcation a pericardium and right auricle adjoin to its located. Along the back and upper walls of right main bronchus passes odd vein inflowing in an upper hollow vein. Along the right surface of trachea a wandering nerve is disposed in paratracheal cellulose. Above bifurcation to the right surface of trachea disposed upper hollow vein. Here and a few to the left of trachea an esophagus which forms an esophago-tracheal furrow with it is located, where a left recurrent laryngeal nerve passes. Down to the left lateral surface of trachea disposed arc of aorta, passing above left bronchus.

Front and lateral surfaces of trachea of it bifurcation and surrounded main bronchial tubes by a cellulose, where vessels pass, nerves and lymphatic nodes have all these formations general fascial shell is (esophago-tracheal fascia) which through band’s and plates forms fixative communications with surrounding formations.

Pectoral part of esophagus

On greater part of the extent pectoral part of esophagus of disposed to the bodies of pectoral vertebrae. To the level of 4th pectoral vertebra it is disposed nearer to left of spine, and at the level of chiasm with the arc of aorta, it deviates to the right. Then at the level of 7th pectoral vertebra, an esophagus again begins to deviate to the left and at level 8-9
pectoral vertebrae walk away from a vertebral post in front of, disposed in front of of pectoral aorta.

From pectoral vertebrae an esophagus is separated by cellulose where a pectoral channel, odd vein, right intercostals arteries and eventual part of semiazygos vein, passes. At level 8-9 vertebrae behind an esophagus are passed by a pectoral aorta. At the level of root of right lung to the back surface of esophagus disposed right wandering nerve. At the front to the 4th pectoral vertebra a trachea joins to the esophagus and the arc of aorta is below than this level, left bronchus and back surface of left auricle. Below than root of left lung for the front surface of esophagus a left wandering nerve at the level of left fits bronchus - tracheobronchial lymphatic nodes.

On the left, to the level of 8th pectoral vertebra, an esophagus abuts upon a descending aorta, and in that place, where an esophagus passes at the front from an aorta, a left mediastinal pleura joins to it.

On the right of level of 4th pectoral vertebra downward, an esophagus adjoins with mediastinal pleura. Mediastinal pleura of disposed to the esophagus from both sides, but on the right this adjoining takes place on a considerably greater area, than on the left. Both on the right and on the left mediastinal pleura easily moves away from an esophagus due to the presence of considerable layer of loose cellulose.

Blood supply of upper part of pectoral part of esophagus is carried out due to the esophagus branches of lower thyroid artery (from a thyroid-neck trunk), and also branches of subelavicular arteries.

Middle part by the blood supply bronchial branches of pectoral part of aorta and intercostals arteries. Lower part by also the blood supply branches of pectoral part of aorta, and partial by intercostals arteries. There are the basic sources of blood supply of pectoral part of esophagus to the branch aortas (esophagus branches) directly outgoing from a pectoral part. Arteries between it anastomosed, forming in the muscular and submucous layer of esophagus of interlacement.

The vein outflow from pectoral part of esophagus is carried out in to the system of odd and semiazygos veins, on anastomoses with the veins of diaphragm - in the system of lower hollow vein, and through the veins of abdomen in the system of collar vein. Innervation of pectoral part of esophagus due to wandering nerves and sympathetic trunks which form nervous interlacements.

Pectoral channel. Takes beginning at the level of 1-2 lumbar vertebrae. Diaphragm a pectoral channel passes through the aortic foramen and is disposed on the bodies of pectoral vertebrae between a pectoral aorta on the left and odd vein on the right. At the front it is covered by an esophagus. At the level of 1st pectoral vertebra of channels heads behind for front and passing between a general carotid and left vertebral artery walking around from above a subelavian artery falls in a left vein coner.

**Operative accesses to the heart**

By the most used place at operations on a heart is left-side thoracotomy in IV, V, VI intercostals spaces without the section of costal cartilages.

The choice of level of one or another intercostals space is related to localization of pathological process in that or other part of heart. So, to the apex of the hypertrophied left ventricle of heart or diaphragm it is comfortably to befit by thoracotomy in VI intercostals space. At a mitral commissurotomy, preplacement of mitral valve and imposition of intervessels anastomosis at Fallout’s tetrad left-side it is better to conduct thoracotomy in IV intercostals space.
To the right parts of heart operative accesses are carried out by means of right-side thoracotomy in IV intercostals space.

Longitudinal sternotomy and transpleural access behave to universal operative accesses to the heart. Advantages of universal accesses consist in that at them approach is possible to any parts of heart, however they traumatic.

At transpleural access of thoracotomy is carried out both on the right and on the left in IV intercostals space. A skin above a breastbone is dissected in transversal direction. On either side skinning cuts are begun to swing in area of middle arm-pits lines. Internal pectoral arteries select on motion of operative access, bandage and dissect between two ligatures.

The periosteum of breastbone is dissected and is moved aside by Farabef's raspatory. After it transversal its section is conducted. By sterile beeswax careful hemostasis is provided from the interbone vessels of breastbone. After completion of operation of edge transversal the cut breastbone is sewn together by a wire or tantalum clips. At operations on a heart a pericardium is dissected on motion of diaphragmatic nerve on either side. After completion of operation on a heart, a pericardium is never sewn up, cavity of it at the use of artificial circulation of blood of draining.

Direct interferences on coronary vessels

V.P. Demichov developed the method of the direct shunting of internal pectoral (a. thoracica interna) and coronary arteries (a. a. coronaria dextra et sinistra) by creation of coronary-mammary anastomosis the first. At the beginning of operation in IV intercostals space thoracotomy is conducted on the left. Mobilization of internal pectoral artery is carried out, but some surgeries recommends higher the sections of basic trunk of internal pectoral artery to make bandaging of all intercostals branches. On motion of operation the front descending branch of left coronary artery which bandages oneself and is dissected below than the place of occlusion is selected. Between the central end of internal pectoral and distal area of descending branch of left coronary artery by a vasosuturing vehicle or anastomosis is hand-crafted laid on.

The aortal-coronary shunting at surgical treatment of chronic coronary insufficiency is one of the most effective operations. To the basic testimonies segmentary atherosclerotic stenoses and occlusion of coronary vessels belong for production of the aortal-coronary shunting, when conservative therapy does not give a positive effect. This operation is conducted at the threatening or sharp heart attack of myocardium, complicated by cardiogenic shock, if during conducting of urgent selective coronarography the limited defeat of coronary to the artery is revealed. First the aortal-coronary shunting in clinical practice was inculcated by Favorolo (1967). He specifies, that at 90% operated patients good results were got, and in three years after operation at 85% of patients shunts remained passable.

Technique of operation. Access to the heart is carried out by middle sternotomy, which facilitates approach to the descending branches of right and left coronary arteries. One brigade of surgeons selects on a thigh a patient autograft from the hypodermic vein of thigh. A cut is carried out on the line by Ken (see in a chapter "Operation on lower extremities"). The superficial vein of thigh bandages oneself by two ligatures some below than the place of inflow of it in a femoral vein. A vessel is dissected between ligatures, is selected from surrounding tissues, and the segment of vessel long 10-20sm is chopped off, central end it’s ligaturing.
The valves of vein transplant collapse by special bougie (dilatator, probe) and after it the transplant of vein submerges in physiological solution.

The second brigade of surgeons before production of basic part of operation unseals the road clearances of hollow veins and femoral artery for introduction of cannule and connecting to the necessary moment of operation of vehicle of artificial circulation of blood (ACB). Operation can be conducted and without connecting of ACB, if complete occlusion of road clearance of coronary vessel is exposed.

A coronary artery is selected from a bed, release from a fatty cellulose, ligaturing higher than the place of occlusion, raise on holder and dissect. If a retrograde blood stream is absent, atherosclerotic name-plates are deleted by turning inside out of distal part of coronary vessel to appearance of retrograde blood stream. After it in the road clearance of vessel enter bougie with a vein transplant on which and arteriovenous anastomosis is created on a type "end in an end". By atraumatic needles sutures key separate. Impermeability of distal part of anastomosis, vein transplant and coronary artery, is checked up in order to avoid the origin of air embolism, is filled by physiological solution with addition to it heparin. The next stage of operation consists in creation of proximal aortal-vein anastomosis. For this purpose by a parietal vascular clamp the area of ascending part of aorta, in which the oval foramen is excised by a size 1, 0-0, 3sm, is wrung out.

