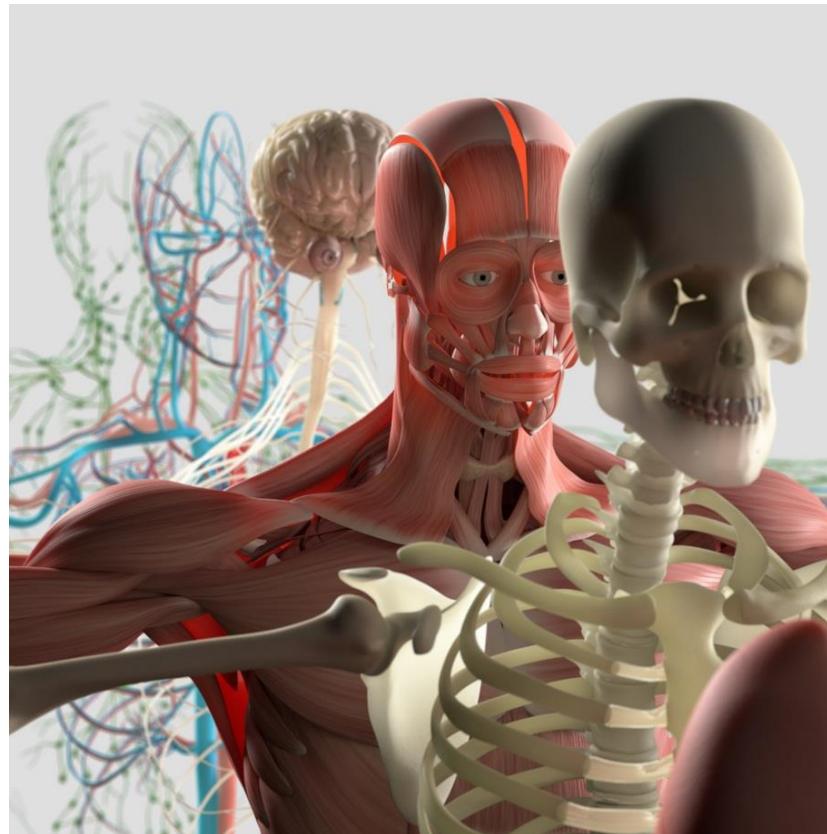


MINISTRY OF PUBLIC HEALTH OF UKRAINE
POLTAVA STATE MEDICAL UNIVERSITY

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Splanchnology with clinical applications. Endocrine glands



STUDY VISUAL GUIDE

UDC 616.441-071

Recommended by the Academic Council of Poltava State Medical University as a study visual guide for foreign students receiving higher master's degrees, studying in the specialties of "Medicine" and "Dentistry") of higher educational institutions of the Ministry of Public Health of Ukraine. Minutes of the meeting of the Academic Council of Poltava State Medical University from 13. 04. 2022 №8.

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Study visual guide in the discipline "Human Anatomy" from the section "Splanchnology" is intended to improve and more accessible assimilation of knowledge by students of higher educational institutions of medical education of Ukraine in the specialties of "Medicine" and "Dentistry". The manual contains Latin anatomical terminology, includes questions on the structure of the inner organs and endocrine glands, to the extent provided by the working curricula, a typical working curriculum in the discipline "Human Anatomy". Presented drawings for visual study of the material, contribute to the assimilation of acquired knowledge and practical skills. At the end of each practical lesson there are questions for self-training, situational tasks for the corresponding lesson from the database of the licensed exam "Step-1".

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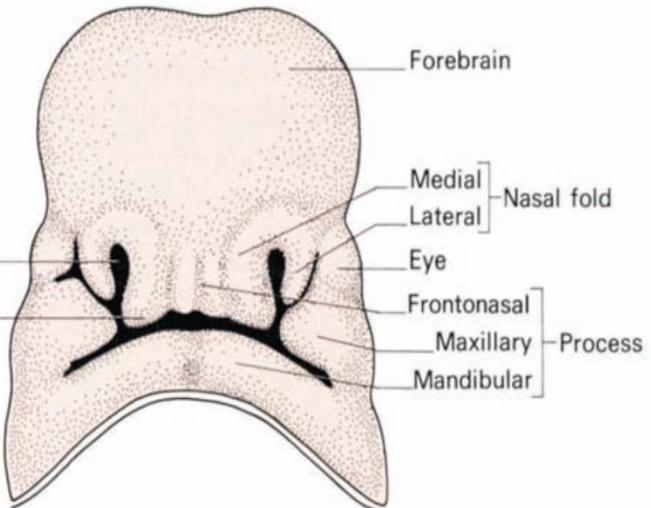
Topic 1. Oral cavity. Palate.

Complete the table.

Term in English	Term in Latin
	Vestibulum oris
	Cavitas oris propria
Lips	
Labial glands	
The cheeks	
The papilla of parotid duct	
The buccal fat pad	

CR!

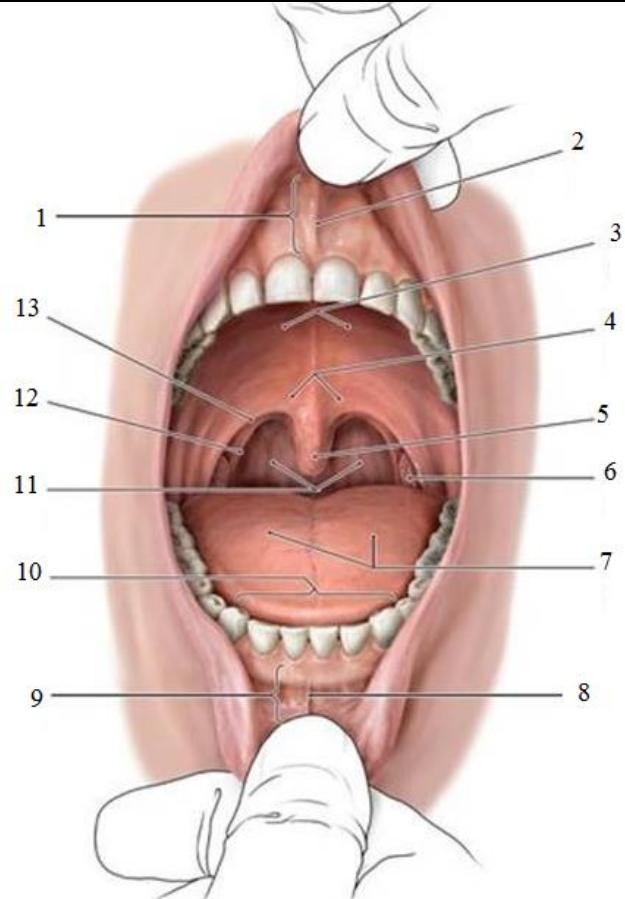
The Gag reflex. The gag reflex is protective against foreign bodies touching the posterior aspects of the oral cavity, which are most innervated by the glossopharyngeal nerve (CN IX). When stimulated, a reflex arc leads to contraction of the pharyngeal musculature and the elevation of the soft palate. The efferent nerve in this case is the vagus nerve (CN X).



The development of the face, lips and palate with special reference to their congenital deformities.
Around the primitive mouth, or stomodaeum, develop the following:

- the frontonasal process which projects down from the cranium. Two olfactory pits develop in it and rupture into the pharynx to form the nostrils. Definitively, this process forms the nose, the nasal septum, nostril, the philtrum of the upper lip (the small midline depression) and the premaxilla the V-shaped anterior portion of the upper jaw which usually bears the four incisor teeth;
- the maxillary processes on each side, which fuse with the frontonasal process and become the cheeks, upper lip (exclusive of the philtrum), upper jaw and palate (apart from the premaxilla);
- the mandibular processes which meet in the midline to form the lower jaw.

Complete the table.



Write all anatomical structures.

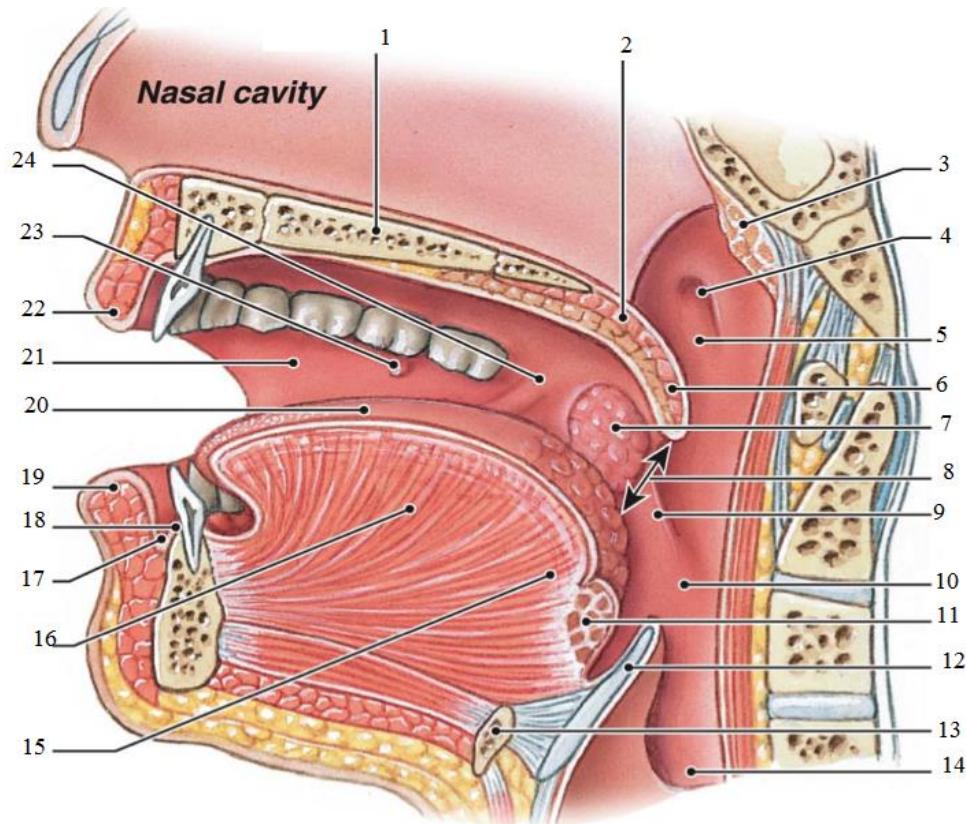
Oral cavity/

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Questions:

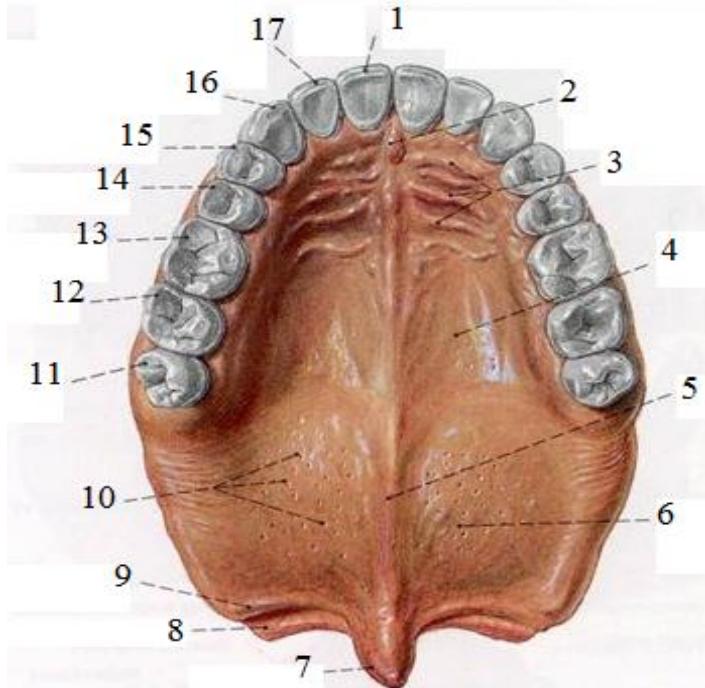
1. Patient 45-years-old accidentally drank acetic acid. Burn what department of alimentary system will occur firstly? _____
2. The examination of the patient revealed hypertrophy and inflammation of the lymphoid tissue, swelling of the mucous membrane of the soft palate between the arches (acute tonsillitis). Which of the tonsils is contained in the norm in this place? _____
3. During the first days of a newborn child, a pediatrician detected that milk gets into the child's nasal cavity. What malformation does this fact indicate? _____
4. During a meal, milk gets into the nasal cavity of a newborn child. What is the probable cause of this pathology? _____
5. On examination, the doctor found a small ulcer on the front left palatine arch. On what muscle possible spread infection process? _____

Write all anatomical structures. Sagittal section of the head.



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Write all anatomical structures. Hard and soft palate.

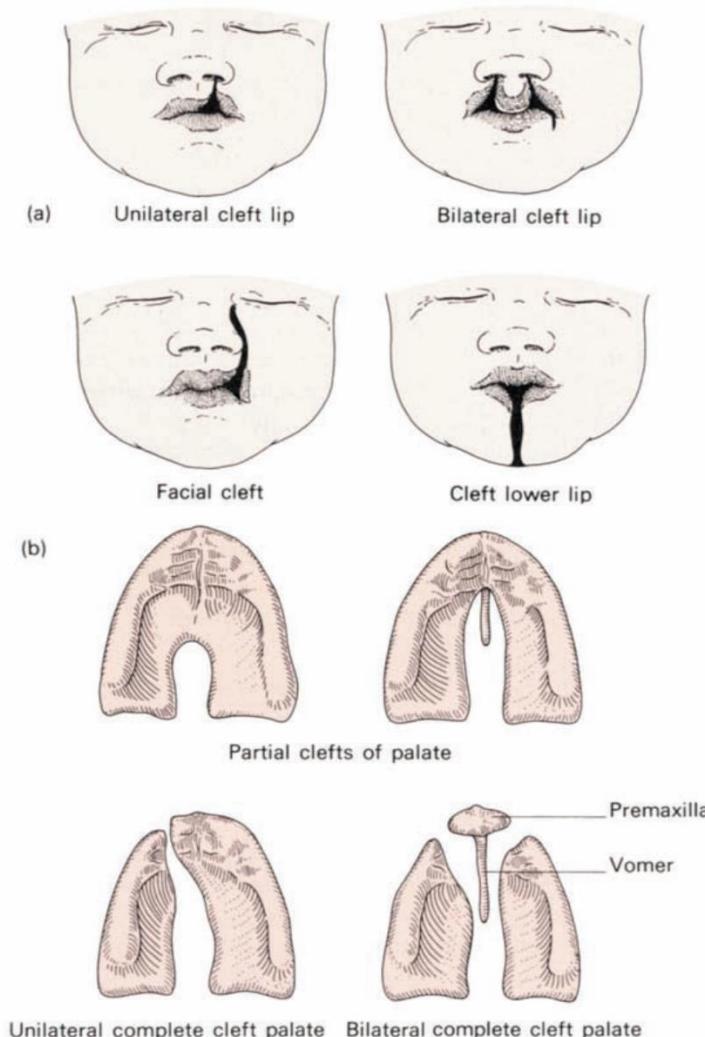


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15. _____
16. _____
17. _____

Questions:

1. Which anatomical structures form the bony palate? _____
2. What muscles form the oral diaphragm? _____
3. Name the function of the tensor veli palatini muscle. _____
4. Name the function of the levator veli palatini muscle. _____
5. Name the function of the musculus uvulae. _____
6. Name the function of the palatoglossus muscle. _____
7. Name the function of the palatopharyngeus muscle. _____
8. A boy, 8 years old, cannot put lips round, the angles of the mouth are pulled out and up, and oral fissure is stretched aside. What muscle is injured? _____
9. Examination of a patient's expression has shown that he cannot put his lips round, whistle, the oral fissure is stretched to sides. What muscle's atrophy do these indicate? _____

CR! Types of (a) cleft lip and (b) cleft palate.



Abnormalities of this complex fusion process are numerous and constitute one of the commonest groups of congenital deformities. It is estimated that one child in 600 in England is born with some degree of either cleft lip or palate.

Frequently, these anomalies are associated with other congenital conditions such as spina bifida, syndactyly (fusion of fingers or toes), etc. Indeed, it is good clinical practice to search a patient with any congenital defect for others.

The following anomalies are associated with defects of fusion of the face.

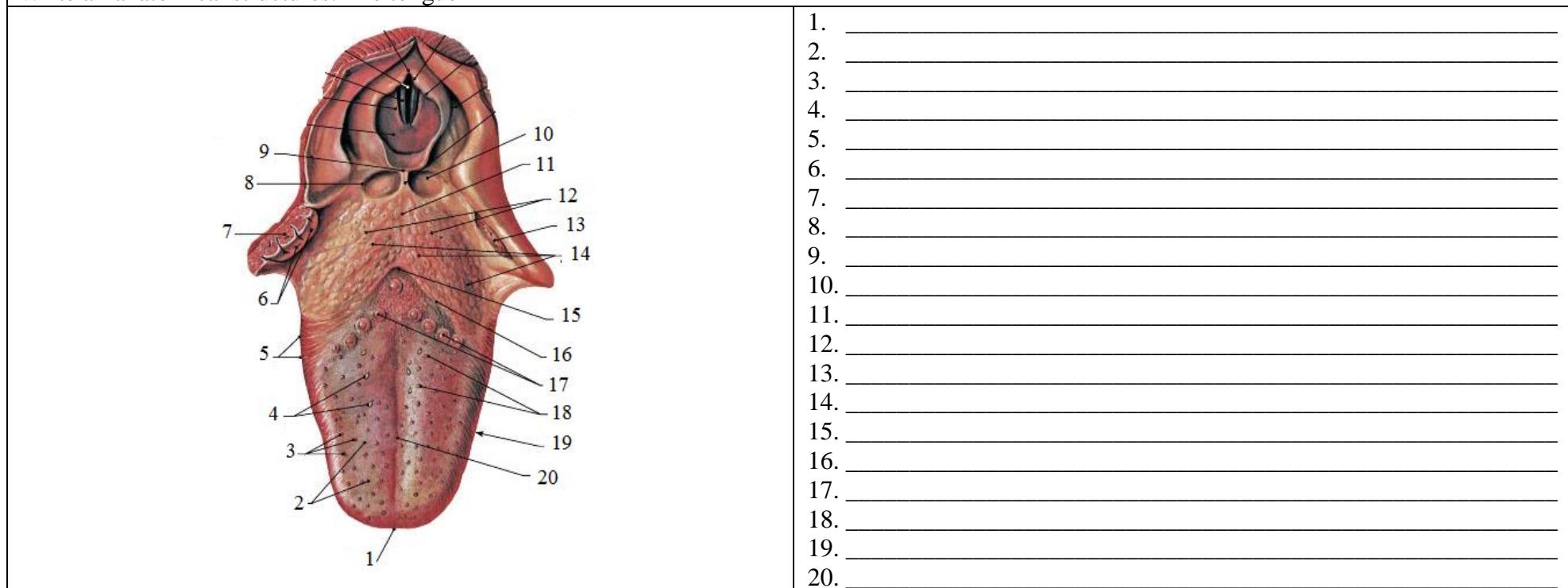
1. Macrostoma and microstoma are conditions where either too little or too great a closure of the stomodaeum occurs.
2. Cleft upper lip (or ‘hare lip’)—this is only very rarely like the upper lip of a hare, i.e. a median cleft, although this may occur as a failure of development of the philtrum from the frontonasal process. Much more commonly, the cleft is on one or both sides of the philtrum, occurring as failure of fusion of the maxillary and frontonasal processes. The cleft may be a small defect in the lip or may extend into the nostril, split the alveolus or even extend along the side of the nose as far as the orbit. There may be an associated cleft palate.
3. Cleft lower lip — occurs very rarely but may be associated with a cleft tongue and cleft mandible.
4. Cleft palate is a failure of fusion of the segments of the palate. The following stages may occur:
 - (a) bifid uvula, of no clinical importance;
 - (b) partial cleft, which may involve the soft palate only or the posterior part of the hard palate also;
 - (c) complete cleft, which may be unilateral, running the full length of the maxilla and then alongside one face of the premaxilla, or bilateral in which the palate is cleft with an anterior V separating the premaxilla completely.
5. Inclusion dermoids may form along the lines of fusion of the face. The most common of these is the external angular dermoid at the lateral extremity of the upper eyebrow. Occasionally this dermoid extends through the skull to attach to the underlying dura.

Topic 2: Tongue. Salivary glands.

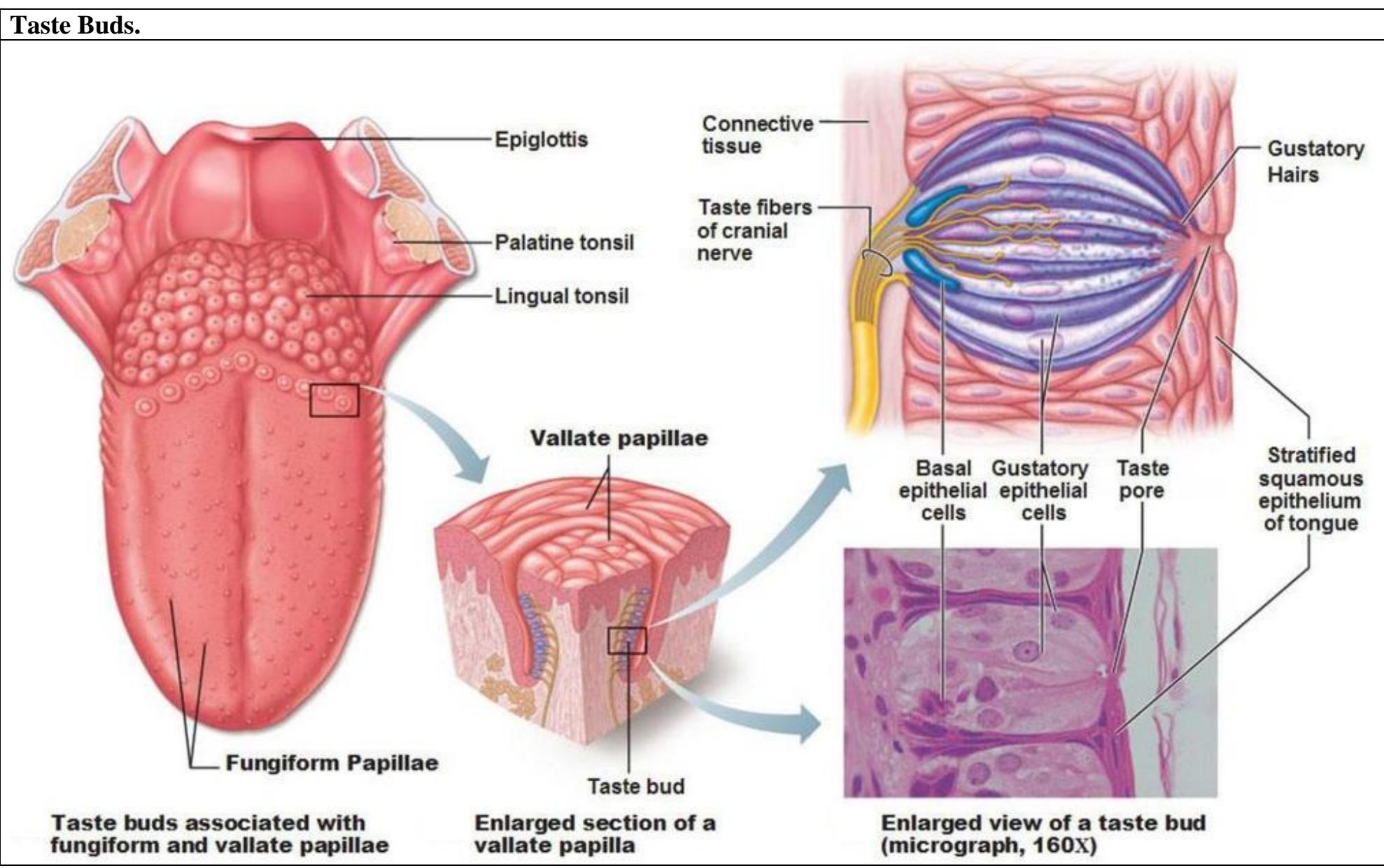
Complete the table.

Term in English	Term in Latin
The tongue	
The root of tongue	
The dorsum of tongue	Tonsilla lingualis
	Glandulae linguaes
	Papillae filiformes
	Ductus parotideus
	Ganglion oticum

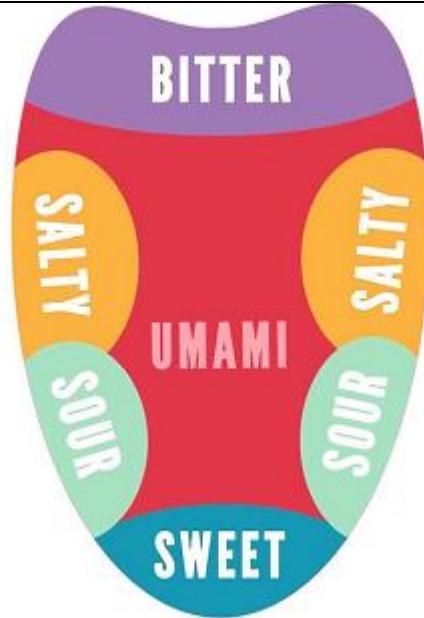
Write all anatomical structures. The tongue



Taste Buds.



Taste areas of the tongue.



Embryology.

The coarse texture of the dorsal surface of the tongue can be attributed to the numerous lingual papillae that are found on its surface. As the 8th gestational week draws to a close, foliate and vallate papillae are the first of the four papillae to develop. These are followed by the appearance of fungiform papillae. By the 10th-11th week of gestation, the thread-like filiform papillae can be observed on the dorsal surface of the tongue. Each type of papillae has a particular role in tongue physiology, and as such, has a unique innervation based on the nerve endings they developed closest to.

The development of taste buds begins as the last of the papillae are formed in the 11th week of gestation. Their formation is influenced by the invading special sensory nerve fibers, as well as inductive factors from the surrounding epithelium. Although the majority of these specialized gustatory receptors will develop on the dorsum of the tongue, they also arise on the hard and soft palates, dorsum of the epiglottis, palatoglossal arches, and the posterior oropharyngeal wall. Taste bud development is concluded around the 13 gestational week.

Muscles of the tongue.

Superior longitudinal	<u>Origin-</u> submucosa of posterior tongue, lingual septum. <u>Insertion-</u> apex/antrolateral margins of tongue. <u>Innervation-</u> hypoglossal nerve(CN XII) <u>Blood supply-</u> lingual branch of external carotid artery <u>Action-</u> retracts and broadens tongue, elevates apex of tongue
Inferior longitudinal	<u>Origin-</u> root of tongue, body of hyoid bone. <u>Insertion-</u> apex of tongue. <u>Innervation-</u> hypoglossal nerve (CN XII). <u>Blood supply-</u> lingual branch of external carotid artery <u>Action-</u> retracts and broadens tongue, lowers apex of tongue.
Transverse muscle	<u>Origin-</u> it take a lateral route, extending from either side of the medial lingual septum to the fibrous submucosa along the lateral margins of the tongue. <u>Insertion-</u> lateral margin of the tongue. <u>Innervation-</u> hypoglossal nerve (CN XII). <u>Blood supply-</u> lingual branch of external carotid artery <u>Action-</u> retracts and broadens tongue, lowers apex of tongue.

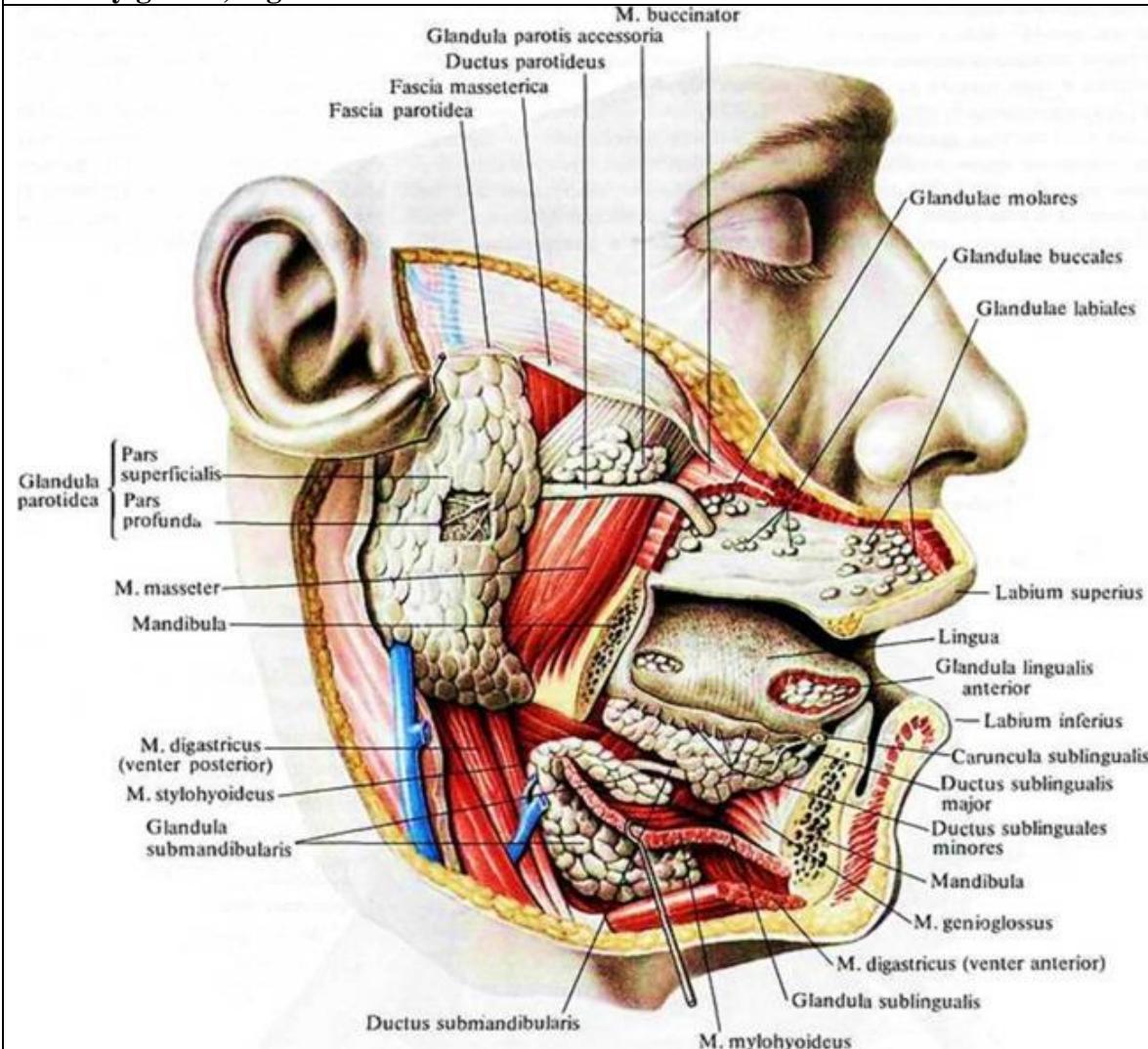
Vertical muscle	<u>Origin</u> - root of tongue, genioglossus muscle. <u>Innervation</u> - hypoglossal nerve (CN XII). <u>Blood supply</u> - lingual branch of external carotid artery. <u>Action</u> - broadens and elongates tongue.
Genioglossus	<u>Origin</u> - superior mental spine of mandible. <u>Insertion</u> - entire length of dorsum of tongue, lingual aponeurosis, body of hyoid bone. <u>Innervation</u> - hypoglossal nerve (CN XII). <u>Blood supply</u> - sublingual branch of lingual artery, submental branch of facial artery. <u>Action</u> - depresses and protrudes tongue (bilateral contraction); deviates tongue contra laterally (unilateral contraction).
Hyoglossus	<u>Origin</u> - body and greater horn of hyoid bone. <u>Insertion</u> - inferior/ ventral parts of lateral tongue. <u>Innervation</u> - hypoglossal nerve (CN XII). <u>Blood supply</u> - sublingual branch of lingual artery, submental branch of facial artery. <u>Action</u> - depresses and retracts tongue.
Styloglossus	<u>Origin</u> - anterolateral aspect of styloid process (of temporal bone), stylomandibular ligament. <u>Insertion</u> - blends with inferior longitudinal muscle (longitudinal part); Blends with hyoglossus muscle (oblique part). <u>Innervation</u> - hypoglossal nerve (CN XII). <u>Blood supply</u> - sublingual branch of lingual artery. <u>Action</u> - retracts and elevates lateral aspects of tongue.
Palatoglossus	<u>Origin</u> - palatine aponeurosis of soft palate. <u>Insertion</u> - lateral margins of tongue, blends with intrinsic muscles of tongue. <u>Innervation</u> - vagus nerve (CN X) (via branches of facial artery, ascending pharyngeal artery). <u>Action</u> - elevates root of tongue, constricts isthmus of fauces.

CR!

Carcinoma of tongue. Malignant tumors in the posterior part of the tongue metastasize to the superior deep cervical lymph nodes on both sides. In contrast, tumors in the apex and anterolateral parts usually do not metastasize to the inferior deep cervical nodes until late in the disease. Because the deep nodes are closely related to the internal jugular vein, metastases from the carcinoma may spread to the submental and submandibular regions and along the inter jugular vein into the neck.

Genioglossus paralysis. When the genioglossus is paralyzed, the tongue mass has a tendency to shift posteriorly, obstructing the airway and presenting the risk of suffocation. Total relaxation of the genioglossus muscles occurs during general anesthesia; therefore, the tongue of an anesthetized patient must be prevented from relapsing by inserting an airway.

Salivary glands, sagittal section.



CR!

Salivary gland cysts can develop due to injuries, tumors, infections or salivary stones that can block the flow of saliva. Since it cannot escape into the ducts it remains within the tissues which start to swell as the saliva builds up.

This condition is usually painless but can cause will correct the problem and recurrence is uncommon.

Ranula.

A ranula is a type of mucocele (mucous cyst) that occurs in the floor of the mouth inferior to the tongue. It is the most common disorder associated with the sublingual glands due to their higher mucin

Ludwig's angina is a cellulitis of the floor of the mouth, usually originating from a carious molar tooth. The infection spreads above the mylohyoid; edema forces the tongue upwards and the mylohyoid itself is pushed downwards so that there is swelling both below the chin and within the mouth. There is considerable danger of spread of infection backwards with edema of the glottis and asphyxia.

Drainage is carried out by a deep incision below the mandible which must divide the mylohyoid muscle.

Questions.

- Which papillae of the tongue serve for holding the food and reception of tactile and pain sensations? _____
- Which papillae of the tongue hold taste buds with gustatory receptors? _____
- Name the intrinsic muscles of the tongue. _____
- Name the skeletal muscles of the tongue. _____

5. Name the function of the vertical muscle. _____
 6. Name the function of the genioglossus muscle. _____
 7. Name the function of the hyoglossus muscle. _____
 8. Name the function of the styloglossus muscle. _____
 9. Name the function of the superior longitudinal muscle. _____
 10. Name the function of the transverse muscle. _____
 11. A 35-year-old patient complained of pain and edema in the site of oral cavity floor. After examination, the inflammatory process in the site of the excretory duct of submandibular gland was diagnosed. Where does this duct open to? _____
 12. A 40-year-old patient complained of pain and edema in the site of oral cavity floor. After examination, the inflammatory process in the site of the major excretory duct of the sublingual gland was diagnosed. Where does this duct open to? _____
 13. A 56-year-old patient complained of pain and edema in the site of oral cavity floor. After examination, the inflammatory process in the site of the minor excretory duct of the sublingual gland was diagnosed. Where does this duct open to? _____
 14. A 53-year-old patient complained of pain and edema in the site of oral cavity floor. After examination, the inflammatory process in the site of the excretory duct of the parotid gland was diagnosed. Where does this duct open to? _____
 15. After a face injury, a patient has hematoma in the cheek area. What salivary glands secretion outflow is blocked by the hematoma? _____
-
16. Dentist during the inspection of the oral cavity found between the middle and posterior third of tongue papillae inflammation. Inflammation which papillae doctor found? _____
 17. On examination, vestibule of mouth dentist found redness on the buccal mucosa, opposite to the upper second molar tooth. Which major salivary gland can be damaged the first place? _____

CR!

Damage to the hypoglossal nerve is readily detected clinically by hemi atrophy of the tongue and deviation of the projected organ towards the paralysed side.

- If the unconscious or deeply anaesthetized patient is laid on his back, the posterior aspect of the tongue drops back to produce a laryngeal obstruction. This can be prevented either by lying the patient on his side with the head down ('the tonsil position'), when the tongue flops forward with the weight of gravity, or by pushing the mandible forwards by pressure on the angle of the jaw on each side; this is effective because genioglossus, attached to the symphysis menti, drags the tongue forward along with the lower jaw.
- Although lymphatic's pierce the floor of the mouth (i.e. the mylohyoid muscle) to reach the submental and submandibular lymph nodes, it is an interesting fact that these tissues are not affected by lymphatic spread of malignant cells (although they may be invaded by direct extension of growth). It seems that the nodes are involved by lymphatic emboli and not by a permeation of the lymphatic channels.

The bilateral lymphatic spread of growths of the posterior one-third of the tongue is one factor contributing to the poor prognosis of tumors at this site.

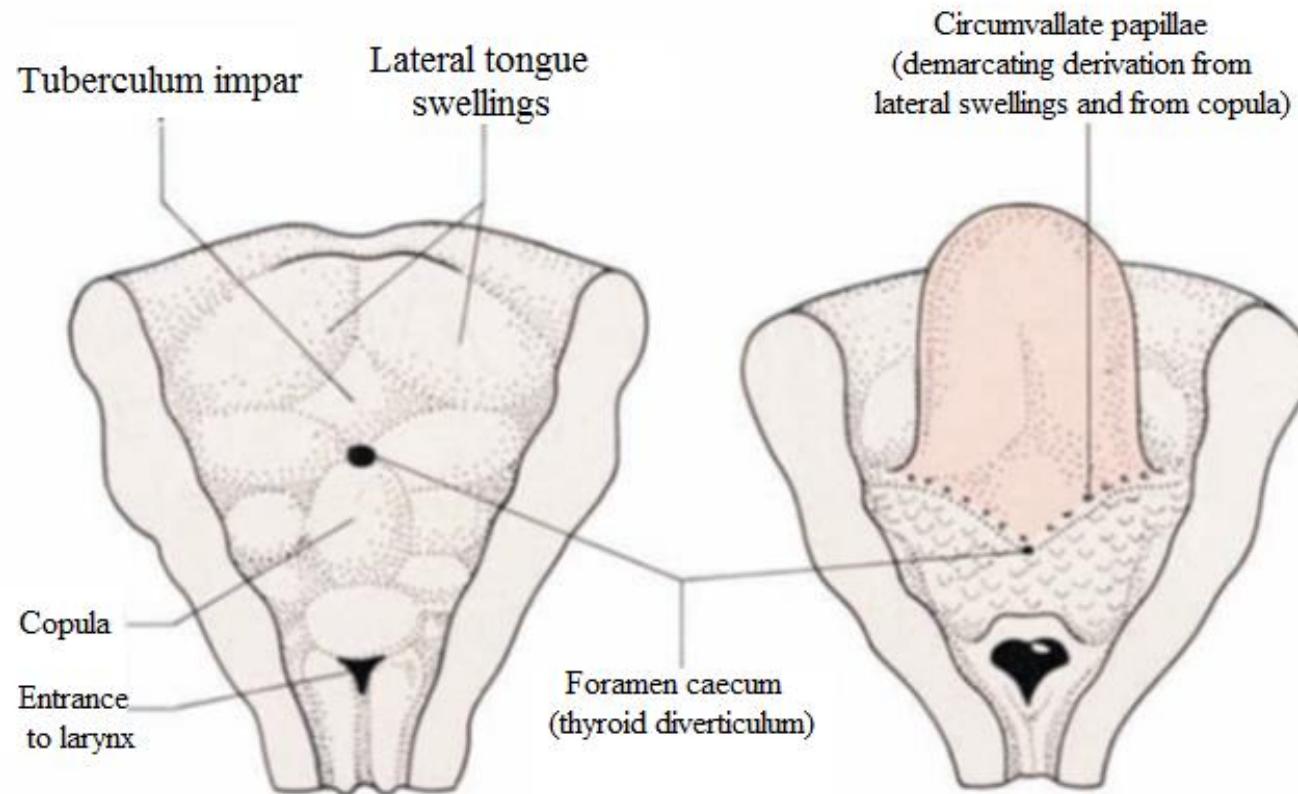
The floor of the mouth

The floor of the mouth is formed principally by the mylohyoid muscles. These stretch as a diaphragm from their origin along the mylohyoid line on the medial aspect of the body of the mandible on each side, to their insertion along a median raphe and into the hyoid bone. They support the tongue as a muscular sling.

On the lower aspect of this diaphragm, on each side, are the anterior belly of the digastric muscle, the superficial part of the submandibular gland and the submandibular lymph nodes, all covered by deep fascia and platysma.

Lying above mylohyoid are the tongue muscles, as a central mass, with the sublingual salivary gland and the deep part of the submandibular gland and its duct lying beneath the mucosa of the mouth floor on either side.

Development of the tongue.



Topic 3: Teeth.

Complete the table.

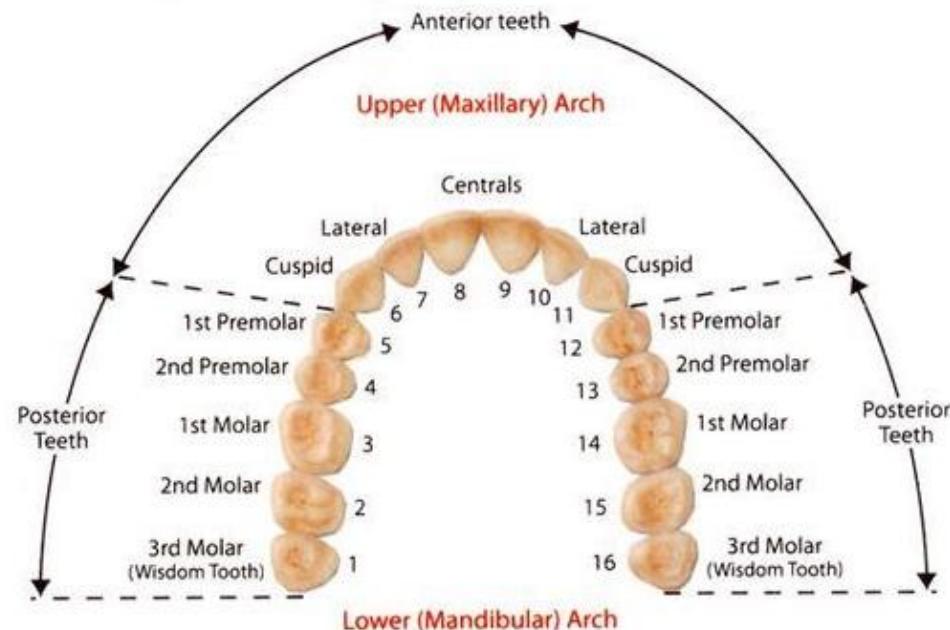
Term in English.	Term in Latin.
	Corona dentis
	Cavitas dentis
The occlusal surface	
Apical foramen	
Wisdom tooth	
The root canal	

Questions:

1. At examination of oral cavity, dentist found out a carious cavity on the crown of the second premolar, cavity directed to first molar. Name the staggered surface of crown. _____
2. Dentist at examination of oral cavity of child found out the short bridle of upper lip. On what teeth will render the negative consequences this anomaly of development? _____
3. A mother appealed for help to the pediatrician. Sick girl 9 months, with a high temperature, cries, pushes toys in a mouth. What tooth cuts through in this age? _____
4. A mother appealed for help to the pediatrician. Sick girl 16 months with a high temperature, cries, pushes toys at mouth. What tooth cuts through in this age? _____
5. A mother appealed for help to the pediatrician. Sick girl 14 months with a high temperature, cries, pushes toys in a mouth. What tooth cuts through in this age? _____
6. A mother appealed for help to the pediatrician. Sick girl 19 months with a high temperature, cries, pushes toys in a mouth. What tooth cuts through in this age? _____
7. A tooth in which lingual surface less than a cheek is remote in a patient. Masticatory surface in the form of oval. A deep transversal fissure divides cheek and language tubercles. A root is strongly constrained in mesio-distal direction with longitudinal fissures on approximal surfaces and bifurcated. Define what tooth is this. _____
8. A mother appealed for help to the pediatrician. Sick girl 6 months, with a high temperature, cries, pushes toys in a mouth. What tooth cuts through in this age? _____
9. While of oral cavity examination, the dentist revealed the formation of the first molar teeth on the lower jaw of a child. How old is this child? _____
10. A mother consulted the doctor about her one-year-old child, who has got six teeth come out. How many teeth should the child of such age have? _____
11. When processing a molar tooth with a dental cutter the dentist has by accident deeply wounded the patient's cheek and damaged not only the mucosa but also a muscle. Which muscle was hurt? _____

12. Name the type of fibrous junction between the dental alveoli and tooth.

Dental chart and common terminology.