Anastomosis between an aorta and coronary artery is executed by atraumatic needles by a continuous stitch. After creation of anastomosis a clamp from an aorta is taken off and is checked up its impermeability. On a pericardium sutures rare. Front mediastinum drainaging, and take in the wound of pectoral wall layer.

Operations at innate and acquired heart-diseases

**Operations at mitral stenosis**

We will remind that the valvular vehicle of the left atrioventricular foramen consists of fibrous ring, front and back leaves, two papillary muscles and tendons filaments. The front leaf of valve acts considerably large part in the obturative function of valve, by what back. Specific gravity of leaves is equal to specific gravity of blood; therefore they are in the weighed state.

Tendons filaments during a systole warn bending of leaves toward auricles, because they are related to the papillary muscles. In a norm, a valve functions as single whole: at the systole of ventricles, a valve hinders to the reverse current of blood in a ventricle from an auricle.

At pathological rheumatic processes, there are the sclerotic changes in the valves of heart. So, at 85% patients with mitral stenosis the form of valves reminds the type of coat loop, because leaves accrete on the edges of valve. Sometimes a valve on the form reminds the form of "fish mouth", that takes place from the low fixing of leaves to the papillary muscles. At stenosis of mitral valve, there is a necessity in surgical treatment. The volume of operative interference depends on the degree of expressed of calcinosis. If a process is limited, shown closed commissurotomy. If calcinosis has widespread character, mobility of leaves diminishes considerably, they close up not fully, and during a systole, part of blood is directed in an auricle. In the conditions of making progress of pathological process insufficiency of mitral valve, adequate to the degree of violations of its locking function, develops from considerable violation of mobility of leaves. In those cases, when calcinosis mitral valve carries widespread character, there are direct testimonies for replacement of valves. Closed commissurotomy can be made both by a finger method and by the special
instruments. In first case, it is necessary to imply a finger commissurotomy, in the second - instrumental.

**Finger commissurotomy**

Access to the heart is conducted by left-side or anterolateral thoracotomy in IV intercostals space. At dissection of pericardium the topography of it and cut is taken into account is conducted parallel to position of diaphragmatic nerve (n. phrenicus). A pericardium after dissection undertakes on holders. Access to the bicuspid valve is conducted through a left ear. For this purpose at foundation of ear in the beginning suture, more distal than which an ear is closed by the clamp of Sagynski. Palpate the state of valvular vehicle, degree of stricture formation leaves and mobility of them, is determined. Tear the front leaf of valve by an arcuated nail phalanx to the fibrous ring. After it a finger turns on 180° and the back leaf of valve is torn. At foundation of ear ligature which after destroying of finger tighten is laid on. Stitch is strung, the apex of ear is excised, its stump is taken in by key stitches. Cavity of pericardium is drainage. The wound of thorax is taken in layer.

**Instrumental commissurotomy**

For production of this operation the special instruments are needed - dilatators different construction. By the technical recommendation they are intended for the division of sclerosis leaves of valve. Commissurotomy can be both intraventricular and interprecardiac. At intraventricular commissurotomy dissection of wall of left ventricle is made between the ligatures imposed nearer to the apex of heart as a IT-vivid stitch.

Under the control the index finger entered through a left ear, dilatator in the built position is brought into the cavity of left ventricle. A surgeon divides the leaves of valve by breeding branch of dilatator on a width 3, 5sm. Thus during the systole of ventricle there is the upcast of blood in the cavity of left auricle. On the size of regurgitation (reverse normal swift motion of blood) judge about efficiency of interference. If it appears insufficient after the division of leaves of dilatator, branch of instrument multiply foramen to 4sm, leaves are repeatedly dissected whereupon. Instruments from the cavity of ventricle hatch in the built kind. A U-vivid stitch delays. Introduction of index finger of surgeon and taking in of wound of ear is done as at a finger commissurotomy. A pericardium is sewn up by rare stitches. Drainage of front mediastinum is conducted. A pectoral wall is taken in layer.

Intraprecardiac commissurotomy is conducted, in the cut of wall of left ear is entered nail or guillotine comissurotome.

Production of mitral of commissurotomy at the thrombosis of left ear, and also at its under-development is carried out through a right auricle and intercardiac partition on the method of Bailey (1945). Comissurotome enters in the atrioventricular foramen on the index finger of the left arm and make the section of leaves. Take in the defect formed on motion of operation in interprecardiac partition by 11-vivid stitches. The wound of auricle is taken in continuous winding stitches.

6. 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. 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 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 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 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 puncture of pleural cavity using thick needle with a wide lumen without syringe, the patient with pleural empyema experienced accelerated breathing and he lost consciousness. What explains this complication?

References
Basic literature

Additional literature
1. **Relevance of the topic:** abdominal injuries, accompanied by damages of 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 surgeons practice.

2. **Specific objectives**
1. Analyze layer by layer topography of anterolateral wall of the abdomen, age and sex 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 anatomy of the inguinal area: boundaries, external guidelines, layer topography.
5. To analyze the anatomy of the inguinal gap as a weak place of the muscular-aponeurotic layer.
6. Explain the anatomy of the posterior surface of the anterior abdominal wall and the inguinal site (fossas and folds of the peritoneum).
7. Explain the surgical anatomy of oblique and straight hernias.
8. Explain how to carry out the most common methods of hernia and plasty of the inguinal canal.
9. 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.
10. Explain the surgical anatomy of the hernia of the white abdomen and umbilical ring.
11. Explain how to perform the most common methods of treating femoral hernia.
12. Explain how to perform surgical interventions on the hernia of the white abdominal line and umbilical ring.

3. Base knowledge, abilities, skills, necessary for study themes (interdiscipline integration).

<table>
<thead>
<tr>
<th>Names of previous disciplines</th>
<th>Got skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>History of medicine</td>
<td>To know the role of home scientists in development of operative surgery and topographical anatomy.</td>
</tr>
<tr>
<td>Anatomy of Human</td>
<td>Able to apply knowledge from the anatomy of the systems, organs within the limits of certain areas of body of man.</td>
</tr>
<tr>
<td>Histology</td>
<td>Able to synthesize micro- and macrostructure of organs and systems of human body, and also to understand intercommunication of structure and function.</td>
</tr>
<tr>
<td>Normal physiology</td>
<td>To know the mechanisms of adjusting of function of organism, work of the special systems of organism (circulation of blood, breathing, digestion, thermoregulation), and locomotorium.</td>
</tr>
<tr>
<td>General surgery</td>
<td>Able to plan operative intervention and determine motion of operative intervention.</td>
</tr>
<tr>
<td>Business Ukrainian</td>
<td>Able freely to own Ukrainian, correctly to conduct business professional documentation, freely to use professional terminology.</td>
</tr>
<tr>
<td>Foreign language</td>
<td>Able to use foreign literature during preparation to employments.</td>
</tr>
<tr>
<td>Philosophy</td>
<td>Able to inculcate methodology and dialectics of cognitive activity at the study of object.</td>
</tr>
<tr>
<td>Bases of justice</td>
<td>Able to use general legal principles for explanation of actions and acts of doctor.</td>
</tr>
</tbody>
</table>
4. Tasks for independent work to prepare for the lesson
4.1. List of the main terms, parameters, characteristics that should be learnt by the student while preparing for the lesson

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hernia</td>
<td>1. Displacement and protrusion of the abdominal organs under the skin through the weak areas of muscular aponeurotic layer of the anterolateral abdomen wall.</td>
</tr>
<tr>
<td>Laparatomy</td>
<td>2. Surgical incision of anterolateral abdomen wall.</td>
</tr>
</tbody>
</table>

4.2. Theoretic questions:
1. Where are the upper, lower and lateral sides of the abdomen?
2. Name the stomach area.
3. Where are projections of the appendix, gall bladder, pyloric and cardial parts of the stomach, spleen, liver, loops of the small and large intestines, bladder?
4. What are the peculiarities of the structure of the navel area, the white line of the abdomen?
5. What are the features of the structure of the vagina of the direct muscle of the abdomen at different levels (above and below the umbilical ring)?
6. Where are the muscles nerves of the anterior-lateral wall of the abdomen?
7. How do nerves and vessels pass to the direct muscle of the abdomen?
8. What is the most efficient access through the vagina of the direct abdominal muscle?
9. What are the advantages and disadvantages of operational access to the appendix? To evaluate the cuts for Volkovich-Dyakonov 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?
13. What is an inguinal triangle and an inguinal space?
14. Where and how are surface and deep inguinal rings designed?
15. What are the folds and fossa formed on the inner surface of the anterior abdominal wall?
16. How is a spermatic cord placed around a hernial bag with straight and oblique inguinal hernias? Of which anatomical formations consists a spermatic cord?
17. How to cut a skin at straight and oblique inguinal hernias?
18. How to carry the plastic inguinal canal according to Girard-Spasokukotsky, Kimbarovsky, Martynov, Bassini?
19. Is it possible to operate the initial form of a hernia (in a child) without the opening of the inguinal canal?
20. How creates a muscular and vascular lacuna?
21. What anatomical formations are limited by the internal opening of the femoral canal?
22. Name the walls of the femoral channel in the formation of hernia.
23. How to distinguish the femoral hernia from the inguinal hernia? What classification of femoral hernias?
24. What are the operational accesses that can be performed during removal of femoral hernia?
25. How to make a plasty of hernial gates according to Cooper-Bassini?
26. How to make a plasty of hernial gates according to Rudzi-Paralavecho?
27. Describe the operations of umbilical hernia (methods of Sapezhko, Lekser, and Meyo).