OCCLUSAL - Used to describe the masticating or chewing surface of the posterior teeth.



BUCCAL SURFACE - Pertaining to the cheek. Used to describe the outside surfaces of the posterior teeth.

DISTAL - The surface of the tooth that is away from the median line.

MESIAL - The surface of the tooth that is towards the median line.



LINGUAL SURFACE - The inside or tongue surfaces of all teeth.



PROXIMAL - The surface of a tooth adjoining another tooth. Usually the Mesial or Distal surface unless the tooth is rotated.



CUSPS - Tapering projections upon the crown of a tooth.



SULCUS - A groove or depression on the surface of the tooth.



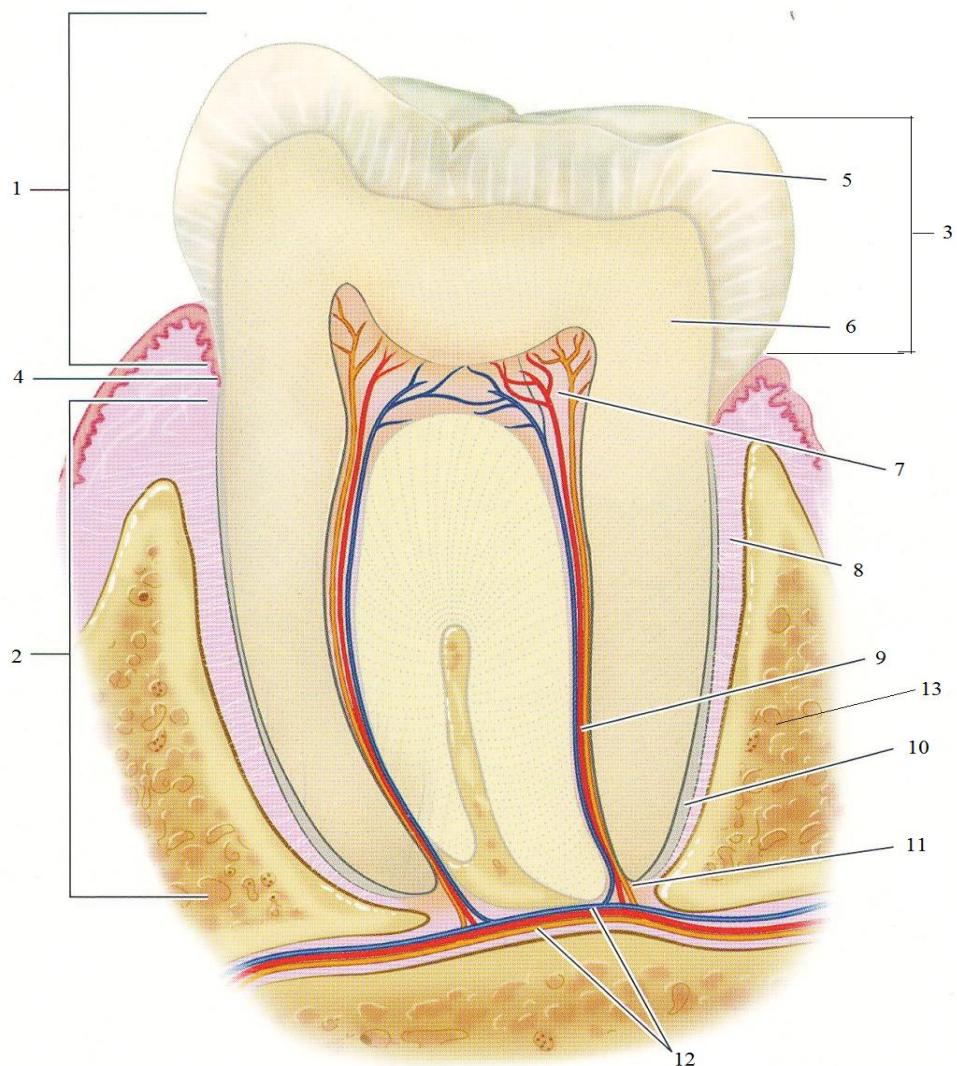
LABIAL SURFACE - Pertaining to the lip. Used to describe the front surface of the anterior teeth.



INCISAL - The biting edge of anterior teeth.

MEDIAN LINE - An imaginary line between the two centrals.

Teeth in sagittal plane.

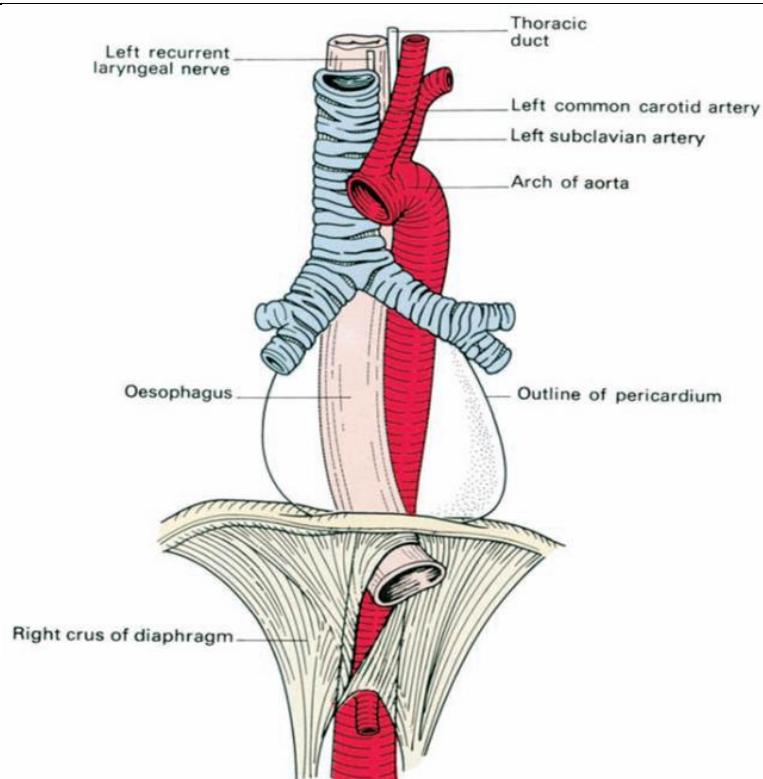


Write all anatomical structures.

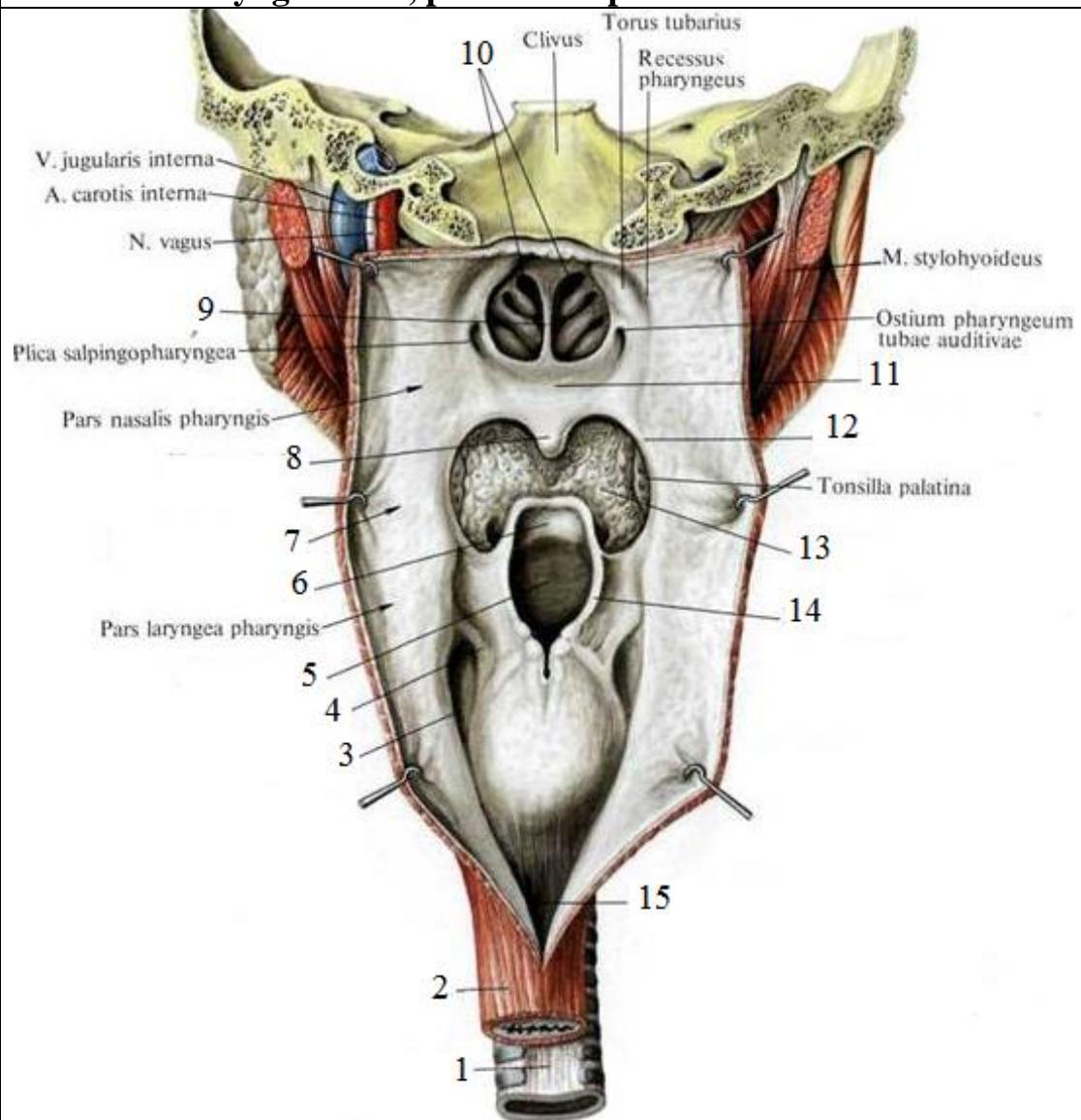
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Topic 4: Pharynx. Esophagus. Stomach.

Complete the table.

Term in English	Term in Latin
The nasopharynx	
The oropharynx	
The esophageal inlet	
The broncho-aortic constriction	
The lesser curvature	
The pyloric sphincter	
The pyloric cusp	
Clinical features	
<p>1. The nasopharynx may be inspected indirectly by a mirror passed through the mouth (posterior rhinoscopy) or studied through a rhinoscope passed along the floor of the nose. Under anaesthesia, it can be palpated by a finger passed behind the soft palate.</p> <p>2. The nasopharyngeal tonsils (adenoids) are prominent in children but usually undergo atrophy after puberty. When chronically inflamed they may all but fill the nasopharynx, causing mouth-breathing and also, by blocking the auditory tube, deafness and middle ear infection.</p> <p>3. The Eustachian tube provides a ready pathway of sepsis from the pharynx to the middle ear and accounts for the frequency with which otitis media complicates infections of the throat.</p> <p>4. The middle ear can be intubated through a catheter passed into the Eustachian tube. The catheter is passed along the nasal floor to the posterior wall of the nasopharynx. Its curved tip is then rotated laterally so that it lies in the pharyngeal recess; it is then withdrawn over the Eustachian cushion to slip into the orifice of the auditory tube.</p> <p>5. Tonsillectomy may be carried out by dissection or by the guillotine; both depend on removing the lymphoid tissue and underlying fascial capsule from the loose areolar tissue clothing the superior constrictor in the floor of the tonsillar fossa. In dissection, an incision is made in the mucosa of the anterior pillar immediately in front of the tonsil; the gland is then freed by blunt dissection until it remains attached only by its pedicle of vessels near its lower pole. This pedicle is then crushed and divided by means of a wire snare.</p>	 <p>This anatomical diagram illustrates the structures at the thoracic inlet. The oesophagus is shown as a pinkish-red tube passing anterior to the aorta. The aorta is depicted as a large red vessel curving downwards. The left recurrent laryngeal nerve is shown as a blue line passing posterior to the aorta. The thoracic duct is a blue line passing posterior to the aorta. The left common carotid artery and left subclavian artery are shown as blue lines branching off the aorta. The right crus of the diaphragm is shown as a thick grey line at the bottom. The outline of the pericardium is indicated by a dotted line.</p>

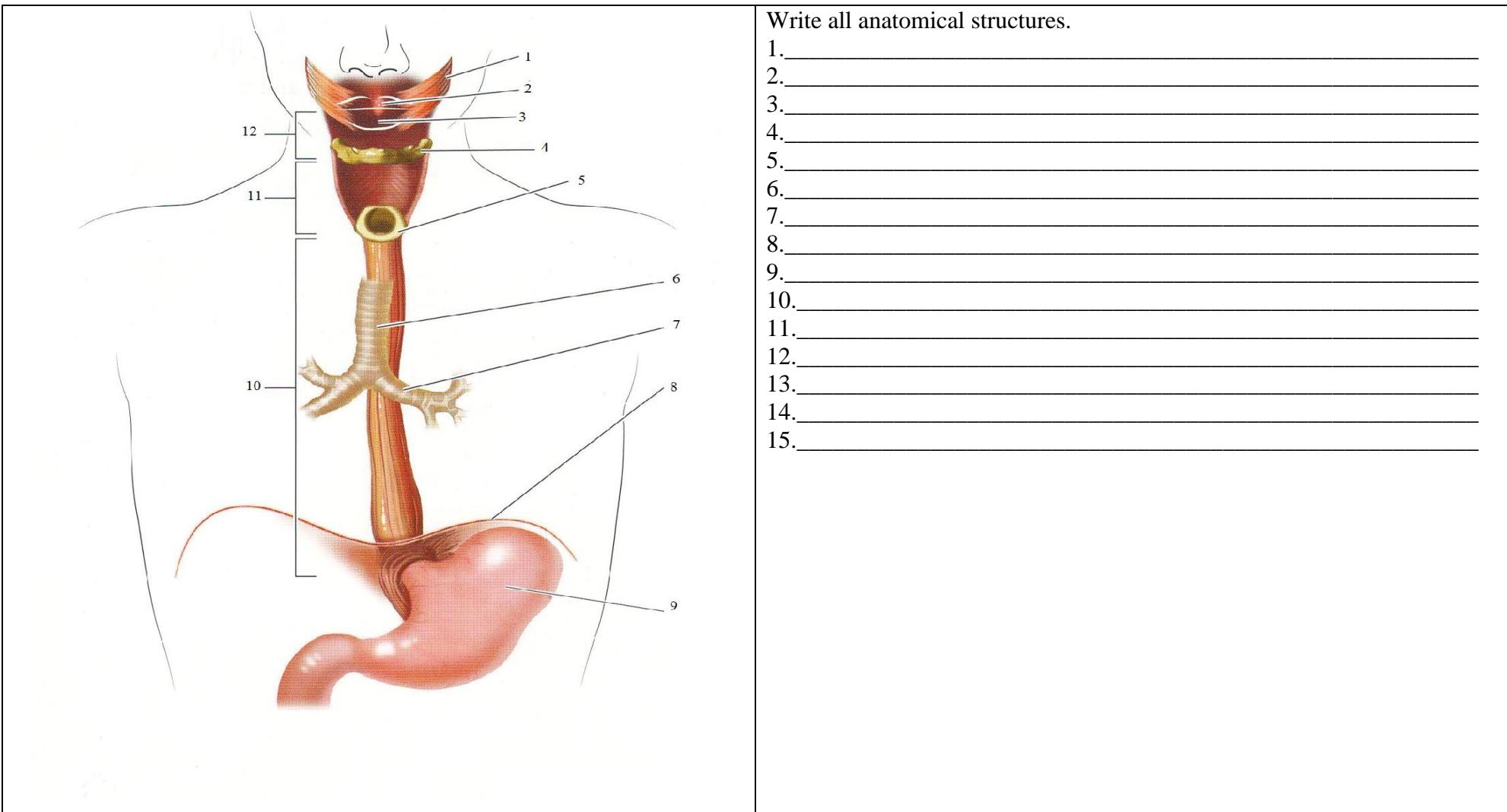
Anterior Pharyngeal wall, posterior aspect.



Write all anatomical structures.

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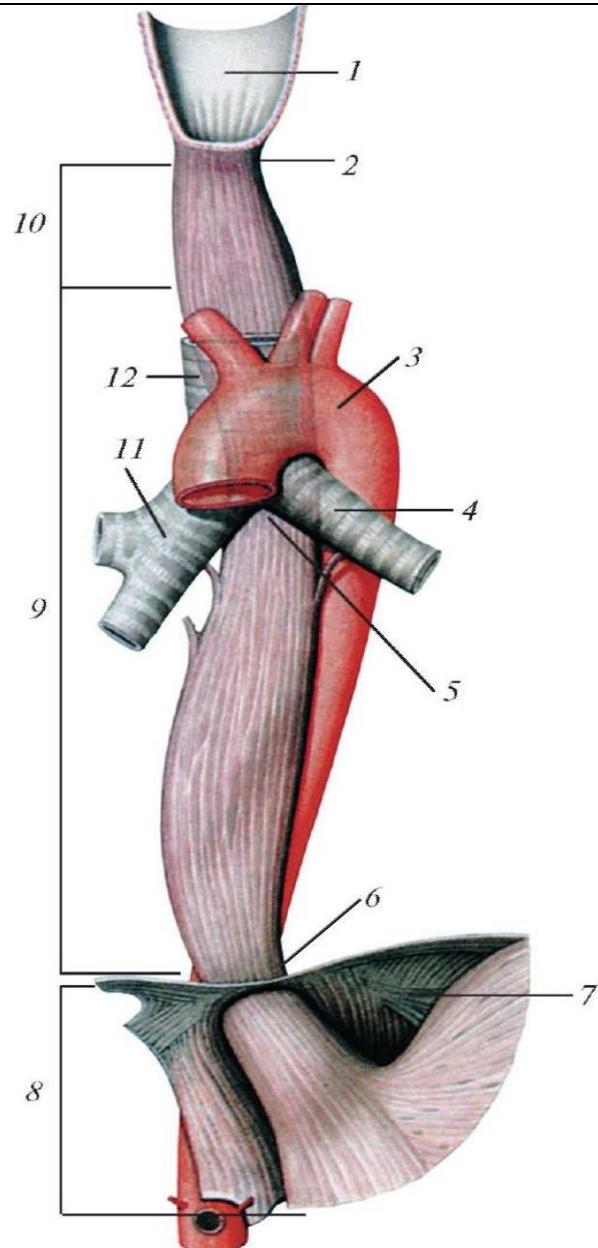
Esophagus, anterior view.



Questions:

1. What structures does the nasopharynx contain? _____
2. What structures form the pharyngeal lymphoid ring? _____
3. Name esophageal constrictions. _____
4. Skeletotopy of the esophagus. _____

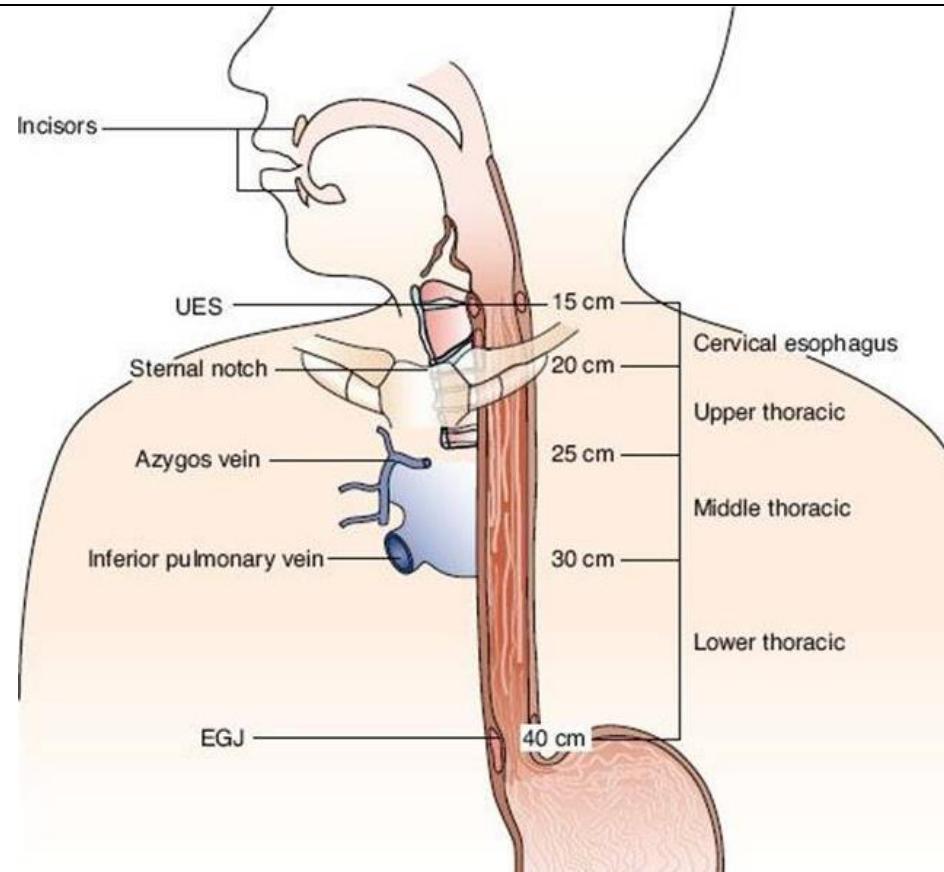
Esophagus.



Write all anatomical structures.

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11. _____
12. _____

Parts of the Esophagus.



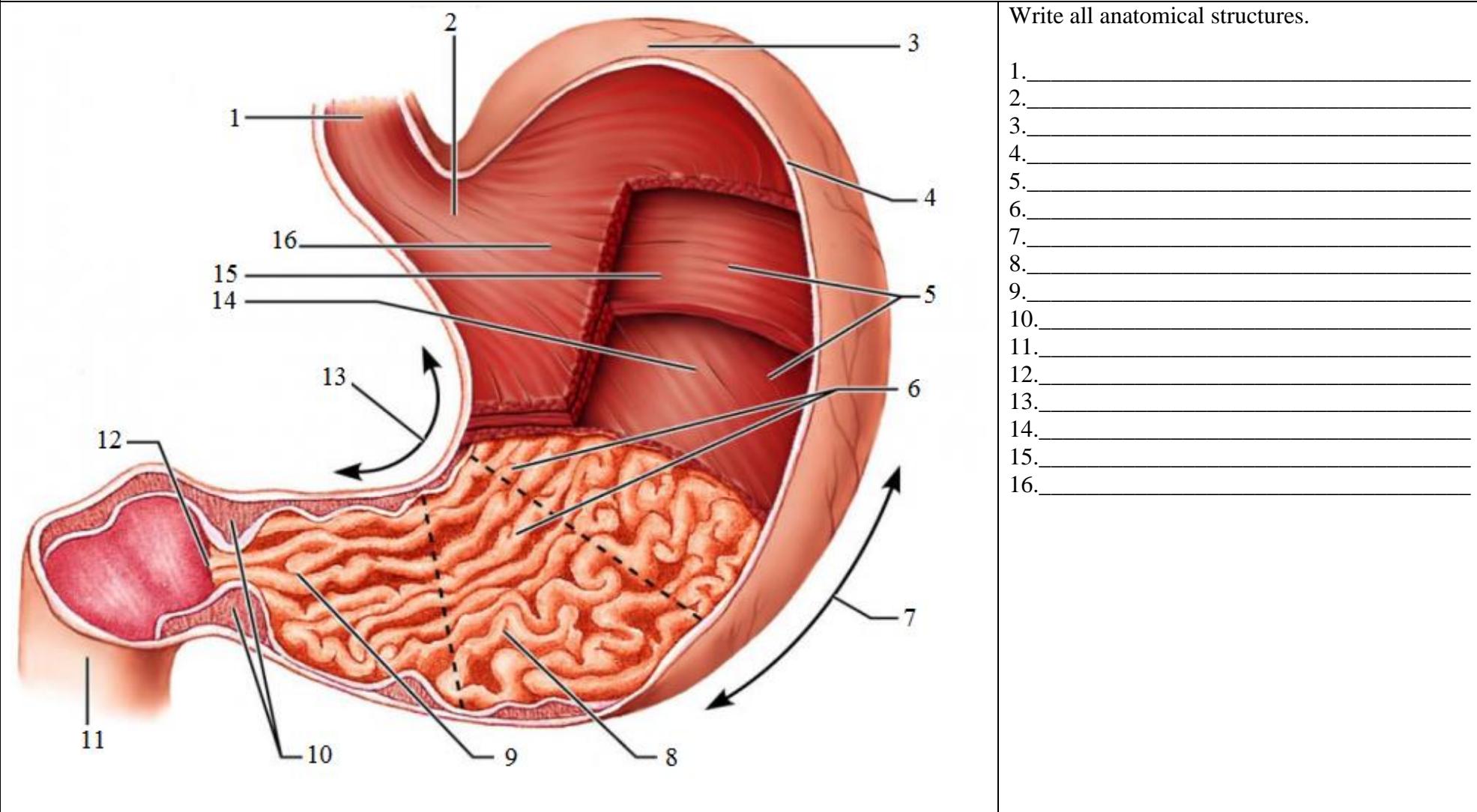
Questions:

1. What structures does the stomach mucosa feature? _____
2. During the X-ray, examination of a 30-year-old patient in vertical position a doctor detected the presence of air in the stomach. What part of the stomach is it in? _____
3. During a duodenal intubation, the probe does not pass from the stomach into the duodenum. What part of the stomach is an obstacle (tumor) in? _____
4. A patient has pain in epigastric region. What organs disease can it indicate? _____

<p>Clinical features.</p>	<p>The usual form of oesophageal stenosis. The upper oesophagus ends blindly; the lower oesophagus communicates with the trachea at the level of the 4th thoracic vertebra.</p>
<ol style="list-style-type: none"> 1. For oesophagoscopy, measurements are made from the upper incisor teeth; the three important levels 7in (17cm), 11in (28cm) and 17in (43cm) corresponding to the commencement of the esophagus, the point at which it is crossed by the left bronchus and its termination respectively. 2. These three points also indicate the narrowest parts of the esophagus: the sites at which, as might be expected, swallowed foreign bodies are most likely to become impacted and strictures to occur after swallowing corrosive fluids. 3. The anastomosis between the azygos (systemic) and left gastric (portal) venous tributaries in the esophageal veins is of great importance. In portal hypertension these veins distend into large collateral channels, esophageal varices, which may then rupture with severe hemorrhage (probably as a result of peptic ulceration of the overlying mucosa). 4. Use is made of the close relationship between the esophagus and the left atrium in determining the degree of left atrial enlargement in mitral stenosis; a barium swallow may show marked backward displacement of the esophagus caused by the dilated atrium. 5. The esophagus is crossed solely by the vena azygos on the right side. This is therefore the side of election to approach the esophagus surgically. 	

5. During a duodenal intubation, the probe does not pass to the stomach from the gullet. What part of the stomach is an obstacle (tumor) in? _____
6. Children frequently have nasal breathing affection caused by the overgrowth of the pharyngeal mucous membrane lymphoid tissue. Which tonsils excrescence may cause this? _____
7. A 10-year-old child complains of nasal breathing affection. Examination has shown that the cause of this is lymphoid tissue hypertrophy. Which tonsil is increased? _____
8. Skeletotomy of stomach. _____
9. Skeletotomy of pharynx. _____

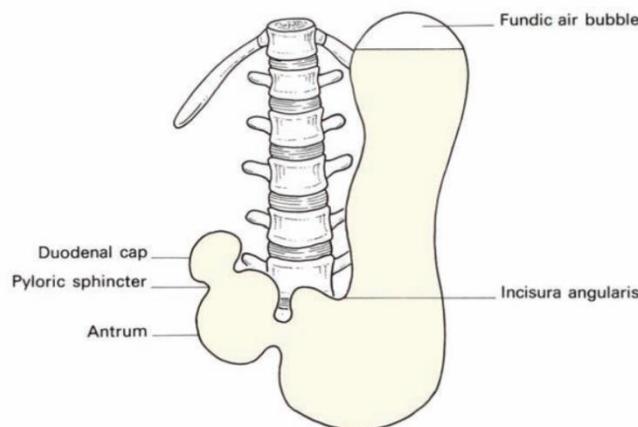
Stomach, anterior view, internal surface.



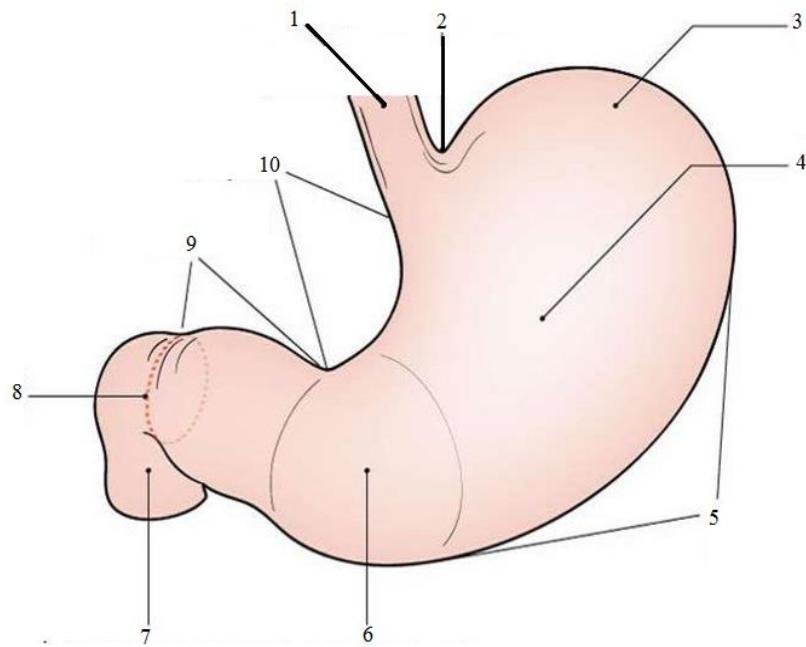
CR! A **hiatal (hiatus) hernia** is a protrusion of a part of the stomach into the mediastinum through the esophageal hiatus of the diaphragm. The hernias occur most often in people after middle age, possibly because of weakening of the muscular part of the diaphragm and widening of the esophageal hiatus.

Blockage of esophagus. The impressions produced in the esophagus by adjacent structures are of clinical interest because of the slower passage of substances at these sites. The impressions indicate where swallowed foreign objects are most likely to lodge and where a stricture may develop, for example, after the accidental drinking of a caustic liquid, such as ley.

Tracing of barium meal X-ray of the stomach.



External structure of the stomach.



Write all anatomical structures.

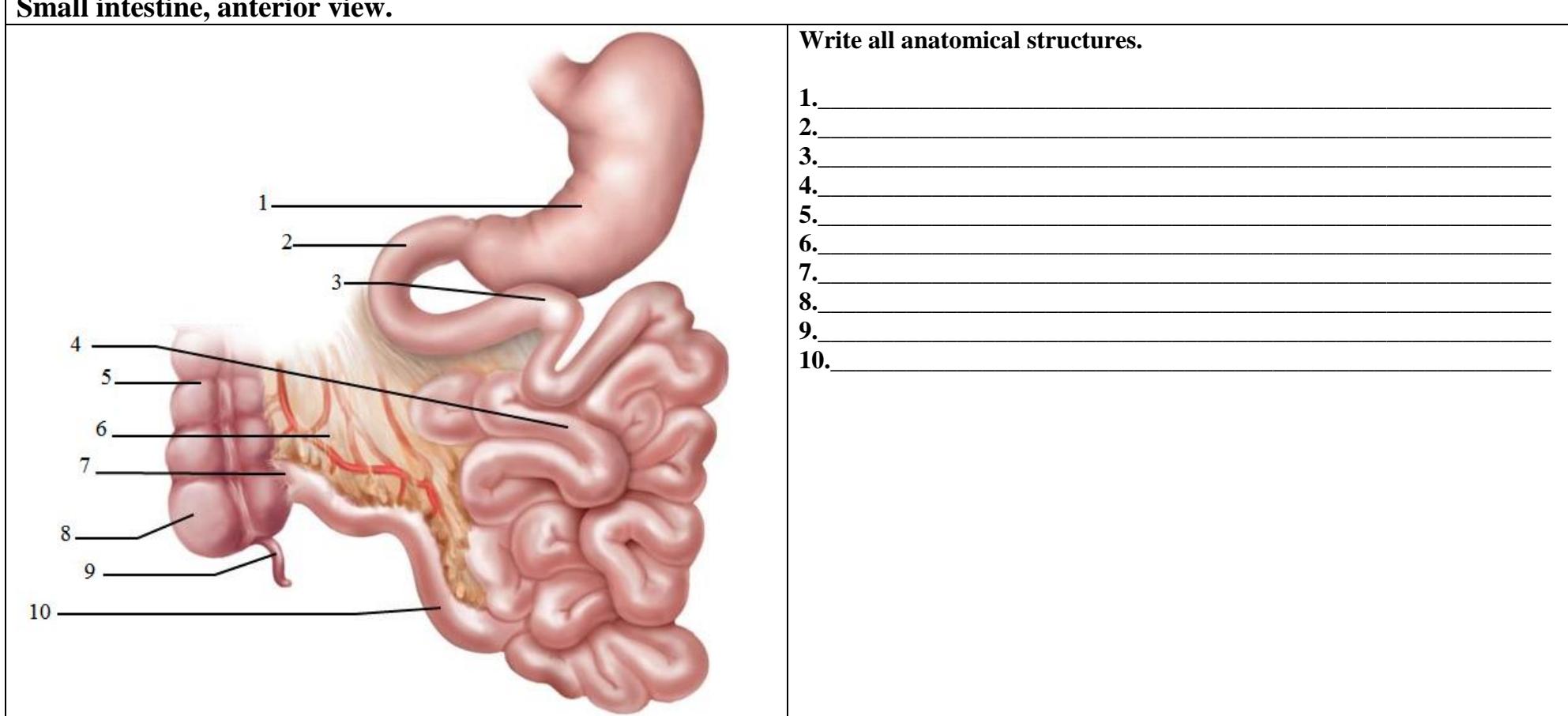
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Topic 5: Small intestine, Intestinum tenuum.

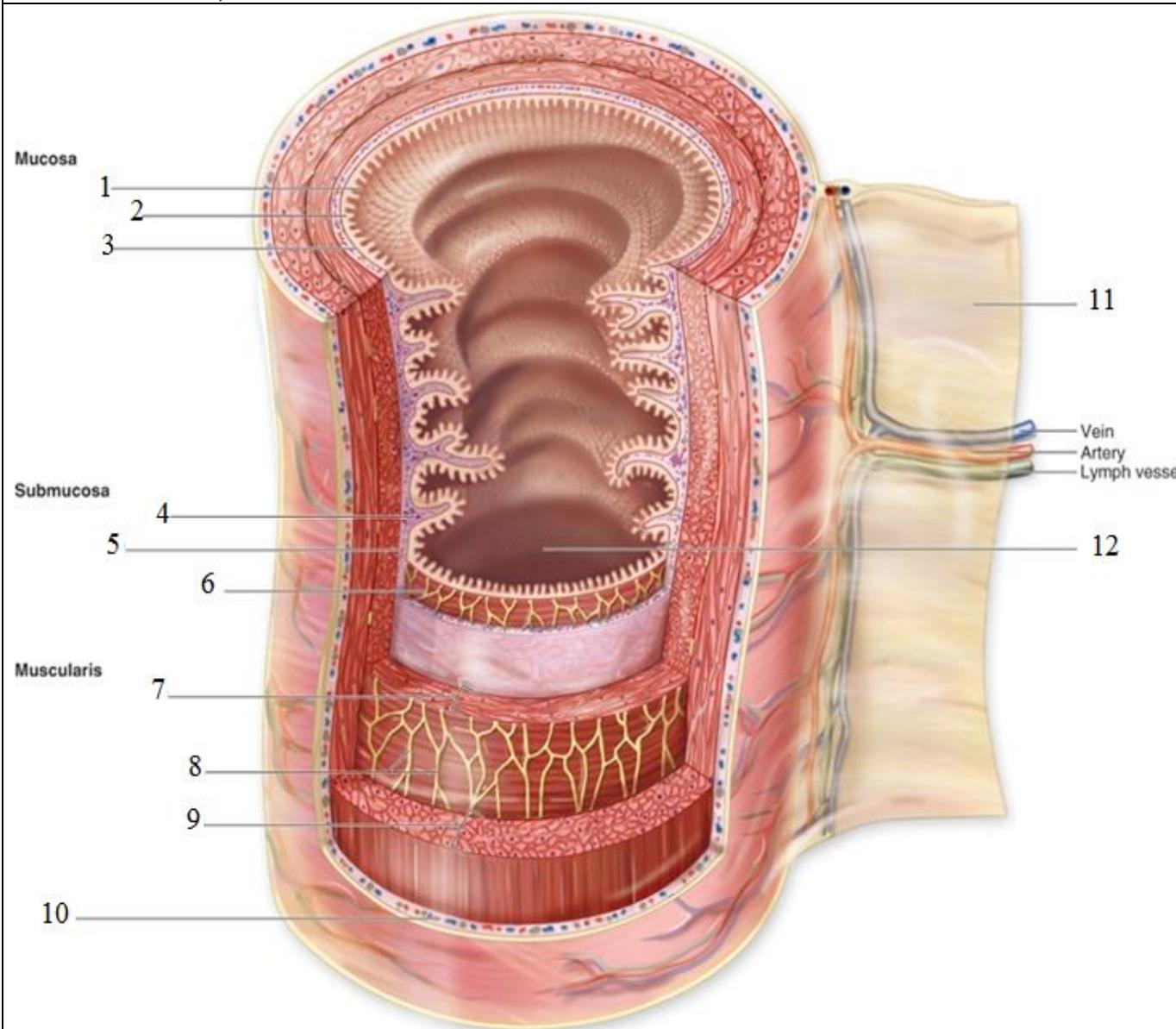
Complete the table.

Term in English.	Term in Latin.
Superior duodenal flexure	
The descending part	
Hepatoduodenal ligament	
	Plica longitudinalis duodeni
	Villi intestinales
	Glandulae intestinales

Small intestine, anterior view.



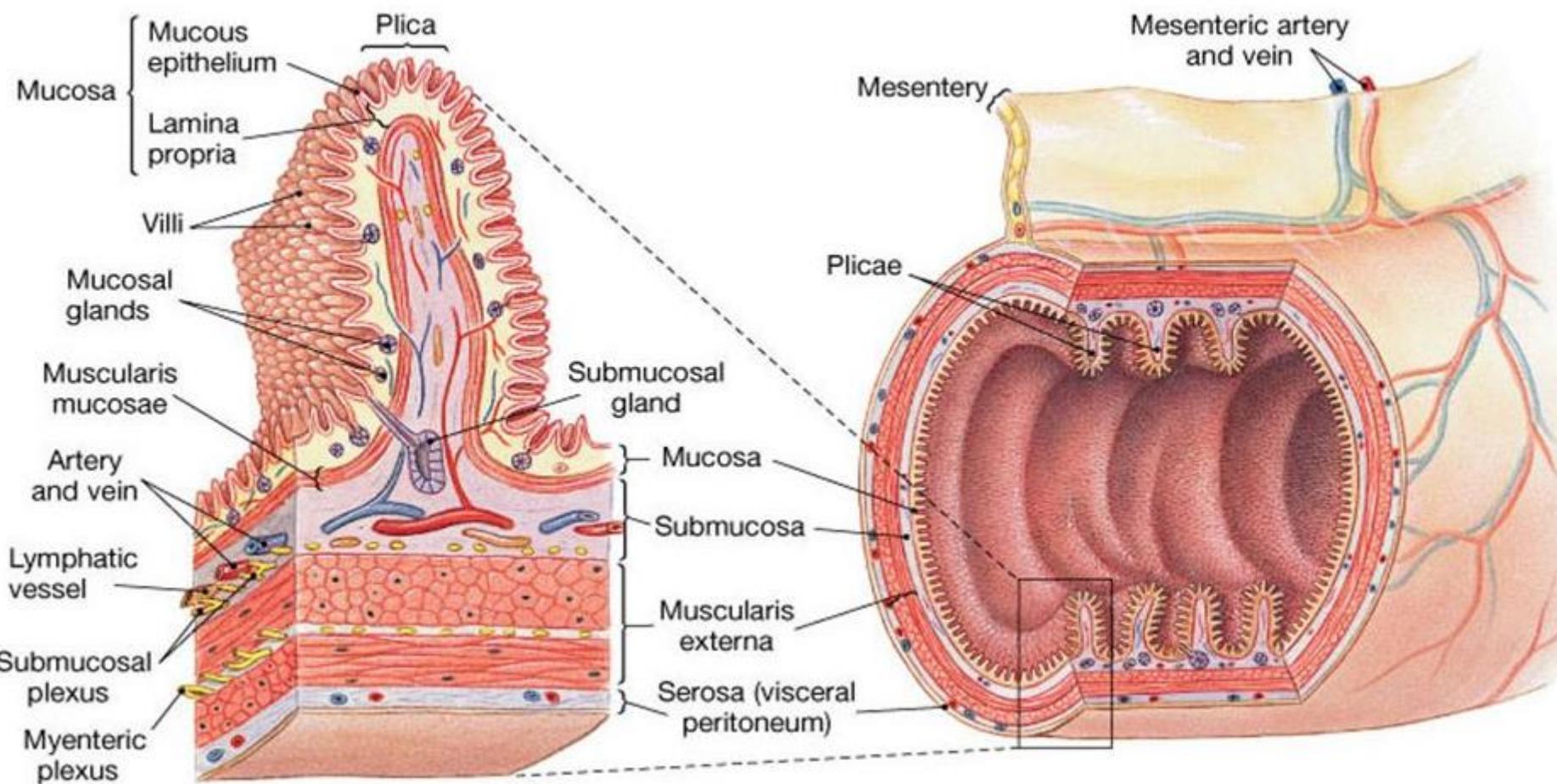
Small intestine, internal structure.



Write all anatomical structure.

1. _____
2. _____
3. _____
4. _____
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11. _____
12. _____

Internal structure of the small intestine.



Questions:

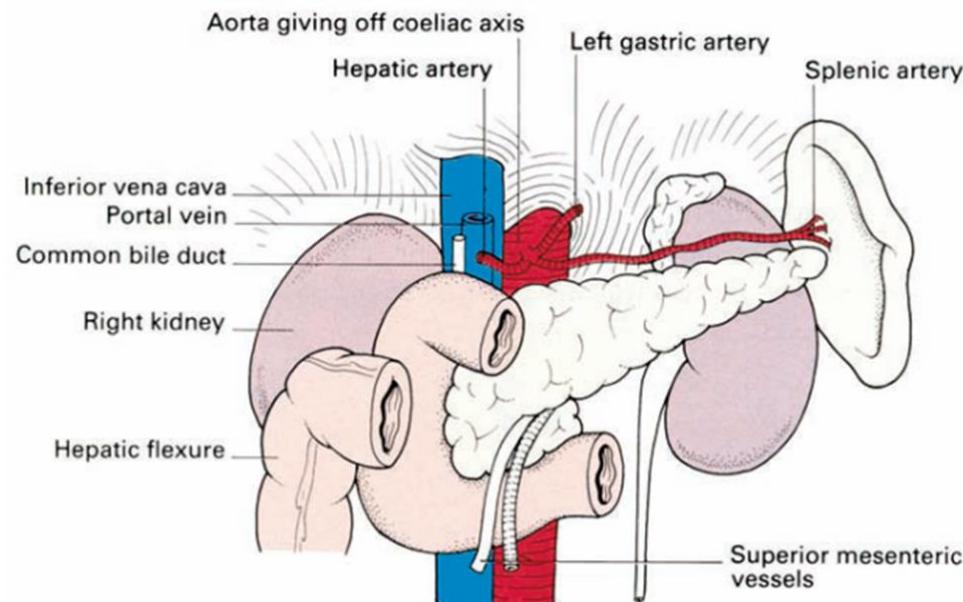
1. Name the layers of the small intestine. _____
2. What structures does the intestinal mucosa feature? _____
3. Which anatomical structures are opened on the top of the major duodenal papilla? _____
4. Which anatomical structure is opened on the top of the minor duodenal papilla? _____

5. Peritoneal relations of the duodenum. _____
6. Peritoneal relations of the jejunum and ileum. _____
7. Where are lied the aggregated lymphoid nodules? _____
8. Name function of the mesentery. _____
9. A patient was admitted to the surgical department with suspected inflammation of Meckel's diverticulum. What part of bowels should be examined in order to discover the diverticulum in course of an operation? _____
10. A patient complains about impaired evacuatory function of stomach (long-term retention of food in stomach). Examination revealed a tumor of initial part of duodenum. Specify localization of the tumor. _____
11. During the endoscopy the inflammation of a major papilla of the duodenum and the disturbances of bile secretion were found. In which part of duodenum were the problems found? _____
12. A patient has pain in epigastric region. What organs disease can it indicate? _____
13. During fibrogastroduodenoscopy, a doctor has to examine the major duodenal papilla. What anatomic formation can serve as a landmark for its revealing? _____

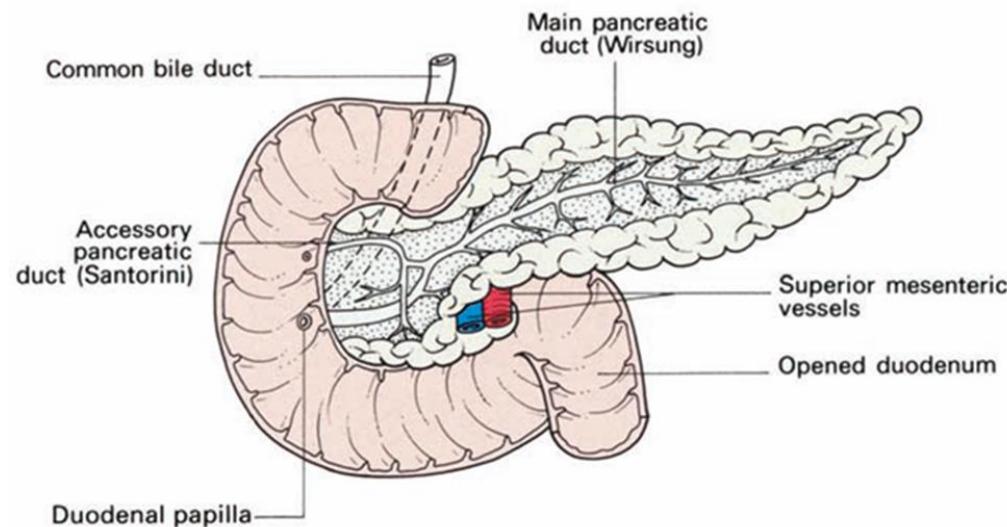
Clinical features.

1. The first part of the duodenum is overlapped by the liver and gallbladder, either of which may become adherent to, or even ulcerated by, a duodenal ulcer. Moreover, a gallstone may ulcerate from the fundus of the gall-bladder into the duodenum. The gallstone may then impact in the lower ileum as it traverses the gut to produce intestinal obstruction (gallstone ileus).
2. The pancreas, as the duodenum's most intimate relation, is readily invaded by a posterior duodenal ulcer. This should be suspected if the patient's pain radiates into the dorsolumbar region. Erosion of the gastroduodenal artery by such an ulcer results in severe haemorrhage.
3. Extensive dissection of a duodenum, scarred by severe ulceration, may damage the common bile duct which passes behind the first part of the duodenum about 1in (2.5 cm) from the pylorus.
4. The hepatic flexure of the colon crosses the second part of the duodenum and the latter may be damaged during the right hemicolectomy. Similarly, the right kidney lies directly behind this part of the duodenum, which may be injured in performing a right nephrectomy.
5. Radiology of the duodenum. Within a few minutes of swallowing a bariummeal, the first part of the duodenum becomes visible as a triangular shadow termed the duodenal cap. Every few seconds the duodenum contracts, emptying this cap, which promptly proceeds to fill again. It is in this region that the great majority of duodenal ulcers occur; an actual ulcer crater may be visualized, filled with barium, or deformity of the cap, produced by scar tissue, may be evident. The rest of the duodenum can also be seen, the shadow being floccular due to the rugose arrangement of the mucosa.
6. Mobilisation of the duodenum, together with the head of the pancreas and termination of the common bile duct, is performed by incising the peritoneum lateral to the second part of the duodenum and developing the avascular plane between these structures and the posterior abdominal wall — Kocher's manoeuvre.

The relations of the duodenum.



The duodenum and pancreas dissected to show the pancreatic ducts and their orifices.

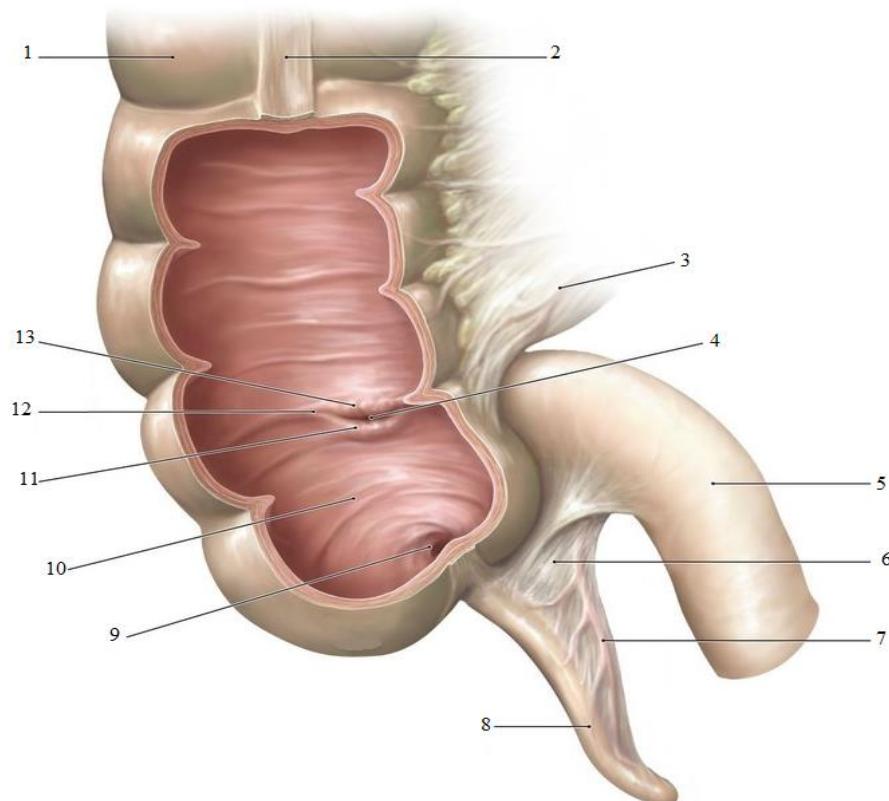


Topic 6: Large intestine, Intestinum crissum.

Complete the table.

Term in English.	Term in Latin.
The vermiform appendix	
The caecal folds	
The superior ileocaecal recess	Frenulum ostii ilealis
Haustra of colon	
The taeniae coli	
	Flexura colica sinistra

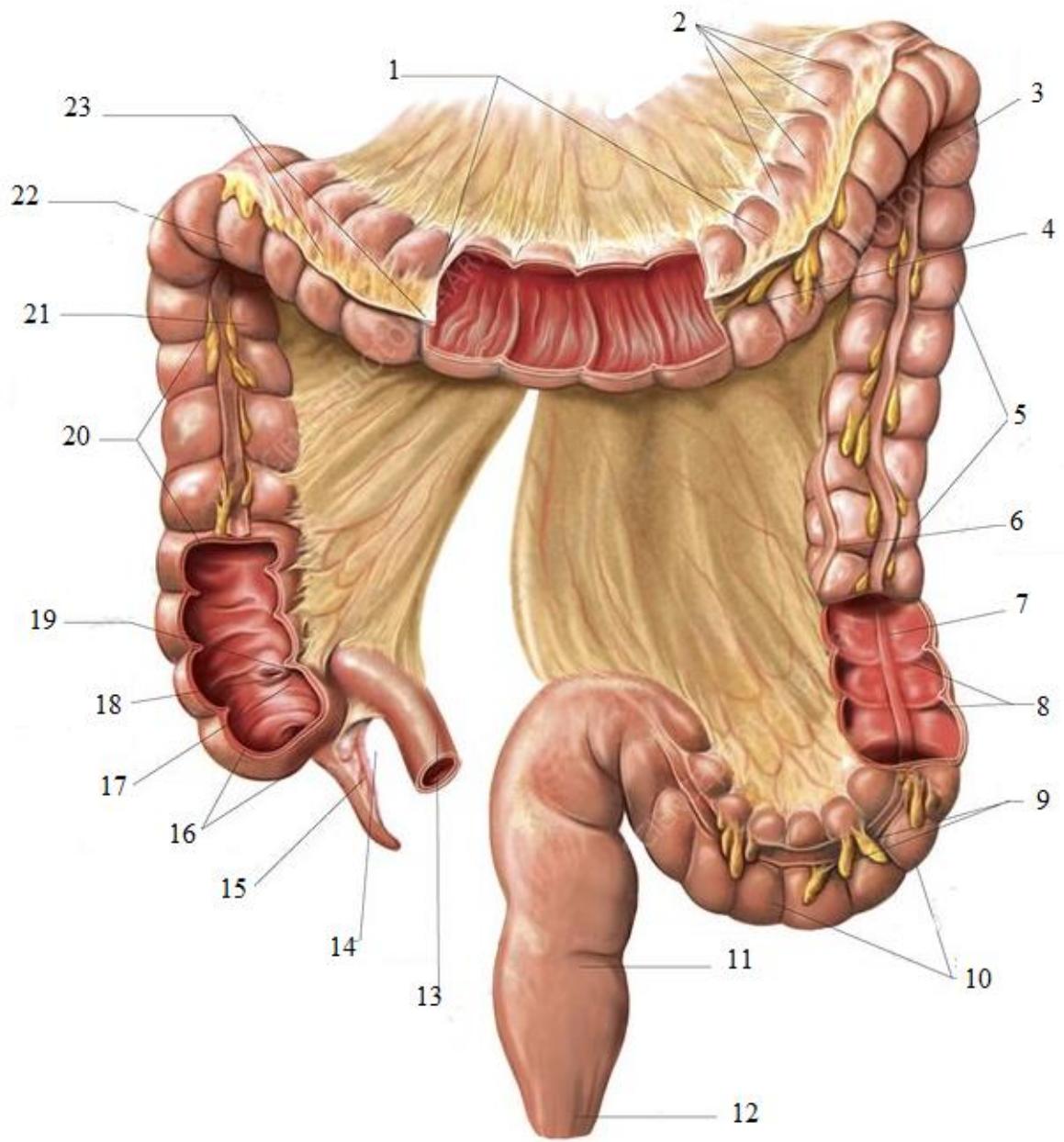
Caecum.



Write all anatomical structures.

1. _____
2. _____
3. _____
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11. _____
12. _____
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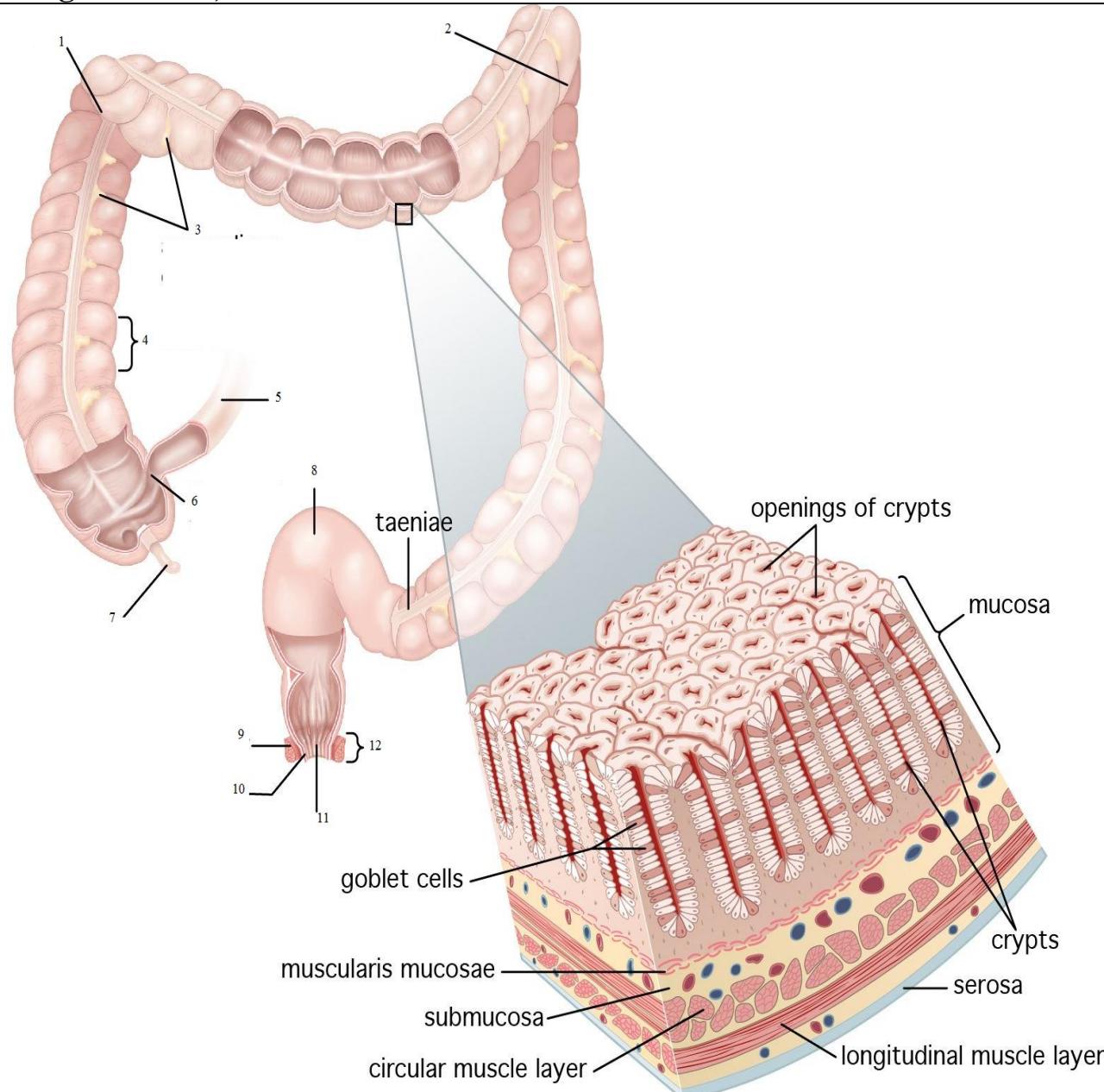
Large intestine.



Write all anatomical structure.

- 1.
- 2.
- 3.
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- 21.
- 22.
- 23.

Large intestine, structures of the walls.



Write all anatomical structures.

1. _____
2. _____
3. _____
4. _____
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12. _____

Questions:

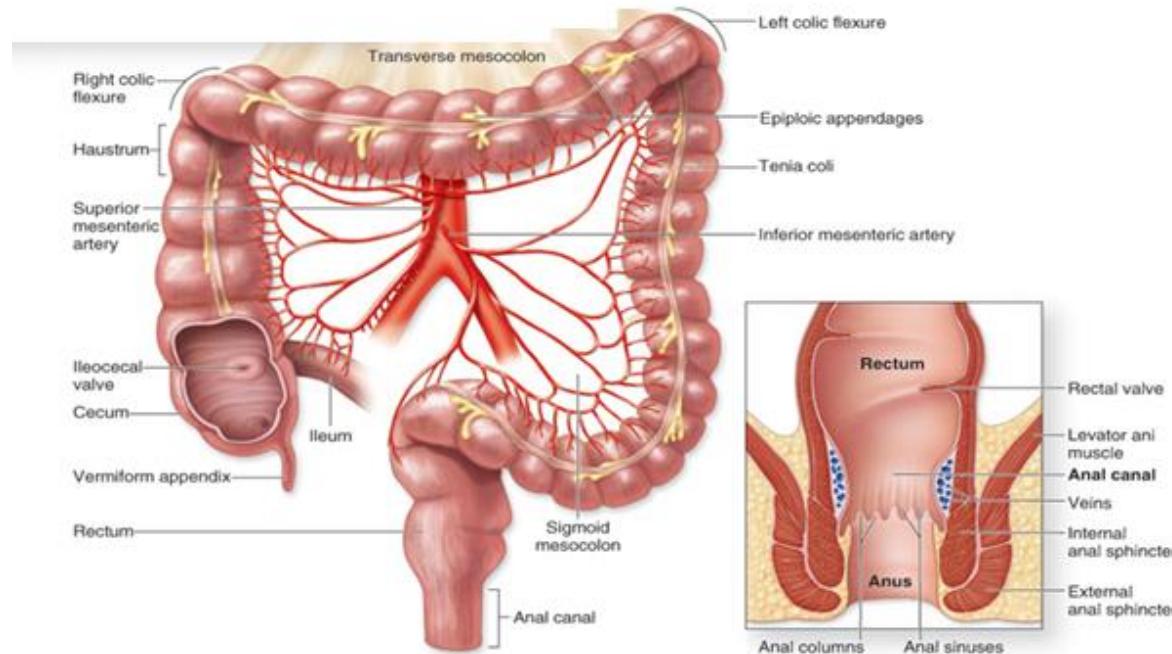
1. Name the layers of the large intestine. _____
2. What inner structures does the colon mucosa feature? _____
3. Peritoneal relations of the caecum. _____
4. Peritoneal relations of the ascending colon. _____
5. Name the outward features of the colon. _____
6. Typical variants of the position of the vermiform appendix. _____
7. Name the derivates of the peritoneum located in the caecum. _____
8. Peritoneal relations of the sigmoid colon. _____
9. An injured person was delivered to the hospital with a penetrating wound in the left lateral region of abdomen. What part of the large intestine is most likely damaged? _____
10. A patient has an injury in right lateral area of belly. What part of large intestine is most likely injured? _____
11. A patient complains about impaired evacuatory function of ileum (long-term retention of food in ileum). Examination revealed a tumour of initial part of the large intestine. Specify localization of the tumour. _____
12. A patient has an injury in the left inguinal region of belly. What part of large intestine is most likely injured? _____

13. An injured person was delivered to the hospital with a penetrating wound in the right inguinal region of abdomen. What part of the large intestine is most likely damaged? _____

Clinical features.

1. The lumen of the appendix is relatively wide in the infant and is frequently completely obliterated in the elderly. Since obstruction of the lumen is the usual precipitating cause of acute appendicitis it is not unnatural, therefore, that appendicitis should be uncommon at the two extremes of life.
2. The appendicular artery represents the entire vascular supply of the appendix. It runs first in the edge of the appendicular mesentery and then, distally, along the wall of the appendix. Acute infection of the appendix may result in thrombosis of this artery with rapid development of gangrene and subsequent perforation. This is in contrast to acute cholecystitis, where the rich collateral vascular supply from the liver bed ensures the rarity of gangrene of the gall-bladder even if the cystic artery becomes thrombosis.
3. Appendectomy is usually performed through a muscle-splitting incision in the right iliac fossa. The caecum is delivered into the wound and, if the appendix is not immediately visible, it is located by tracing the taeniae coli along the caecum—they fuse at the base of the appendix. When the caecum is extra peritoneal it may be difficult to bring the appendix up into the incision; this is facilitated by first mobilizing the caecum by incising the almost avascular peritoneum along its lateral and inferior borders. The appendix mesentery, containing the appendicular vessels, is firmly tied and divided, the appendix base tied, the appendix removed and its stump invaginated into the caecum. The Colon is divided into four parts: the ascending, transverse, descending, and sigmoid.

Blood supply of the large intestine.



Differences Between the Small and Large Intestines

External Differences

1. Small intestine is more mobile (exception is the duodenum), whereas the ascending and descending parts of the colon are fixed.
2. Small intestine has a mesentery (except duodenum), whereas large intestine is retroperitoneal (except transverse colon and sigmoid colon).
3. Diameter of full small intestine is smaller than that of full large intestine.
4. Longitudinal muscle of small intestine forms a continuous layer around the gut, whereas in the large intestine (with the exception of the appendix, rectum, and anal canal), the longitudinal muscle forms three bands, the taeniae coli.
5. The small intestine has no fatty tags attached to its wall, whereas the large intestine has the appendices epiploicae.
6. The wall of the small intestine is smooth, whereas that of the large intestine is sacculated.

Internal Differences

1. The mucous membrane of the small intestine has permanent folds, plicae circulares, which are absent from the large intestine.
2. The mucous membrane of the small intestine has Payer's patches, whereas the large intestine has solitary lymph follicles.
3. The mucous membrane of the small intestine has villi, which are absent from the large intestine.

Clinical features.

Hemorrhoids.

Hemorrhoids (piles) are dilatations of the superior rectal veins. Initially contained within the anal canal (1st degree), they gradually enlarge until they prolapse on defecation (2nd degree) and finally remain prolapsed through the anal orifice (3rd degree). Anatomically, each pile comprises: a venous plexus draining into one of the superior rectal veins; terminal branches of the corresponding superior rectal artery; and a covering of anal canal mucosa and submucosa.

The so-called ‘thrombosis external pile’ is a small tense hematoma at the anal margin caused by rupture of a subcutaneous vein and is much better termed a perianal hematoma.

Perianal abscesses

These may be localized beneath the anal mucosa (submucosa), be beneath perianal skin (subcutaneous) or occupy the ischiorectal (-anal) fossa, or, more anatomically accurate, the isschio. Occasionally, abscesses lie in the pelvirectal space above levator ani, alongside the rectum and deep to the pelvic peritoneum.

Fistulae

Anal fistulae usually result from rupture of perianal abscesses. They are classified anatomically and may be:

- submucosa — confined to the tissues immediately below the anal mucosa;
- subcutaneous — confined to the perianal skin;
- low-level — passing through the lower part of the superficial sphincter (most common);
- high-level — passing through the deeper part of the superficial sphincter;
- anorecto — which has its track passing above the anorectal ring and which may or may not open into the rectum.

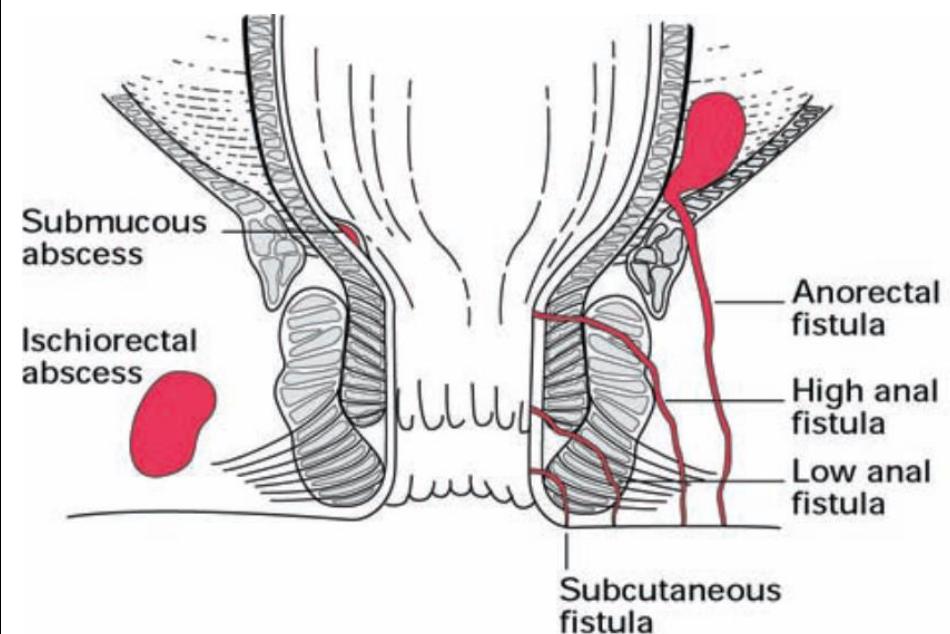
In laying open fistulae in ano, it is essential to preserve the anorectal ring if fecal incontinence is to be avoided. The lower part of the sphincter, on the other hand, can be divided quite safely without this risk.

The development of the intestine and its congenital abnormalities

The primitive endodermal tube of the gut is divided into:

- 1) the fore-gut (supplied by the coeliac axis) extending as far as the

The anatomy of perianal fistulae and abscess.



entry of the bile duct into the duodenum;

- 2) the mid-gut (supplied by the superior mesenteric artery) continuing as far as the distal transverse colon;
- 3) The hind-gut (supplied by the inferior mesenteric artery) extending thence to the ectodermal part of the anal canal.

At an early stage rapid proliferation of the gut wall obliterates its lumen and this is followed by subsequent recanalization.

The fore-gut becomes rotated with the development of the lesser sac so that the original right wall of the stomach comes to form its posterior surface and the left wall its anterior surface. The vagi rotate with the stomach and therefore lie anteriorly and posteriorly to it at the esophageal hiatus.

This rotation swings the duodenum to the right and the mesentery of this organ then blends with the peritoneum of the posterior abdominal wall — this blending process is termed zygosis.

The mid-gut enlarges rapidly in the 5-week fetus, becomes too large to be contained within the abdomen and herniates into the umbilical cord.

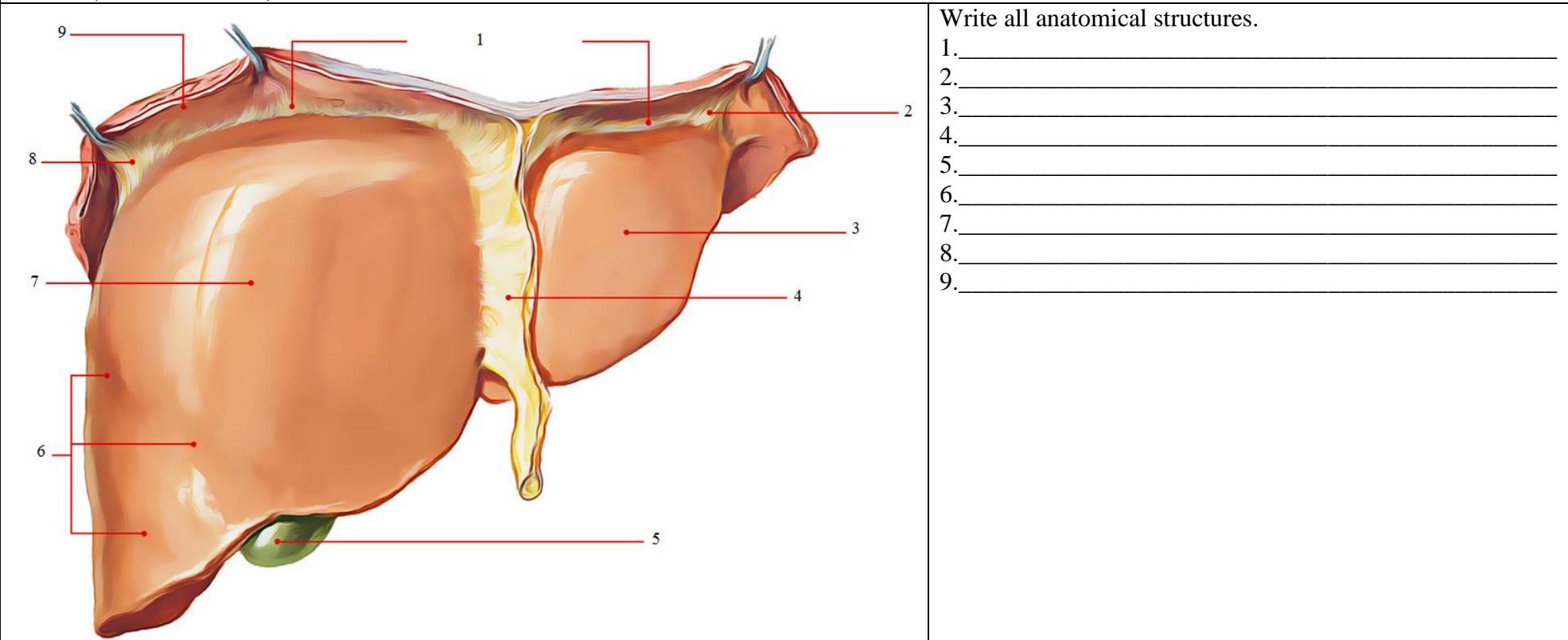
The apex of this herniated bowel is continuous with the vitello-intestinal duct and the yolk sac, but this connection, even at this early stage of fetal life, is already reduced to a fibrous strand.

Topic 7: Liver. Pancreas.

Complete the table.

Term in English.	Term in Latin.
The liver	
The bare area	
The body of gallbladder	
The pancreatic lobules	
The sphincter of bile duct	
Omental eminence	

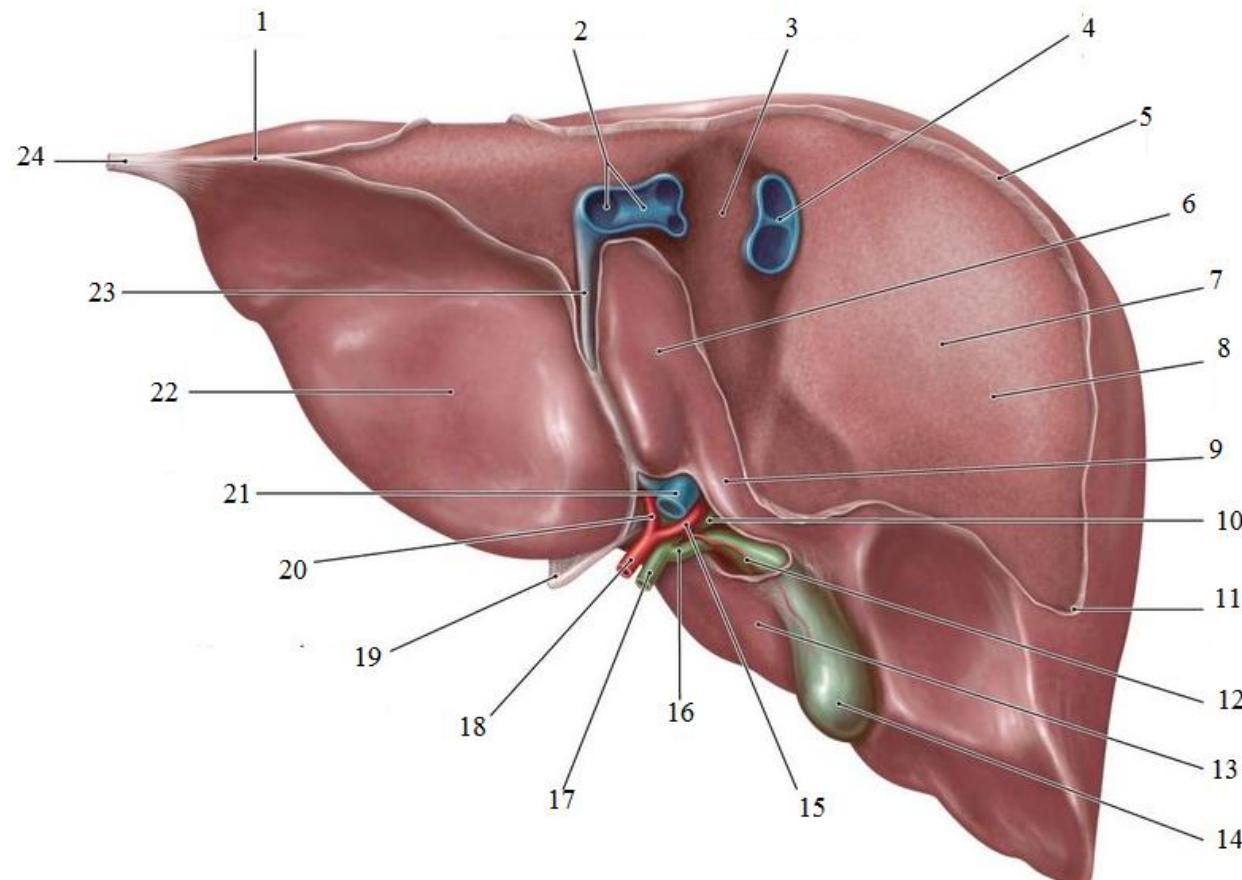
Liver (anterior view).



Questions:

1. In case of a penetrating wound of the anterior abdominal wall the wound tract went above the lesser curvature of stomach. What peritoneum formation is most likely to be injured? _____
2. A patient with cholelithiasis fell ill with mechanic jaundice. Examination revealed that the stone was in the common bile duct. What bile-excreting ducts make up the obdurate duct? _____
3. A surgeon has to find the common hepatic duct during the operative intervention on account of concerns in the gall ducts. The common hepatic duct is located between the leaves of: _____
4. Obturative jaundice developed in a 60-year-old patient because of malignant tumor of the big papillary of the duodenal. Lumen of what anatomical structure is squeezed with tumor? _____
5. A female patient with a tumour of pancreas has developed mechanic jaundice resulting from compression of a bile-excreting duct. Which duct is compressed? _____

Liver (inferior view).



Write all anatomical structures.

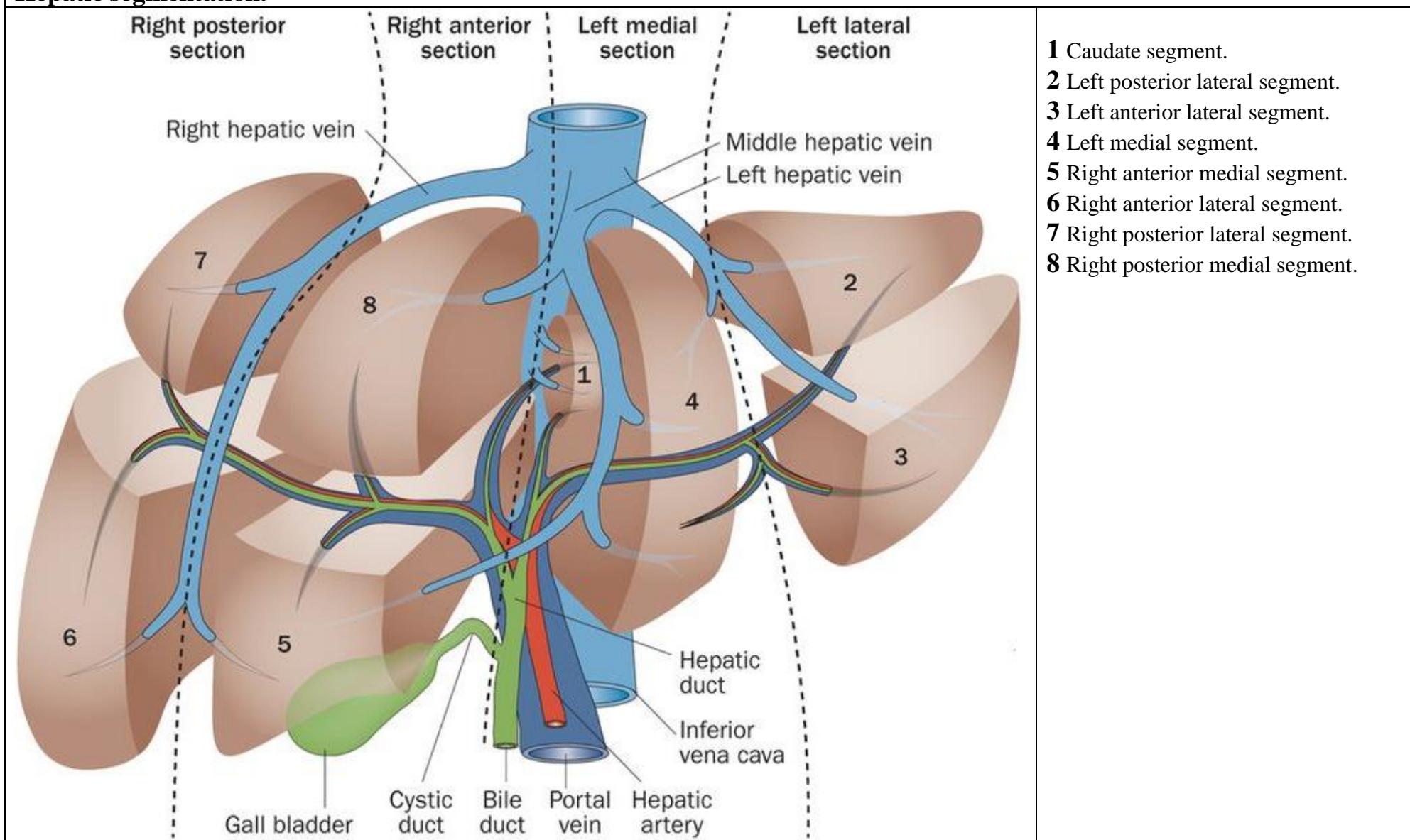
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23. _____
24. _____

Questions:

6. Dimensioning of liver gave an opportunity to establish that its superior border along the right middle clavicular line is on the forth intercostal space level; its inferior border projects from the costal margin by 4 cm. evaluate the liver size. _____
7. Dimensioning of liver gave an opportunity to establish that its superior border along the right middle clavicular line is on the forth intercostal space level; its lower border does not come out from the costal arch. Evaluate the liver size. _____

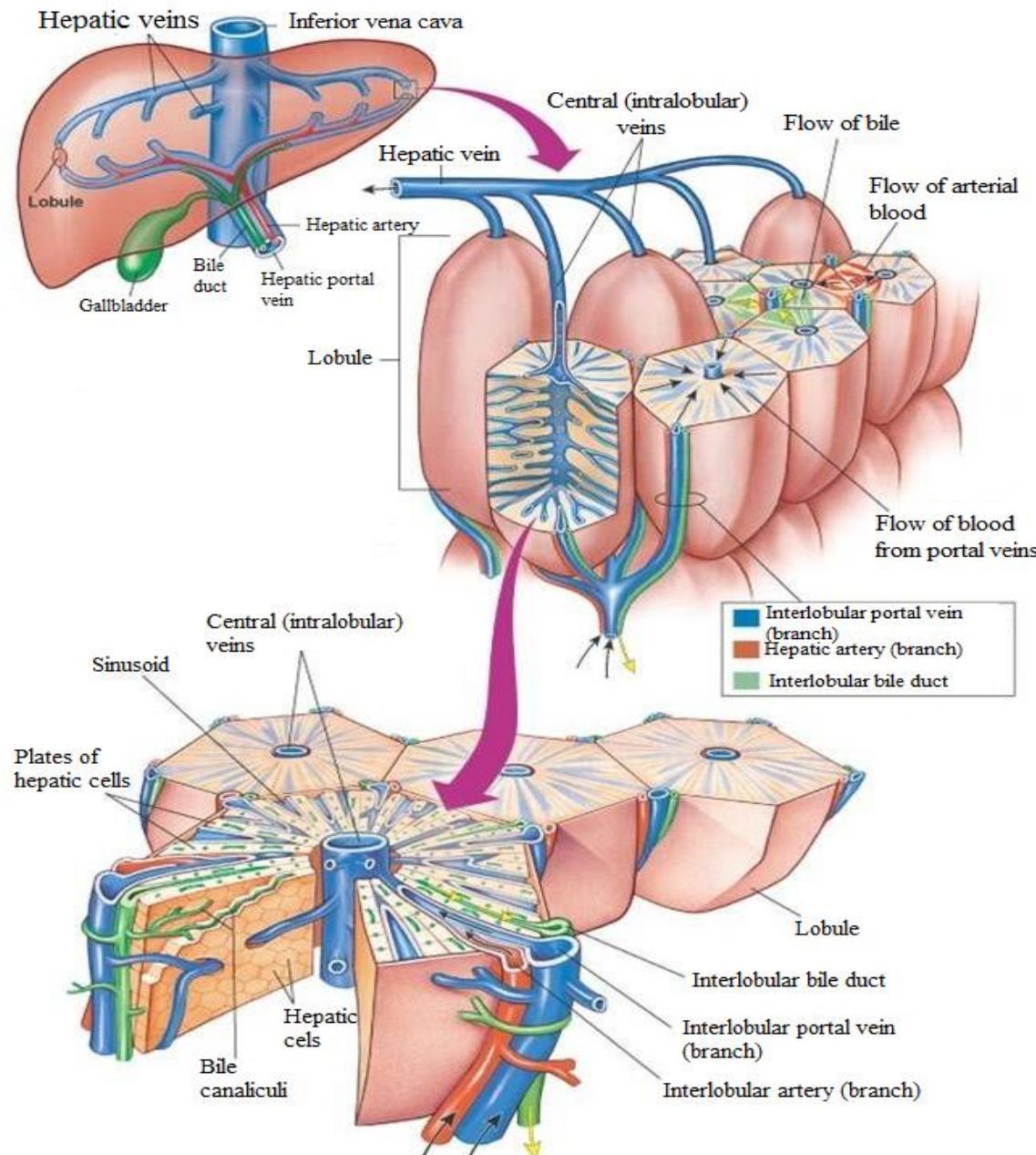
8. A patient with cholelithiasis fell ill with mechanic jaundice. Examination revealed that the stone was in the common hepatic duct. What excreting ducts make up the obdurate duct? _____

Hepatic segmentation.



- 1** Caudate segment.
- 2** Left posterior lateral segment.
- 3** Left anterior lateral segment.
- 4** Left medial segment.
- 5** Right anterior medial segment.
- 6** Right anterior lateral segment.
- 7** Right posterior lateral segment.
- 8** Right posterior medial segment.

Structure of the Hepatic lobules.

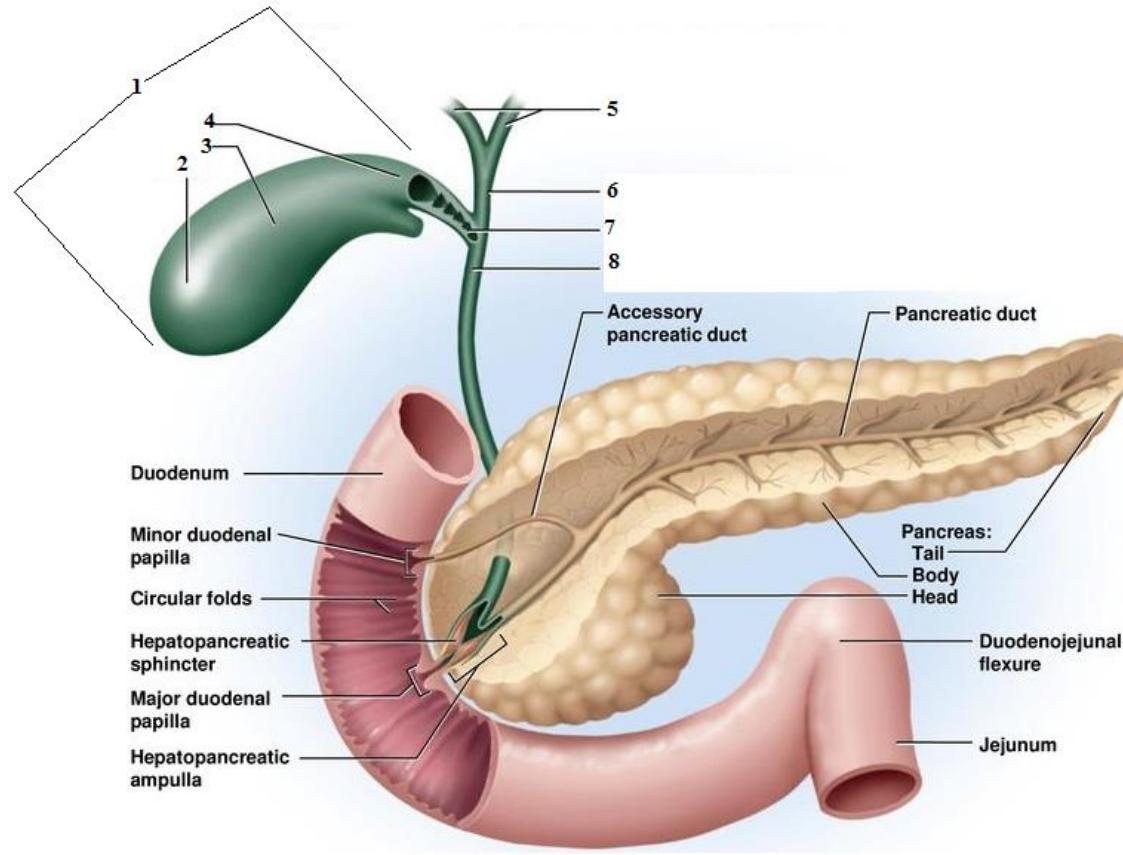


Clinical application.