4.3. Practical activities performed in class:
1. Determine the borders of the abdomen, its area, external reference points, projections of organs.
2. To substantiate and carry out rational access to the organs of the abdominal cavity.
3. Treatment of a hernial bag and plastic of the walls of the inguinal canal in various ways: Girard-Spasokukotsky, Martynov, Bassini and their modifications (Kimbarovsky's sutures).

5. 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 lip 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 aponeurusis m. obliquus externus abdominis 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. obliquus 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) anterior and laterally is bounded by the anterolateral wall of the abdomen; posterior – 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).

**Topographical anatomy of front abdominal wall of abdomen**

The form of abdomen depends on age and floor and is determined by sizes and form of thorax and pelvis. For determination of form make measuring. At children it has the appearance of oval approximately. At persons with a narrow thorax and wide pelvis (women) is an abdomen has the form of pear, by a wide end turned downward. At persons with a wide thorax and comparatively by a narrow pelvis (men) - that form, but turned a wide end upwards. To every form the special location and form of prisoners corresponds in the abdominal region of organs.

Content of cavity of abdomen is limited by abdominal walls. Walls are distinguished: anterolateral wall, back, upper, and lower. An upper wall is a diaphragm. A lower wall represents the diaphragm of pelvis.

Front wall of abdomen
The front wall of abdomen is a "mirror" which reflects the state of organs of abdominal region, and very often its kind and state facilitate diagnostics of diseases of cavernous organs.

The symptom of protective tension of muscles of front wall of abdomen (defanse musculaire) is reflex tonic reduction of muscles of abdominal wall, arising up from the irritation. The muscles of abdominal press participate in motions fixing of vertebral post at run, walking, standing, seating, withholding of equilibrium. They participate actively in the act of breathing. An abdominal press retains in certain position of interior of abdominal region. At simultaneous reduction of muscles of abdominal wall the volume of abdominal region diminishes.

From point of professional-hygienically activity of abdominal a press is of interest in that at getting up of weights there is the sharp reduction of abdominal press, attended with the sudden and strong increase of intraperitoneal pressure. The similar increase of intraperitoneal pressure can lead to formation of hernia in the weak points of front abdominal wall.

An inguinal channel, white line umbilical ring, is such places, the general anatomic feature of which there is absence in them of rectus muscular defence.

Regions

The anterolateral wall of abdomen is subdivided into separate regions, although anatomic defining their strict borders is not succeeded. The division is based on conducting of row of conditional lines. Two is conducted horizontally from them: one connects ends X ribs and carries the name of lin.costarum, and other connects both upper front awns of ilia and carries the name of linea spinarum. Consequently, select three regions: epigastric, gastric, hypogastric. Each of these three parts by two vertical lines conducted along the outward edge of recti abdominis to the pubics tubercles, divides by three regions. There are nine abdomen regions of all front-lateral wall.

Layers of front abdominal wall

Superficial layers

A skin is comparatively thin, mobile, easily undertakes in a fold and differs by large tensility. There are whitish scars bars at large tensions of abdominal walls - stria gravidorum. Hypodermic fatty cellulose is expressed individually; maintenance of fat in it is different. The layer of it can achieve a considerable thickness, except for a belly-button, where fat is not quite present to the white line, where it usually little. At the strongly developed fatty layer there is development of a few layers dissociated from each other by fascial sheets. Presence between the layers of fat can mislead them at determination of depth of cut in area of abdomen.

In the upper part of front wall of abdomen usually there are the two layers structure of hypodermic cellulose, and in a lower part three-layered, and sometimes and fourth layers structure.

Superficial hypodermic hemorrhage and suppurations adopting wide sizes due to friability of fatty cellulose of abdominal wall can spread downward depending on that, in what layer arises up. If a hemorrhage happened in a superficial layer, it can spread and on a thigh, in a deep layer comes to the inguinal ligament.

Superficial fascia is continuation of fascia of contiguous regions. In the lower part of front abdominal wall from it a sheet is unhooked (fascia Thompsoni). This sheet is made
more compact and can be accepted for aponeurosis by the outward oblique of muscle of abdomen, especially as it is down fixed to the inguinal ligament.

**Middle layers**

**Own fascia.** Every wide muscle of abdomen has own fascia covering both surfaces of muscles, but expressed differently at different levels. Most expressed, from data of Nym-Tzon-Sync, own fascia covering an outward muscle.

Along the whole length of muscular part of this muscle own fascia is a transparent, but dense connecting-tissue lamina.

**Outward oblique muscle of abdomen.** It begins from an outward surface 7-8 lower ribs and lumbar fascia, follows in front of and downward and registers to the outward lip of wing of ilium. Rest of muscular fibres passes to aponeurosis which forms an inguinal ligament and white line of abdomen. The fibres of aponeurosis of internal end of inguinal ligament go away, forming the fissure - outward opening of inguinal channel.

**Internal oblique muscle of abdomen.** Begins from the place of confluence of sheets of thoracolumbar fascia of f.thoracolumbalis, from the wing of ilium and from an inguinal ligament, muscular fibres go away by a fan, greater part follows in front of and upwards. They by upper bunches register to the lower edges of three ribs, and other to aponeurosis of recti abdominis.

**Transversal muscle of abdomen.** Muscular fibres have transversal direction. The place of transition of muscle in aponeurosis follows on the bent line - lin.semilunaris By the Spigellii turned bulge of outside is a weak point, where hernia is.

**Recti abdominis.** The recti abdominis are surrounded by the vaginas created from the tendons cricks wide abdomen.

**Vagina of recti abdominis** (vagina m. recti abdominis). In the upper parts of abdomen to the line located on 4-5 sm below than a belly-button (linea arcuata), the front wall of vagina is formed by aponeurosis by an outward oblique muscles of abdomen and superficial sheet of aponeurosis by the internal oblique of muscle, back is deep sheet of aponeurosis by an internal oblique muscles and aponeurosis of transversal muscle of abdomen. Below than a belly-button on 4-5 sm the front wall of vagina is formed by all three aponeurosis — outward and internal oblique and transversal muscles of abdomen, behind the recti abdominis transversal fascia (fascia transversalis) is disposed only part of intraperitoneal fascia Transition of all aponeurosis on the front wall of vagina of recti abdominis forms the arched line protuberant up and disposed on 4—5 sm below than a belly-button (linea arcuata).

**White line of abdomen.** The width of white line not is identical. Down narrow, higher belly-button, 1-2 and even to 4 sm. Most wide part in area of belly-button. Costs variations in the dimensions of white line depending on development of muscles of abdomen. The less muscles developed, the wider white line.

**Deep layers:** transversal fascia, pre-peritoneal cellulose, parietal peritoneum.

**Arteries of front and lateral wall of abdomen**

Arteries are divided into superficial and deep. Superficial arteries are in hypodermic fatty cellulose between two sheets of superficial fascia and give the eventual branches to the skin, thus direction of skinning vessels corresponds to motion of lines of pull of skin. At cutting out of skinning shreds for plastic aims on the anterolateral wall of abdomen is needed (with the purpose of saving of feeding vessels) in a shred to bring all thickness of hypodermic fatty cellulose along with superficial fascia.

**Superficial arteries**
1. superficial epigastric artery
2. superficial artery surrounding an ilium
3. Branches of outward sexual arteries.