There is progressive destruction of hepatocytes in cirrhosis of the liver and replacement of them by fibrous tissue. This tissue surrounds the intrahepatic blood vessels and biliary ducts, making the liver firm and impeding circulation of blood through it.

Hepatic tissue may be obtained for diagnostic purposes by liver biopsy. The needle puncture is commonly made through the right 10th intercostal space in the midaxillary line. Before the physician takes the biopsy, the person is asked to hold his or her breath in full expiration to minimize the costodiaphragmatic recess and to lessen the possibility of damaging the lung and contaminating the pleural cavity.

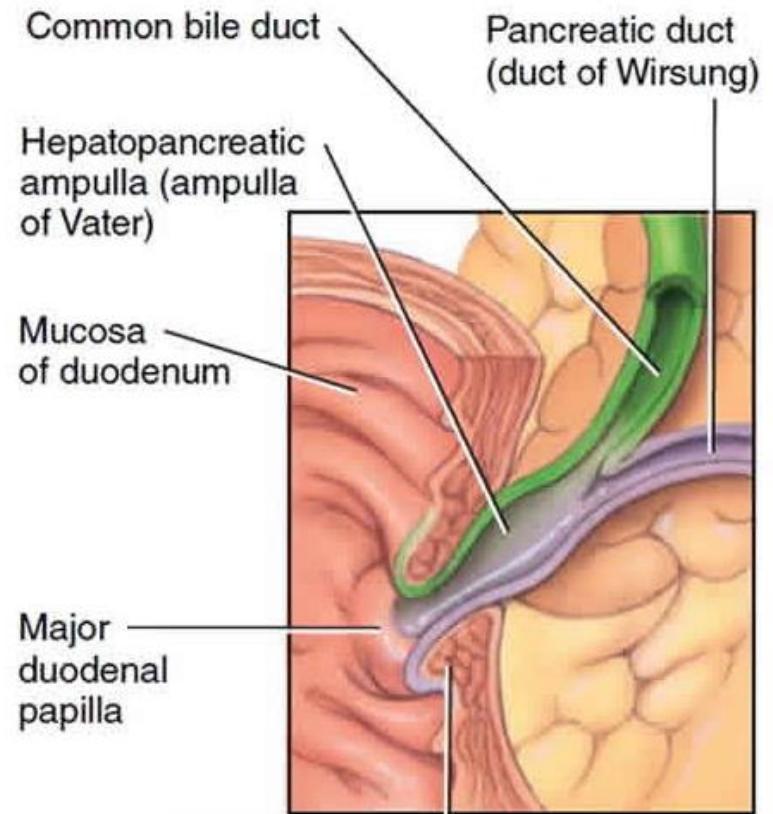
Gallbladder, Vesica fellea.



Write all anatomical structures.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

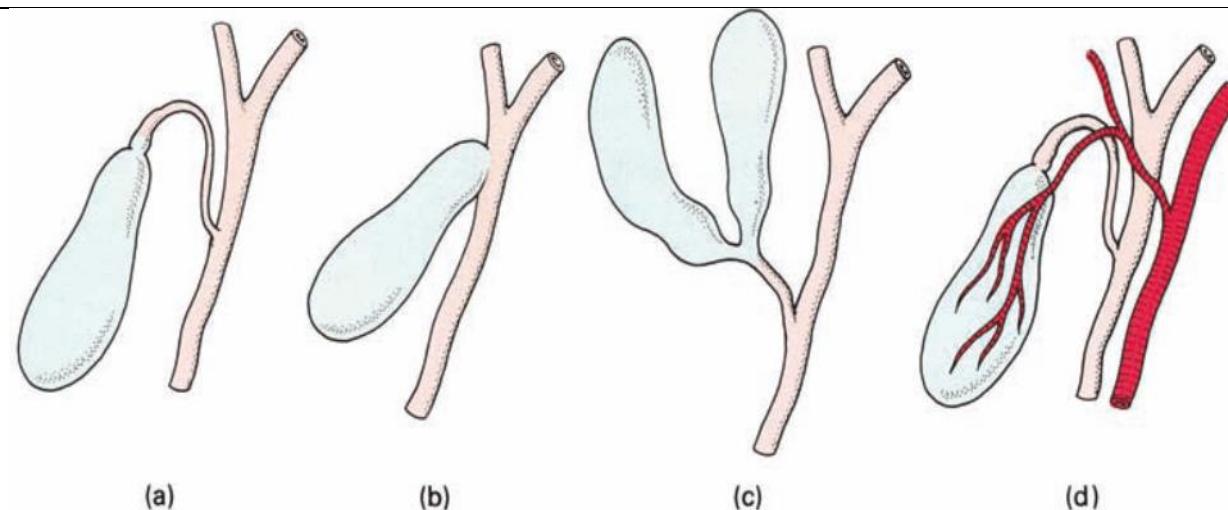
Details of hepatopancreatic ampulla.



Sphincter of the hepatopancreatic ampulla (sphincter of Oddi)

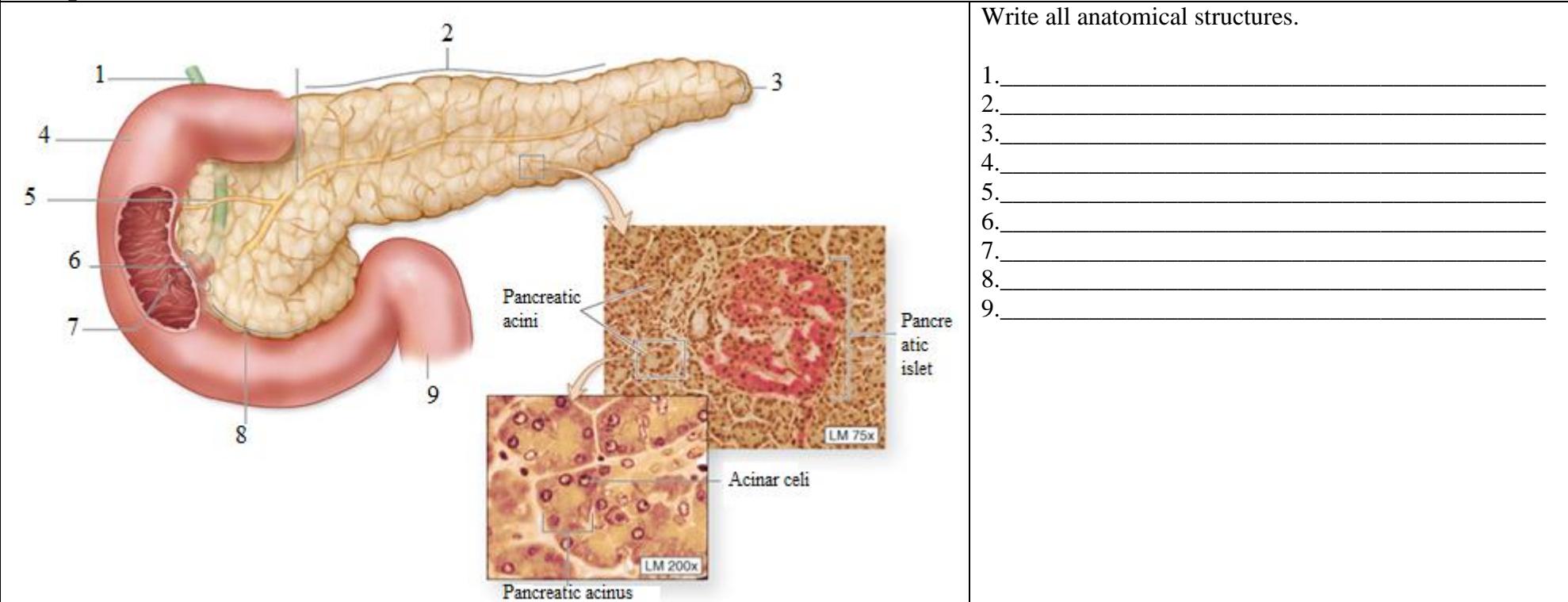
Clinical features

1. Errors in gall-bladder surgery are frequently the result of failure to appreciate the variations in the anatomy of the biliary system; it is important, therefore, before dividing any structures and removing the gallbladder, to have all the three biliary ducts clearly identified, together with the cystic and hepatic arteries. The cystic artery is constantly found in Calot's triangle, formed by the cystic duct, the common hepatic duct and the inferior aspect of the liver.
2. Haemorrhage during cholecystectomy may be controlled by compressing the hepatic artery (which gives off the cystic branch) between the finger and thumb where it lies in the anterior wall of the foramen of Winslow (Pringle's manoeuvre).
3. Gangrene of the gall-bladder is rare because even if the cystic artery becomes thrombosed in acute cholecystitis there is a rich secondary blood supply coming in from the liver bed. Gangrene may occur in the unusual event of a gall-bladder on an abnormally long mesentery undergoing torsion, which will destroy both its sources of blood supply.
4. Stones in the common duct can usually be removed endoscopically using a Dormia basket introduced after dividing the sphincter of Oddi. At other times, the common bile duct is explored via an incision in its supraduodenal portion. Sometimes a stone impacted at the ampulla of Vater must be approached via an incision in the second part of the duodenum. This last approach is also used when it is necessary to divide the sphincter of Oddi or to remove a tumour arising at the termination of the common bile duct.



Some variations in biliary anatomy. (a) Along cystic duct joining the hepatic duct low down behind the duodenum. (b) Absence of the cystic duct—the gallbladder opens directly into the common hepatic duct. (c) A double gall-bladder, the result of a rare bifid embryonic diverticulum from the hepatic duct. (d) The right hepatic artery crosses in front of the common hepatic duct; this occurs in 25 per cent of cases.

The pancreas.



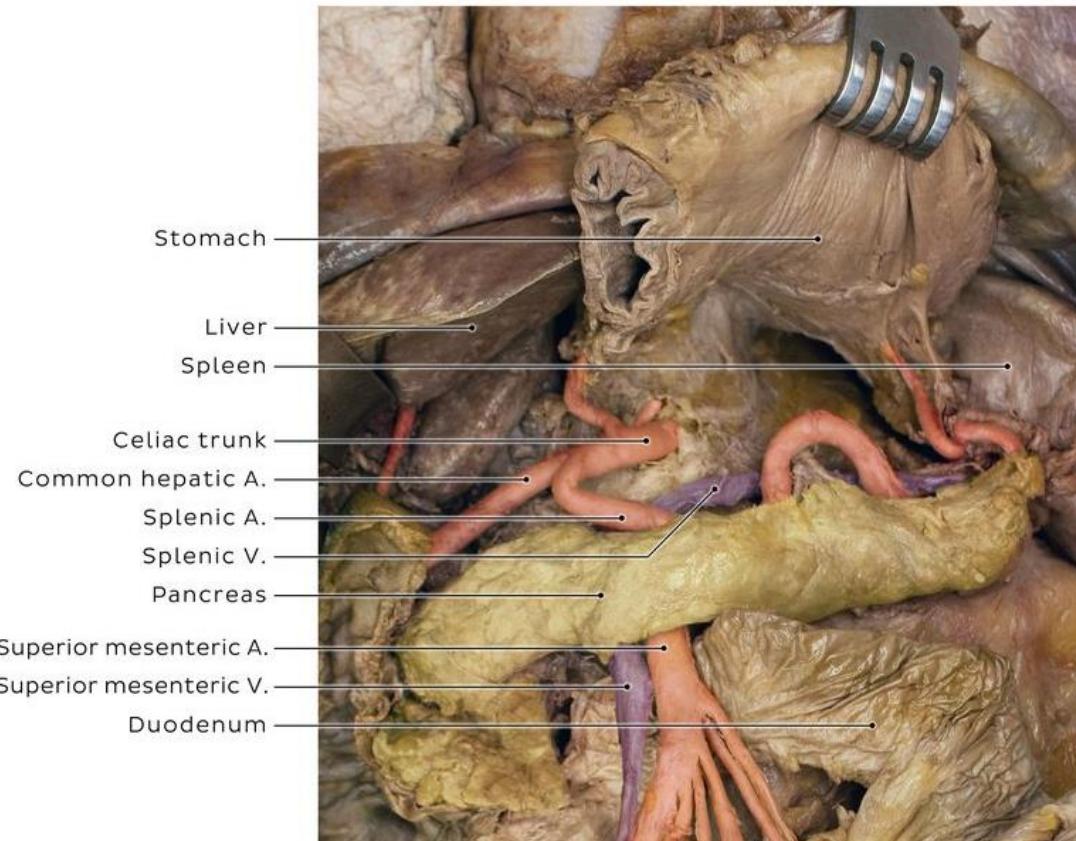
1. Rarely, the two developing segments of the pancreas completely surround the second part of the duodenum ('annular pancreases) and may produce duodenal obstruction.
2. Note from the posterior relations of the pancreas that a neoplasm of the head of the pancreas will produce obstructive jaundice by compressing the common bile duct. An extensive growth in the body of the gland may cause portal or inferior vena caval obstruction.
3. Anterior to the pancreas lies the stomach, separated from it by the lesser sac. This sac may become closed off and distended with fluid either from perforation of a posterior gastric ulcer or from the outpouring of fluid in acute pancreatitis, forming a *pseudocyst of the pancreas*. Such a collection may almost fill the abdominal cavity.

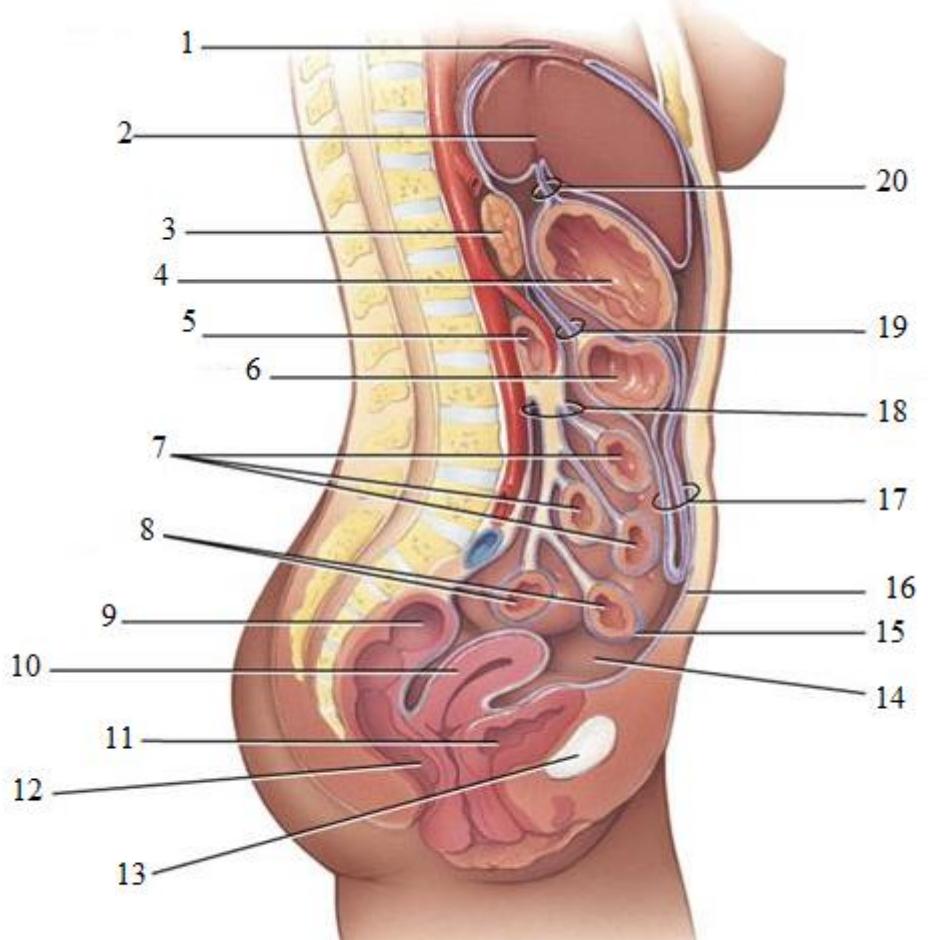
Topic 8: The peritoneum.

Complete the table.

Term in English.	Term in Latin.
	Tunica serosa
The peritoneal cavity	
The greater omentum	Ligamentum gastrocolicum
	Plica umbilicalis mediana

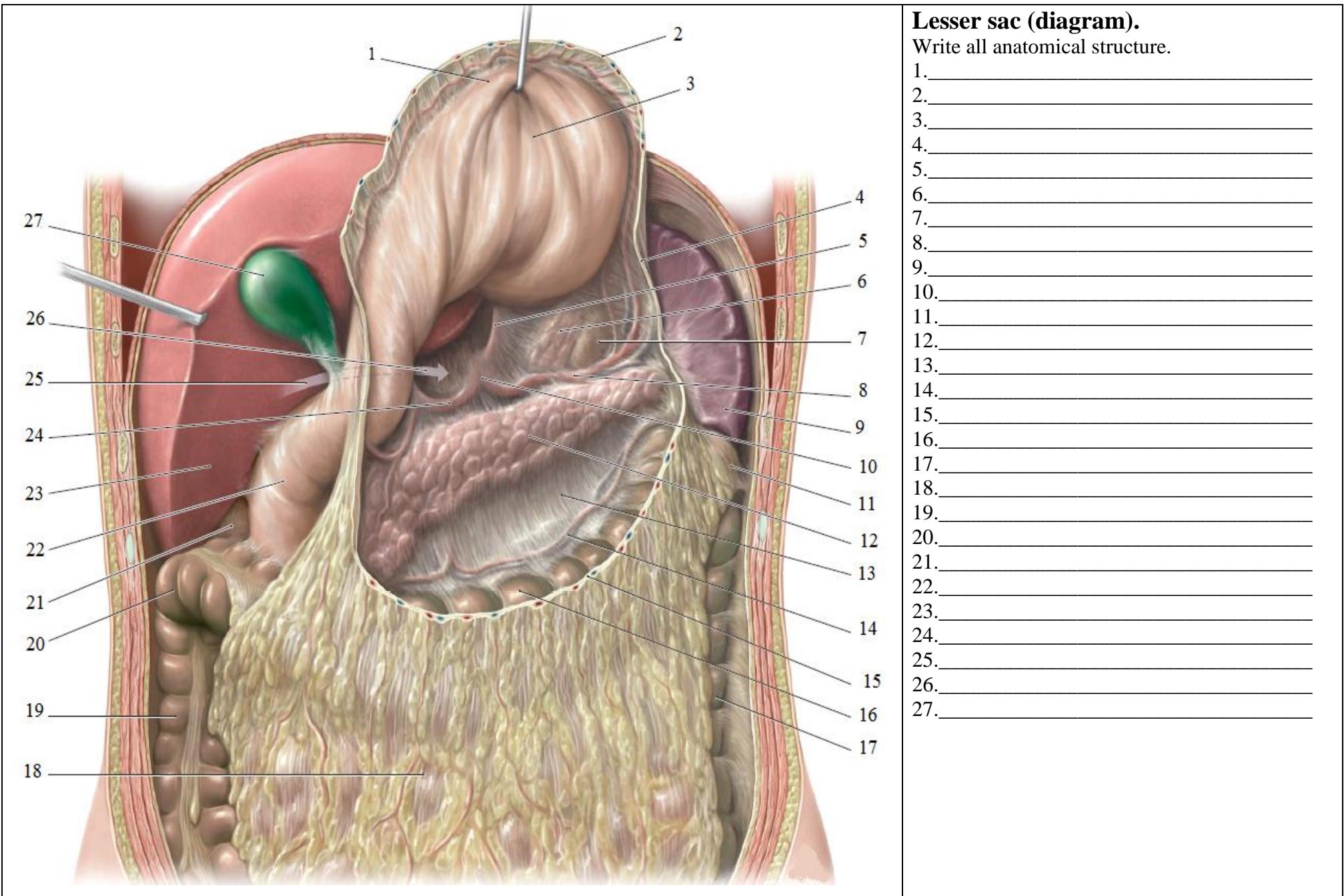
Omental bursa in a cadaver: Omental bursa is located posterior to the stomach. Therefore, it's very easy to find it during a cadaveric dissection by simply lifting the stomach. It communicates with the greater peritoneal sac via the omental foramen.





Midsagittal section showing the peritoneal folds.
Write all anatomical structure.

- 1.
- 2.
- 3.
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Lesser sac (diagram).

Write all anatomical structure.

1. _____
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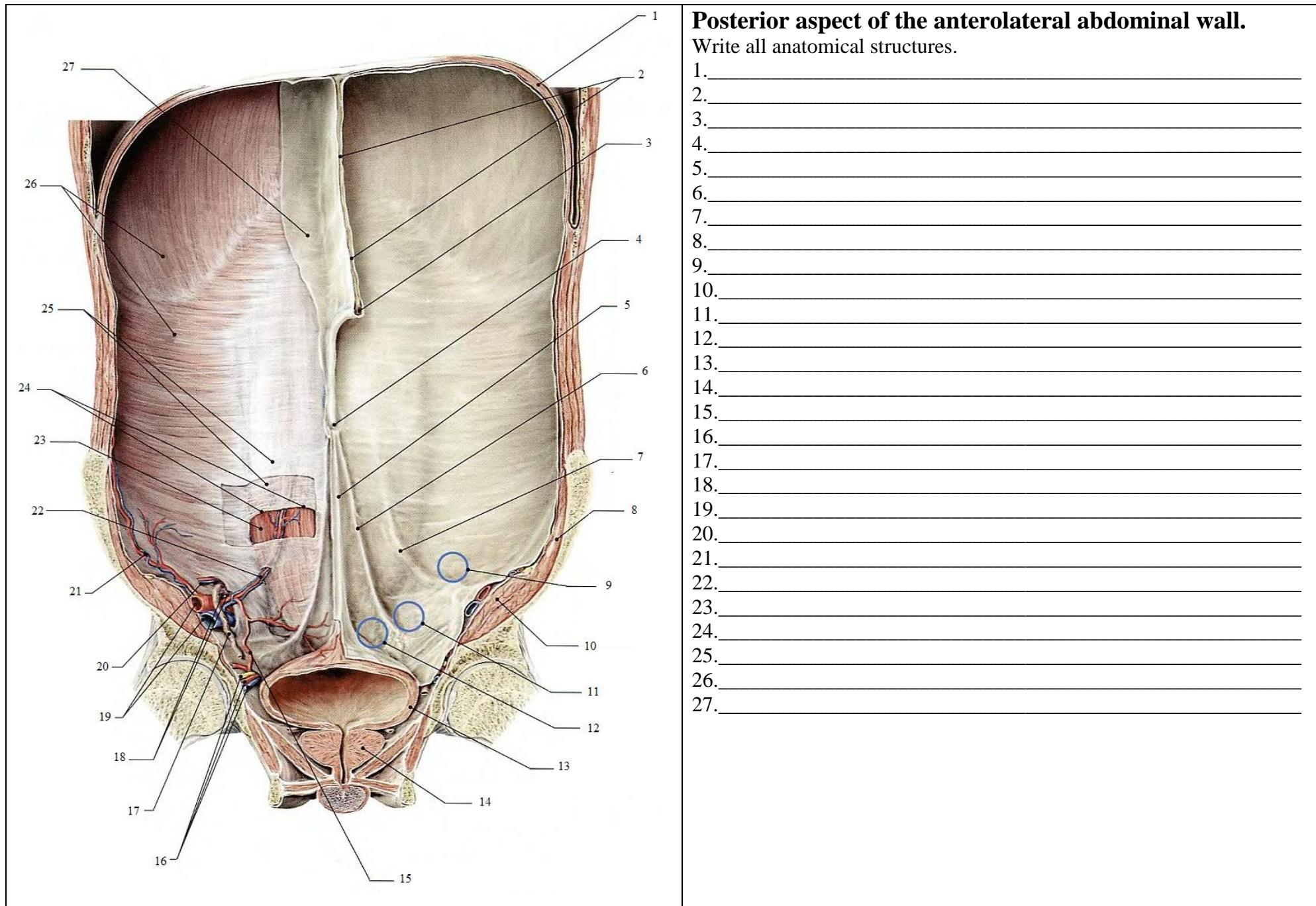
Embryology.

During embryonic development, the peritoneum is anchored to the gut in the midline of the abdomen anteriorly, with the dorsal mesentery securing it posteriorly. The mesenteric layers develop in an anterior direction around the upper alimentary canal, carrying the blood supply and creating the ventral mesentery.

Due to the growth of the organs, they gradually become larger and have to shift in order to fit into the abdominal cavity. The stomach rotates 90 degrees, the spleen is displaced to the left and the liver moves to the right. The peritoneum twists with these movements which lead to the formation of the falciform ligament, the lesser omentum and the coronary ligaments of the liver. Throughout this entire process, the cavity of the lesser sac is created.

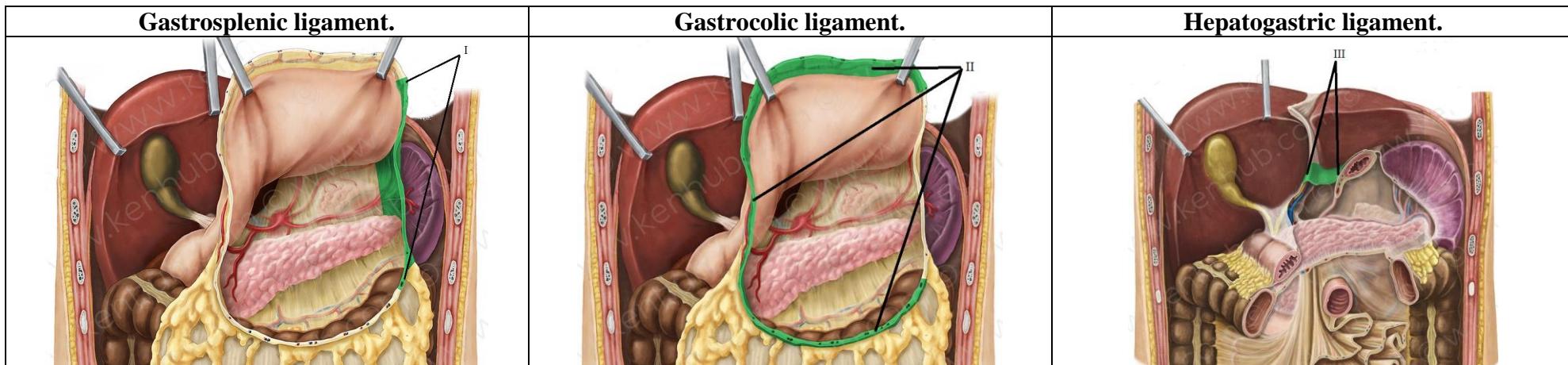
Questions:

1. A 45-year-old patient was admitted to the surgical department with complaints of abrupt sharp pain in the epigastric region. After examination it was diagnosed: perforated ulcer of the posterior wall of the stomach. Where did content of the stomach flow out while perforation? _____
2. A 53-year-old female patient was diagnosed with liver rupture resulting from a blunt abdominal injury. The escaped blood will be assembled in the following anatomic formation. _____
3. A man with internal abdominal right side injury and suspicion of liver rupture was admitted to the traumatological department. In what peritoneal structure will blood accumulate? _____
4. A patient with a stab wound of the anterior stomach wall is in surgical care. What formation of abdominal cavity did the stomach contents get into? _____
5. A surgeon should reach the omental bursa to perform an operation on abdominal cavity. How can he reach this part of peritoneal cavity without affecting the integrity of lesser omentum? _____
6. A 28-year-old woman has been diagnosed with extra uterine pregnancy complicated by the fallopian tube rupture. The blood is most likely to penetrate the following peritoneal space: _____
7. Necrotic form of acute pancreatitis of a patient is diagnosed. Into what peritoneal formation does serous fluid exudation spread? _____
8. During the examination of a patient, the presence of suppurative exudation in the straight rectouterine pouch was suspected. Through what anatomic formation is it better to puncture the pouch? _____
9. In case of a penetrating wound of the anterior abdominal wall the wound tract went above the lesser curvature of stomach. What peritoneum formation is most likely to be injured? _____
10. A surgeon has to find the common hepatic duct during the operative intervention on account of concrements in the gall ducts. The common hepatic duct is located between the leaves of: _____



Peritoneal ligaments.

I Splenic ligaments.	Phrenicocolic ligament (sustentaculum lienis). Gastrosplenic ligament. Splenorenal (lienorenal) ligament.
II Gastric ligaments.	Gastrophrenic ligament. Gastrocolic ligament.
III Hepatic ligaments.	Falciform ligament. Gastrohepatic ligament. Hepatoduodenal ligament.



Clinical relations!

Ascites.

Ascites by definition is accumulation of more than 20 milliliters of fluid within the peritoneal cavity. The most common cause is increased pressure in the hepatic portal vein, portal hypertension. Portal hypertension is most often seen in people with liver cirrhosis. Ascites clinically presents as a building belly showing waves of moving fluid when gently struck- this is not the case for fat tissue.

The diagnosis of ascites is by physical examination and medical imaging. The ideal treatment of ascites is directed towards its cause together with dietary restrictions of sodium because sodium promotes fluid retention. In any case, it is important to treat ascites as a potential complication this state is peritonitis.

Inflammation of the parietal peritoneum can occur due to an enlarged organ or by the escape of fluid from an organ. The area becomes inflamed and causes pain over the affected region.

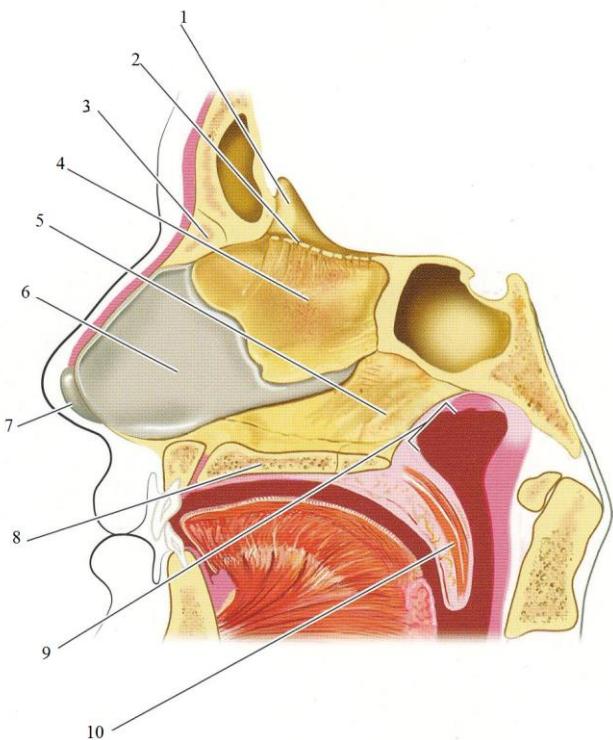
Rebound tenderness is a pain that is elicited after pressure over the inflamed area is released.

Topic 9: Nose (Nasus). Larynx.

Complete the table.

Term in English.	Term in Latin.
Ala of nose	
The septal nasal cartilage	
The cavernous plexus of conchae	
The ethmoidal bulla	
The semilunar hiatus	
Larynx descent	
Cuneiform cartilage	
The cricothyroid joint	

The Nose.

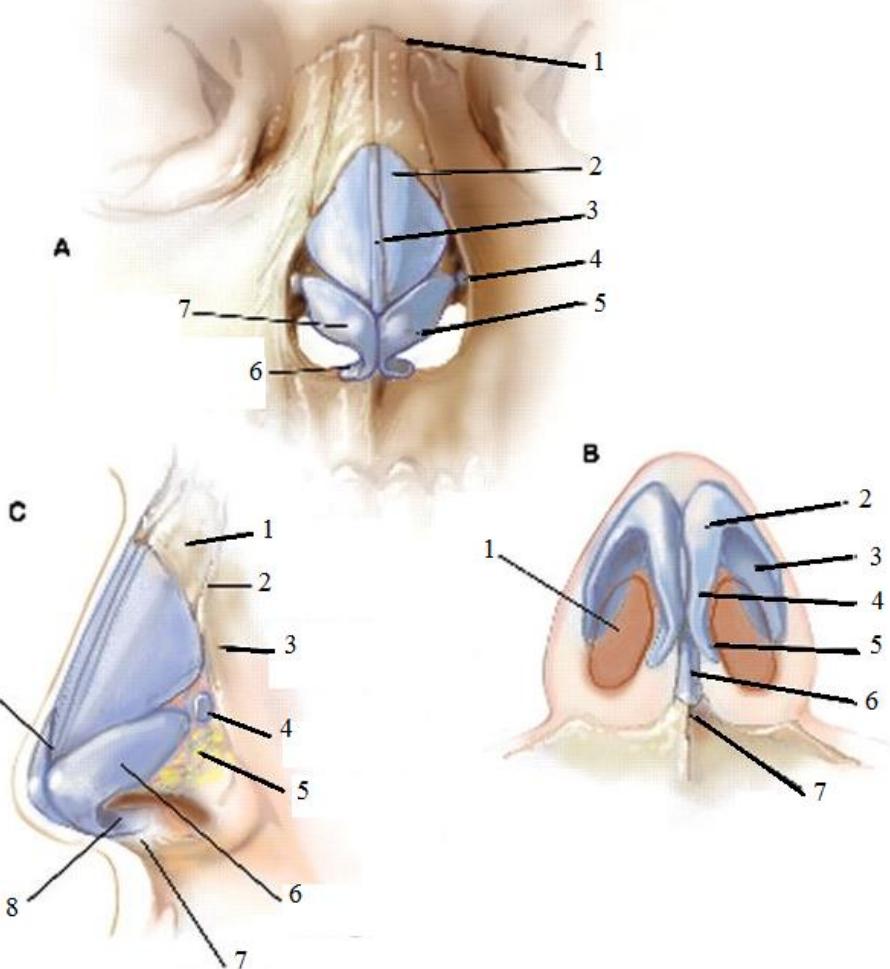


Nasal septum, medial view.

Write all anatomical structure.

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Nasal cartilages.



Write all anatomical structure.

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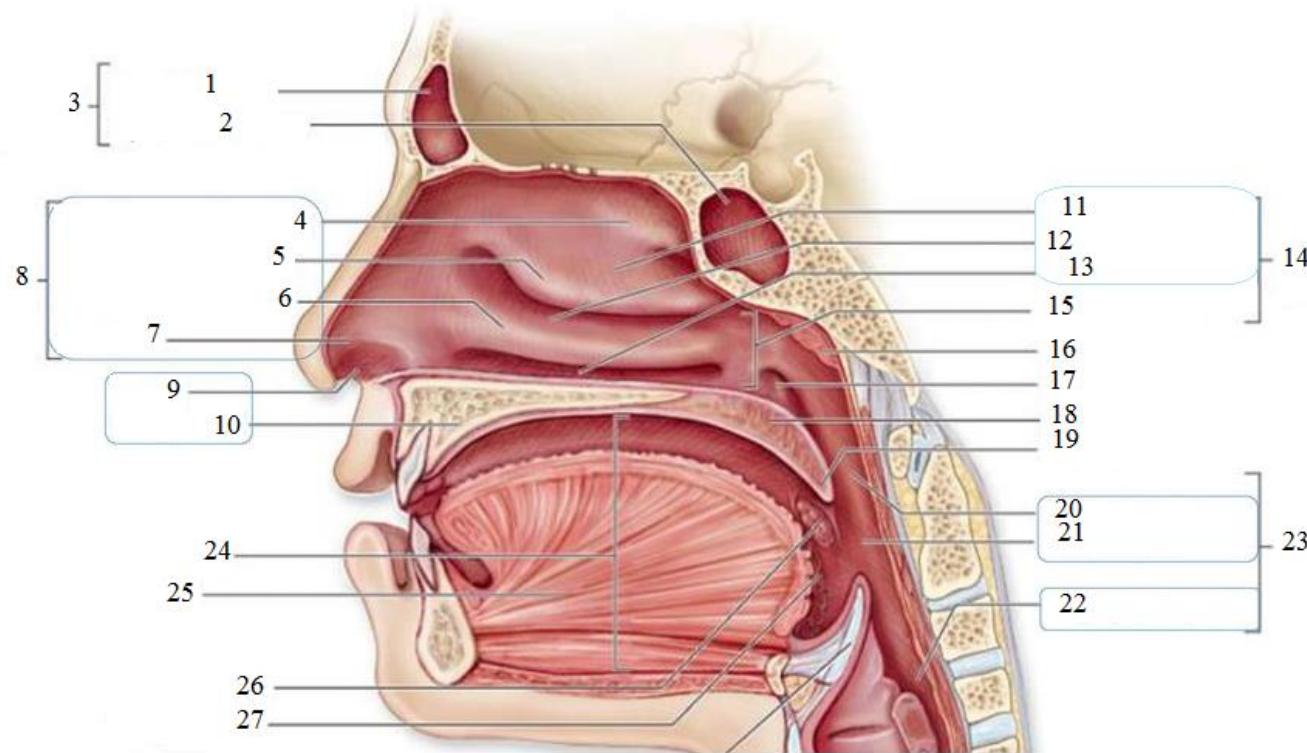
B.

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C.

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Lateral wall of nasal cavity and oral cavity.



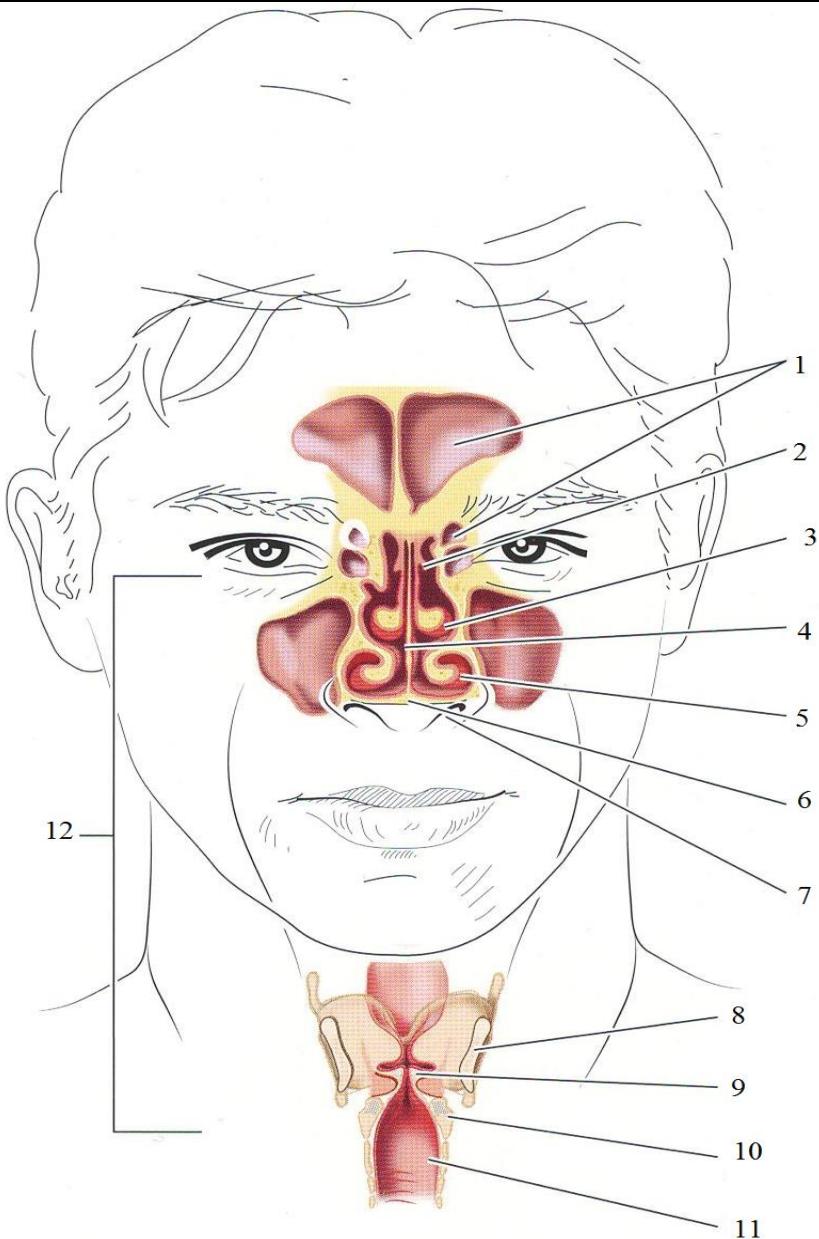
Write all anatomical structures.

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Nasal conchae, larynx, and sinuses, coronal section.



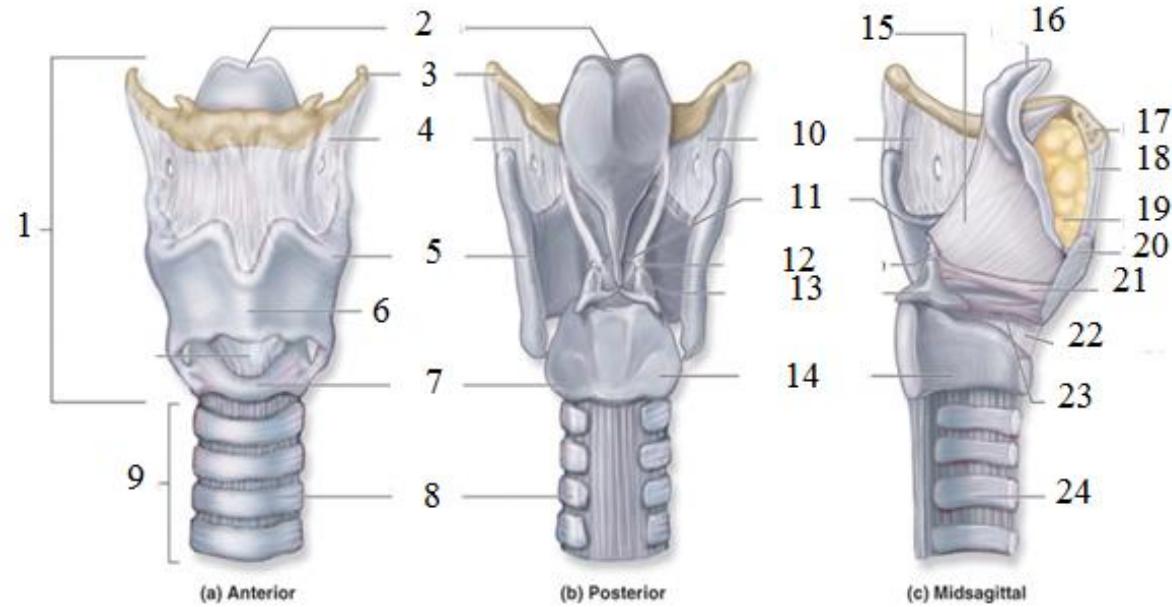
Write all anatomical structure.