**Deep arteries**
1. Upper epigastric - a.epigastrica superior is
2. Lower epigastric - a.epigastrica inferior is
3. Deep artery surrounding an ilium - a.circumflexa ilium profundum
4. In blood supply walls take part in 5-6 intercostals arteries.
5. Lumbar arteries - pass in a layer between an internal oblique and transversal muscles of abdomen.

**Veins of front lateral wall of abdomen**

Veins of anterolateral wall of abdomen are also divided into superficial and deep. Superficial veins are developed better than arteries and deep veins, forming in the fatty layer the walls of abdomen, especially in area of belly-button, thick latticework. They are joined together and with deep veins. Through thoracoepigastric veins (vv. thoracoepigastricae), inflowing in an armpit vein, and superficial epigastric vein (v. epigastrica superficialis) opened in a femoral vein, connection of the systems of upper and lower hollow veins is carried out (cavocaval anastomoses). Vienna of front abdominal wall by means of vv. paraumbilicales, disposed in an amount 4-5 in the round ligament of liver and inflowing in a collar vein, connects the system of v. portae with the system of v. cavae (portocaval anastomoses).

The deep veins of anterolateral wall of abdomen (vv. epigastricae superiores et inferiores, vv. intercostales and vv. lumbales) accompany (sometimes on two) of the same names arteries. Lumbar veins are the sources of odd and semiazygos veins. Violation of current of blood in the system of collar vein (tumours, thrombosis, cirrhosis of liver) results in expansion of veins (especially hypodermic) of front abdominal wall, carrying out the roundabout vein outflow. Veins become winding, extended, form the wide latticework of anastomoses as the ball of veins, reminding the head of jelly-fish.

**Nerves of anterolateral wall of abdomen**

In innervation of anterolateral wall of abdomen takes part 7-8 lower intercostals nerves and two lumbar of n.iliohypogastricus (ilio-hypogastric) and n.ilioinguinalis (iliac-inguinal).

The basic trunks of these nerves are disposed between an internal oblique and transversal by the muscles of abdomen, giving sprigs for all three lateral muscles of abdomen and superficial lateral skinning branches. Direction of basic nervous trunks - behind in advance, from top to bottom parallels the friend other.

At a few of nerves direction of basic trunks more horizontal, between the separate nerves of bond’s little or they are quite absent, and territory of their innervation saves expressed segmental.

At plenty of nerves, direction of trunks them more oblique, between separate nerves a lot of bond’s and ceilings and displacements of territory of their innervation are marked.

Distinctions coming to light in innervation of front abdominal wall are reflected and on character of changes in the muscles of it after the different damages nerves, including and cuts them during operations.

Cut of 1-2 intercostals nerves nearer to the spine due to the presence of bonds and ceiling of territories of innervation of changes in a rectus muscle does not cause.
At the damage of the same amount of nerves on periphery the changes, expressed in atrophy of muscular tissue, substitution by its fatty and connecting tissue, come to light already.

Especially the sharp changes in muscles come after the cut 3 and more branches of intercostals nerves.

The cuts on a front abdominal wall at patients, attended with violation of safety of row of nerves, cause change, both sensitiveness of skin of abdomen and functional state and structure of muscles. Most changes are observed at longitudinal cuts, including pararectal, the least - at transversal and oblique transversal.

**Topography of region of belly-button**

A belly-button is located on the middle of white line of abdomen.

A belly-button is the pulled scar in place of umbilical ring. The form of belly-button is various - sometimes this pretty deep pit on the day of which there is the scar rise, sometimes a belly-button has the appearance of rise.

An umbilical ring is opening limited by the made more compact tendons fibres of white line. In an antenatal period through an umbilical ring passes an umbilical rope, connecting embryo with the organism of mother. Two umbilical arteries, umbilical vein and urinary channel of urachus, are disposed in an umbilical rope. In future these formations obliterating and grow into ligaments, urinary channel - in a middle umbilical ligament, umbilical arteries - in mesial umbilical ligaments, and umbilical vein - in the round ligament of liver.

Outside an umbilical ring is covered by a very thin skin, accreting with scar tissue of belly- button and superficial fascia. From within umbilical fascia and peritoneum of accrete with each other for lack of connecting tissues layers. A peritoneum, calling under the upper or lower edge of umbilical fascia, forms different diverticula’s from above, from below, or from above and from below. Diverticula’s of umbilical ring meets more frequent at men.

In those cases, when there is well expressed umbilical fascia, it is possible to talk about the presence of umbilical channel having 4 walls. An internal surface is the front wall of it of white line, back is umbilical fascia, lateral mesial edges of vaginas of recti abdominis.

The presence of diverticula’s of peritoneum in area of umbilical ring is a predisposing moment for formation of umbilical hernia. At presence of large diverticulum in an umbilical channel and at stopping in it of content of abdominal region talk about by an internal oblique to umbilical hernia. Direct umbilical hernia appears at thrusting out of the peritoneal thrusting out directly through an umbilical ring. Except for indicated, for formation of umbilical hernia the features of structure of the most umbilical ring are predisposing moments is increase of its diameter, weak development of umbilical fascia.

Internal surface of front abdominal wall

On the internal surface of front abdominal wall five peritoneal folds are disposed: two pair and one odd. Last — plica umbilicalis mediana is formed due to motion of copy urinary channel; pair folds — plica umbilicalis media corresponds to motion of copy umbilical arteries; and plica umbilicalis lateralis corresponds on the peritoneum of vasa epigastrica inferiors. Three pits appear between peritoneal folds: fossa supravesicalis (between middle and mesial folds of peritoneum); fossa inguinalis media (between mesial and lateral peritoneal folds) and fossa inguinalis lateralis (outside from plica umbilicalis lateralis). Fossa inguinalis medialis is disposed on one vertical line with an outward inguinal ring, through it the output of direct inguinal hernia is carried out. Fossa
inguinalis lateralis corresponds to the internal ring of inguinal channel, oblique inguinal hernia go out through it.

**Classification of hernia**

Hernia of abdomen names thrusting out of the entrails covered by the parietal sheet of peritoneum, through the different openings of abdominal wall or pelvis. The fall is the output of the entrails not covered by a peritoneum, through the natural or posttraumatic openings in a front abdominal wall.

Eventration the output of the entrails is not covered by a peritoneum, if at the fall of entrails integrity of skinning cover is violated. Hernia of abdomen can be outward and internal. At outward hernia entrails outcrop through openings in the front wall of abdomen of small of the back or buttock region. At internal hernia the restriction of organs is carried out in peritoneal pockets (bursa omentalis, foramen Winslovi, flexura duodenojejunalis) or openings of diaphragm. Quite often restriction of internal hernia is diagnosed during operation.

Outward hernia taking into account anatomic signs is divided on: inguinal, femoral, umbilical, white line of abdomen, lumbar.

Depending on the origin of hernia can be innate and acquired. The last divide by traumatic, pathological and artificial. Traumatic hernia arise up after the traumas of abdominal wall, here postoperation hernia belong and recurrent, being investigation of the before conducted operations on an occasion hernia. Pathological hernia is accompanied by violation of safety of separate layers of abdominal wall because of the different diseases carried before.

In the origin of hernia in mature age a considerable role is taken to the factor of increase of intraperitoneal pressure at physical tension, to low fatness of organism and features of anatomic structure of region, where the hernia thrusting out appeared. Formation of hernia can be conditioned by the reasons of local and general character: heredity, age, floor, degree of fatness and feature of build; increase of intraperitoneal pressure and weakening of abdominal wall. Local reasons are conditioned by the features of anatomic structure of that region, where hernia appeared.

Hernia can be distinguished as complete and incomplete; reducible and irreducible; complicated and uncomplicated. At the complicated hernia there is the restriction of going organs out in area of hernia gate, here organs can be viable, with the irreversible pathological changes or with a phlegmonous process in area of the hernia thrusting out.

**Component elements of hernia**

The component elements of hernia are: hernia gate hernia sack and hernia content. A hernia gate is the weak points of abdominal wall, through which will tend hernia (inguinal pits, umbilical ring, white line of abdomen, openings, in a diaphragm). In a norm through these openings pass one or another anatomic formations (seminal rope, round ligament of uterus, vascular-nervous bunches and T. of d.). Openings appearing as a result of break of muscles and aponeurosis at the trauma of abdomen can serve as a hernia gate at traumatic and postoperation hernia, or after surgical interference. A hernia gate can be as a crack or to achieve largeness at ventral postoperation hernia.