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Questions:

1. A patient complains of headache, heavy breathing. X-ray examination confirmed the diagnosis - frontitis. What nasal meatus may contain purulent discharge? _____
2. Because of the carried illness at a man, expansion of glottis was violated. What from the counted muscles is damaged? _____
3. A 69-year-old patient has got an abscess of frontal lobe as a result of purulent infection in nasal cavity. What anatomical formation did the infection penetrate through? _____
4. X-ray examination revealed an accumulation of suppuration in maxillary sinus. Into what nasal meatus excretes the suppuration? _____
5. A 18-year-old patient came to the out-patient department with the complaints of bleeding trauma in the vestibule of his nose. On examination: the mechanical injure of the mucous layer of the vestibule without continuation into nasal cavity proper. What is the boundary between the vestibule and nasal cavity proper? _____
6. A 35-year-old patient applied to a doctor with complaints about having intense rhinitis and loss of sense of smell for a week. Objectively: nasal cavity contains a lot of mucus that covers mucous membrane and blocks olfactory receptors. In what part of nasal cavity are these receptors situated? _____
7. Acute inflammatory process of the nasolacrimal duct mucosa of a 28-year-old has been diagnosed. Influenza was followed by 10-days' discharge from the nose. From that part of the nasal cavity could the infection get into the nasolacrimal duct? _____
8. A patient has got a complication after rhinitis. X-ray examination showed pus accumulation in the maxillary sinus on the left. To what nasal meatus does the pus release? _____
9. A patient has a tumor in the superior nasal meatus region. Which function can be affected? _____
10. During woodwork, a worker accidentally inhaled a bulb nearly 0.5 cm in diameter, which caused strong cough. Which part of respiratory influence? _____
11. A 25-year-old patient appealed to doctor with complains of high temperature and headache lasting for 4 days. Examination diagnosed frontitis. Through which nasal meatus did the infection get into the frontal sinus? _____

Larynx.

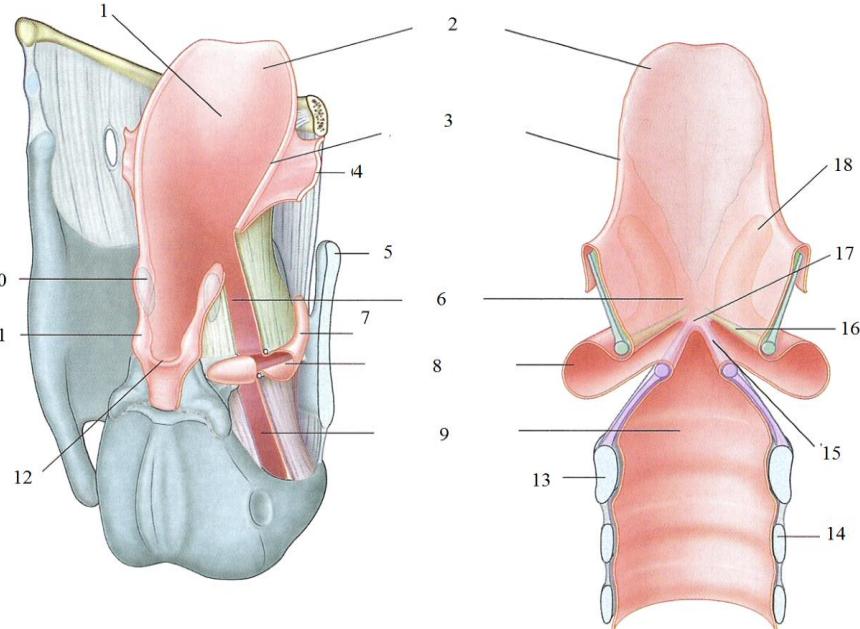


Write all anatomical structure.

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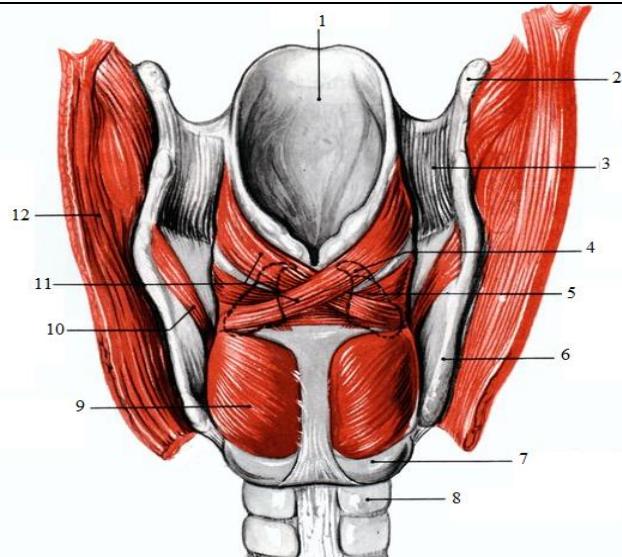
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The laryngeal cavity.



Write all anatomical structures.

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The laryngeal muscles, (posterior view). Write all anatomical structures.

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DEVELOPMENT OF RESPIRATORY ORGANS IN HUMANS

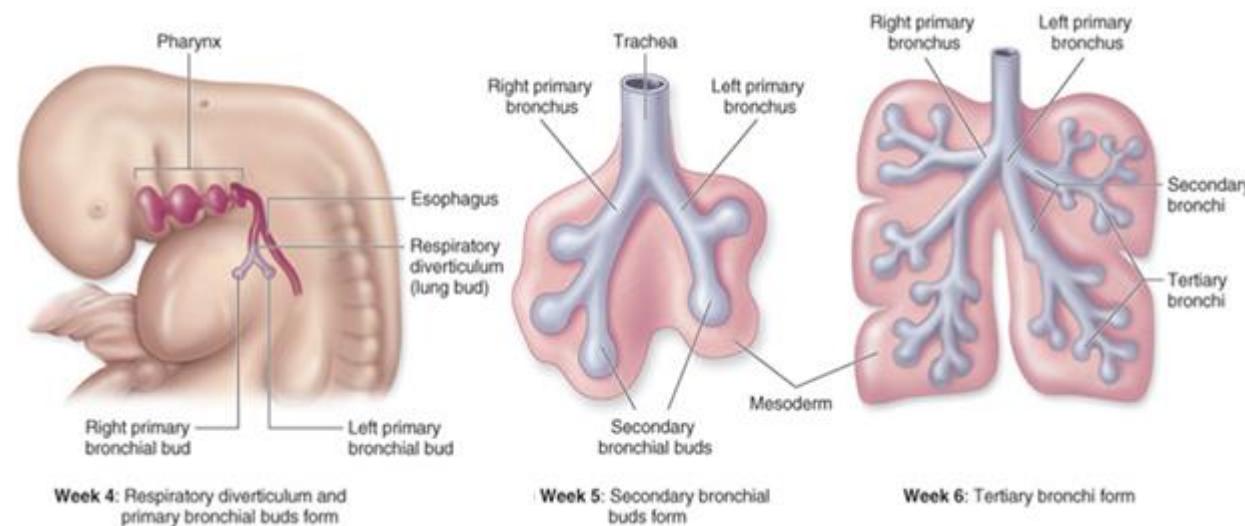
Formation of the respiratory system from pharyngeal endoderm. The trachea and larynx begin at the 4th week of development as unpaired diverticulum on the ventral pharynx wall right below the last bronchial cleft. The diverticulum soon transforms into the tubular projection, which grows and elongates caudally, lying parallel to digestive tube.

Formation of bronchi and lungs. By the 6th week of development the caudal end of the tracheal tubule splits into the left and right diverticula (the Broncho pulmonary buds), which give rise to respective main bronchi and lungs.

Both primordia eventually grow into ambient mesenchyme. Further on, the primary endoderm outgrowth gives rise solely to epithelial lining and goblet cells while connective tissue, cartilages, muscular elements and blood vessels arise from the mesenchymal cells of the middle embryonic layer — the mesoderm.

Development of the larynx and trachea. The cranial segment of respiratory tubule, which neighbors the pharynx exhibits very early differentiation into the trachea. Condensation of mesenchyme in the 2nd and 3rd bronchial arches results in eventual formation of laryngeal cartilages and muscles. Extremely active growth of epithelium leads to recrudescent obliteration of the laryngeal lumen. Later on, during intensive growth of cartilages and muscles the laryngeal cavity reopens to develop related structures (the folds and ventricles). The larynx is continuous with unpaired tube — the tracheal primordial.

Development of lungs. The lungs develop from two asymmetrical bronchopulmonary buds. The right bud very soon splits into three buds (pneumomeres) and the left — into two buds respective to future pulmonary lobes. The endodermal primordial grows to give birth to more and more new pneumomeres that grow into mesenchyme and consecutively give birth to new generations. This process leads to formation of the bronchial tree already by the 5th month of development. Development of the bronchial tree features dichotomizing division of each generation. Intensive growth of alveolar tree (i.e. respiratory bronchioles, alveolar ducts and alveolar sacs — the alveoli proper) is observed beginning from the 5th month of development. This growth process features multiple divisions of each respiratory bronchiole instead of dichotomizing featured by the bronchial tree.



Blood vessels grow into the lungs and blood capillaries come to intimate contact with alveolar epithelium. Epithelium gradually becomes squamous and adheres to the capillaries.

Alveoles grow continuously through the entire embryonic period and last after birth up to 10-12 years of life. Immediately upon delivery (in healthy newborn), the lungs after the first cry become filled with air. Blood starts circulation in the pulmonary route and the alveoli expand to give the lungs characteristic spongy consistency.

Clinical applications.

The lung, which never expanded is dense as it contains no air and thus sinks in water. The lungs of liveborn child, who started normal respiration, contain some air and thus float when placed in water. This distinction is used for forensic test to determine if the child was stillborn or liveborn.

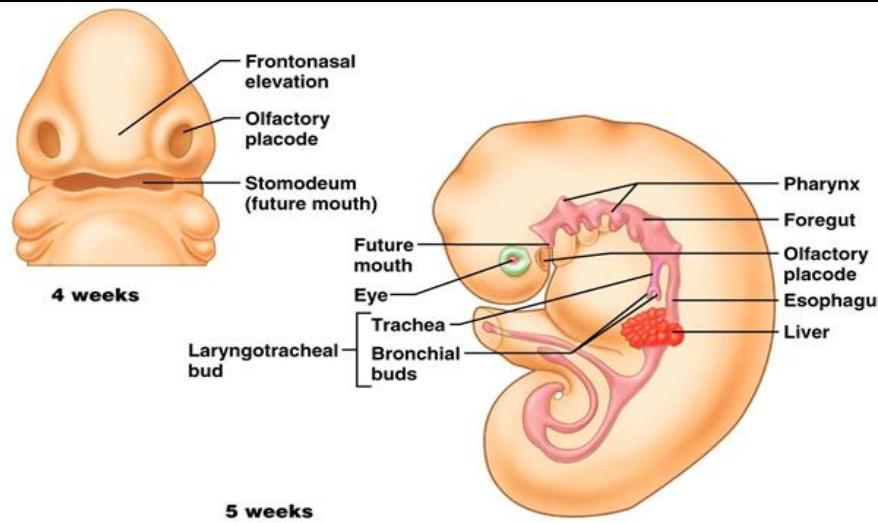
Development of pleural cavities. Lungs primordia as they develop dislocate caudally to the thoracic cavity being developed. Here it is necessary to mention that before embryo twisting the ventral mesoderm splits into two layers — the visceral (splanchnopleura) and parietal (visceropleura). The space between these layers is called the primary body cavity — the coelom. By the 5th week of development the coelom separates into the abdominal and thoracic cavities. In the latter, the splanchnopleura gives birth to the parietal pleura and the visceropleura — to visceral pleura. These two layers form an isolated pleural cavity. Apart from this, the mesodermal layers form an unpaired pericardial cavity around the heart.

Developmental anomalies of respiratory system.

Agenesis and aplasia. Agenesis (complete absence) of both lungs is uncommon and constitutes a fatal pathology. Agenesis of a single lung or lobe results from deranged formation of bronchopulmonary buds at early stages of development. These occurrences are too uncommon.

Hypoplasia (underdevelopment) of lung or lobe is more common and features diminished organ or its portion. It also features narrowing of the respective bronchi. Hypoplasia of a lobe as a rule leads to compensatory enlargement of remaining portions so gaseous exchange functioning is not affected much.

Tracheo-oesophageal fistulas. Within the trachea the abnormal congenital communications with oesophagus (fistulas) may occur. The fistulas as a rule lie inferior to the trachea. During food intake, the food particles may enter the lower respiratory tracts and cause a severe pneumonia. This condition requires surgery.

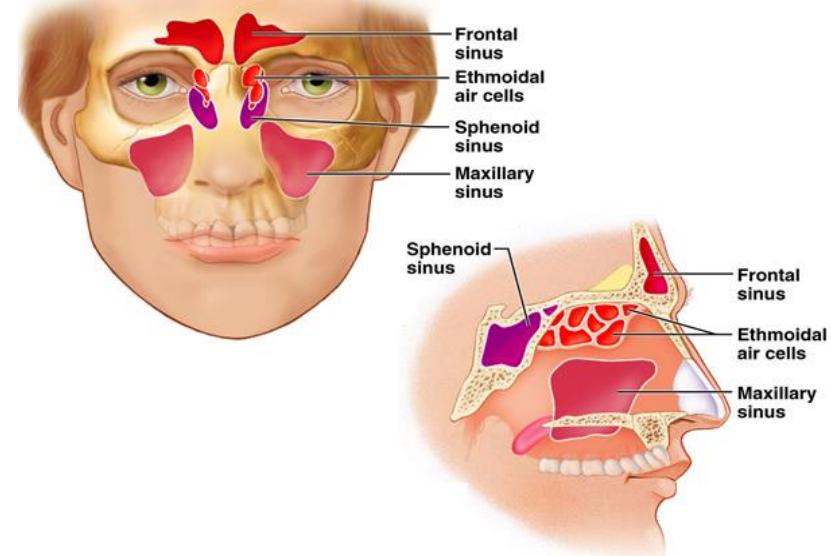
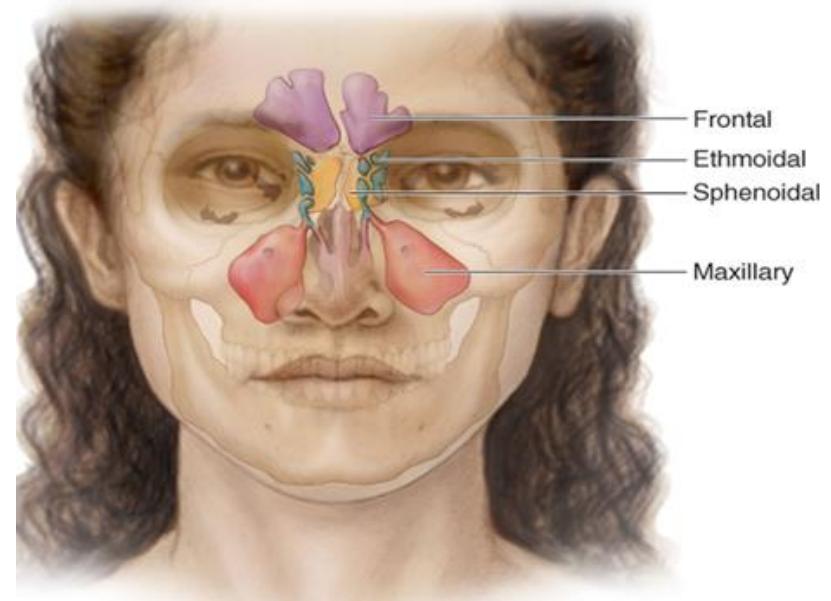


Clinical significance of the paranasal sinuses.

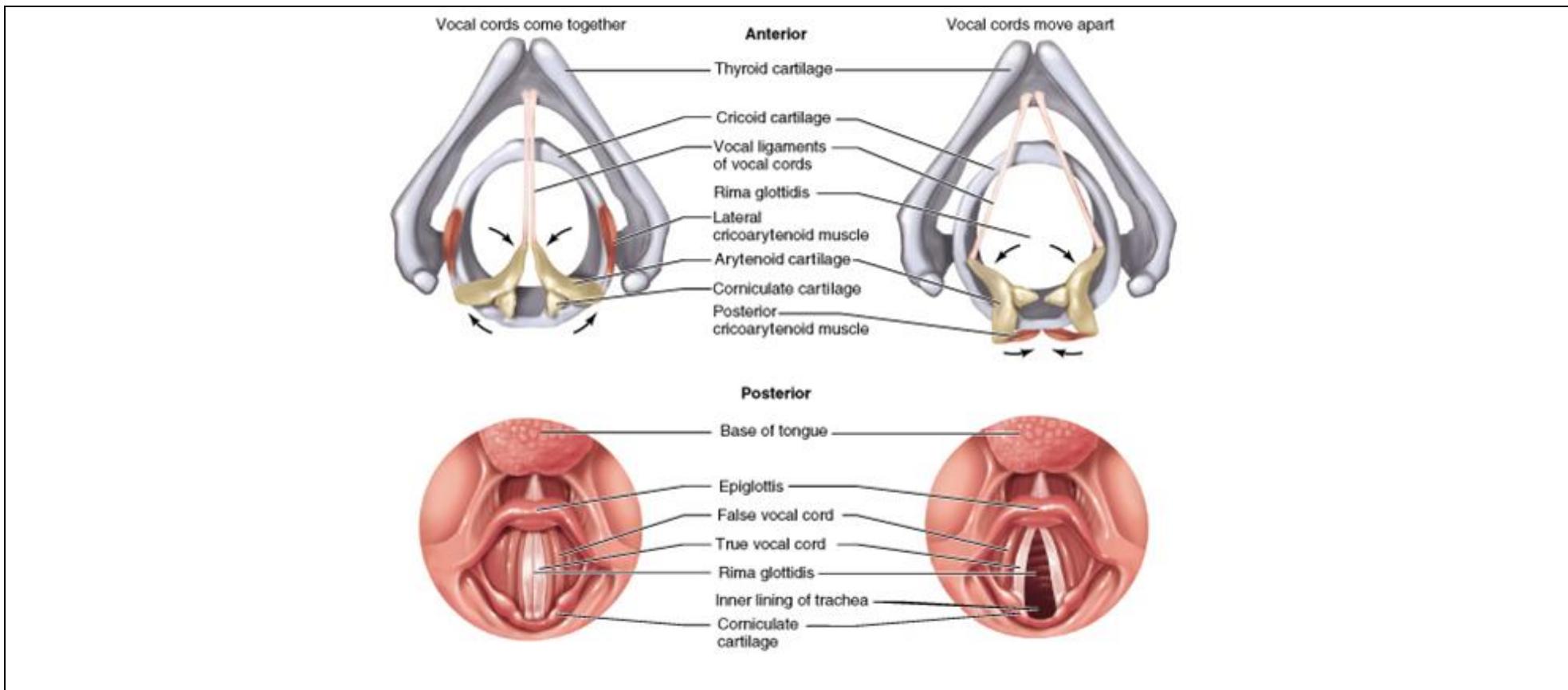
The sinuses increase the surface of mucosa, enfold the acoustic, vestibular, visual, olfactory and gustatory apparatuses, warm air acting as heat insulation and keep constant temperature around the sense organs. Moreover, they serve as vocal resonators and decrease weight of cranial bones.

The paranasal sinuses often develop inflammatory diseases (antritis, frontal sinusitis). Infection may infiltrate sinuses either from the nasal mucosa or from corrupted teeth (odontogenic sinusitis). The sinuses may accumulate pus, which requires removal by means of puncturing. Apart from medication surgical opening of the sinuses may be performed. Inflammation of the paranasal sinuses is dangerous because they neighbor the brain, eyes and hypophysis. Pus may erode bony walls of the cavities and severely affect the neighboring organs. The mucosa, tunica mucosa is divided into olfactory and respiratory regions. The olfactory region, pars olfactoria is the portion of superior nasal meatus mucosa and the respective area of the nasal septum (about 2 cm²). This part is lined with yellowish olfactory epithelium, which contains olfactory receptors.

The often reason of functioning disorders in respiratory region is rhinitis (from Greek ‘rhinos’ — nose and ‘-ids’ — the suffix, which denotes inflammation). Chilling, irritation, viruses and allergens may cause inflammation and swelling of the mucosa.



Movements of the Vocal Folds.



Clinical applications. First place among laryngeal diseases belongs to acute and chronic laryngeal mucosa inflammation — laryngitis. The acute laryngitis may be complicated with larynx swelling, which leads to labored breathing. Rapid development of swelling may require tracheotomy (trachea opening) to avoid asphyxiation. Deranged laryngeal innervation may result in motion disorders (laryngospasm, dystonia, aphonia). In the area of the vocal folds small benign tumors — fibromata and papillomas may occur. These tumors require removal. Laryngeal carcinoma is the most frequent malignancy. The patients that undergone laryngectomy may regain speech abilities using regurgitation of air from stomach and oesophagus. Sound production in this case belongs solely to articulation apparatus (pseudo-voice).

Topic 10: The Trachea, bronchi, lungs.

Complete the table.

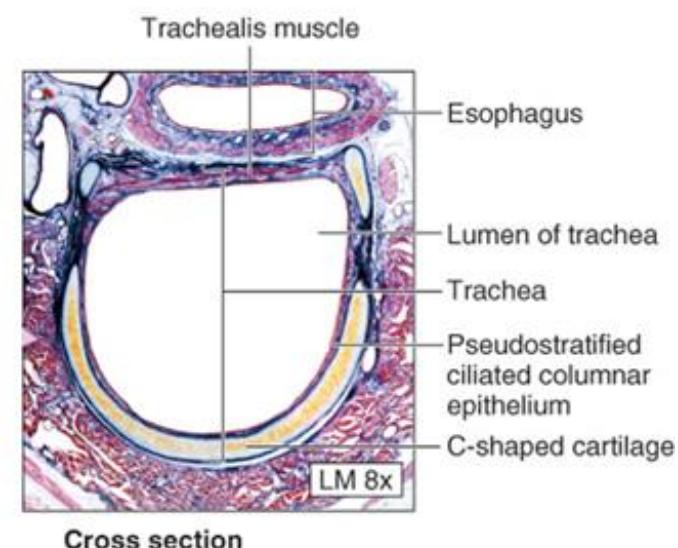
Term in English.	Term in Latin.
The tracheal bifurcation	
The carina of trachea	
The annular ligaments	
The lobar bronchi	

CR!

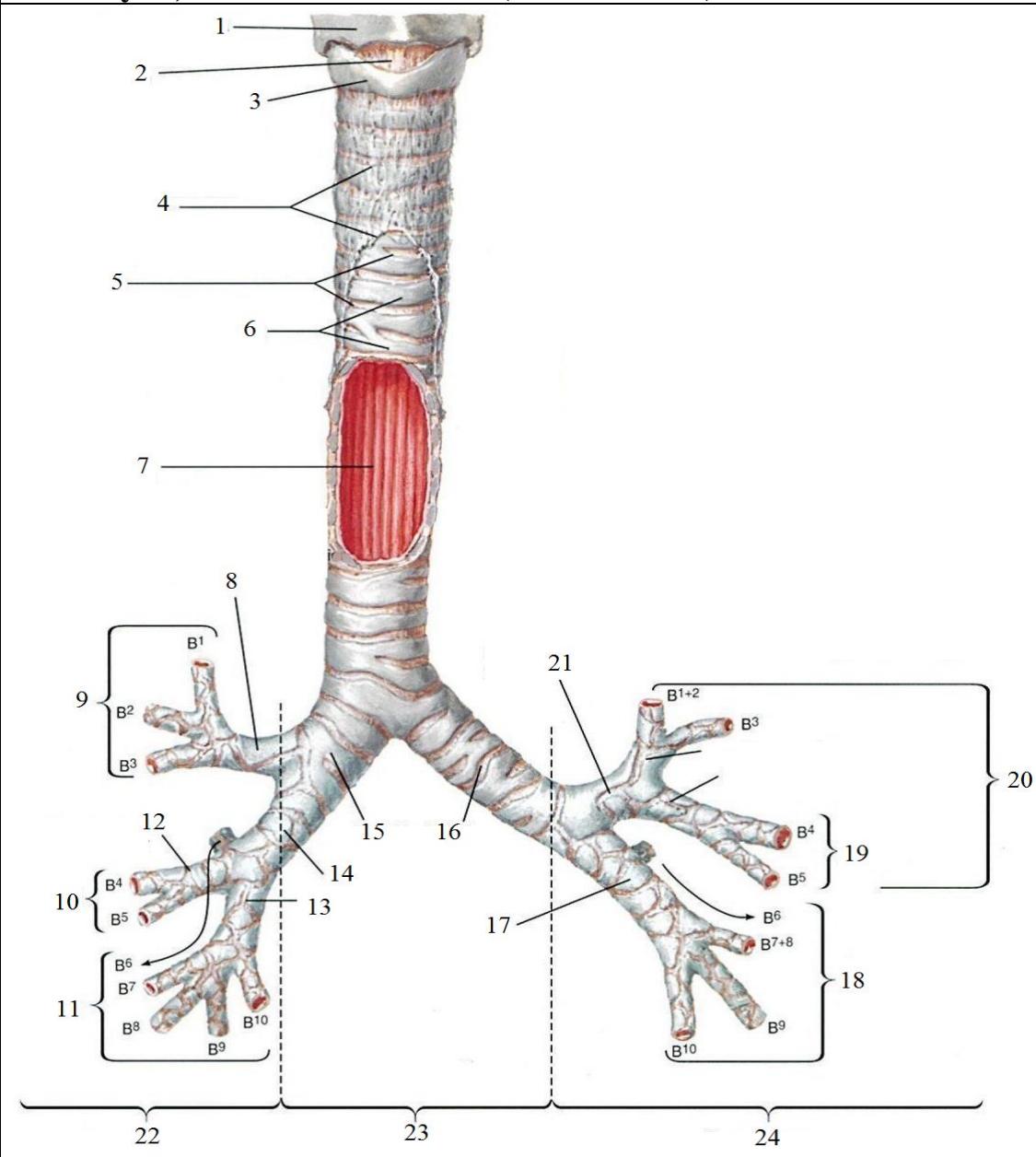
The trachea is a hollow, cylindrical tube slightly flattened antero-posteriorly; it expands directly from the larynx and ends at the tracheal bifurcation. In adult humans the average length of trachea constitutes about 11-13 cm and average width ranges 1.5 through 2.0 cm. The trachea begins from the lower border of larynx at the level of C6 and ends at the level of the upper border of C4 or C5 where it splits into two principal bronchi to form the tracheal bifurcation, bifurcation tracheae.

The bifurcation site is visible from inside as a crescent-shaped projection on mucosa — the carina of trachea, carina tracheae declined to the left principal bronchus lumen. The trachea is divided into two main parts — the cervical and thoracic parts.

Some diseases complicated with larynx swelling and obstruction (diphtheria, laryngeal carcinoma) require tracheotomy (surgical opening of trachea) and tracheostomy (insertion of a tracheostomy tube). Esophageal carcinomas and chemical burns of esophagus may damage neighboring membranous wall and cause tracheo-oesophageal fistulae.



The larynx, trachea and bronchi (anterior view).

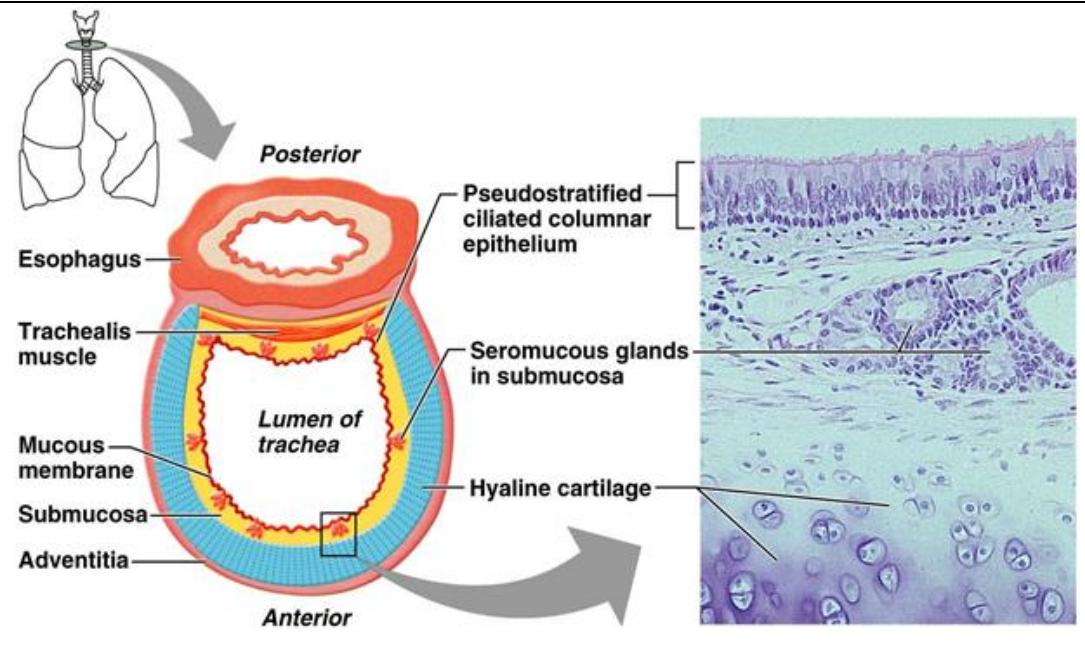


Write all anatomical structures.

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The bronchi, bronchi are the end-point airways passing from the nasal cavity to the bronchioles. The bronchi form the bronchial tree that consists of main bronchi, lobar bronchi, segmental bronchi and their branches and terminal bronchioles. Walls of the latter are devoid of cartilages substituted with membranes. Bifurcation sites of smaller bronchi feature circular muscle fibers, which may narrow or completely close passage to bronchi next to bifurcation. The submucosa contains numerous bronchial glands, glandule bronchioles.

Foreign bodies inspired to the trachea are most likely to be found in the right main bronchus because it is wide and believed to be a continuation of the trachea. Declined leftwards carina may also contribute to such foreign body location.

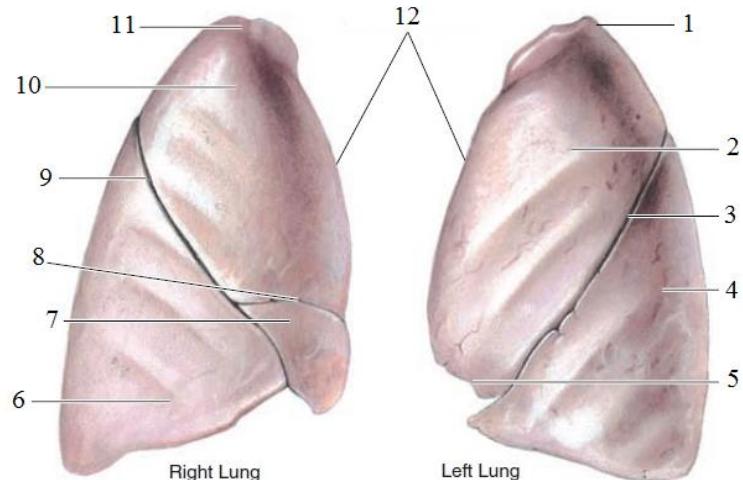


Synonym ‘pneumon’ (Greek) — the lung, (from ‘pneuma’ — respiration, breathing) gives rise to ‘pneumonia’ and other medical terms. The lungs reside in the thoracic cavity laterally to the mediastinum. The inferior parts of lungs neighbor the diaphragm, the lateral and posterior parts — the thorax and the medial parts — the mediastinum and vertebral column. The lungs fixed only with roots, the rest of parts are freely movable. Each lung has shape of sagittal- sectioned cone. The right lung lies slightly higher than the left as the right lobe of liver lies under it. The left lung is notably compressed and retracted leftwards with the heart. Thus although similar, the lungs are not identical: the vertical size of the right lung is less than that of the left but it is wider and its weight and volume are higher than in the left (approx., by 10%). Each lung is conical in shape, and presents for examination an apex, a base, three borders, and two surfaces.

Questions:

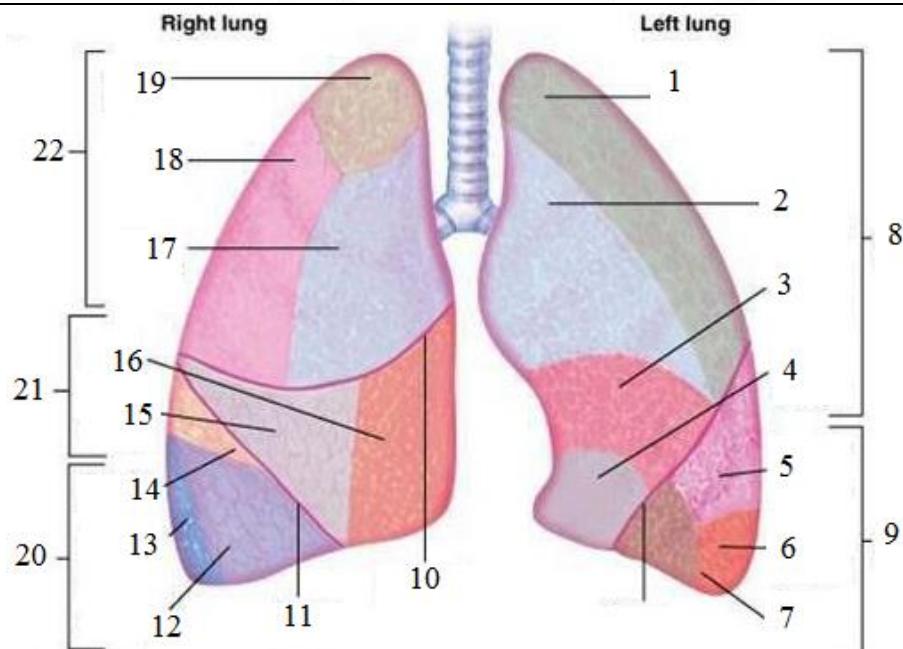
1. A foreign body (a button) closed space of the right superior lobar bronchus. What segments of the right lung won't be supplied with air? _____
2. In the specimen of one of the parts of respiratory system, a tubular organ was found. It has low epithelium, well developed muscular tunic, glands and cartilage are absent. Name this organ: _____
3. When the foreign body get in respiratory tracts, where more frequent location of it appearing? _____
4. At children do only upper tracheotomy because of low location? _____
5. In course of an operation surgeon removed a part of a lung that was ventilated by a tertiary bronchus accompanied by branches of pulmonary artery and other vessels. What part of a lung was removed? _____

The lungs, lobes and segments (anterior view).



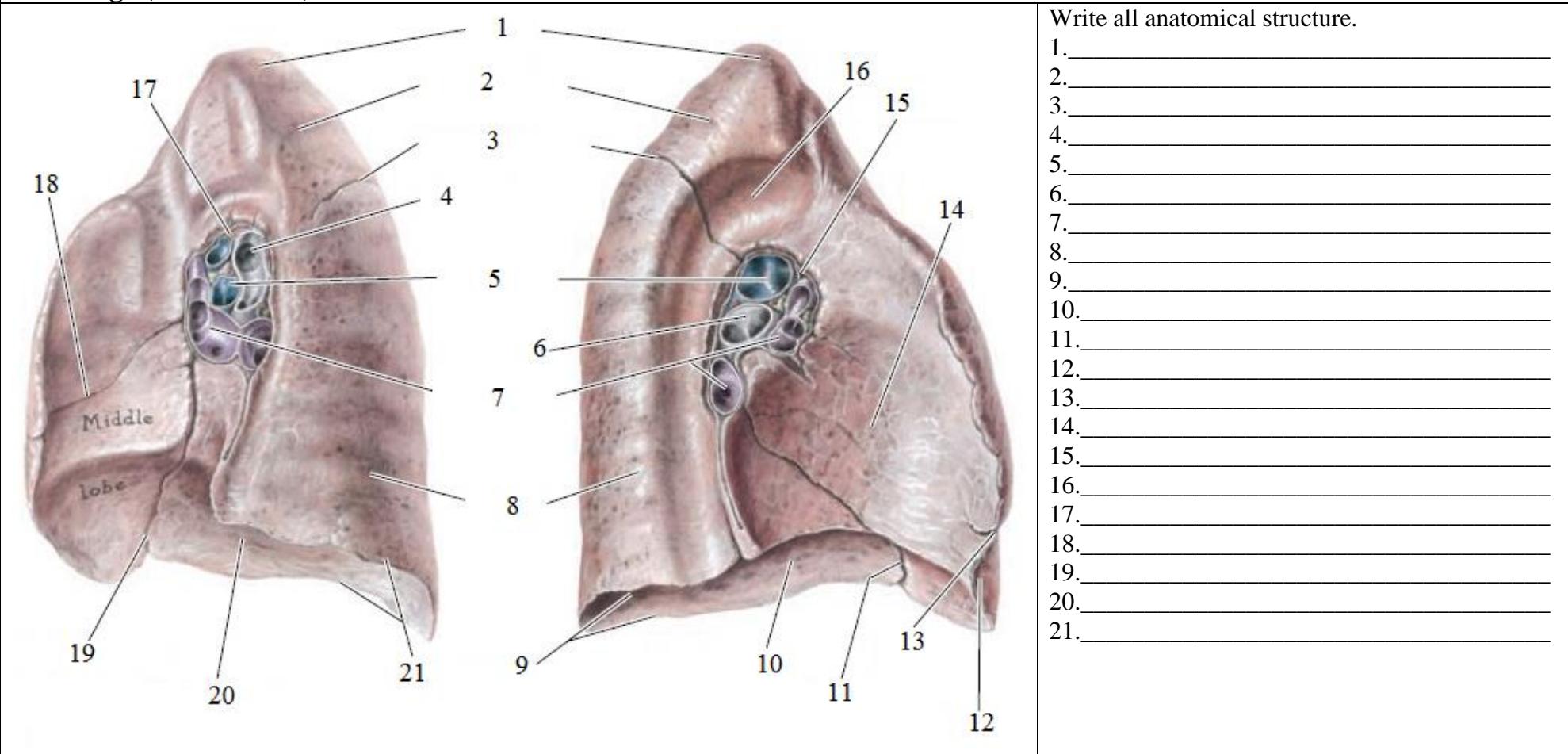
Write all anatomical structure.

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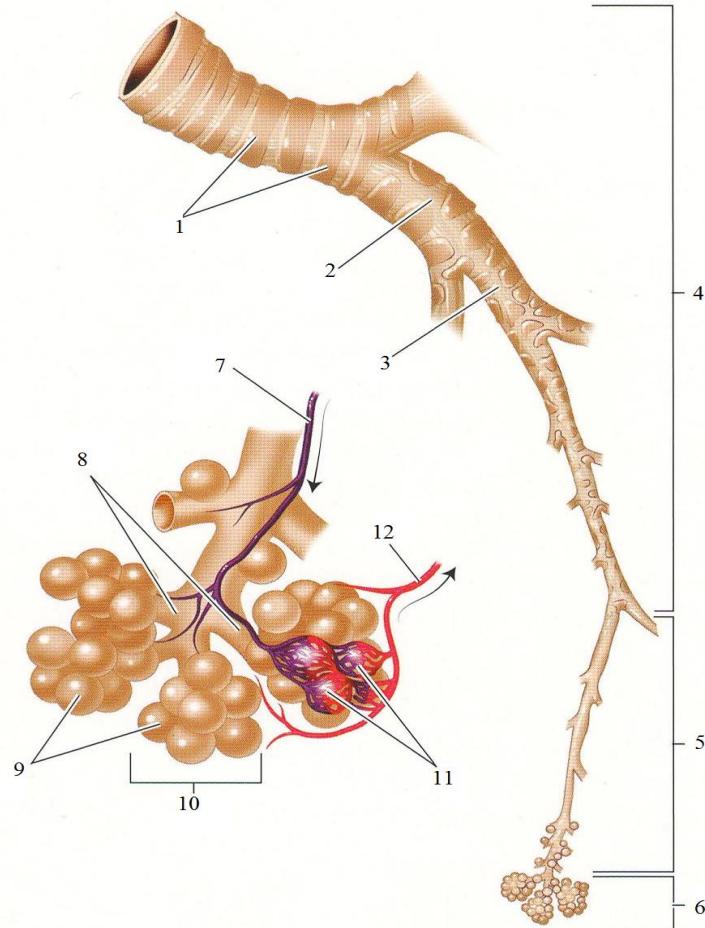
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The lungs (medial view).



6. A patient, 50 years old with the tumor of larynx was made tracheotomy. Can you define, at what level it was made? _____
7. A patient was admitted to a hospital with a knife wound of the thorax on the right and pneumothorax. Percussion has shown that the inferior right lung border at the midclavicular line rose to the III rib level. Where is it located normally? _____

Air pathway and alveolus.



Write all anatomical structure.

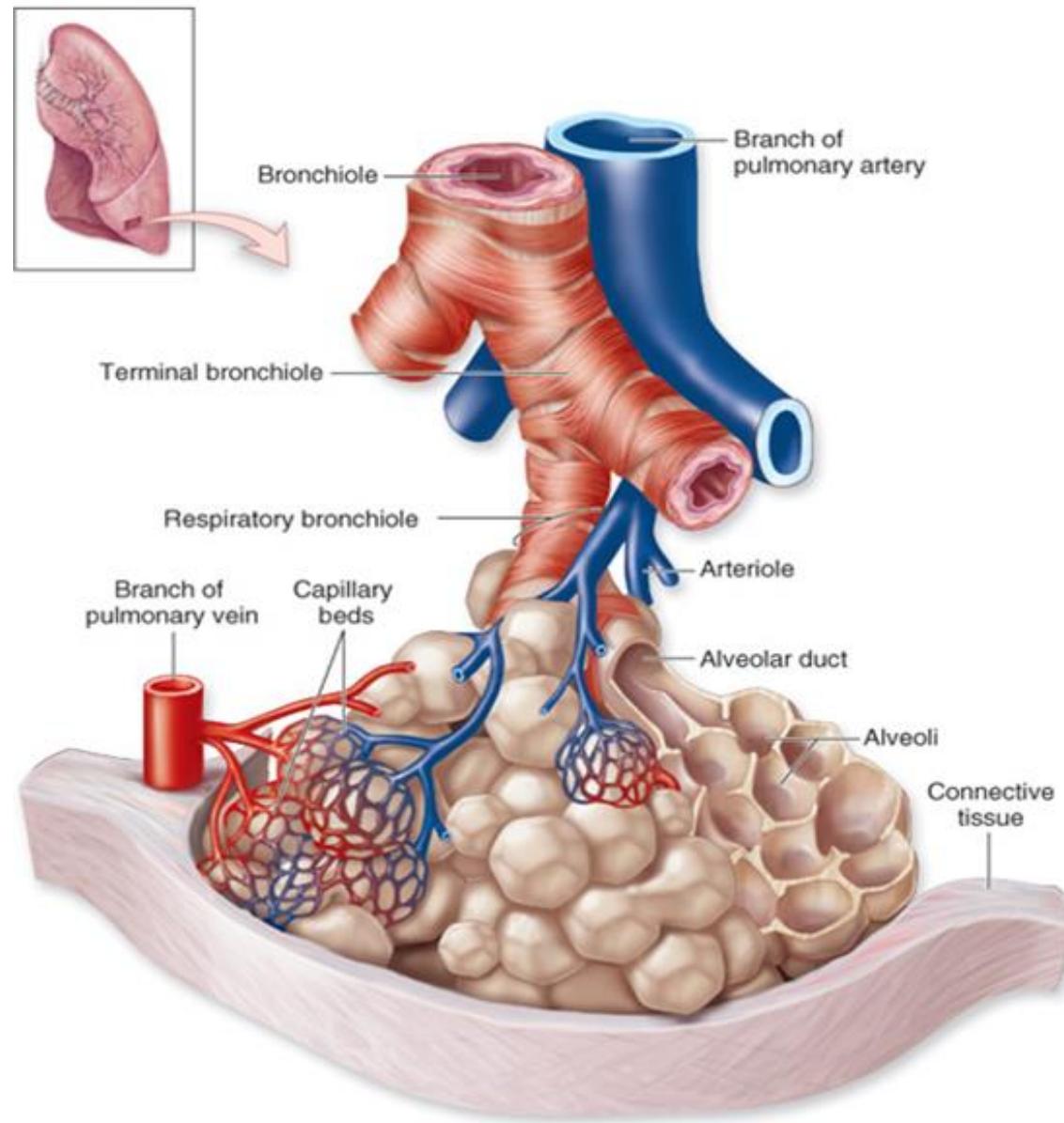
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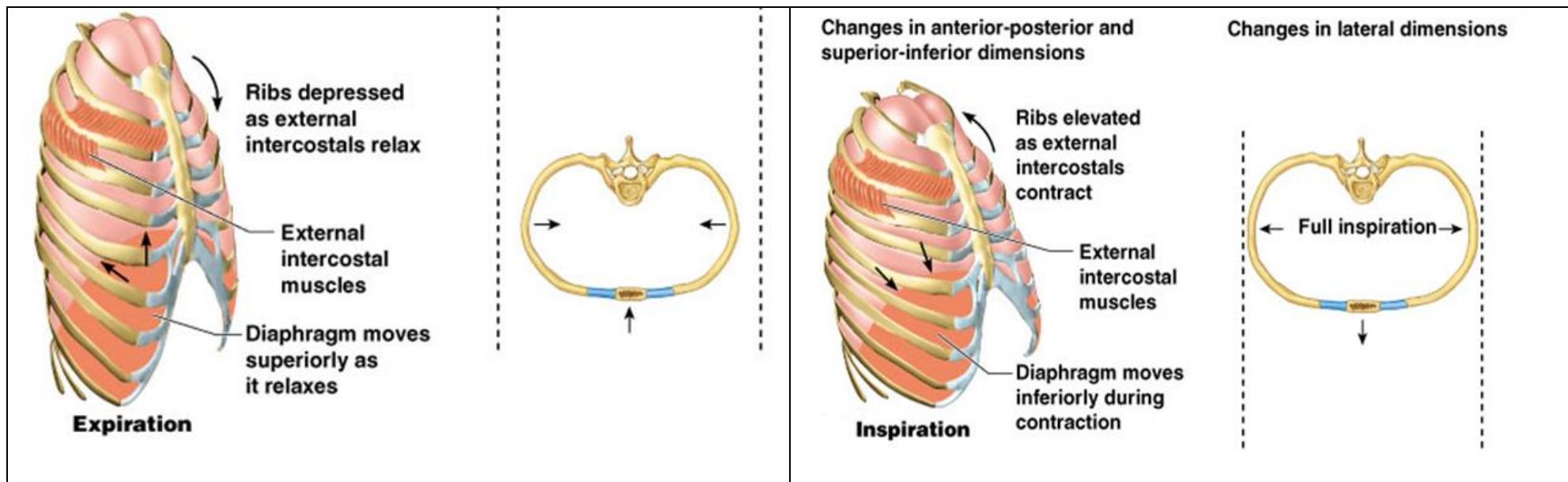
Cardiac tamponade (heart compression) is a potentially lethal condition because heart volume is increasingly compromised by the fluid outside the heart but inside the pericardial cavity. The heart is increasingly compressed and circulation fails. Blood in the pericardial, hemopericardium, produces cardiac tamponade.

The pleural cavity is a potential space between the visceral and parietal pleurae that contains a thin layer of fluid. If a sufficient amount of air enters the pleural cavity, the surface tension adhering visceral to parietal pleura (lung to thoracic wall) is broken, and the lung collapses (atelectasis) because of its inherent elasticity (elastic recoil).

Anatomy of alveoli.



8. A 37-year-old patient has suffered from pulmonary tuberculosis since childhood. Amputation of the middle lobe of the right lung has been performed. Which segments have been amputated? _____
9. During the right-side lobectomy surgeon reached the right lung root in pick out and process its components. Point the order of lung root component from top to bottom? _____
10. A 50-year-old patient with carcinoma of lung had a right-side lobectomy (ablation of the superior lobe of the lung) performed. How many segments were ablated during the operation? _____
11. A patient has a left-side pulmonectomy performed because of the carcinoma of lung. After the dissection of the mediastinal pleura pulmonary veins must be ligated first of all to decrease the possibility of malignant cells metastasis. To avoid mistakes a surgeon must know the order of the root anatomic of the left lung from top to bottom. _____
12. A 10-year-old patient was admitted to a clinic. The day before he had swallowed a nut after what continuous cough and signs of heavy breathing appeared. Phonation function wasn't affected. Where may the foreign body localize? _____
13. During the examination of a 67-year-old patient, X-ray examination shows a tumor of the middle lobe of the right lung. What segments located in this lobe? _____
14. Right-side bronchopneumonia of medial and lateral segments of a patient was diagnosed. To which lobe of lungs do they refer? _____
-
15. A 37-year-old patient had a cough, then asphyxia because a foreign body got into the respiratory tracts. Tracheotomy was made in the neck region limited by the superior belly of omohyoid muscle, sternocleidomastoid muscle and the median neckline. In what triangle of neck was the operation performed? _____



Topic 11: The pleura. Mediastinum. The review of the serous membranous of the inner organs.

Complete the table.

Term in English.	Term in Latin.
The superior interpleural area	Recessus costomediastinalis
	Mediastinum anterius
	Mediastinum posterius

The structure of the pleura.

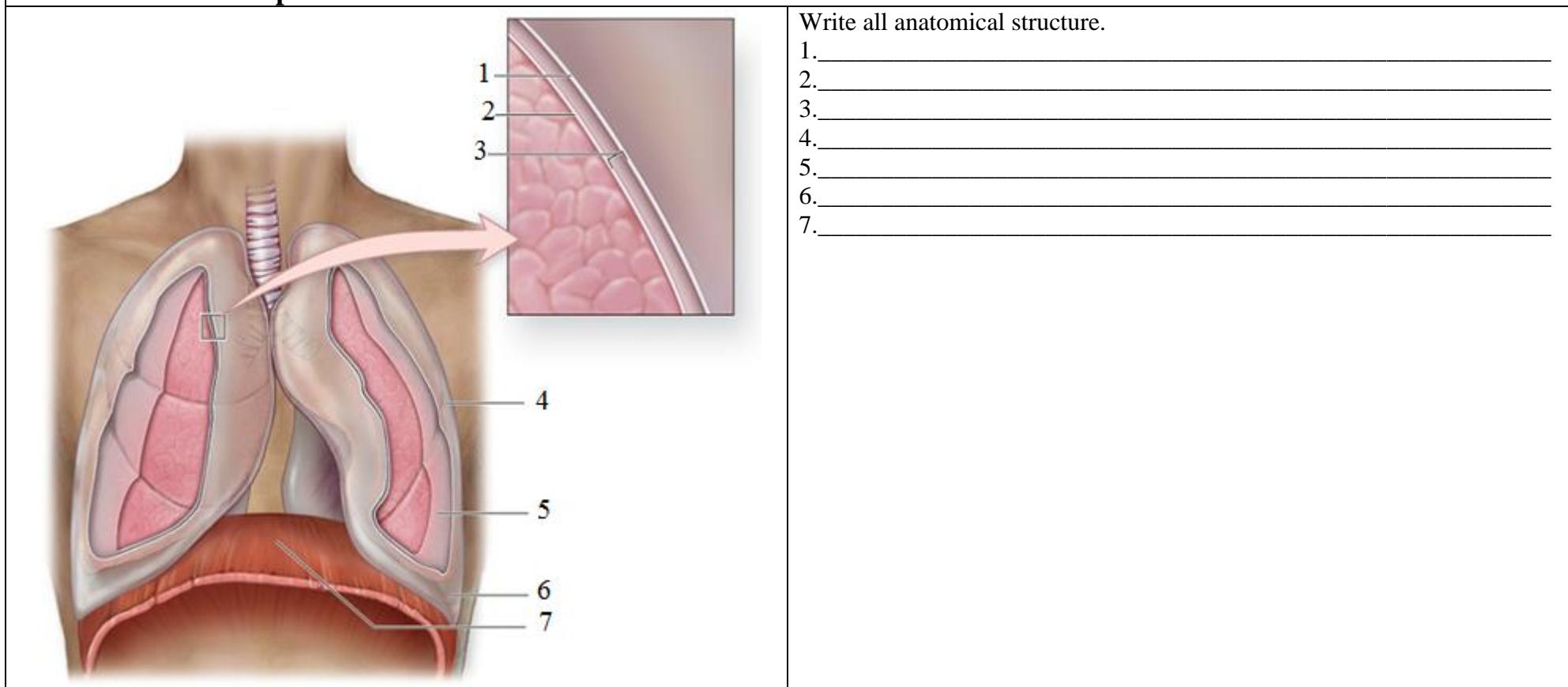
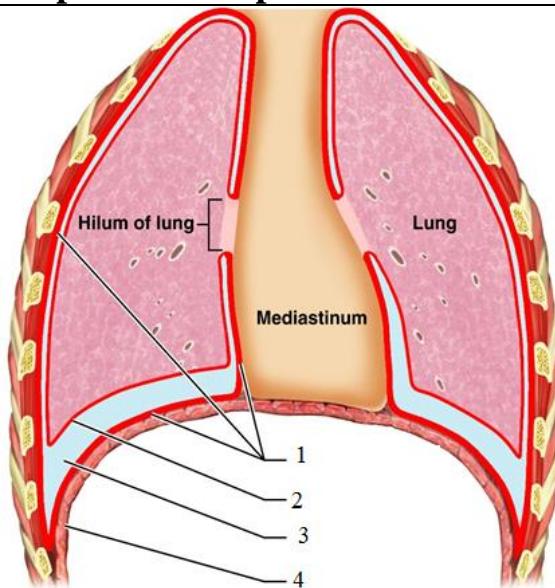


Diagram of the pleurae and pleural cavities.



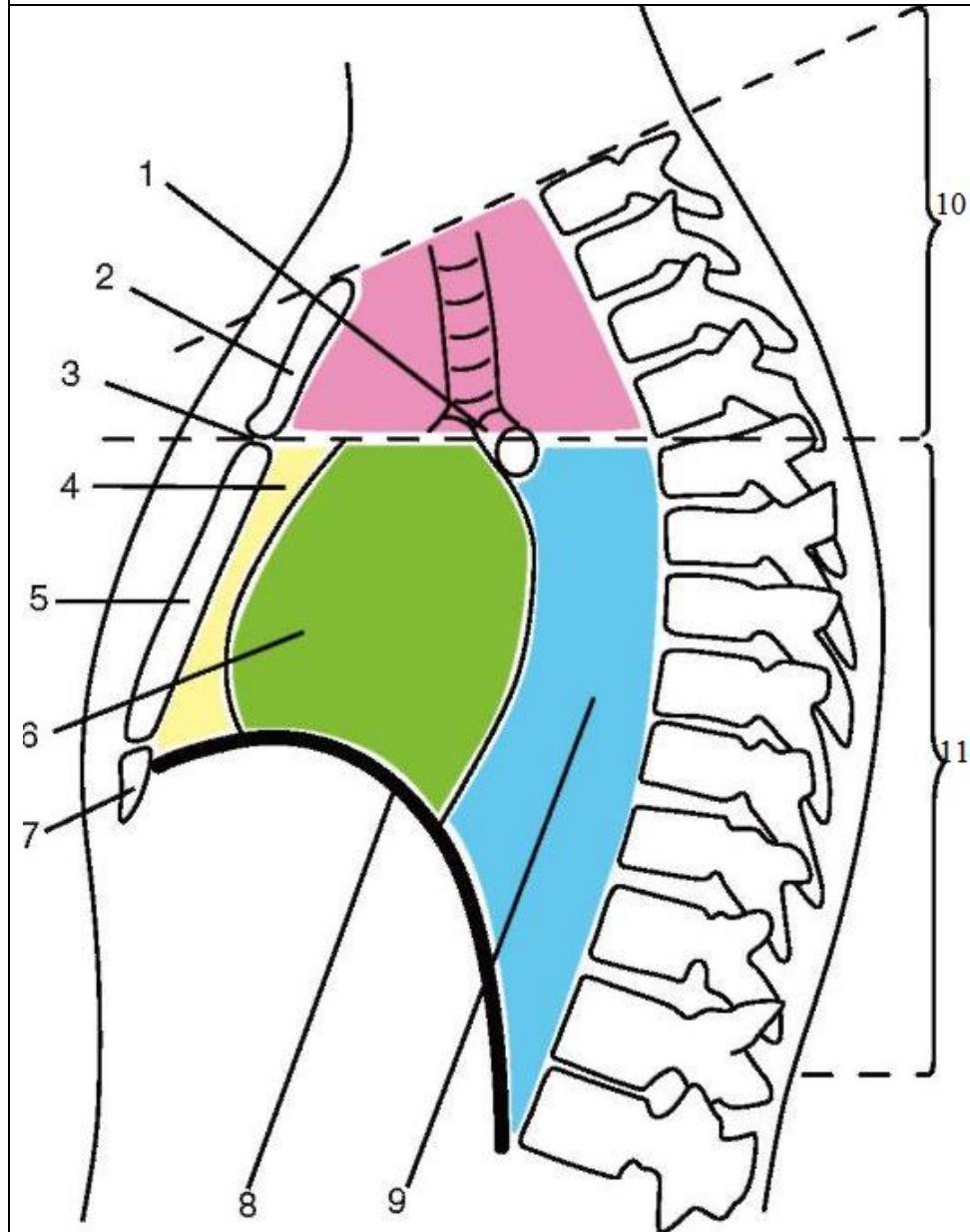
Write all anatomical structure.

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2. _____
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Questions:

1. A patient has an exudative pleurisy. At what level should the pleural puncture along the posterior axillary line be taken? _____
2. After the carried dull trauma of thorax, at a patient pain appeared in a breastbone which increased at percussion, edema of neck and thorax. About the damaging of organs of what mediastinum can we think? _____
3. A 45-year-old patient was hospitalized with complaints of high temperature, pain during respiration, dyspnea and cough. Examination and radio diagnostics diagnosed pleurisy. For exudation evacuation pleurocentesis was prescribed. In what place of the pleura cavity is the largest quantity of exudation? _____
4. Specify parts of the pleura. _____
5. The inferior borders of the lungs never reach the bottom of this recesses whatever deep inspiration. Specify it. _____
6. Specify organs that are situated in the superior mediastinum. _____
7. Specify organs that are situated in the middle mediastinum. _____
8. Specify organs that are situated in the anterior mediastinum. _____
9. Specify organs that are situated in the posterior mediastinum. _____
10. A patient was admitted to a hospital with a knife wound of the thorax on the right and pneumothorax (presence of air in the pleural cavity). Percussion has shown that the inferior right lung border at the midclavicular line rose to the III rib level. Where is it located normally? _____

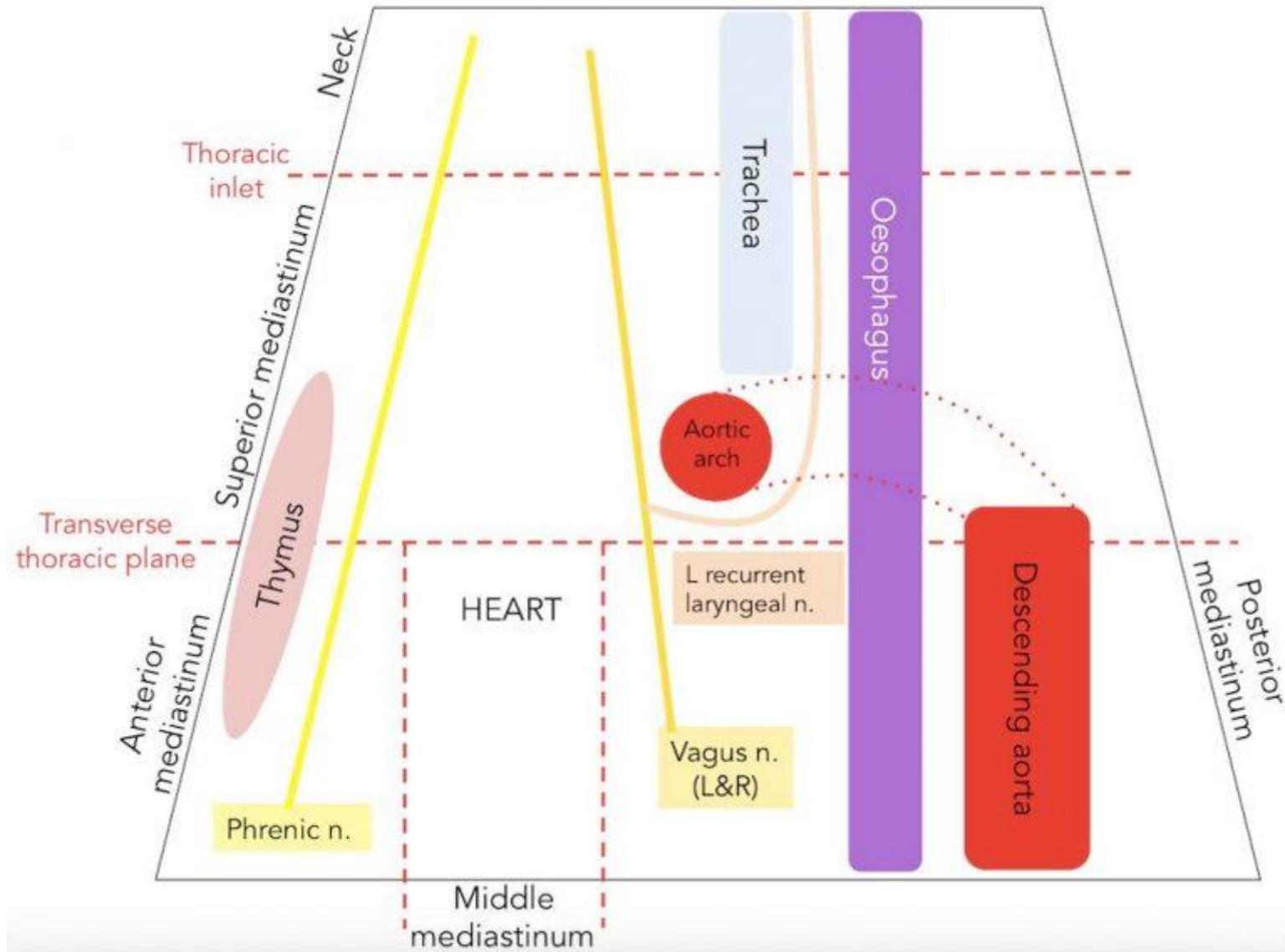
The mediastinum.



Write all anatomical structure.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.

The special relationship of structures that pass from the superior mediastinum to neighbouring regions.

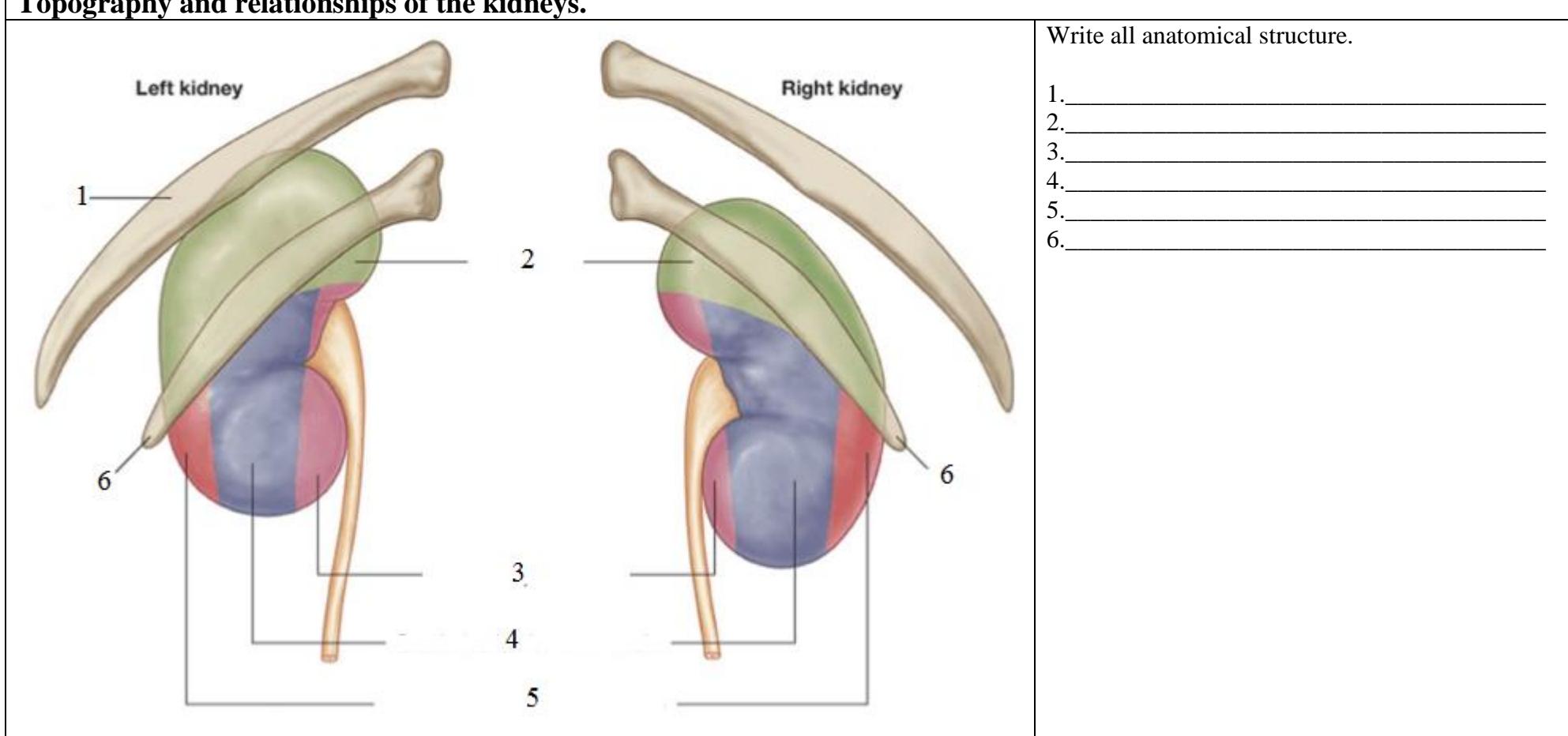


Topic 12: Kidney: external structure, the topography.

Complete the table.

Term in English.	Term in Latin.
The hilum of kidney	
	Sinus renalis
	Capsula adiposa
	Papilla renales

Topography and relationships of the kidneys.

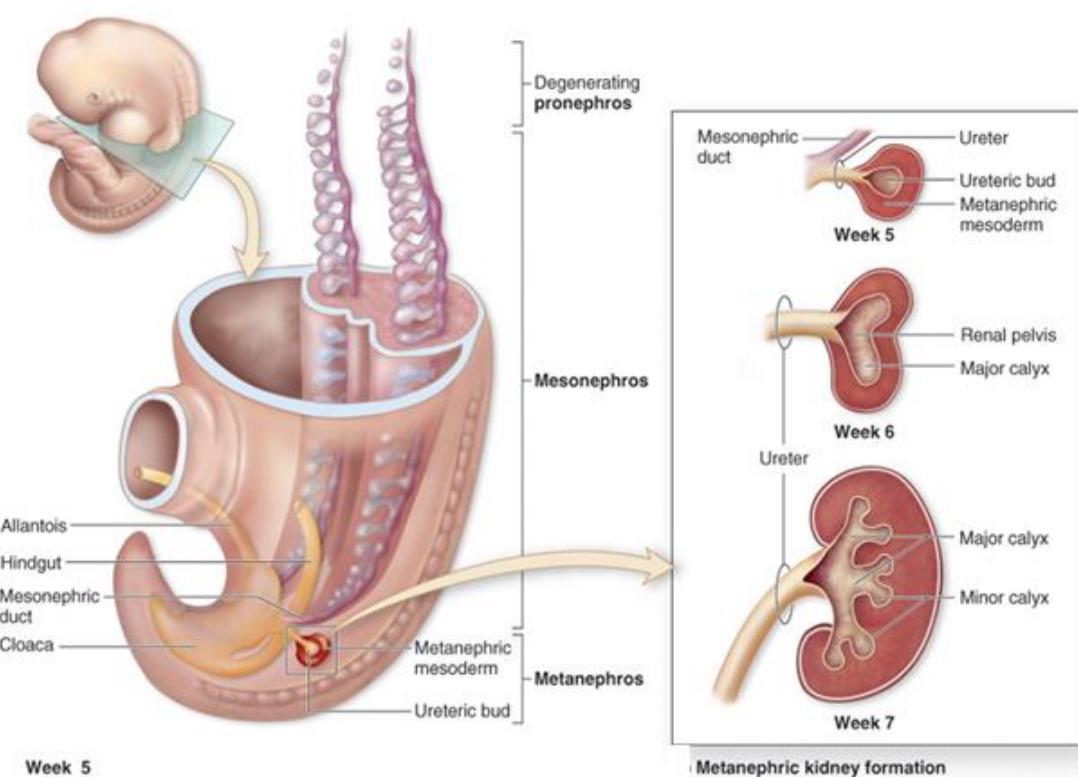


Evolution of excretory organs in vertebrates features a successive development and replacement of three different types of organs — the pronephros (primary kidney), mesonephros (intermediate kidney), and metanephros (definitive kidney).

Structure of pronephros. The pronephros forms in all vertebrates but persists only in cyclostomes. Pronephros is a system of segmental convoluted tubules (nephridia). Proximal ends of tubules open into the body cavity and distal merge to form the excretory canal, which terminates in the caudal segment of digestive tube. The orifices of proximal ends feature cilia that direct the flow to nephridia. Subserous blood vessels form glomerules that filter the fluid. The fluid therefore first collects in the body cavity and then proceeds to the canaliculi. The canaliculi are responsible for urine concentration due to epithelium functioning.

Structure of mesonephros. Further development of renal canaliculi leads to degeneration of the orifices that open into the body cavity. Mesonephral canaliculi thus come into intimate contact with capillary glomerules. Each canaliculus develops a blind double-walled capsule, which enfolds the glomerule to form a renal corpuscle well resembling that of the definitive kidney. The canaliculi become longer, convoluted and acquire more complex structure. They open into common mesonephric duct, ductus mesonephricus, which in turn opens into the cloaca. Generally, the mesonephros appears as a paired elongated organ, which runs along the body. It lies retroperitoneally on the dorso-lateral wall of the body cavity. Mesonephros persists in fish, amphibians and some reptiles.

Relations of the mesonephros to the genitals. The internal genital organs are closely related to the mesonephros. The mesonephric duct in male fish, amphibians and reptiles communicates with the genitals and thus serves to transport semen. Females develop paired paramesonephric ducts, which serve to transport the oocytes. The mesonephros separates into two compartments — the cranial, which loses excretory function and becomes related to the genital organs and caudal, which retains excretory



Metanephric kidney formation

function.

The definitive kidney (metanephros). The birds and mammals develop the definitive kidney appearing as a compact bean-shaped organ. The metanephros retains only excretory function leaving transporting of reproductive products to mesonephros.

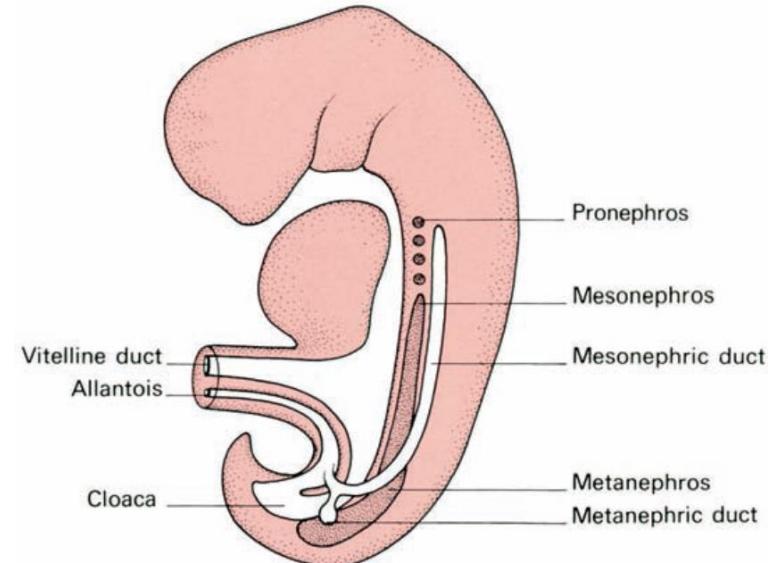
The definitive kidney arises from two sources. The projection in the caudal compartment of the mesonephric duct (the ureter) grows cranially and enters the nephrogenic mass where renal corpuscle and tubules form. The metanephros thus separates from the mesonephros, which in turn becomes responsible for reproductive products transport. In view of the fact that the definitive kidney forms in the lesser pelvis cavity it is also called the pelvic kidney.

DEVELOPMENT OF URINARY ORGANS

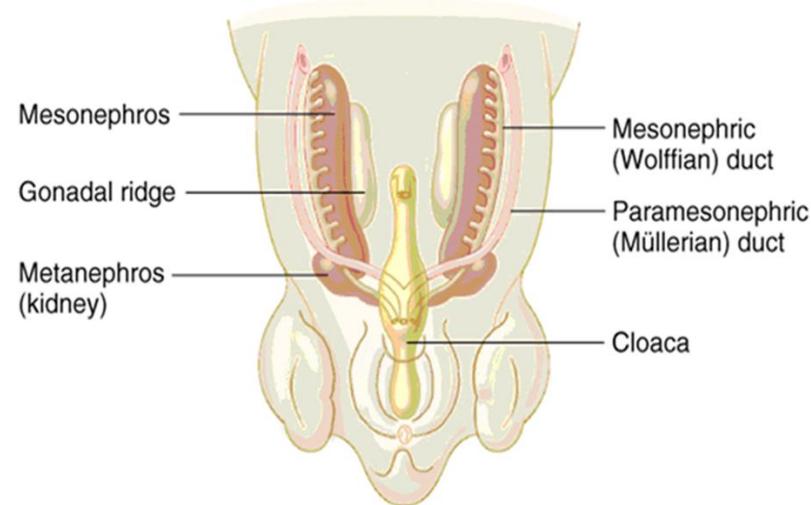
Formation of the urinary organs from mesoderm. Formation of the renal canaliculi is observed by the 4th week of development in so-called intermediate mesoderm (which lies between the ventral and dorsal mesoderm). The canaliculi lie in each segment and generally appear as dense mass called the nephrogenic strand. The nephrogenic mass is a source for all kidney generations.

Recapitulation of kidney phylogeny. During embryonic period, the kidneys successively pass through all evolutional stages i.e. embryo develops the pronephros, mesonephros and metanephros. As development progresses, the pronephric canaliculi degenerate rapidly to become replaced with mesonephric canaliculi. Finally, the metanephros develops so the most part of mesonephros also degenerates except for the canaliculi that give rise to seminiferous tubules.

The pronephros. At the beginning of the 4th week of development, the embryo develops 7 pairs of pronephric canaliculi. They form at the level of cervical and upper thoracic somites. The canaliculi open into the common duct that grows lengthwise and terminates in the cloaca. Orifices of the proximal ends open into the coelomic cavity. Very soon, the pronephros undergoes involution and completely disappears by the 1st



*Development of the pro-, meso-, and metanephric systems
(after Langman).*



The development of the urinary system.

month of development.

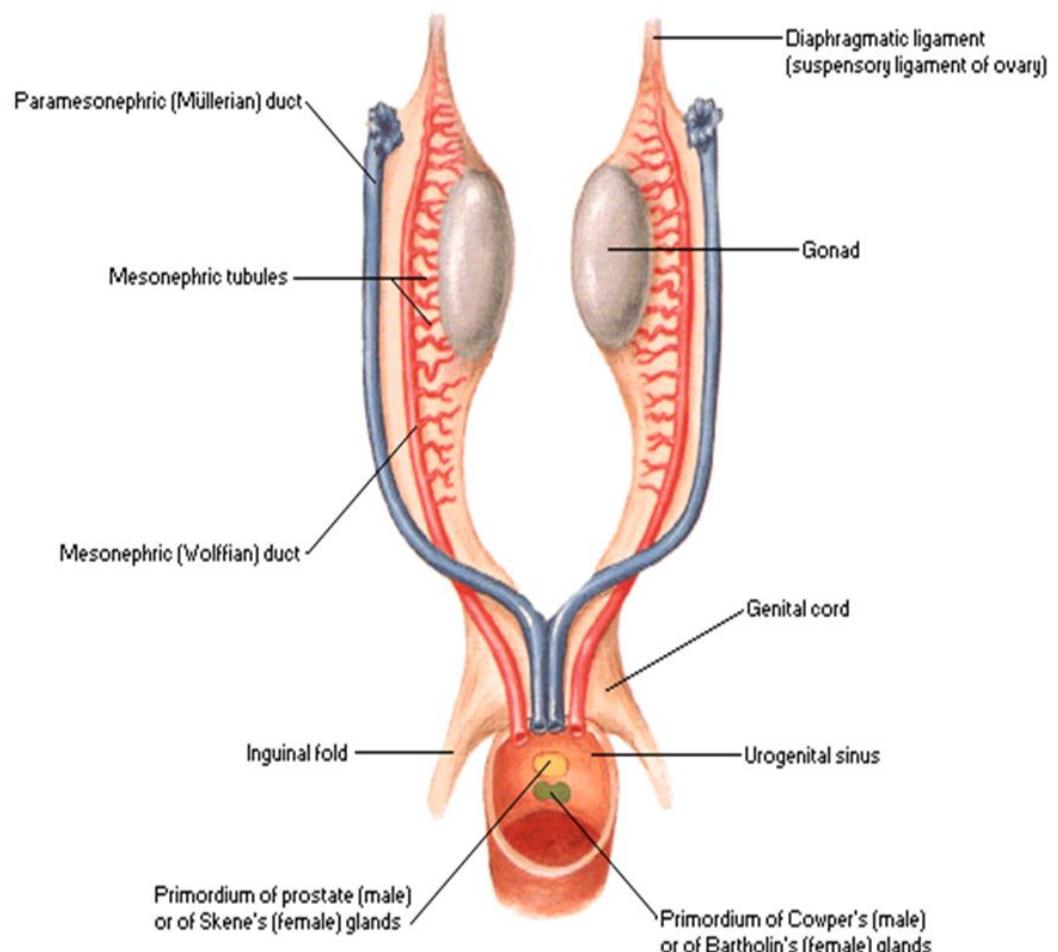
The mesonephros in human embryo exhibits intensive development and unlike pronephros fully performs excretory function. The mesonephros also arises from the nephrogenic strand. It forms as paired S-shaped convoluted canaliculi, which join the pronephric duct. The latter henceforth is called the mesonephric duct, ductus mesonephricus (the Wulfs duct). The nephrogenic strand gives rise to approximately 30 canaliculi but they do not exist simultaneously because as new canaliculi appear in the caudal portion of mesonephros the older ones undergo involution.

Blood vessels of mesonephros. The intermediate kidney receives numerous segmental arterial branches that arise from aorta. Inside the organ, each branch forms a capillary glomerule. The dilated proximal ends of the canaliculi enfold the glomerules and form double-walled capsule. Another arteriole leaves the capsule and again splits into capillary network that enfolds the canaliculi. These capillary collect into the efferent veins.

Maximum development and degeneration of mesonephros. By the end of the 2nd month of embryo life, the mesonephros reaches maximum development. At this period, it appears as an elongated organ, which runs along the body cavity by its dorsal wall. Protruding into the body cavity, the mesonephros gives rise to paired urogenital ridge, plica urogenitales that run along the dorsal mesentery. Further, each ridge splits into lateral mesonephric fold and medial genital fold. The latter gives rise to genitals.

After formation of the metanephros, the mesonephros undergoes involution yet its duct and canaliculi residua give rise to genitals. Double source of metanephros formation. The metanephros appears caudally to the mesonephros and arises from two sources:

- projection of the mesonephros gives rise to the ureter, renal calices, pelvis, papillary ducts and collecting ducts;
- the metanephrogenic mass gives rise to nephron ducts.



The development of the urogenital organs.

Formation of the voiding passages. By the end of the 4th week, the caudal portion of mesonephric duct develops a projection, which is the ureter primordia. Very soon, the end of projection becomes dilated; this dilation corresponds to renal pelvis and calices. The primordia grows cranially and incorporates into the caudal portion of the nephrogenic strand. The metanephrogenic mass enfolds the primordia from all sides. Further, the renal calices primordias give rise to the papillary ducts and collecting ducts.

Formation of the nephrons. Internal differentiation of the metanephrogenic mass constitutes formation of nephron ducts. The renal artery incorporates into the mass and branches off to form the glomerules. The ducts enfold glomerules and form the double-walled capsule. Growing on, the ducts develop segments and eventually join the collecting ducts that arise from calices primordias.

Congenital polycystic kidney.

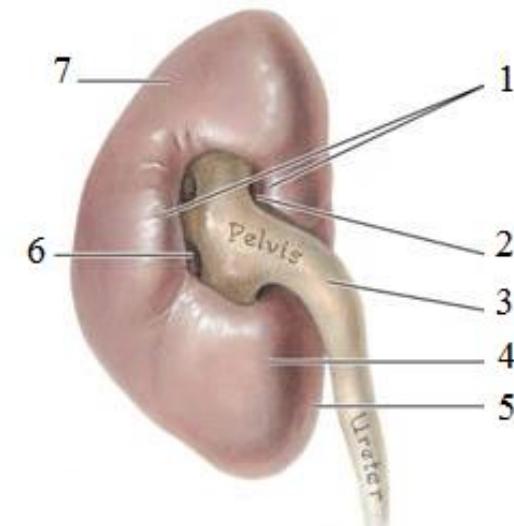
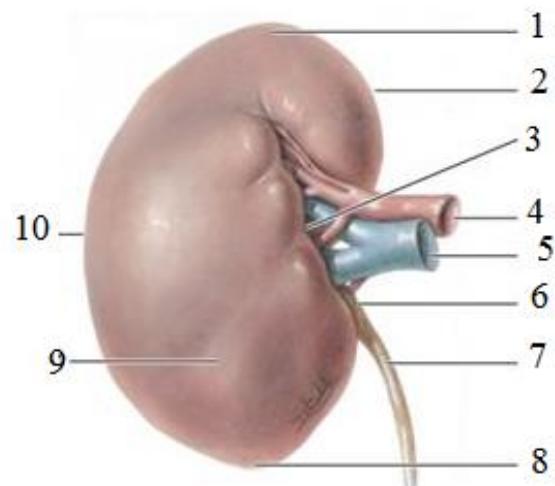
The definitive kidney features tubular systems arising from different sources. If these systems fail to merge, the nephron ducts remain closed. Unable to withdraw the fluid, the nephrons become dilated, which results in formation of vesicles and cysts. The cysts may be solitary or multiple. The most severe congenital renal disease is the polycystic kidney, which features numerous cysts.

Kidney relocation. The metanephrogenic mass, which gives rise to the definitive kidney, resides in the developing caudal portion of embryo. The kidney thus appears in the lesser pelvis cavity. Rapid growth of caudal part of body and ureter primordia results in kidney ascent from the lesser pelvis to the lumbar area. In newborns, the kidney resides at the level of LI. Apart from this the kidney rotates around the long axis so that its lateral surface becomes anterior and the medial — posterior. Alongside with this, the hilum that first faces posterior occupies medial position.

Questions:

1. A patient with a knife wound in the left lumbar part was delivered to the emergency hospital. In course of operation a surgeon found that internal organs were not damaged but the knife injured one of muscles of renal bed. What muscle is it? _____
2. A patient with a knife wound in the right lumbar part was delivered to the emergency hospital. In course of operation a surgeon found that the knife injured one of muscles, which plays the most important role in support of kidneys. What muscle is it? _____
3. After a significant weight loss a 70-year-old man has dull pain in the loin. The diagnose is a floating kidney. In which part of the kidney fixative apparatus have the changes taken place? _____
4. During operation on kidneys, a surgeon must select the renal stalk. What goes out from a kidney gate? _____
5. Ultrasonic examination of a young man of 19 y.o. has shown nephroptosis. Which vertebrae level is the kidneys' normal position? _____
6. During operation on kidneys, a surgeon must select the leg of kidney. What enters in the kidney gate? _____
7. After a significant weight loss, a 67-year-old woman has dull pain in the loin. The diagnose is a floating kidney. In which part of the kidney fixative apparatus have the changes taken place? _____
8. Ultrasonic examination of a young woman of 23 y.o. has shown nephroptosis. Name the structures that is not responsible for kidney support. _____
9. Specify surfaces of the kidney. _____
10. The renal bed – the excavation bounded by which muscle: _____
11. Specify anatomical structure that do not play the role in kidneys' support. _____
12. Which vertebrae level is the kidneys' normal position? _____
13. Skeletope of the right kidney. _____

External structure of the kidney.



Anterior view.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Anteromedial view.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

DEVELOPMENTAL ANOMALIES OF KIDNEYS

Incidence and clinical significance. Kidney development features complex processes (two different primordia, kidney ascent etc.) so renal malformations incidence constitutes 1% of all occurrences in neonates. Some anomalies are asymptomatic and remain undiagnosed throughout the life while some require immediate treatment. Studying of renal malformations thus is of great significance for urology.

Number anomalies. Absence of primordia or growth failure results in unilateral or bilateral renal agenesis (complete absence). Bilateral agenesis is a fatal pathology, while unilateral agenesis or underdevelopment is more common. It becomes important in cases when pathology develops in the single kidney.

Double kidney is another common deformity, which results from unilateral formation of two ureteric buds. The kidney as a rule is enlarged and has two functional ureters. Less common is the smaller accessory (third) kidney.

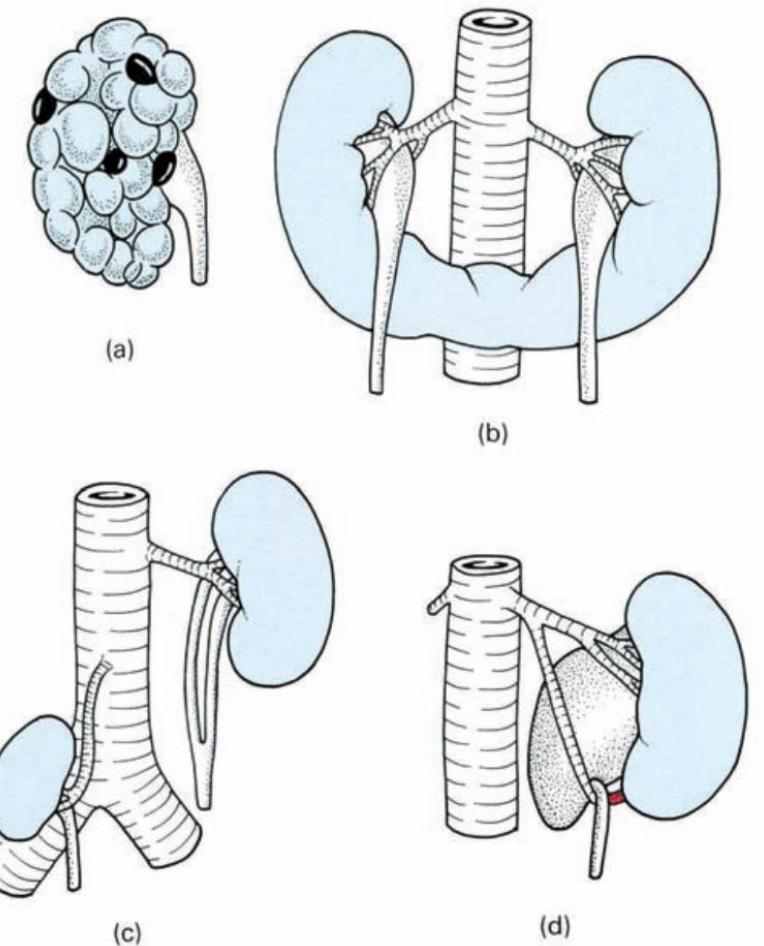
Size anomalies. Unilateral reduction (hypoplasia) of one kidney as a rule combines with enlargement (hyperplasia) of the contralateral organ. Bilateral hypoplasia is uncommon and features severe malfunctioning.