A hernia sack is the parietal sheet of peritoneum, covering entrails going out through hernia gates. At innate inguinal hernia the uncopsy vaginal sprout of peritoneum is a hernia sack (processus vaginalis petitonei). In a due form a hernia sack can be cylindrical, spherical. In a hernia sack select a mouth, neck, body and bottom. Through a mouth a
hernia sack unites with an abdominal region. A neck transitory in the body of sack follows by it. A body and neck can be different both on length and on volume, a size them depends on the size of hernia. Sometimes a hernia sack achieves the volume of head of the grown man. The body of sack ends with a bottom.

**Ingual channel.** Topographical-anatomical ground of operations at inguinal hernia

Ingual hernia is localized in an iliac-inguinal region which has the form of rectangular triangle. From below and lateral this region is limited by the sexual ligament of from above — line, connecting the front upper awns of ilia, from within — outward edge of recti abdominis. This region a pair, in it select an inguinal triangle, the upside of which there is a horizontal line connecting a point between outward one and middle third inguinal ligament with the lateral edge of recti abdominis. An inguinal ligament serves as the lower side of this triangle, mesial is outward edge of recti abdominis. A skin in this region is mobile. The layer of hypodermic-fatty cellulose is expressed individually. In it pass the superficial branches of femoral artery: superficial epigastric artery, superficial artery rounding an ilium, outward shame artery. Quite often these vessels pass between the sheets of superficial fascia of abdomen, the deep sheet of which carries the name of Thomson plate. It is more designated and registers to the inguinal ligament. The eventual branches in this region are determined of n. ilioinguinalalis and n. genitofemoralis.

Own fascia of abdomen in this region is represented by thin fibrous tissue. As well as Thomson plate, it accords to the inguinal ligament. Both fascial sheets hinder to lowering of inguinal hernia on a thigh.

Deeper aponeurosis is disposed by the outward oblique of muscle of abdomen the fibres of which goes parallel to the inguinal ligament and take direct part in its formation. Aponeurosis by the outward oblique of muscle of abdomen is more designated at women, by what at men. In lower part of iliac-inguinal region of fibre of it goes away, what lateral and mesial legs which limit the outward ring of inguinal channel appear due to. At healthy men it usually skips a finger-point indicatory. Palpation and determination of sizes of outward ring of inguinal channel is made an index finger through, scrotum. Transversal the located fibres of fibrae intercrurales strengthen aponeurosis by the outward oblique of muscle - abdomen. If these fibres are poorly developed or is absent quite, an inguinal ring assumes an air of crack, here it little resists to intraperitoneal pressure. After aponeurosis by the outward oblique of muscle is disposed internal oblique and transversal muscles of abdomen, which not along the whole length adjoin to the inguinal ligament, what an inguinal interval appears due to. In other words inguinal an interval is the space limited from above by a lower edge by an internal oblique and transversal muscles of abdomen, from below — inguinal ligament, from a mesial side — outward edge of recti abdominis and fibres of m.cremaster. A size and form of inguinal interval is in direct communication with the degree of adjoining to the inguinal ligament by the transversal and internal oblique of muscles of abdomen.

Than the lower edge of these muscles is nearer located in relation to an inguinal ligament, the less sizes there will be an inguinal interval, the less possibility of origin of inguinal hernia. In a due form an inguinal interval can be three-cornered, round, oval and fissure. On determination A.P.Krumov, at women muscular wall of inguinal region «more accomplished, than at men», therefore the greater percent of inguinal hernia meets exactly at men.

After an internal oblique and transversal by the muscles of abdomen transversal fascia more made more compact at an inguinal ligament and outward edge of line of
muscles of abdomen due to lig. Henle is disposed. Transversal fascia in area of inguinal triangle is fixed due to the aponeuroses fibres located from within (falx inguinalis) and outside (lig. interfoveolare). Transversal fascia is dissociated from a peritoneum by the layer of pre-peritoneal cellulose, which is more shown in the mesial comer of inguinal region. In preperitoneal fat pass two arterial vessels (a. epigastrica inferior, a. circumflexa ilium profunda & n. genitofemoralis).

An inguinal channel is disposed within the limits of inguinal triangle, it represents an intramuscular crack through which in a norm at men passes a seminal rope, and women have the round ligament of uterus. An inguinal channel not is expressed in default of hernia. In it distinguish four walls: front is aponeurosis by the outward oblique of muscle of abdomen; back - transversal fascia of abdomen; upper - lower edge by an internal oblique and transversal muscles of abdomen; lower - inguinal ligament. At healthy people the front wall of inguinal channel is formed besides aponeurosis by the outward oblique of muscle of abdomen by fibres by the internal oblique of muscle, and an upper wall is represented only by the edge of transversal muscle. If the internal oblique muscle of abdomen at the front does not cover a seminal rope, terms are created for the origin of inguinal hernia, because it is a basic element which counteracts to intraperitoneal pressure. Transversal fascia of abdomen at the innate weakness of aponeurosis by the outward oblique of muscle can not during great while to resist to intraperitoneal pressure, due to what the weakness of walls of inguinal channel and predisposition is to formation of inguinal hernia.

An inguinal channel is had by two rings: internal and outward. At the weakness of back wall of inguinal channel and high inguinal interval (to 5.5 sm) there is direct inguinal hernia the output of which takes place through fossa inguinalis medialis, being on one vertical line with an outward ring. Hernia does a direct way; from here and there was its name. Complete line inguinal hernia can in rare cases to go down in a scrotum, here it is located backwards from a seminal rope and its shells. At women the back wall of inguinal channel (transversal fascia of abdomen) is expressed weaker, than at men, therefore direct inguinal hernia meet more frequent at women.

Hernia sack of direct inguinal hernia which goes out through the outward opening of inguinal channel will be covered by the following layers: by a skin with a hypodermic cellulose, superficial fascia and layer of pre-peritoneal cellulose.

Oblique inguinal hernia goes out from an abdominal region through the internal ring of inguinal channel (fossa inguinalis lateralis). Quite often bind the origin of this type of hernia to weakening of front wall of inguinal channel, aponeurosis by the outward oblique of muscle of abdomen. If hernia is complete, it passes through all inguinal channels up to its outward opening. Hernia can go down in a scrotum on motion of seminal rope, in this case accepted to talk about inguinal-scrotum hernia; at women oblique inguinal hernia can achieve the cellulose of large sexual lips. Hernia does a oblique way, because direction of inguinal channel oblique - from top to bottom, outside inward.

The hernia sack of oblique inguinal hernia passes under the general vaginal shell of seminal rope of testicle; it is surrounded by the elements of seminal rope and outside is disposed from it.

Component parts of seminal rope are: ductus deferens, a. testicularis, a. cremasterica, a. ductus deferentis.

Interlacement appears round a seminal rope - plexus pampiniformis. In limit of inguinal channel passes n. ilioinguinalis, r.genitalis n. genitofemoralis.
A hernia sack at oblique inguinal hernia is covered by the following layers: by a skin with a hypdermic cellulose, superficial fascia aponeurosis by the outward oblique of muscle of abdomen and seminal fascia outside an inguinal channel, muscle levitating a testicle and of the same name fascia, in the same layer pass and. et v. cremasterica et r.genitalis n. genitofemoralis.

A next layer is represented by the general vaginal shell of testicle and seminal rope, quite often a hernia sack from the last is dissociated by a pre-peritoneal cellulose.

**Operations at inguinal hernia**

About 2-4% of people suffer from hernia of abdomen. Hernia of abdomen names thrusting out of the entrails covered by the parietal sheet of peritoneum, through the different openings of abdominal wall or pelvis.

**Operations at oblique inguinal hernia**

Treatment of inguinal hernia of abdomen can be conducted only by an operative way.

Anaesthetizing. Herniotomy more frequent than all is conducted under local anesthesia. Anesthesia is carried out on the method by A.WVishnevsky as tight infiltration of all layers of inguinal region 0,25 % by solution of Novocain. Quite often use block regional anesthesia which begin at the level of front upper awn of ilium on motion of ilio-hypogastric nerve. Here enter Novocain fan-shaped under aponeurosis and on 5-6 sm mesial from an awn. The second point for block regional anesthesia is at the level of middle of inguinal ligament, prick needles make on 2 sm mesial from it. The third point is on 1,5-2 sm higher than a pubic tubercle.

Operations of complicated forms and sliding hernia of abdomen and also operative interferences at children are performed under anesthesia.

**Operations at the acquired oblique inguinal hernia**

All operative interferences at the acquired oblique inguinal hernia are removal of existent hernia strengthening of front wall of inguinal channel, operation will be executed on is in direct dependence on the size of hernia muscular-aponeuroses formations of inguinal region.

The basic stages of operation of herniotomy are taken to the following:
1. is access;
2. are selection and treatment of hernia sack;
3. are the plastic arts of hernia gate.

The cut of skin of all types of inguinal hernia is conducted parallel to the inguinal ligament on 2 sm higher than it, from the level of front upper awn to the pubic tubercle, long 8-12 sm. Layer unseal a skin, hypdermic cellulose superficial fascia, between two ligatures dissect a.et v.epigastrica superficialis, bare the front wall of inguinal channel.

Conduct the selection of hernia sack typically. After the section of aponeurosis by the outward oblique of muscle of abdomen and selection of hernia sack from under the vaginal shell of seminal rope and testicle, it undertakes on 2 Bylrot’s clamps and bluntly moves away from shells by fingers and swab. At first bare the bottom of sack, and then and its neck located in area of internal ring of inguinal channel. After dissection of hernia sack and examination of its content, produce setting of going entrails out in an abdominal region. A hernia sack is sewn at foundation and is bandaged oneself by a thick silk filament on both sides, it is chopped off after.

The third stage of herniotomy is related to the plastic arts of hernia gate.
There are the extraperitoneal methods of herniotomy, foreseeing dissection of aponeurosis by the outward oblique of muscle of abdomen, and methods which an inguinal channel is not unsealed at. The last have a number of failings, as is produced in blind, a hernia sack can not be remote fully. Methods without dissection of front wall of inguinal channel are used more frequent in child's practice (Cherny, Ru, Oppel), and also at the initial forms of hernia at adults.

Methods of strengthening of front wall of inguinal channel without dissection of aponeurosis by the outward oblique of muscle of abdomen.

**Cherny’s method** foresees imposition of 2 stitches on the legs of aponeurosis by the outward oblique of muscle of abdomen and 3-4 stitches on the front wall of inguinal channel. The outward ring of inguinal channel suggests narrowing Krasnobaev by a 1 stitch or 2-3 stitches to lie on the appearing fold of aponeurosis by the outward oblique of muscle of abdomen.

**Ru’s method** - at the plastic arts of front wall of inguinal channel on it sutures 4-5. From above, besides aponeurosis the outward oblique of muscle of abdomen in a stitch takes a lower edge by an internal oblique and transversal muscles, and from below take an inguinal ligament. Imposition of stitches is made from the side of outward ring of inguinal channel.

**Oppel’s method** - besides sewing underneath of uncut aponeurosis with subject muscles to the inguinal ligament includes and moment of narrowing of outward ring of inguinal channel by sewing together of its legs. Must skip the remaining openings finger-point indicatory.

Methods strengthening the front wall of inguinal channel, with dissection of aponeurosis by the outward oblique of muscle of abdomen.

**Method by Martunov** is used at the easy forms of oblique inguinal hernia low inguinal interval. Essence of method consists of formation of duplication from the shreds of aponeurosis by the outward oblique of muscle of abdomen. In the beginning and in front of of seminal rope to the inguinal ligament the upper sheet of aponeurosis is sewn underneath by the outward oblique of muscle of abdomen by 4 stitches. Above all things string a lateral stitch after all the other stitches, since a mesial side. The lower shred of aponeurosis is laid on over upper with subsequent its fixing by a few key stitches, here try to avoid the sharp narrowing of the outward opening of channel and restriction of seminal rope.

**Method by Lucka-Shampyoner-Bobrov** consists of strengthening of front wall of inguinal channel due to imposition 4-5 stitches, conducting of filaments of which carry out
through the upper shred of aponeurosis by the outward oblique of muscle of abdomen, lower edge by an internal oblique and transversal muscles of abdomen and transversal fascia in front of of seminal rope, after a prick needle a filament is conducted through a inguinal ligament lower shred of front wall of inguinal channel. Stringing of filaments is carried out under the control a finger in order to avoid the restriction of seminal rope.

**Method by Gerar** foresees sewing underneath of lower edge by an internal oblique and transversal muscle of abdomen to the inguinal ligament in front of seminal rope. Then over this layer the upper shred of aponeurosis is sewn underneath to the inguinal ligament, and a lower shred is fixed by separate key stitches to upper. At the plastic arts of hernia gate on this method quite often relaxes lower edge of lateral muscles of abdomen and inguinal ligament due to the double row of stitches. Taking into account this circumstance, S.I. Spasocucotsky offered in one stitch to take the upper shred of aponeurosis and lower edge by an internal oblique and transversal muscles of abdomen with the subsequent sewing underneath them to the inguinal ligament.

**Method by Kymbarovsky** is based on contiguity of homogeneous tissues (aponeurosis by the outward oblique of muscle of abdomen with an inguinal ligament), as they accrete better. An original stitch after tightening of filaments of which there is sewing underneath of upper mesial shred of aponeurosis under a lower edge by an internal oblique and transversal muscle of abdomen was offered to them to that end. Thus conduct a filament through the upper shred of aponeurosis by the outward oblique of muscle of abdomen, lower edge by an internal oblique and transversal muscles, after veer needle, prick of it is carried out only through aponeurosis, second time veer needles and filament conduct through a inguinal ligament. Such stitches 4-5 are laid on. By the outward oblique of muscle of abdomen sew underneath the lower shred of aponeurosis by key stitches over the muscular-aponeurotic layer fixed to the inguinal ligament. Methods strengthening the back wall of inguinal channel are mainly used at the plastic arts of hernia gate at direct inguinal hernia.

**Method by Bassini.** After dissection of front wall of inguinal channel proceed to the selection of hernia sack from under transversal fascia, dissect the parietal sheet of peritoneum, covering hernia content, the last is immersed in an abdominal region. A hernia sack in area of neck is sewn, is bandaged oneself and is chopped off. Select a seminal rope along the whole length and take aside on gauze hook. Then proceed to the plastic arts of back wall of inguinal channel. Essence of it consists of lowering of lower edge by an internal oblique and transversal muscles of abdomen together with transversal fascia to the inguinal ligament behind a seminal rope. An inguinal interval is thus liquidated, and a new bed appears for a seminal rope. In an inguinal ligament make sewing underneath of the transferred formations by 5-6 key stitches, bewaring to hurt a seminal rope in the upper and lower comer of wound. From a mesial side to inguinal ligament and to the periosteum of pubic bone is sewn underneath by 1-2 stitches edge of vagina of recti abdominis. If there is the pull on the line of stitches that on the vagina of recti abdominis is done by weakening cuts. A seminal rope is laid on a muscularM bed; the sheets of aponeurosis by the outward oblique of muscle of
abdomen sew together by separate key stitches. The plastic arts of back wall of inguinal channel on Bassini are resulted on a fig.

Presently for strengthening of both back and front wall of inguinal channel materials of biological and synthetic nature are used. Quite often auto flap is used from wide fascia of thigh, skin, neighboring muscles on feeding foundation and etc. Most distribution was got by the plastic arts by synthetic fabrics: Capron, nylon, foam rubber, polyethylene.

**Plug and Patch method**

Lately wider the method of the plastic arts, at which after the selection of hernia sack and its immersion (without the preliminary bandaging), began to develop, in the appearing crater of abdominal region enter the polypropylene net designed in the form of "shuttlecock". In subsequent make the plastic arts on the standard method of Liechtenstein. It is considered that this net additionally strengthens the internal opening of inguinal channel and hinders to formation of relapse. Such combined method plug and patch is named.

A net convolute as a cone is set on relaxing transversal fascia in the projection of internal inguinal pit

**Femoral channel. Operations at femoral hernia**

A femoral triangle is that region within the limits of which subject to the condition certain there is the output of femoral hernia. It from above is limited by an inguinal ligament, lateral - sartorial muscle and mesial-long bringing muscle thighs over. From inguinal that they go out below than an inguinal ligament is the basic difference of femoral hernia.

The space, located between an inguinal ligament and pubic ilia, contains of two parts: lateral (lacuna musculorum) and mesial (lacuna vasorum), parted between it arcus iliopectineus - offspur of iliac fascia.