Shape and position anomalies.

Abnormal position (ectopia) constitutes 25% of all congenital anomalies. Ectopia may be unilateral and bilateral. Lumbar and iliac ectopias are the most common types of abnormal position of kidneys. Pelvic ectopia occurs as the result of complete ascent failure. Abnormal position usually combines with deformities and incomplete rotation.

Number anomalies and position anomalies of the renal arteries. In this group, additional renal arteries are the most frequent. It has a smaller diameter and goes to the upper or lower segment of the kidney from the abdominal aorta or from the trunk of the kidney, suprarenal, common iliac arteries. Additional renal arteries can be six or more. They are one of the main causes of violation of urodynamics and development of hydronephrosis. Additional arteries can be found in 21.4% of patients operated because of hydronephrosis. The main clinical sign of additional vessels of the lower pole of the kidney is the pain syndrome of varying intensity (attack of renal colic), complicated by pyelonephritis. Diagnosis of additional vessel can be based on X-ray and other methods. The

Renal abnormalities. (a) Polycystic kidney. (b) Horseshoe kidney. (c) Pelvic kidney and double ureter. (d) Aberrant renal artery and associated hydronephrosis.



treatment should be surgical.

Double kidney artery. Kidney is supplied with blood by two identical diameter arteries. One of the two renal artery lies behind the pelvis. It branches into the form of a network. The pelvis is blocked by the renal artery and its branches of a large diameter. This can prevent from removing of the stone through an incision in the back of the kidney.

Multiple kidney arteries. There are common for the kidney in a shape of a horseshoe and other types of dystopia kidney, but can also occur in the normally developed kidney. Renal artery aneurysm are also corresponded to the anomalies of shape and structure of the renal arterial trunks. Renal artery aneurysm is represented in the shape of sack or fusiform enlargement of the vessel. Moreover, they are of an unilateral. Aneurysms have a certain symptomatology detected in 60-80% of cases.

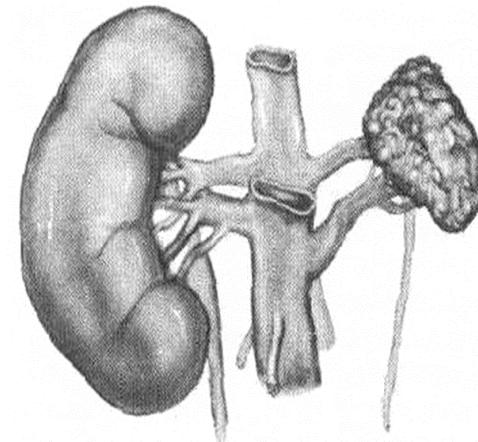
The doubling of the kidneys also happens quite often, it is associated with two ureteral outgrowths on one side. Such a kidney is enlarged and has 2 ureters.

1) full doubling of the left pelvis and ureter, 2) doubling of the the left pelvis with splitting of the ureter, 3) bilateral doubling of pelvises and ureters, 4) bilateral doubling of pelvises and ureters splitting, 5) bilateral doubling of pelvises, doubling of the right ureter and splitting of the left one

Rare anomaly is the presence of an extra (third) kidney, which is much smaller by size.

The abnormal sizes. Decrease (hypoplasia) of the size of one kidney with its normal structure usually combines with an increase (hyperplasia) of the opposite kidney. Hypoplasia of both kidneys includes severe disruption of their functions, which is rather uncommon.

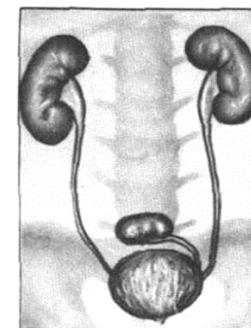
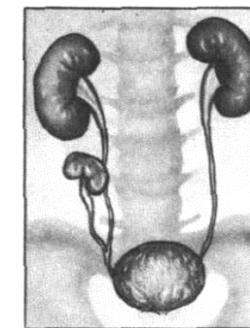
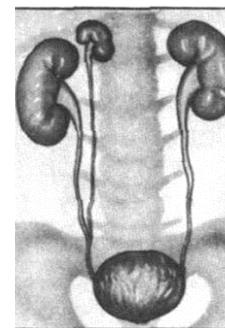
Shape and position anomalies. Abnormal position (ectopia) constitutes 25% of all congenital anomalies. Ectopia may be unilateral and bilateral. Lumbar and iliac ectopias are the most common types of abnormal position of kidneys. Pelvic ectopia occurs as the result of complete ascent failure. Abnormal position usually combines with deformities and incomplete rotation.



Aplasia of the left kidney.

The absence of the kidneys on both sides is incompatible with life.

Variants of agenesis and aplasia of the left kidney. A - agenesis with absence of ureter, b - aplasia with the presence of a rudimentary ureter, β - crossed dystopia of the right kidney with agenesis of left kidney.



- 1) heterolateral dystopia,
- 2) cross iliac dystopia of the one kidney,
- 3) pelvic dystopia of one kidney,
- 4) pelvic dystopia.

The kind of dystopia determines the blood supply of the kidney. The vessels of lumbo-dystopic kidney are placed normally, but more often they can be doubled and originate from the aorta, from the level of the second lumbar vertebra before the bifurcation of the abdominal aorta.

If the kidney is above the sacrum bone or in the pelvic cavity, the vessels may deviate from the common iliac and the external iliac, median sacral or inferior mesenteric arteries. The arteries are accompanied by corresponding veins. Kidney dystopia combined with anomalies of genital organs.

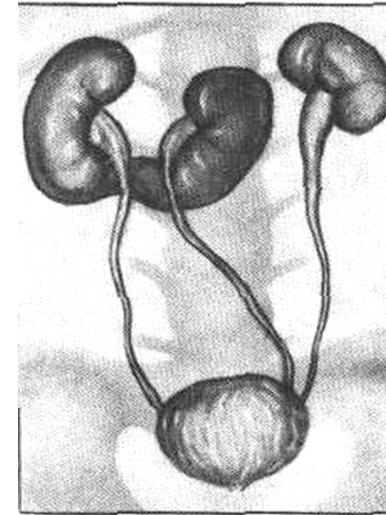
Intrathoracic dystopia of a kidney is very rare and is called epiphrenic dystopia. A healthy kidney is placed above the diaphragm and it is not clinically detected.

Pelvic dystopia is characterized by deep-seated kidney positioned in the pelvic cavity. It can be placed in the sacral groove. In these cases, the fatty tissue, sacral nervous plexus, pyramidal and sacrococcygeal muscle are located between the sacral bone and the kidney.

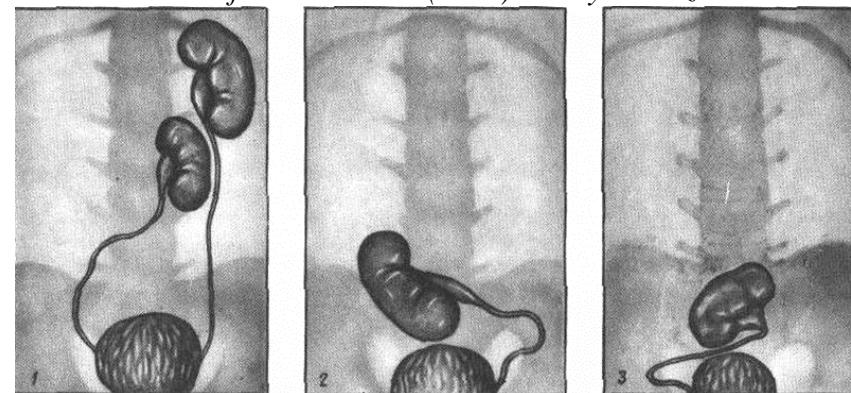
In severe pelvic kidney dystopia, the kidney is located between the rectum and the bladder in men and between the uterus and rectum in women. The upper pole of the kidney is covered by peritoneum, and the lower one is on the pelvic diaphragm, and the middle part of the kidney is bordered with the prostate gland in men or the back of the vagina in women. Pelvic dystopia can be uni- or bilateral. At bilateral dystopia it is possible the fusion of the kidneys. The form of the kidney can be round, flattened, galette-like and partial.

Pelvic dystopia of the left kidney. Ureter of the left kidney is compressed by one of the numerous branches of the renal artery.

Kidneys fusion. Fusion of two renal primordia results in formation of single organ with two ureters. Most common is fusion of inferior poles called horseshoe kidney (90% of all occurrences). This malformation as a rule is associated with lumbar or pelvic ectopia. Less common are rosette kidney, S-shaped kidney, L-shaped kidney, hook-like kidney, etc.



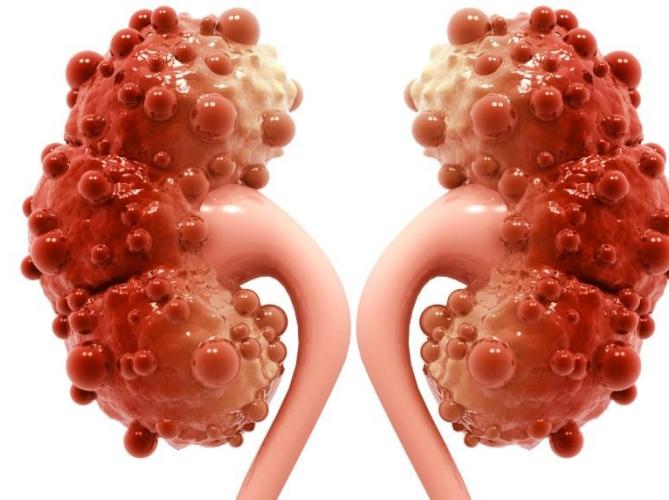
Schemes of an additional (third) kidney localization.



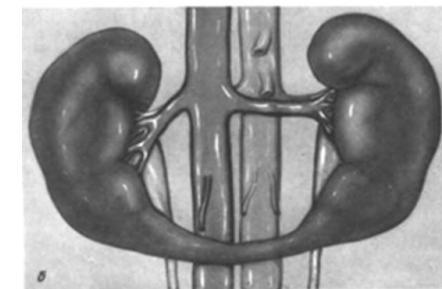
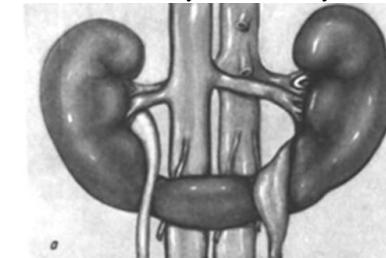
The anomalies of kidney position.

Multicystic kidney. This is a rare anomaly which amounts to 1.1% of all the anomalies of the kidney. This anomaly is characterized by a total replacement of the renal parenchyma by cystic formations. In 50% of cases older children and adults in the projection multicystic kidney can be determined by round shadows, calcified cysts in the X-ray.

Polycystic kidney disease. This is a severe abnormality of both kidneys, which is characterized by replacement of renal parenchyma by multiple cysts of different sizes. There are two forms of polycystic kidney disease: the first one with increasing dimensions of the kidney (detected more often) and second one with no increasing or with some decreasing size of the kidneys.



Multicystic kidney.



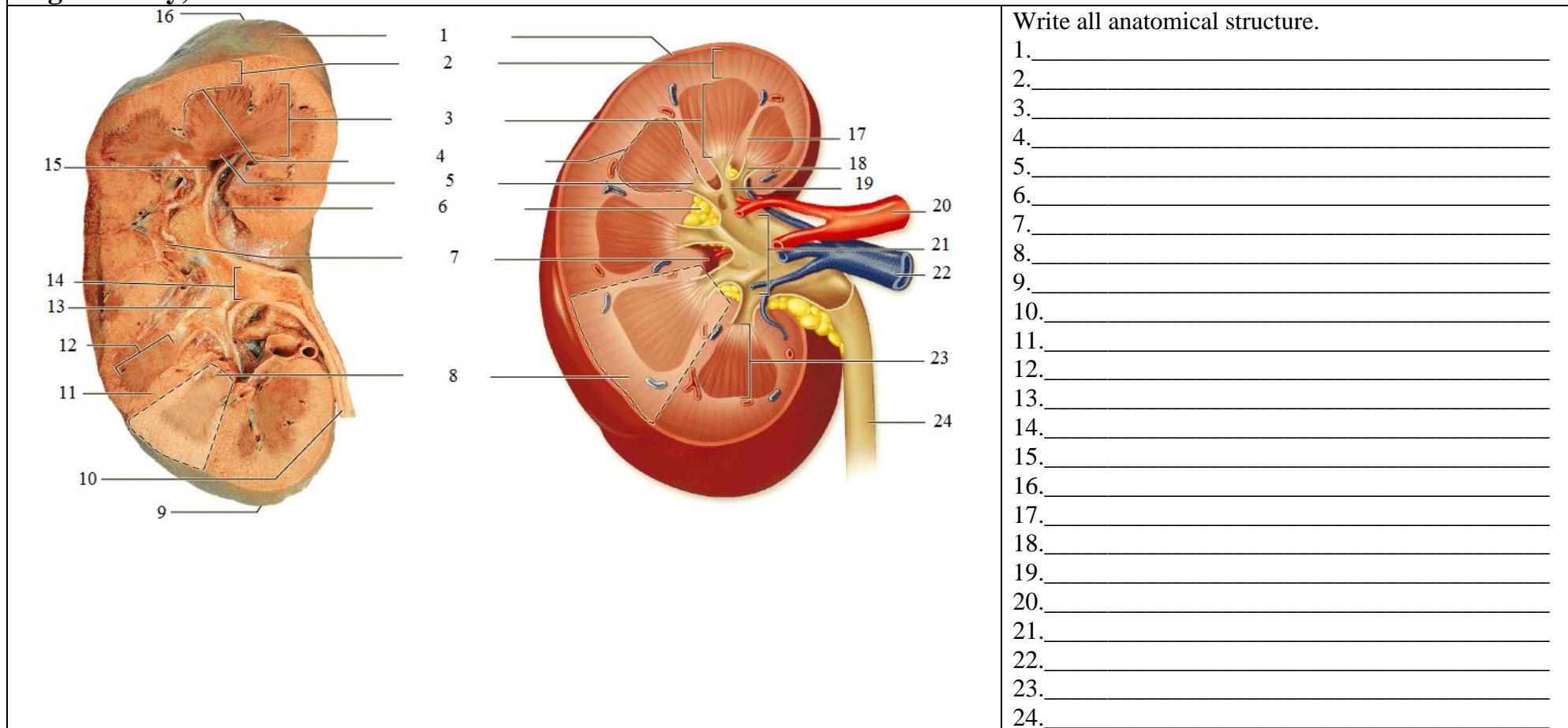
A horseshoe kidney with wide isthmus (a), which compresses the urethra and narrow (b) of the isthmus.

Topic 13: Internal structure of the kidney. The segments of the kidney. Malformations.

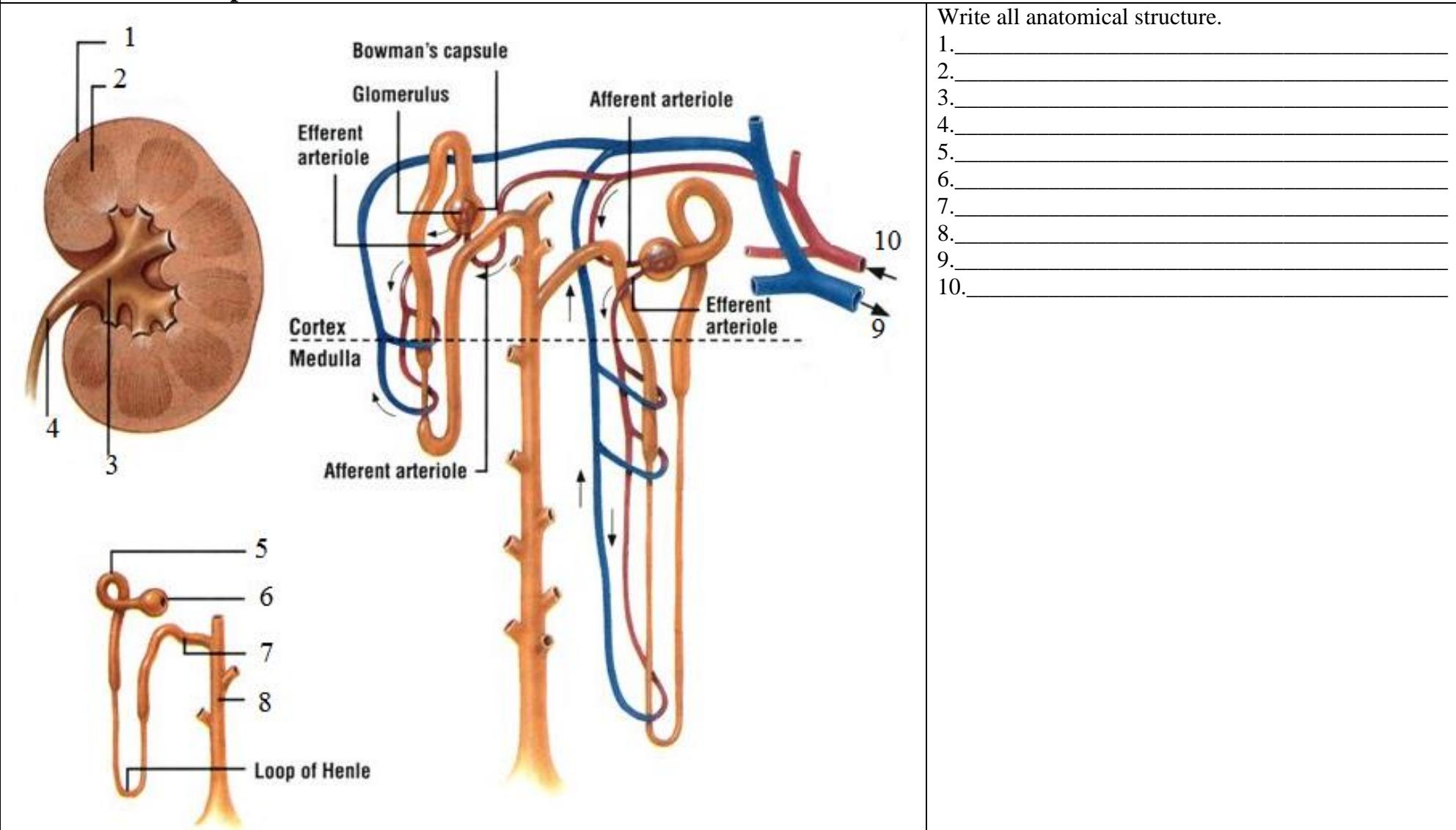
Complete the table.

Term in English.	Term in Latin.
	Capsula glomeruli
	Ductuli papillares
	Pelvis renalis
	Calices renales

Right kidney, coronal section.



Structure of the nephron.



Clinical applications.

Under conditions of rapid blood loss (e.g. in hemorrhagic shock) the small arterioles of outer nephrons contract leaving renal circulation to jux- medullary nephrons. Blood circulation thus becomes restricted to the medulla. This may result in renal insufficiency though renal blood circulation remains undisturbed. The most significant place among renal diseases belongs to tubular degeneration (nephritis) and inflammatory diseases of glomerular tubular system (nephritis and glomerulonephritis). These pathologies often develop as complications of infectious diseases and intoxications. The branch of medicine that studies diagnostics and treatment of renal diseases is called nephrology.

The renal pelvis, pelvis renalis (Greek synonym is ‘pyelos’; it gives birth to ‘pyelitis’ — inflammation of pelvis) lies in the renal sinus. Its narrower part enters the hilum of kidney where becomes continuous with the ureter. Within the hilum, the pelvis lies posterior to related blood vessels.

Sphincters. Walls of the calices and pelvis contain non-striated circular muscle fibers, which resemble sphincters. These sphincters reside in the fornix and pelvic outlet. The sphincters assist in forcing urine through the calices and pelvis and prevent urine backflow. Pathologies of calices and pelvis may result in urinary congestion.

The calices and pelvis are the common places where renal stones (calculi) form. Dislodged stone may block the pelvis or ureter lumen. Very often, the tone affected pelvis exhibits purulent inflammation complicated with nephritis (pyelonephritis). Passing stone causes severe pain called the renal colic. This state requires surgery. Recent treatment modalities include ultrasound techniques of stones fragmentation suitable for outpatient use.

Questions:

1. Describe interior of the kidney on frontal section. _____

2. Name the renal segments. _____

3. Give definition of renal lobes and lobules. _____

4. Give definition of nephron and describe its structure. _____

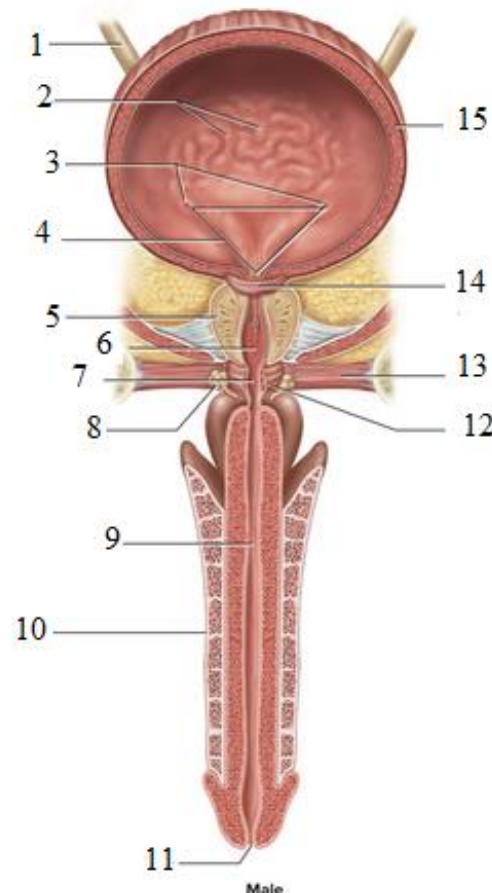
5. What groups of nephrons are distinguishable in renal cortex? _____

Topic 14: Ureters, urinary bladder. Male and female urethrae. X-ray anatomy of the urine voiding organs.

Complete the table.

Term in English.	Term in Latin.
The fundus of bladder	
The median umbilical ligament.	
The vesico-uterine pouch	
Recto-vesical pouch	

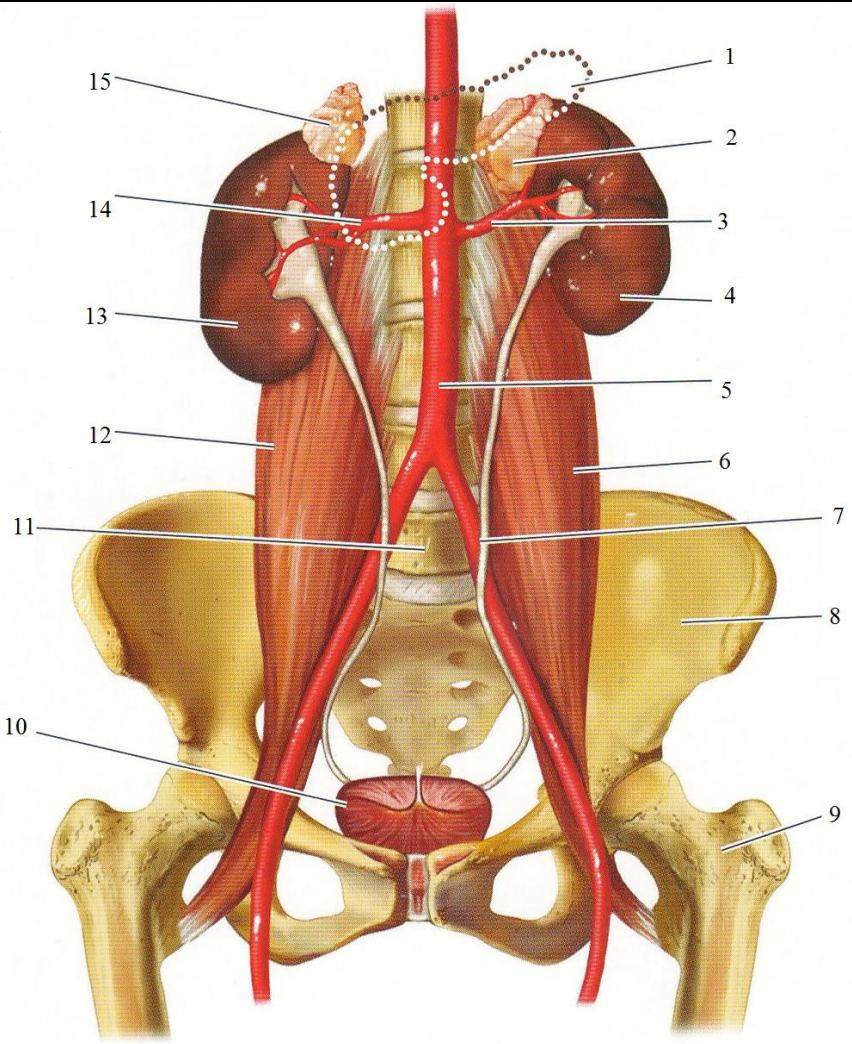
The Urinary Bladder and Urethra (frontal sections).



Write all anatomical structure.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.
- 13.
- 14.
- 15.

Anatomical relationships of the urinary system (anterior view).



Write all anatomical structures.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____

CR!

Micturition (urination) is the process by which urine is expelled from the urinary bladder. It involves the contraction of the detrusor muscle, and may be aided by contractions of muscles in the abdominal wall and pelvic floor, and by fixation of the thoracic wall and diaphragm. Micturition also involves the relaxation of the external urethral sphincter. This muscle, which is part of the urogenital diaphragm, surrounds the urethra about 3 centimeters from the bladder and is composed of voluntary skeletal muscle tissue.

The need to urinate is usually stimulated by distension of the bladder wall as it fills with urine. When the wall expands, stretch receptors are stimulated, and the micturition reflex is triggered.

The micturition reflex center is located in the sacral portion of the spinal cord. When the reflex center is signaled by sensory impulses from the stretch receptors, parasympathetic motor impulses travel out to the detrusor muscle, which undergoes rhythmic contractions in response. This action is accompanied by a sensation of urgency.

Although the urinary bladder may hold as much as 600 milliliters of urine, the desire to urinate is usually experienced when it contains about 150 milliliters. Then, as the volume of urine increases to 300 milliliters or more, the sensation of fullness becomes increasingly uncomfortable.

As the bladder fills with urine, and its internal pressure increases, contractions of its wall become more and more powerful. When these contractions become strong enough to force the internal urethral sphincter to open, another reflex begins to operate. This second reflex signals the external urethral sphincter to relax, and the bladder may empty.

However, because the external urethral sphincter is composed of skeletal muscle, it can be consciously controlled. Thus, the sphincter muscle ordinarily remains contracted until a decision is made to urinate. This control is aided by nerve centers in the brain stem and cerebral cortex that are able to inhibit the micturition reflex. When a person decides to urinate, the external urethral sphincter is allowed to relax, and the micturition reflex is no longer inhibited. Nerve centers within the pons and the hypothalamus function to make the micturition reflex more effective. Consequently, the detrusor muscle contracts, and urine is excreted to the outside through the urethra. Within a few moments, the neurons of the micturition reflex seem to fatigue, the detrusor muscle relaxes, and the bladder begins to fill with urine again.

Damage to the spinal cord above the sacral region may result in the loss of voluntary control of urination. However, if the micturition reflex center and its sensory and motor fibers are uninjured, micturition may continue to occur reflex. In this case, the bladder collects urine until its walls are stretched enough to trigger a micturition reflex, and the detrusor muscle contracts in response. This condition is called an automatic bladder.

Major events of micturition

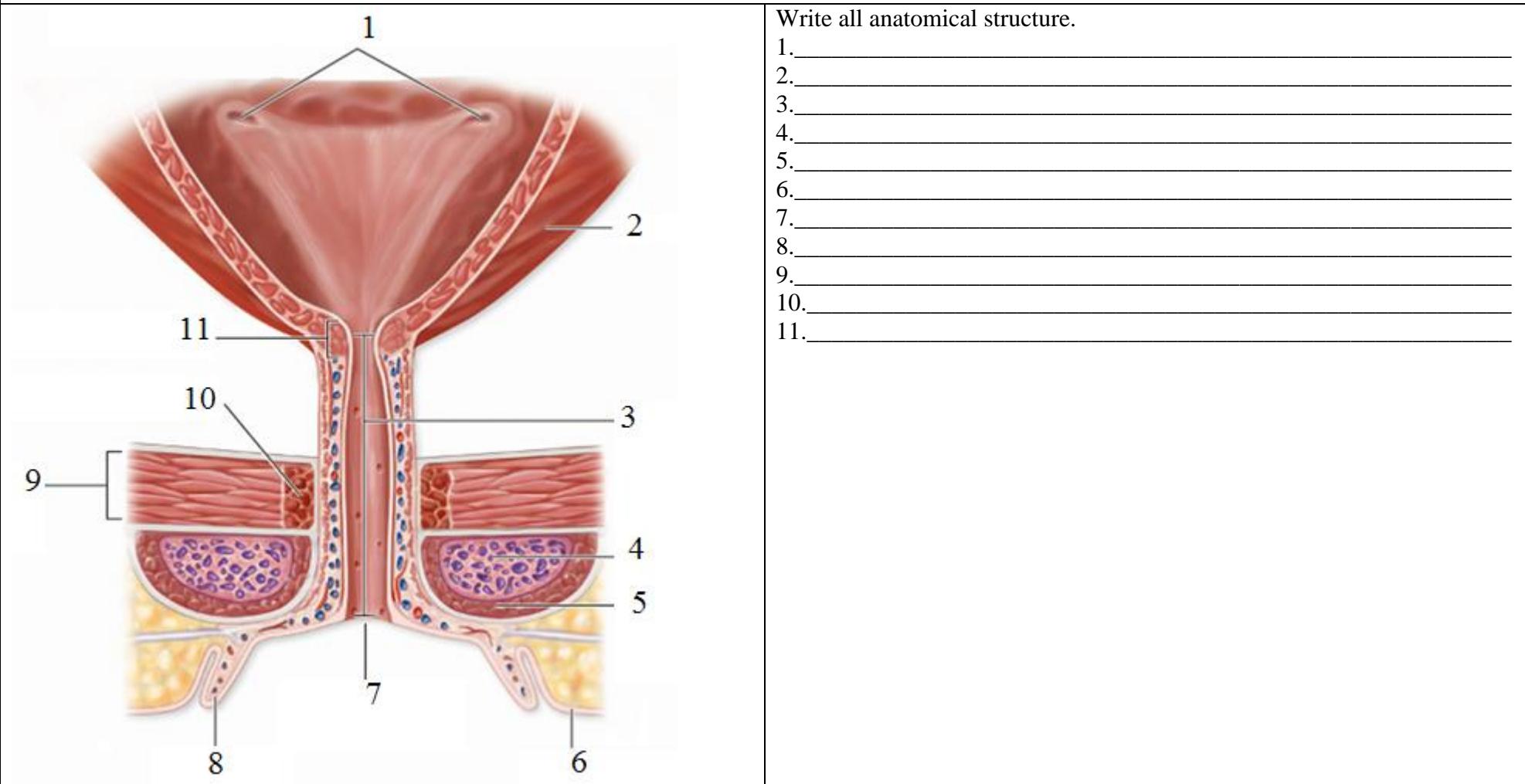
1. Urinary bladder becomes distended as it fills with urine.
2. Stretch receptors in the bladder wall are stimulated, and they signal the micturition center in the sacral spinal cord.
3. Parasympathetic nerve impulses travel to the detrusor muscle, which responds by contracting rhythmically.
4. The need to urinate is sensed as urgent.
5. Urination is prevented by voluntary contraction of the external urethral sphincter and by inhibition of the micturition reflex by impulses from the brainstem and the cerebral cortex.
6. Following the decision to urinate, the external urethral sphincter is relaxed, and the micturition reflex is facilitated by impulses from the pons and the hypothalamus.
7. The detrusor muscle contracts, and urine is expelled through the urethra.
8. Neurons of the micturition reflex center fatigue, the detrusor muscle relaxes, and the bladder begins to fill with urine again.

The male urethra extends from the internal urethral orifice in the urinary bladder to the external urethral orifice at the end of the penis. It presents a double curve in the ordinary relaxed state of the penis. Its length varies from 17.5 to 20 cm.; and it is divided into three portions, the prostatic, membranous, and cavernous, the structure and relations of which are essentially different. Except during the passage of the urine or semen, the greater part of the urethral canal is a mere transverse cleft or slit, with its upper and under surfaces in contact; at the external orifice the slit is vertical, in the membranous portion irregular or stellate, and in the prostatic portion somewhat arched.

The female urethra is a narrow membranous canal, about 4 cm. long, extending from the internal to the external urethral orifice. It is placed behind the symphysis pubis, imbedded in the anterior wall of the vagina, and its direction is obliquely downward and forward; it is slightly curved with the

concavity directed forward. Its diameter when undilated is about 6 mm. It perforates the fasciae of the urogenital diaphragm, and its external orifice is situated directly in front of the vaginal opening and about 2.5 cm. behind the glans clitoridis. The lining membrane is thrown into longitudinal folds, one of which, placed along the floor of the canal, is termed the urethral crest. Many small urethral glands open into the urethra.

Female urethra.



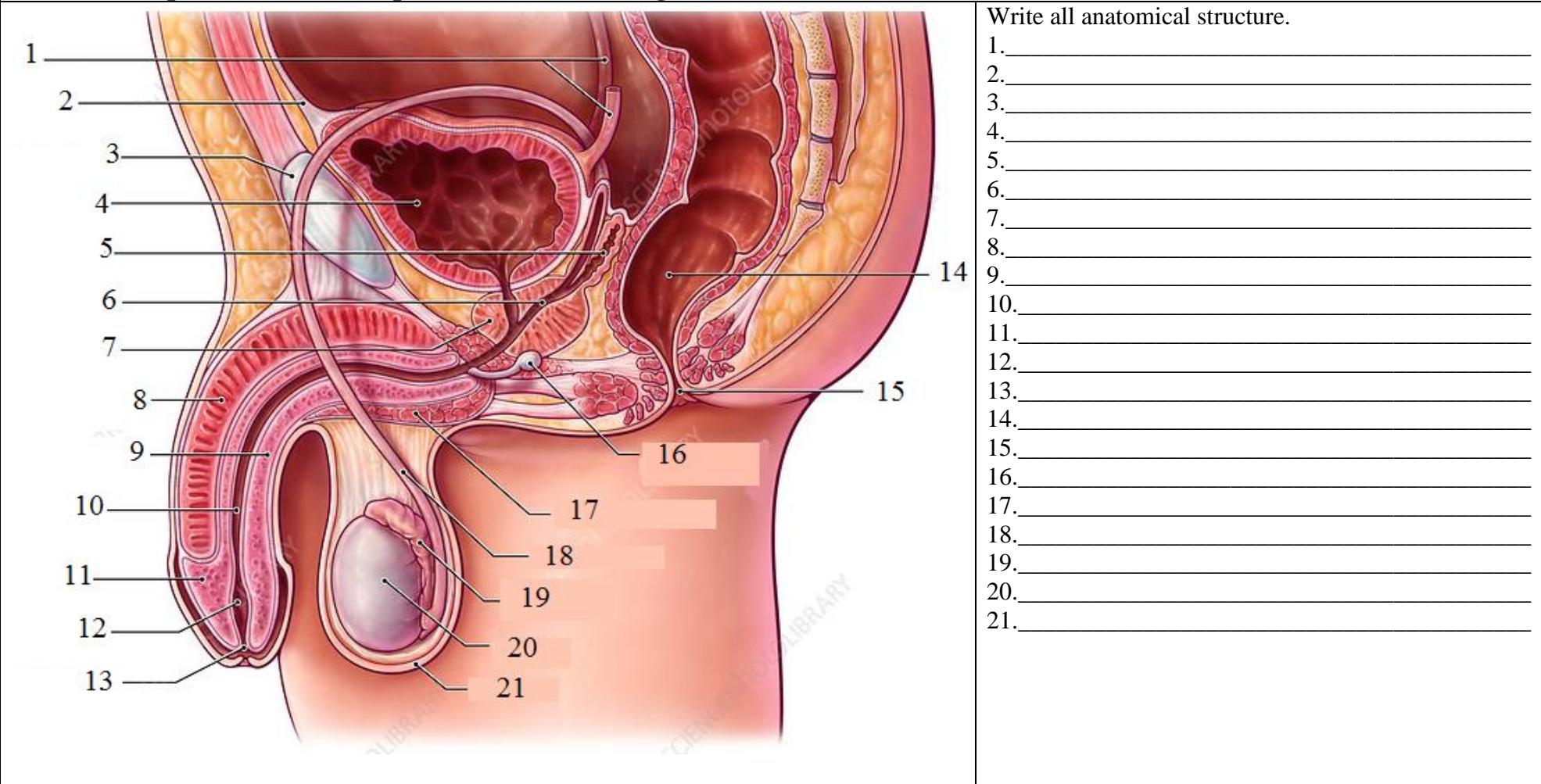
Questions:

1. In course of a small pelvis operation, it became necessary to ligate an ovarian artery. What formation may be accidentally ligated together with it? _____
2. A 58-year-old woman had her uterus and all appendages completely removed. It resulted in stoppage of urine excretion. Cystoscopy results: bladder doesn't contain any urine, urine doesn't come also from ureteric orifices. What part of urinary excretion system was damaged during the operation? _____
3. A patient has urolithiasis that was complicated by a renal stone passage. At what level of ureter is it most likely to stop? _____
4. During complicated labour, the symphysis pubis ruptured. What organ can be damaged mostly? _____
5. During cystoscopy, mucous membrane of urinary bladder normally makes folds except for a single triangular area with smooth mucosa. This triangle is located in the following part of urinary bladder: _____
6. During a urinary bladder catheterization, an abrupt catheter introduction caused bleeding because of the trauma of the urethral mucous tunic in the external sphincter muscle area. In which urethral area should the doctor be careful and feel the resistance of soft tissues as the catheter through? _____
7. An elderly man has complicated urination. Which part of urethra becomes narrower with age the most often? _____
8. During a surgery on the small pelvis, there was a need to perform an intraoperative uterine artery ligation. Which one of the mentioned may be accidentally ligated together with it? _____
9. A 40-year-old man had a ureteral calculus instrumentally removed, which was complicated by a rupture of the ureter wall in the abdominal part. Where will urine get through the rupture in the ureter wall? _____

Topic 15: Internal male genital organs. External male genital organs. Malformations.**Complete the table.**

Term in English.	Term in Latin.
The upper pole	
The head of epididymis	
The parenchyma of testis	
The seminiferous tubules	
The rete testis	

Relations of pelvic viscera and perineum in male (sagittal section).



Development of genitalia in humans is tightly associated with urinary system development and begins with indifferent stage. At this stage, embryo has no signs of developing sex.

Indifferent stage of genitalia development. As mentioned previously, the urogenital folds form on the dorsal wall of embryonic body cavity laterally to developing vertebral column. Each fold splits into urinary (lateral) fold and gonadal (medial) ridge. Gonads primordias develop at 3-4 week of embryo development from mesodermal epithelium, which covers the gonadal ridge. The epithelium incorporates into the gonadal ridge mesenchyme to form primary sex cords. Primordial sex cells, which are likely to migrate from the yolk sac, appear in the sex cord. Sex cords in male embryo differentiates into seminiferous tubules, while in female embryo the cords separate into cell groups, which give rise to primordial follicles. The gonadal primordias gradually

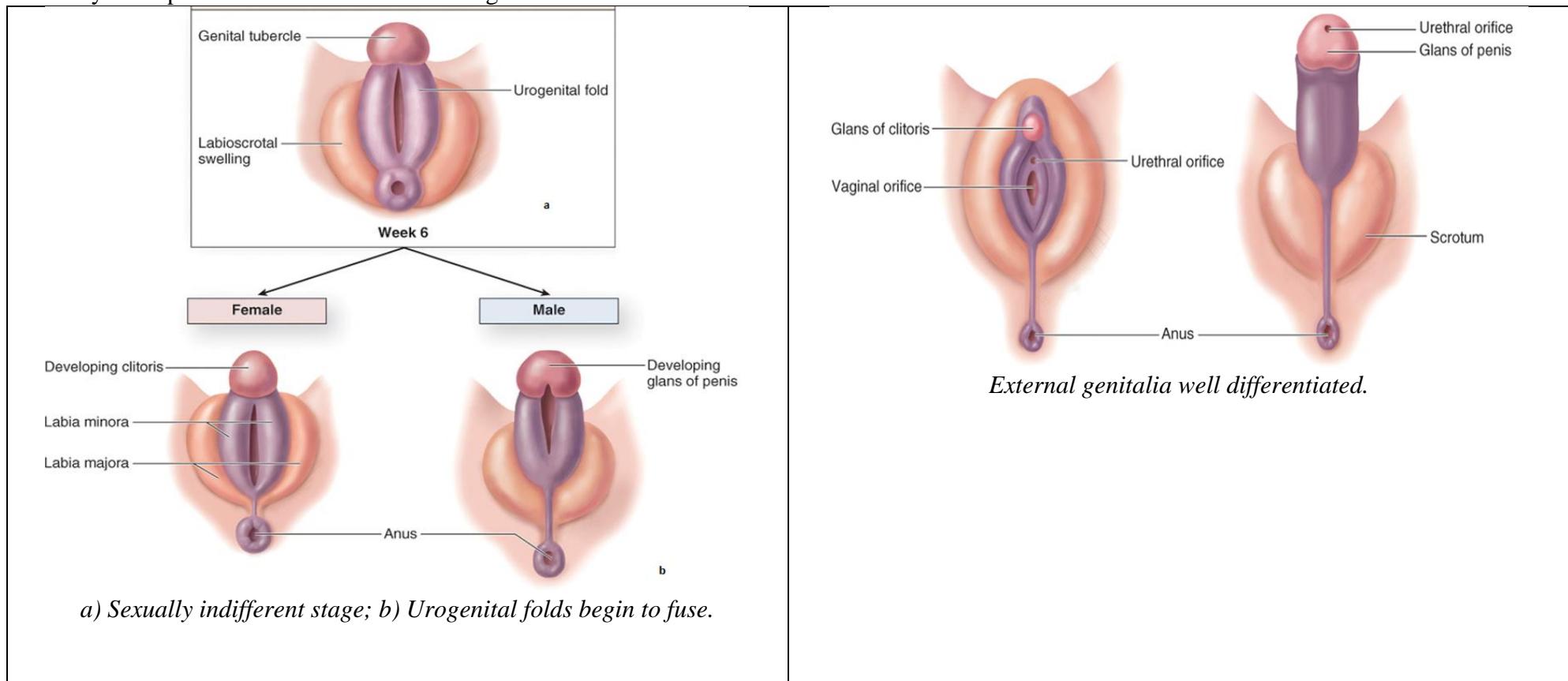
separate from the mesonephros to become individual organs. The gonads remain indifferent up to the 2nd month of development. Sex differentiation of the gonads starts at the 3rd month of development.

Development of mesonephric and paramesonephric ducts. Mesonephros with associated duct develops simultaneously with the gonads. Neighboring primordias of paramesonephric ducts form at the 6th week of development. They grow in caudal direction to fuse and open into nearby cloaca. Thus, by the end of the 2nd month of development each embryo regardless of sex develops: 1) paired indifferent gonadal primordias, 2) paired mesonephric ducts and 3) paired para-mesonephric ducts.