A ilio-lumbar muscle femoral nerve and cutaneous-lateral nerve of thigh pass through muscular lacunay, here at the tubercular defeats of spine can go down on a thigh "cold" abscesses, and in the small percent of cases femoral hernia can go out lateral a.et v. femoralis.

Vascular lacuna is limited at the front by an inguinal ligament, outside of -arcus iliopectineus, from within - lig. lacunare and behind - periosteum of share bone and lig. pectineale (Cooper’s ligament). R.genitalis n. genitofemoralis are located from lateral side
femoral vessels. Large significance in the origin of femoral hernia is attached to the internal part of vascular lacuna, located between the mesial surface of femoral vein and lacunar ligament. This space carries the name of femoral ring (annulus femoralis), at the front it is limited inguinal, and behind by a pectineal ligament and of the same name fascia. Femoral hernia meets more frequent at women, which have the anatomic predisposition to their formation, conditioned by the largeness of pelvis and femoral ring. Width of annulus femoralis at women - 1,8 sm, at men - 1,2 sm. Outside it is covered by the layer of fatty cellulose and lymphatic knot by Rosenmuller-Pyrogov, therefore it is a pliable enough place, and so loose tissues poorly resist to the increase of intraperitoneal pressure, exactly here is the output of the entrails covered by the parietal sheet of peritoneum.

The last circumstance is instrumental in forming of femoral channel which does not exist in a norm.

A femoral channel has a trihedral form. The front wall is represented by the falcate edge of wide fascia of thigh (margo falciformis), lateral - internal surface of femoral vein, back mesial - ilio-pectineal fascia. Length of femoral channel corresponds to length of front its wall and 1 -3 sm is on the average equal. Internal a femoral ring, which from the side of abdominal region is covered by transversal fascia of abdomen, made light in this region due to motion of lymphatic vessels, serves by opening of channel. Hiatus safenus is the outward ring of femoral channel.

The shells of hernia sack of femoral hernia, examining them from within outside, will be represented by the following layers: by pre-peritoneal cellulose, transversal fascia, cellulose of femoral channel, made light latticed fascia hypodermic cellulose and skin.

At the hurt femoral hernia the section of internal ring of channel must be made taking into account motion of bloods vessels. Outside from a ring a femoral vein is disposed, from above is lower epigastric artery, and from a mesial side can pass a.obturatoria at anomalous it’s departing from an inferior epigastricum trunk. Such location of obturative artery in area of internal ring of femoral channel got the name the "Crown of death" (corona mortis). Last circumstance must be taken into account by surgeons, because a hurting ring is accepted to dissect only in mesial direction.

**Operations at femoral hernia**

Treatment of femoral hernia must be conducted only by an operative way. All methods of operations can be divided into two kinds:
1. Operations conducted from the side of inguinal channel.
2. Operations executable from the side of thigh.

Anaesthetizing: local anesthesia By A.V.Vishnevsky, foreseeing layer introduction a 0,25% solution of Novocain into a skin, hypodermic cellulose located in area of neck of hernia sack, is most often used. Possibly conducting of anesthesia by Braun, at which make introduction of Novocain from 3-4 points.

Access at femoral hernia will depend on the type of operative interference. So at herniotomy from the side of inguinal channel make the cut of skin parallel to the inguinal ligament on 2-3 sm higher than it. At the plastic arts of hernia gate from the side of thigh execute a vertical cut through the center of the hernia thrusting out, began which on 2-3 sm higher than a inguinal ligament. It is possible to conduct the cut of skin parallel to the inguinal ligament, but below than it on 2-3 sm. For irreducible femoral hernia of largeness use angular and T-vivid cuts.
Method by Rudgi. Conduct dissection of skin, hypodermic cellulose superficial fascia parallel to the inguinal ligament, as well as at inguinal hernia. Unseal the front wall of inguinal channel is aponeurosis of oblique muscle of abdomen. A seminal rope undertakes on gauze hook and is taken up together with a lower edge by an internal oblique and transversal muscle of abdomen. After the section of transversal fascia fit for the internal opening of femoral channel. Select the neck of hernia sack, last by hooks and to deliver in a wound. Treatment of hernia sack is conducted the same as at inguinal hernia. It is taken to its dissection examination and immersion of hernia content in an abdominal region, to sewing and bandaging of neck of hernia sack and chopping off of distal its part.

The plastic arts of hernia gate consist of imposition of 3-4 stitches on inguinal and Cooper’s ligament, closely associated with the periosteum of share bone. Restore integrity of back wall of inguinal channel, sewing together transversal fascia of abdomen, lay a seminal rope into the place, sew together aponeurosis by the outward oblique of muscle of abdomen by separate key stitches. Operation ends with the layer taking in of wound.

Method by Parlavecchio. This method foresees dissection of inguinal channel with saving of integrity of its outward ring. At the plastic arts of hernia gate make simultaneously and strengthening of inguinal interval by sewing underneath of lower edge by an internal oblique and transversal muscles of abdomen to the periosteum of share bone behind a seminal rope. The second row of stitches is laid on the same muscles inguinal ligament. String the filaments of stitches, since the mesial comer of wound.

Method by Reich. Differs from the method of Parlavecchio that sewing underneath by an internal oblique and transversal muscle of abdomen together with an inguinal ligament to the periosteum of share bone goes in front of of seminal rope.

Method by Praskin can be delivered to the digit of the combined methods. At it the selection and treatment of hernia sack goes from the side of thigh, and make the plastic arts of hernia gate from the side of the unsealed inguinal channel behind a seminal rope. Sew underneath a lower edge by an internal oblique and transversal muscle of abdomen together with an inguinal ligament to the periosteum of share bone.

Operations executable from the side of thigh

Method by Lockwood-Bassini. Herniotomy from the side of thigh foresees causing on a skin and hypodermic cellulose of oblique cut, going below to the inguinal ligament and strictly parallel to it or the vertical cut displaced in a mesial side in relation to the projection of femoral vessels. Make the selection of hernia sack from surrounding tissues up to a neck by a dull way. The bottom of sack is unsealed between two clamps. After examination and immersion of entrails execute treatment of hernia sack typically. After chopping off of distal part of sack, stump of it is immersed under an inguinal ligament. Execute the plastic arts of femoral ring due to sewing underneath of inguinal ligament to the periosteum of share bone by 2-3 stitches, using steep round needles here.

Bassini complemented the method of the plastic arts by the second row of stitches which are laid on the semilunar edge of oval pit (margo falciforms) pectineal fascia. Found clinical application and plastic methods of closing of femoral ring by autotissues. For these aims it was offered to use shreds from a pectineal muscle with of the same name fascia.

Method by Watson-Cheyne - the cut shred out from a pectineal muscle long 6-7 sm, foundation of which is directed up, is sewn underneath to the inguinal ligament outside. The additional fixing of transplant is carried out to the vascular vagina pectineal fascia.
Operations on umbilical hernia and hernia of white line of abdomen

**Umbilical hernia**

**Anaesthetizing.** More frequent than all apply local infiltration anesthesia 0,25—0,5 % by solution of Novocain. At large umbilical hernia, especially at irreducible and with the presence of unions of falling organs out with a hernia sack, anesthesia is shown with intubation and application of muscle relaxant. Possibly application of peridural anesthesia.

Taking into account the size of hernia, and also concomitant divergence of recti abdominis. Apply the different cuts of skin: vertical on a middle line with attitude of belly-button on the left; oval in transversal direction with excision of belly-button; semilunar, bordering belly-button from below.

**Technique of operation.** Skive and hypodermic cellulose to the white line of abdomen and front wall of vagina of rectus muscles. At a vertical cut prepare a turning shred out from
left to right, dissociating the skin of belly-button from a hernia sack. Make the selection of hernia sack to the neck. Here the circular separation of hernia sack is a very important moment from the hernia gate formed by the dense aponeurotic edge of umbilical ring. The selected hernia sack is unsealed, falling organs out set in an abdominal region, chop off a sack, retreating on 1 —1,5 sm from the edge of ring. At presence of joints between falling out organs and hernia sack make the selection of organs. If necessary a large stuffing-box can be resection with subsequent careful hemostasis. At a narrow neck sew a hernia sack and bandage at foundation on both sides, at the considerable size of defect sew up a peritoneum by a continuous catgut stitch.

At large umbilical hernia make an oval cut in transversal direction with excision of surplus skin hypodermic cellulose and belly-button.

Methods of the plastic arts of umbilical ring. After liquidation of hernia sack, depending on the method of applied the plastic arts, dissect an umbilical ring longitudinally or transversal. At the plastic arts by Meyo dissect a ring in sides and upwards with transition of cut on the front wall of vagina of recti abdominis.

Sewing together transversal cut aponeurosis at the level of hernia gate make by its doubling. There are sutures silk or kaprons IT-vivid. Sew the upper shred of aponeurosis outside inward, retreating on 1,5 sm from an edge. By the same filament do a stitch in transversal direction on a lower shred, on 0,5 sm from its edge, and again sew an upper shred, but from within outside. Such stitches can be required from 3 to 6. At stringing of stitches there is displacement of lower shred under upper with doubling of aponeurosis. Fix the free lower edge of upper shred by separate key thin stitches to the lower shred.

At the plastic arts by K.M.Sapegko umbilical ring extend by the section of white line upwards and downward. Doubling of aponeurosis in longitudinal direction is achieved. By imposition of row of IT-vivid stitches: a filament passes on 0,5 sm from the edge of right shred, further sew a left shred from within outside, retreating on 1,5—2 sm from its edge, repeatedly pass the same shred, but in retrograde and again sew a right shred from within outside. Lay the free left edge of aponeurosis over right and fix by separate key stitches. It is expedient to use this method at presence of concomitant diastasis of recti abdominis. Doubling of aponeurosis can be got sewing underneath of shreds by separate key stitches.

Apply explantation at large umbilical hernia with the considerable defect of aponeurosis, when the plastic arts by own tissues technically impossible. By a middle cut select and process a hernia sack, the edges of aponeurotic defect, to which, taking muscles, sew underneath a kapron, tephlon or lavsan net. An implanting net serves as framework, which dense fibrous tissue closing a hernia gate is formed on.

Considerable difficulties arise up during operation on an occasion the hurt umbilical hernia at presence of plural joints and necrosis’s of the hurt organs. The plastic arts by I.I. Grekov foresees the delete of the hernia thrusting out without dissection of hernia sack.

Make a circular cut at foundation of the hernia thrusting out, get to the abdominal region of outside hurting ring. Resection of bowel, stuffing-box make out of abdominal region, deletes the hernia thrusting out fully by a single block. Complete operation by the plastic closing of hernia gate. In the comers of the sewn skinning wound up enter drainpipes.

The relapses at small umbilical hernia are 15-20, at large —- 30-40 %.

Hernia of white line of abdomen

On localization of hernia of white line of abdomen divide into epigastric, paraumbilical and hypogastric. The hernia gate of white line has the rounded or oval form
with transversal direction. Through them originally there is thrusting out of pre-peritoneal cellulose with forming of the so-called pre-peritoneal lipoma. In subsequent a small peritoneal crater grows into a hernia sack.

Anaesthetizing during operation local, with obligatory introduction of solution of Novocain in the vagina of recti abdominis. Additionally anesthetic enters higher and below than a hernia gate for penetration of it in a pre-peritoneal cellulose.

At small hernia make a transverse section longitudinal or, prepare a skin and hypodermic cellulose from aponeurosis on the white line of abdomen and from the front wall of vagina of recti abdominis. Make treatment of hernia sack the same as at umbilical hernia. At the middle cuts of white line there is tension of postoperative scar under influencing of traction of lateral muscles, the relapses are possible. Therefore a hernia gate usually sews up transversal with formation of duplication. At a few hernia of white line of abdomen, in combination with diastasis recti abdominis, apply the plastic arts of wall of abdomen by K.M. SaPEGko, at which double only aponeurosis without doubling of peritoneum.

The restriction of hernia of white line of abdomen is accompanied by signs characteristic for other types of the hurt hernia of anterolateral wall of abdomen. More frequent than all a large stuffing-box is hurt, thin, transversal rim bowels. The restriction of pre-peritoneal lipoma is accompanied by pain. Thus operation is conducted with the observance of general principles of operation at the restriction.

Diastasis of recti abdominis develops, as a rule, in the upper part of white line. Thus take place thinning of aponeurosis, atrophy of muscles. Testimonies to operation at diastasis of muscles are limited, absence of typical hernia gate does not result in the restriction.

On an occasion diastasis of recti abdominis make operation on the method by Martunov without dissection of vagina of rectus muscles. By ellipsoid cut excise surplus of skin, bare the white line of abdomen. A white line is dissected along the whole length of diastasis, retreating on 1 sm from the edge of vagina of left line of muscle, and then unseals an abdominal region. Beginning from above, the edges of back wall of vagina of rectus muscles sew together by separate stitches, lay on the free edge of aponeurosis of vagina of right line of muscle at the front and sew down to the vagina of left line of muscle.

On the method by Napalkov at diastasis dissect aponeurosis on the anterointernal edge of recti abdominis without dissection of peritoneum. Sew together by separate silk stitches in the beginning back, and then front duplication aponeurosis.

**Hernia of anterolateral wall of abdomen at children**

Direct inguinal hernia is considered rareness in child's age, because transversal fascia is elastic and well resists to the increase of intraperitoneal pressure. At children are the most frequent reasons of origin of oblique inguinal hernia, except for the anomaly atresia of vaginal sprout peritoneums, weakness of the muscular-aponeurotic system of inguinal channel and considerable increase of intraperitoneal pressure from the moment of birth from weeping, scream, strong cough. Operations at children at inguinal hernia usually execute after 6 months from the moment of birth.

**Anaesthetizing a common**

The methods of herniotomy must be used most simple: at pectoral children and at the children of nursery age are operations without the section of aponeurosis by the outward oblique of muscle (methods by Cherny, Ru, Krasnobaev, Oppel), at the children of preschool age — with the section of aponeurosis, that allows to reach to the neck of hernia.
sack. At the plastic arts of inguinal channel of muscle not must be taken in stitches, to violate not their functions, make interference on the method of Martunov.

Femoral hernia of children is observed rarely.

Umbilical hernia develops during the first two months of life of child. In default of complications children on an occasion umbilical hernia must be operated after 3 years. To it is possible to apply an adhesive plaster bandage. At children more senior 4-5 years application of it not expediently, because the independent closing of umbilical ring in this age is observed rarely. By a testimony to operation at umbilical hernia at new-born thinning can serve skins of belly-button, rapid increase of thrusting out, rarely meeting restriction.

6. Materials for self-control

A. Tasks for self-control:

Test №1. During the medial laparotomy, the surgeon damaged the circular ligament of the liver. What kind of 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 №2. Over what formation located a peritoneum fold, which goes from the navel down on medial line?

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

Test №3. The doctor palps the 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 №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 №5. The patient has an injury to the anterior-lateral wall of the abdomen. During the damage of each layer of the tissue the wound of the anterior-lateral wall of the abdomen is permeable?

a) depth layer of surface fascia;
b) the walls of the hollow internal organs;
c) muscle-aponeurotic layer;
d) interior abdominal fascia;
e) parietal peritoneum.

Test №6. The surgeon made access to the stomach from the tip of the xiphoid process vertically downwards within the epigastric region. What is the name of this type of laparotomy?

a) the middle;
b) upper middle;
c) medium middle;
d) upper transverse;
e) transrectal.

B. Tasks for self-control:

Task №1. In the surgical department, the victim was hospitalized with a closed abdominal trauma. Was performed a midline laparotomy to revise the organs of the abdominal cavity. Show landmarks for midline laparotomy. Name all tissues that were cutting by the surgeon. From which side more often go round the navel and why?

Task №2. When operating a seven-year-old child about 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 №3. In the surgical clinic was hospitalized a patient with a penetrating wound of the abdominal cavity in the navel region. What are the damaged layers of the abdominal wall?

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

Task №5. In the surgical department of the ambulance, was sent a patient, 28 years old. Two hours ago she felt a lot of pain in the right inguinal regoin. The patient is smooth. The spastic pain in the abdominal wall, mainly around the navel and in the right inguinal region, is detected, there is a slight protective tension of the muscles, a slight irritation of the peritoneum. Temperature 38 ° C. She was vomiting. Pulse within 80-90 / min. During the vaginal examination, the sharp pain is in the right appendages of the uterus. Third
month delayed menstruation. Which diagnosis should a surgeon install? With which cut he will enter the abdominal cavity?

References

Basic literature

Additional literature

Methodical development was prepared by associate professor Koptev M. M.