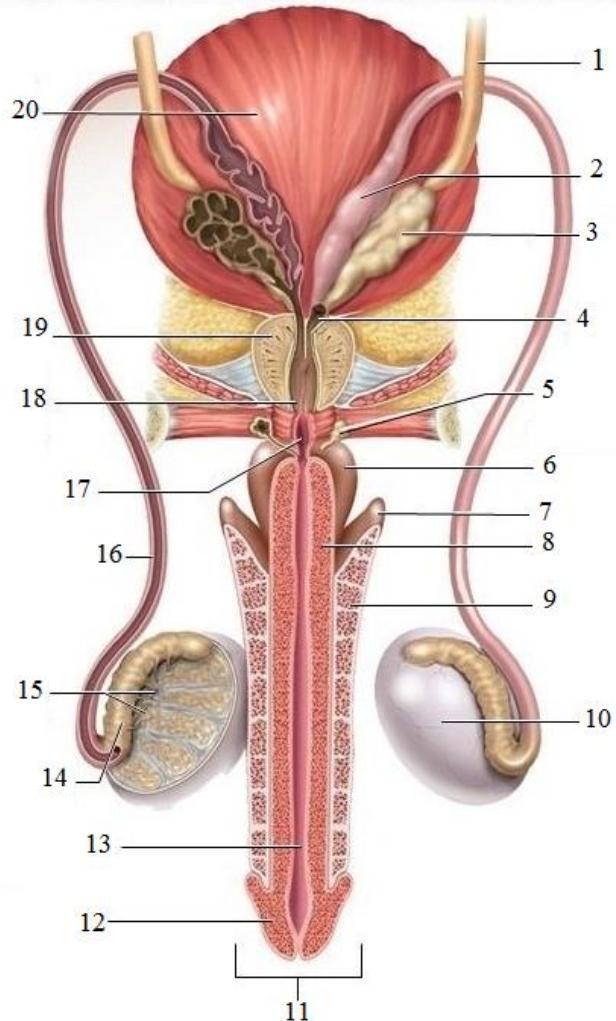
Development of male gonads. Former indifferent primordia develops seminiferous tubules, which connects to the mesonephros and its duct to form semen transporting pathways. The mesonephric duct eventually transforms into the ductus deferens while paramesonephric ducts disappear.

Development of female gonads. In this case, the primordia tissue differentiates into the cortex and medulla. The cortex contains dividing primordial cells, which transform into oogonia. Each ovary contains approximately 1 million of such cells. Each oogonium surrounded by a single layer of epithelial (follicular) cells forms a primary follicle.

Descent of the gonads. The gonadal primordia appear at the level of L4-L5; however, neither ovaries nor testes remain at the place of origin but descend caudally. This process is called descent of the gonads.



Urethra, testis.



Write all anatomical structures.

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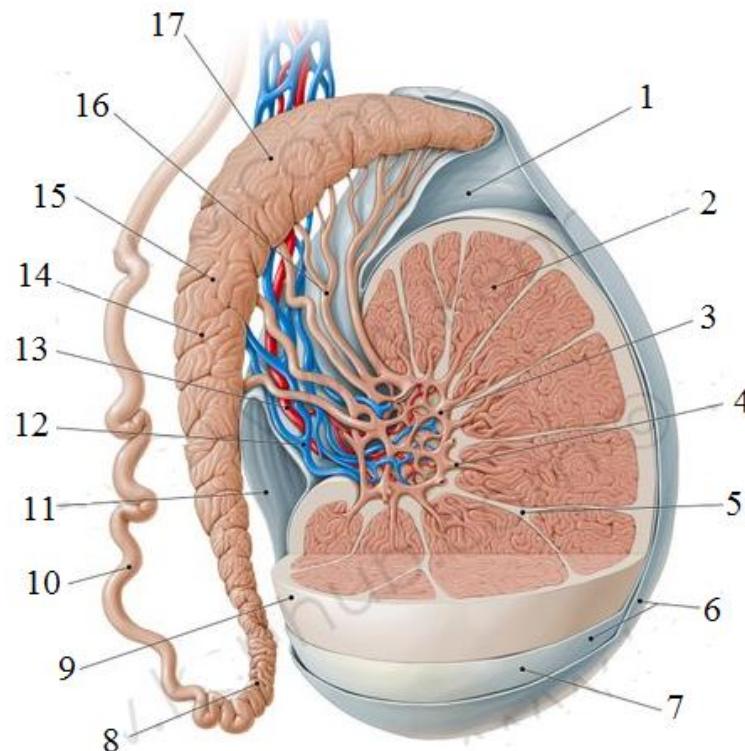
Descent of the testes. Key role in descent of the testes belong to the gubernaculum, gubernaculum testis — a ligament arising from the inferior pole of testis. The ligament runs caudally and penetrates the anterior abdominal wall to terminate in growing scrotum. As the result of rapid growth of trunk accompanied by reduction of the mesonephros and gubernaculum, the testis descends caudally. By the 3rd month of development, the testis reaches the pelvic cavity and by the 7th month — the deep inguinal ring.

The processus vaginalis. During descent of the testes, the peritoneum forms the projection called the processus vaginalis, processus vaginalis peritonei. The processus also penetrates the anterior abdominal wall moving the muscles and fascia apart to form the inguinal canal. The processus enters the scrotum as well as the gubernaculum.

In the course of descent, the retroperitoneal testis appears posterior to the processus vaginalis by the 8th month of development. Upon completion of descent, the testis becomes enfolded into double layer of peritoneum. The ductus deferens as it follows the testis becomes wrapped by the layers of anterior abdominal walls previously forced by the processus vaginalis. This process results in spermatic cord formation. After delivery, the upper portion of processus vaginalis occludes and two peritoneal cavities part. Descent of the testis is of great biological significance because spermatogenesis requires appropriate temperature (approx. 34°C) maintained in the scrotum. In rodents, the inguinal canal remains open wide throughout the life and the testes descend to scrotum during mating season and remain protected by the abdominal wall the rest of the time.

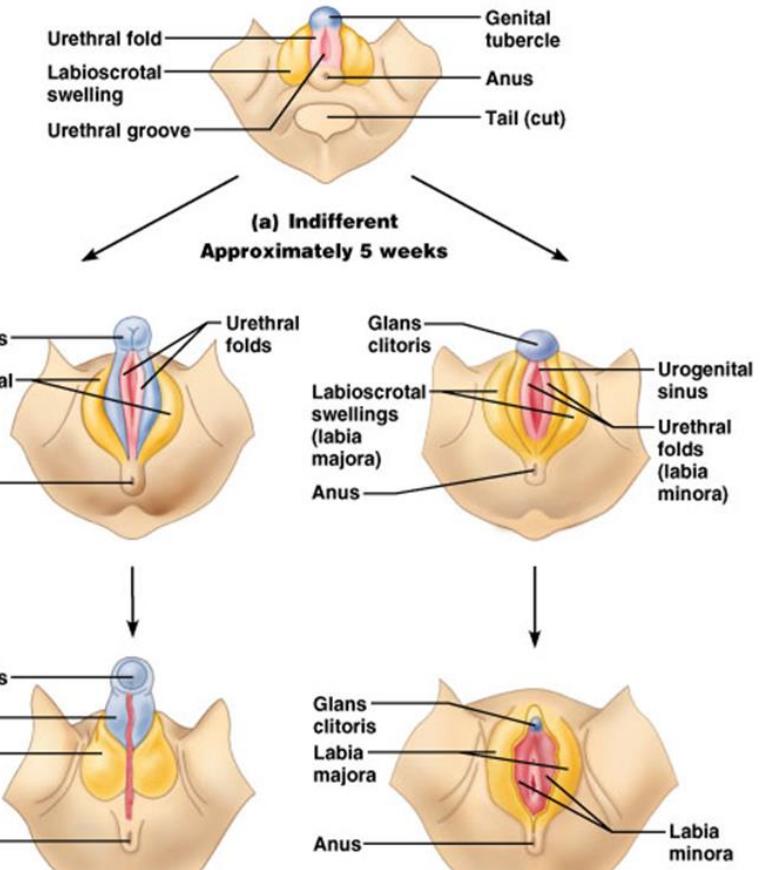
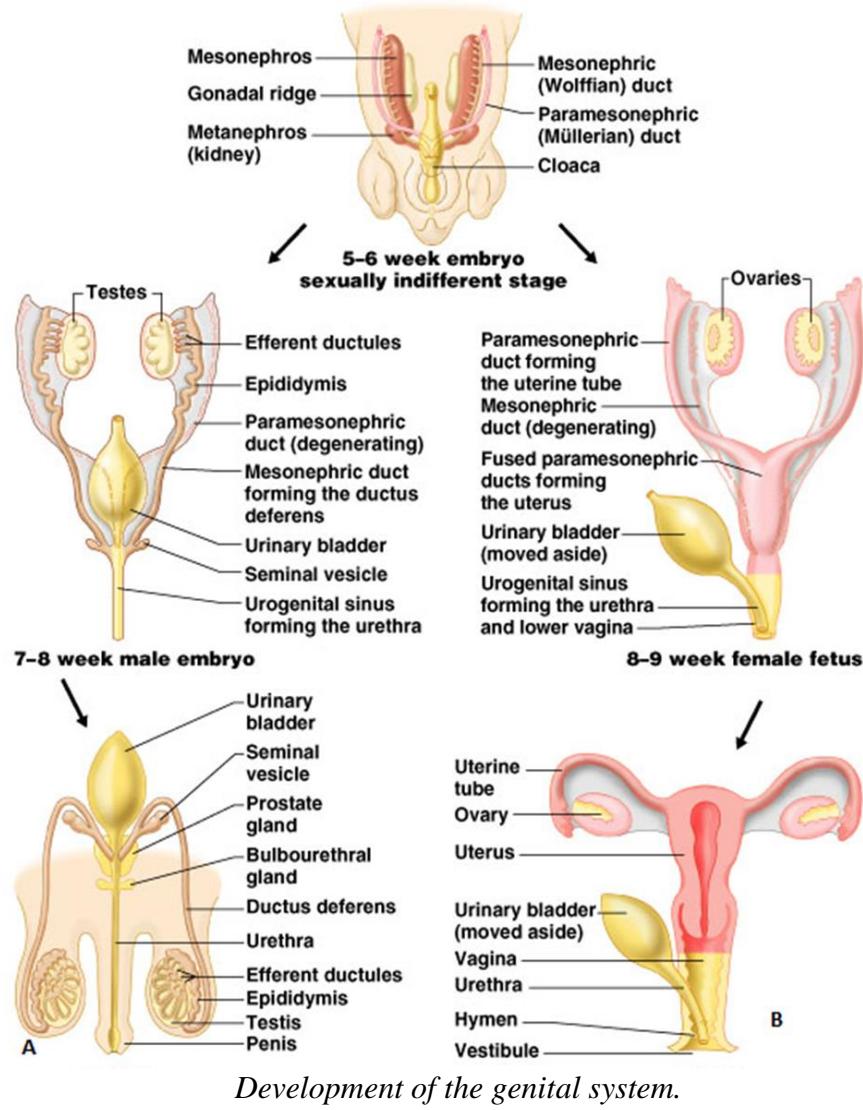
If the processus vaginalis fails to occlude, the inguinal canal retains communication with serous cavity, which may result in hereditary inguinal hernias. In 50% of cases, the processus vaginalis remains patent up to 1st month of life.

The interior of testis and epididymis .



Write all anatomical structures.

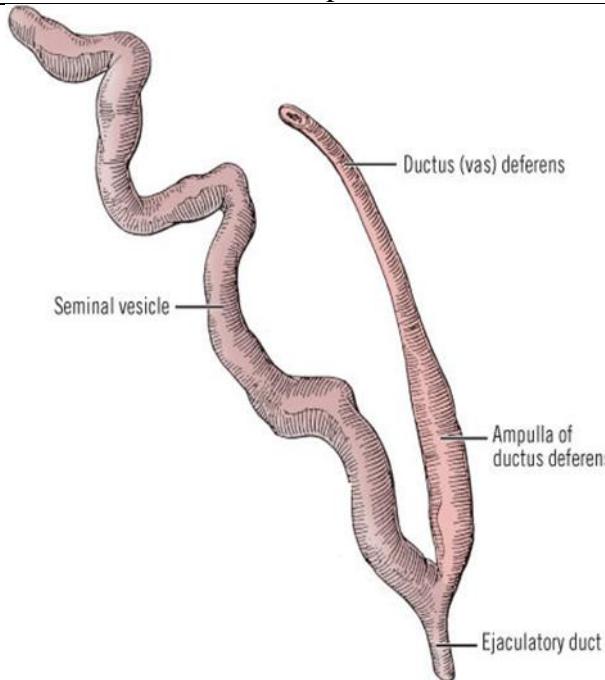
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Anomalies of the testes.

Abnormalities of the number, structure and position of the testes are distinguished. The anomalies of the number include anorchism, cryptorchidism, monorchism, poliorchism. Anorchism is absence of both testes at birth. This anomaly is rare and is caused by disturbances in the early stages of embryonic development of the gonads after a short secretion of androgens. At the anorchism there are no prostate and seminal vesicles, underdeveloped

genitals, eunuch like body structure, secondary sexual characteristics are weak or absent. Monorchism is congenital absence of one testis. The anomaly is due to violation of embryogenesis before placing the final kidneys and gonads. At the monorchism, there is no epididymis and ejaculatory duct. Poliorchism is very rare. The additional testis is placed near the general, but there is no epididymis and ejaculatory duct. Sinorchism is congenital fusion of two testises that cannot drop out of the abdominal cavity.



Anomalies of testis development

Underdevelopment of testes may result in monorchism (absence of one testis) or anorchism (absence of both testes). Deranged descent may result in unior bilateral retention of the testes in abdominal cavity. Such anomaly is called cryptorchidism. Surgical correction is required before the individual reaches 5 years of age otherwise malignancy or sterility become a concern.

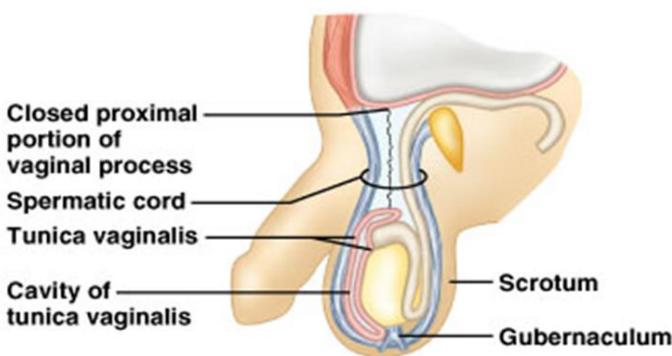
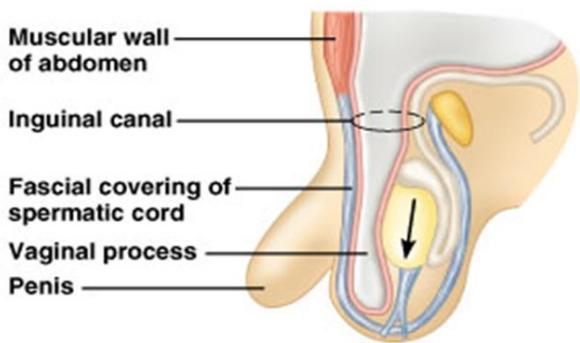
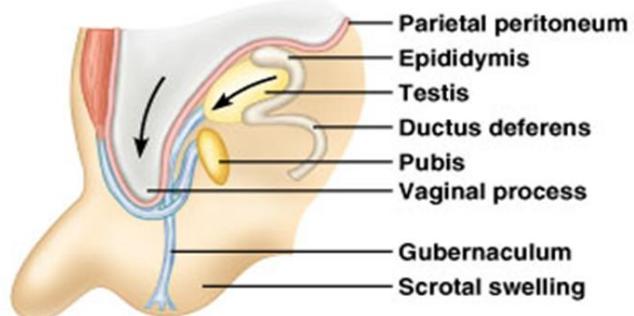
Descent of the ovaries. Positioning and shape of ovaries also undergoes considerable changing: they enlarge and descend to pelvic cavity rotating around the sagittal axis. The ligament, which corresponds to the gubernaculum in males transforms into the ligament of ovary and round ligament of uterus. Ovarian serous coating reduces but mesovarium persists. Developmental anomalies of the ovaries. Common anomalies are hypoplasia and aplasia (both unilateral and bilateral). Ovaries may completely descend through the inguinal canal and appear in the area of labia majors.

Development of the uterus, uterine tubes and vagina. Key role in development of internal genitalia in females belong to the paramesonephric ducts. They appear by the end of the 2nd month of development and reside laterally to the mesonephros, which disappears later. Paramesonephric ducts give rise to the uterine tubes, uterus and superior portion of vagina. As mentioned previously, the distal ends of paramesonephric ducts fuse to form the uterus and vagina. This portion exhibits intense growth especial in myometrium. Un fused portions give rise to the uterine tubes. The cranial ends of tubes develop funnel-shaped opening and fimbriate trimming.

Developmental anomalies of the uterus. These anomalies result primarily from fusion disorders and constitute various degrees of duplication and abnormal positioning. Most common is fundus duplication. More severe disorders result in formation of bicornuate uterus with two cervices. In such cases, each horn has one uterine tube. Duplication may expand to the vagina to result in formation of double uterus with double vagina. Unicomuate uterus with one tube may form if unilateral underdevelopment of a paramesonephric duct occurs.

Apart from deformities described, underdevelopment of the uterine tubes, uterus and vagina may be observed. Vaginal atresia occurs as a part of severe general developmental disorders.

Development of the external genitalia. The external genitalia, as well as internal develop from indifferent primordias. At indifferent stage, all embryos regardless of sex feature the following primordias: 1) the genital tubercle 2) urethral folds, which enclose the urethral groove and 3)



the paired labioscrotal swellings. Beginning from the 3rd month of development, the sex distinction signs become apparent.

Masculine-type transformations: 1) the genital tubercle grows to form the penis; 2) the urethral folds fuse to form the spongy urethra; 3) the labioscrotal swellings also fuse to form the scrotum. Fusion line appears as well distinguishable raphe of scrotum. The testes eventually descend into the scrotum.

Feminine-type transformations: 1) the genital tubercle grows slowly to form a small clitoris; 2) the urethral folds do not fuse and form the labia minores with vestibule between them; 3) the labioscrotal swellings also do not fuse and develop into the labia majores.

Hermaphroditism. The term generally refers to ambiguous sexual differentiation due to developmental disorders during embryonic period. There are two major types of hermaphroditism: true and false (pseudo hermaphroditism). True hermaphroditism is a rare-type state featuring presence of both female and male gonads in an organism. The cases of true hermaphroditism are uncommon in humans; only single instances, when presence of seminiferous tubules and follicles was histologically confirmed in one organism have ever been reported. An individual in this case features underdeveloped intersexual genitalia.

Pseudo hermaphroditism is more common; it can be divided into male and female types.

Male pseudohermaphroditism. The individual has 46XY chromosomal constitution and male gonads (usually underdeveloped) but genitalia are intersexual or resemble female. The penis is small and resembles the clitoris, the urethral folds and labioscrotal swellings remain unfused resembling thus the labia majores and minores.

Female pseudo hermaphroditism. The individual has 46XX chromosomal constitution and underdeveloped (in most cases) ovaries. The external genitalia resemble those in males: the enlarged clitoris, fused labia majores and minores, looking like the scrotum. The ovaries (one or both) may descend to the labia majores area.

The external genitalia in hermaphrodites are often poorly differentiated making it difficult to determine individuals' sex. In this case, a special histological study of the gonads is required.

Clinical applications. Developmental disorders of external genitalia can be surgically corrected in order to bring the faulty genitalia into consistence with individuals' sex. Studying of hermaphroditism variety thus is of importance for applied medicine apart from basic studies.

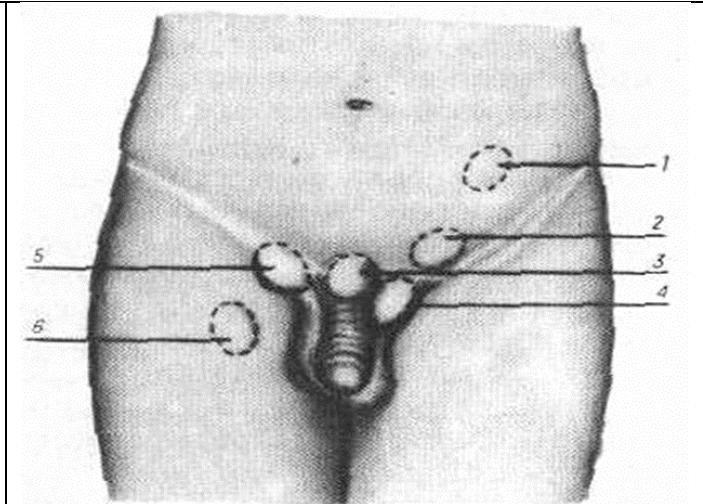
Anomaly structure. Uni- and bilateral testicular hypoplasia are distinguished. Testicular hypoplasia develops due to violations during early embryonic development. At unilateral hypoplasia underdeveloped testis needs to be removed, as it can serve as a source for the development of malignant tumors.

Anomaly position. Widespread abnormalities of gonads in men are cryptorchidism and testicular ectopia. In 1786, John Gunther, was the first person who proposed the theory that explains the occurrence of cryptorchidism, according to which the cause disturbances of testicular descent lies in the organ itself.

Cryptorchidism is the delayed testicular descent. Cryptorchidism is a fairly common anomaly of the reproductive organs in childhood, creating multiple health and social problems. It is usually combined with other anomalies and chromosomal abnormalities, resulting in a large number of options of this disease. This requires the surgeon's profound knowledge of anatomy and surgical treatment options. The lack in the development of sexual organs at cryptorchidism is already observed in the neonatal period, while the secondary sexual characteristics are delayed for 2-3 years compared to healthy children.

Cryptorchidism can be inguinal (uni- or bilateral), intraperitoneal (uni- or bilateral). False and acquired cryptorchidism are distinguished.

- Ectopia (deviation from the norm during descending testes into the scrotum). Ectopic testis occurs when the testis does not descend into the scrotum through the inguinal canal, but through the femoral canal or turns to other parts of the inguinal canal. At the heart of this anomaly, there are different mechanical reasons that violate migration testis (connective tissue septum at the entrance to the scrotum, narrow inguinal canal, adhesions in the inguinal canal). The testis usually placed under the skin of the anterior abdominal wall in the inguinal area on the aponeurosis of the external oblique muscle, pubic region (ectopia pubopenialis). There are cases of testicular location near the penis, on the medial or anterior surface of the femur (ectopia femoralis), the perineum (ectopia perinealis). Less common transverse ectopia (ectopia transversum) happens when both testes are in the same half of the scrotum. Ectopic testis is 4% of all anomalies. In children, testicular ectopia shows no signs of hormone deficiency and eunuhoidism.



Ectopic of the testis.

1 – abdominal; 2, 4,5 - inguinal, 3 - pubic, 6 - femoral.

Questions:

1. While performing a man's inguinal canal operation on account of hernia a surgeon damaged the canal's contents. What exactly was damaged? _____
2. A patient complains of having urination disorder. He is diagnosed the hypertrophy of prostate gland. What part of gland is damaged? _____

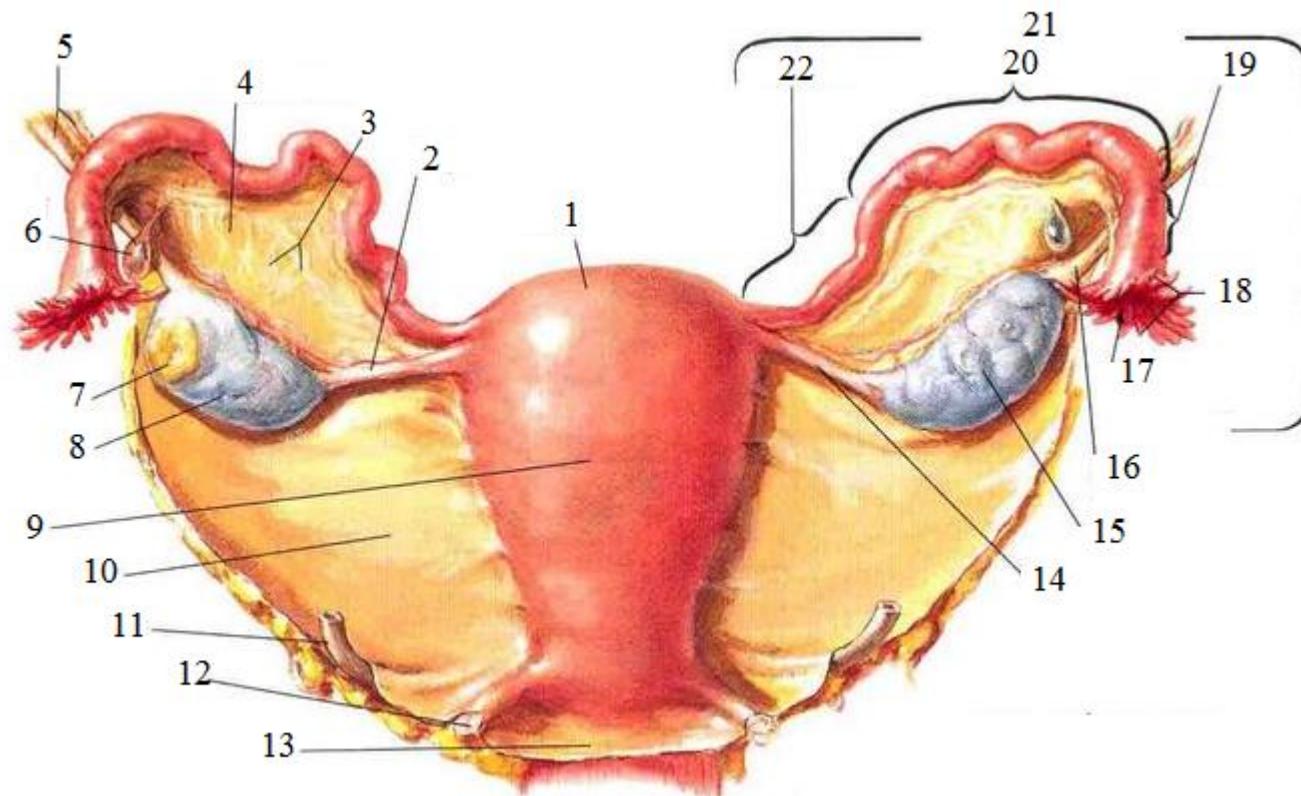
3. Patient complains of frequent and difficult urination. Imperfection of what formation can cause it? _____
4. Examination of a newborn boy's genitals revealed a cleft of urethra that opens on the inferior surface of his penis. What developmental anomaly is meant? _____
5. A young man consulted a doctor about disturbed urination. Examination of his external genitals revealed that urethra is split on top and urine runs out of this opening. What anomaly of external genitalia development is the case? _____
6. A boy was diagnosed with a scrotal hernia. The underdevelopment of which testicular membrane caused the hernia? _____
7. A man of 35 complains of pain and swelling of the right testicle. Examination has shown a tumor, the surgery of which requires dissection of testicle tunics. Which tunic will be dissected last before tunica albuginea? _____
8. A patient is diagnosed with scrotal hydrocele - an increase of fluid quantity in serous sac. Between which testicular tunics is the pathologic content located? _____
9. A surgeon has detected scrotal hydrocele of a patient. Between the layers of which testicular tunic has the fluid accumulated? _____
-

Topic 16: Female genital organs. Malformations. Perineum.

Complete the table.

Term in English.	Term in Latin.
The mesovarian border	
The hilum of ovary	
Tubal extremity	
The ovarian medulla	
The suspensory ligament of ovary	
The uterine ostium	
The infundibulum	
The ovarian fimbria	
The recto-uterine fold	

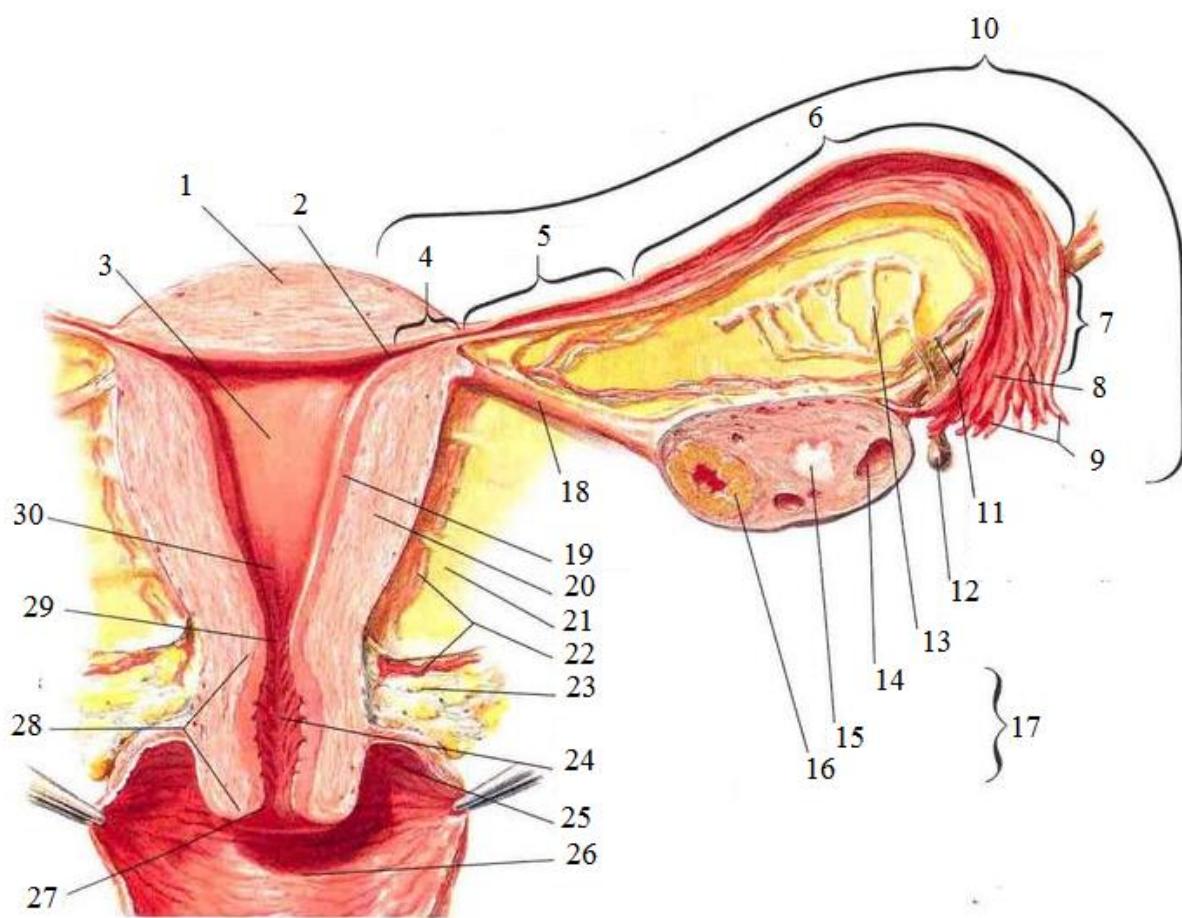
The female genital organ, posterior view. Write all anatomical structures.



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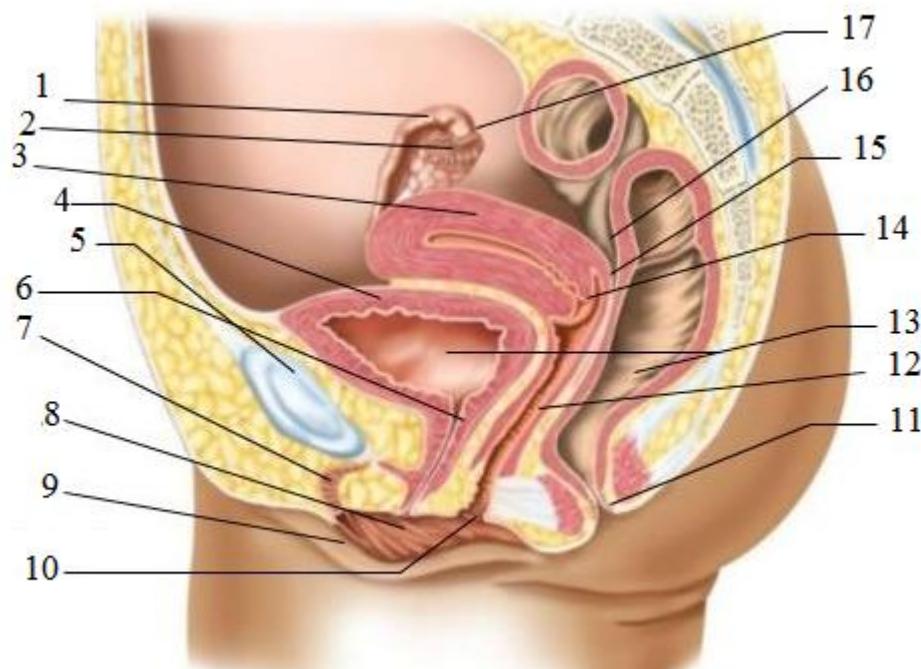
The female genital organ, frontal section.



Write all anatomical structures.

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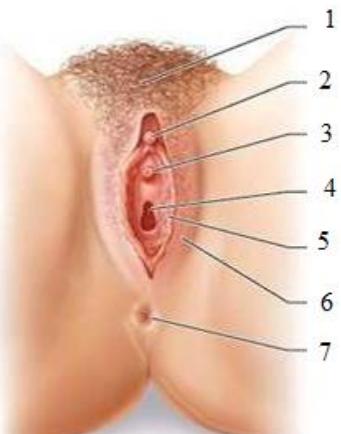
Relations of viscera in female lesser pelvis (midsagittal section).



Write all anatomical structures.

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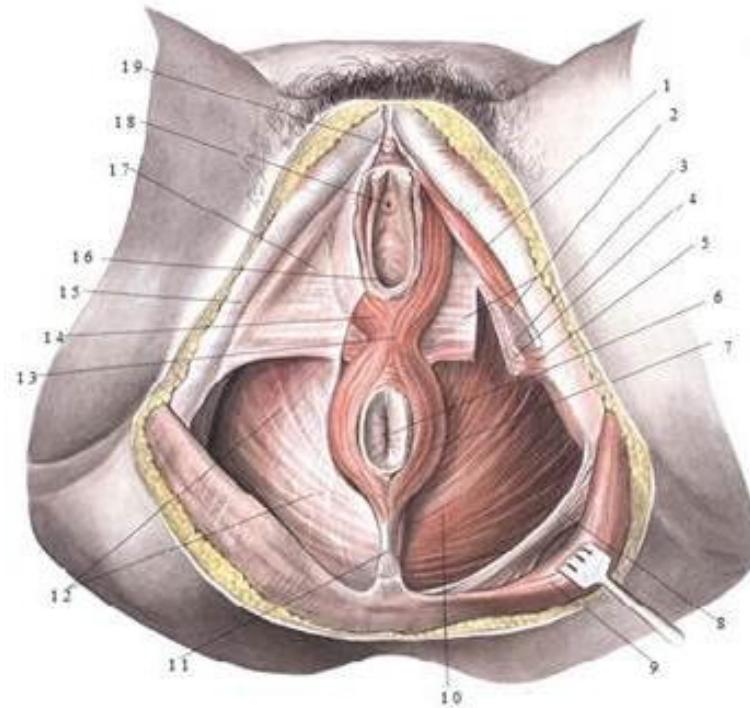
The female external genitalia.



Write all anatomical structures.

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7. _____

Female pudendum.



Write all anatomical structures.

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CR!

Anomalies of the ovary.

The wrong position of the ovary (ectopia ovariorum) is an anomaly which means that one or two ovaries are located at the deep inguinal ring or protrude under the skin of the labia majora. In the last case, a uni- or bilateral ovarian hernia (hernia ovarica) is formed. About 2 - 4% of the women can have additional (ovarii accessorii) ovaries which are located next to the normal ovary.

Developmental abnormalities of the fallopian tube.

1. Atresia of the fallopian tube can be uni- or bilateral, local or total. It is the result of congenital obliteration of tubes.
2. The doubling of the fallopian tube can be uni- or bilateral.
3. The increase of the fallopian tube can be accompanied by excessing and twisting of tubes.
4. The decrease of the fallopian tube is the result of its hypoplasia. When the abdominal opening of the fallopian tube reaches the ovary, the sperm cells can not go to the tube.

Anomalies of the uterus.

1. Agenesis of the uterus is the absence of the uterus and happens rarely.
2. Aplasia of the uterus. Happens when the uterus has a form of one or two rudimentary muscle ridges. The frequency varies from 1:4000-5000 to 1:5000-20000 in newborn girls. This anomaly is often combined with aplasia of the vagina, as well as anomalies of other organs: the spine (18.3%), heart (4.6%), teeth (9.0%), gastrointestinal (4.6%), urinary organs (33.4%).

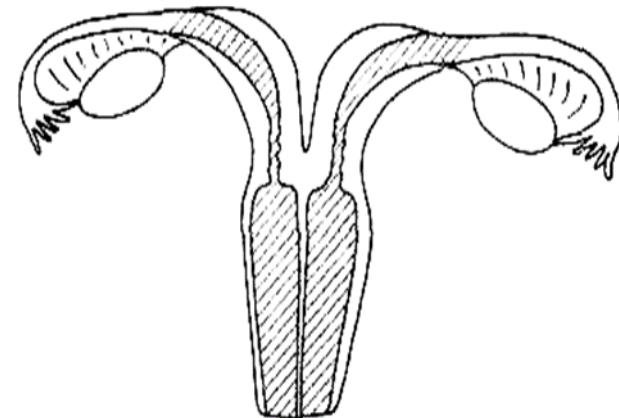
The variants of aplasia:

- a) the rudimentary uterus, can be defined in the form of cylindric, located in the center of the pelvis, left or right, and has the size of 2,5-3,0 x 2,0-1,5 cm;
 - b) the rudimentary uterus, has the form of two muscular ridges, located at the wall of the pelvis, measuring 2.5 x 1.5 x 2.5 cm;
 - a) muscle ridges (no vestiges of the uterus) can be detected
3. Hypoplasia of the uterus (uterine infantilism). Happens when the uterus is reduced in size, has a large bend forward and conic cervix. There are 3 degrees of hypoplasia:
a) rudimentary uterus is underdeveloped uterus (up to 3 cm long), which is not divided into the neck and body, and has no cavity;
b) an infantile uterus is a small uterus (3-5.5 cm long) with a long neck and conic cervix;
c) teen uterus is 5.5-7 cm long.

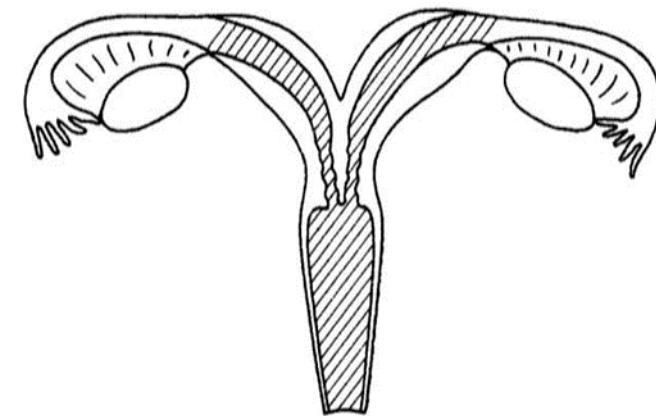
4. The doubling of uterus occurs during embryogenesis as a result of isolated development paramezonephric ducts, when the uterus and vagina develop as paired organ. There are several variants of doubling:

- a) the doubling uterus (uterus didelphys) means the existence of two separate unihorned uteruses. Each of them is connected to a corresponding portion of the bifurcated vagina. This is due to non merging paramezonephric ducts along their entire length. Two sexual apparatus are divided by a transverse fold of peritoneum. On each side there is one ovary and one fallopian tube.
- b) the split of the uterus (uterus duplex) occurs when in the specific area uterus and vagina are combined by the fibromuscular layer; while the cervix and two vaginas are fused (Fig. 103). Some variants can be possible: one of the vaginas is closed, one of the uterus has no connection with the vagina or one of the uterus is small by size with a reduced functional activity.

5. Bicornuate uterus (uterus bicornutus) is the division of the body of the uterus in 2 parts with the presence of one cervix, without separating of the vagina. The division into parts starts high, but in the lower part of the uterus they always merge.



Uterus et vagina duplex is the doubling of the uterus and vagina, which occurs when nonunion paramesonephric ducts.



Uterus duplex is the doubling uterus with a vagina. It is the result of nonunion middle portion paramesonephric ducts.

The division into 2 horns begins within the body of the uterus so that the two horns diverge in opposite directions at high or low angles. At the distinguished splitting of the uterine body in two parts bicornuate uterus are formed. Often, two horns, which are not merged, have no cavities. These processes take place during the 10-14th week of fetal development due to incomplete or too low fusion of paramezonefric ducts. There are three forms:

a) complete form which is a rare variant, the division into two uterine horns begins practically at the level of the sacro-uterine ligaments. At hysteroscopy it is detected that from the start of the internal fornix two separate hemicavities are formed, each of them has only one orifice of the uterine tube.

b) incomplete form is divided into two horns and observed only in the upper third of the body of the uterus. In this case, the size and shape of the uterine horns are usually different. At hysteroscopy one cervix is defined, and closer to the bottom of the uterus there are two hemicavities. In every part of the body of the uterus there is one orifice of the fallopian tube.

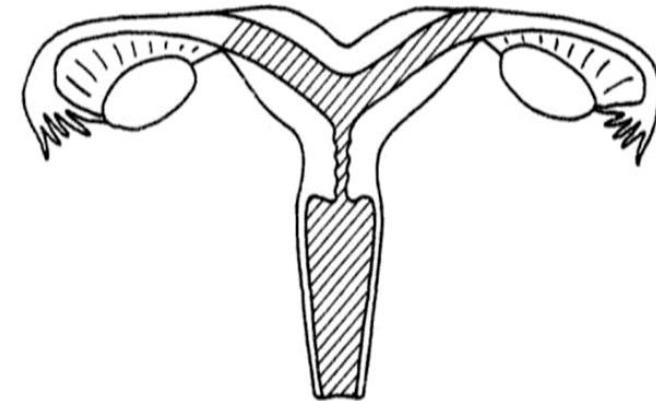
c) saddle shape (uterus arcuatus) is division of the body of the uterus into two horns only in the bottom to form a small indentation on the outer surface in the form of the seat (bottom of the uterus is not usually rounded and concave inside). Hysteroscopy shows both the orifices of the fallopian tubes, while the bottom appears in the uterine cavity in the form of the ridge.

Unihorned uterus (uterus unicornus) is a form of uterus with a partial reduction of one half. This is a result of atrophy of one paramezonefric duct. The difference of unihorned uterus is the absence its bottom in the anatomical sense. In 31.7% of cases, it is combined with anomalies of the urinary organs. It occurs in 1-2% of cases of anomalies of the uterus and vagina.

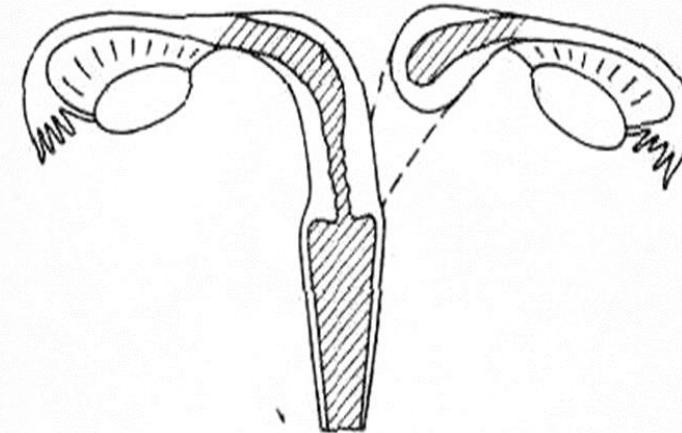
The divided uterus (bifid uterus, intrauterine septum) is observed in the presence of septum in the cavity of the uterus, which makes it bichambered. Its frequency is 46% of the total number of anomalies of the uterus. Intrauterine septum can be thin, thick, or broad-based (in a shape of a triangle).

- a) uterus septus is a fully formed, completely divided uterus.
- b) uterus subseptus is an incomplete form, partly divided uterus 4.1 cm long.

1. Agenesis of the vagina means no vagina and happens rarely.
2. Aplasia of the vagina develops during the 17th-week of fetal development as a result of the central cell lysis of paramezonefric ducts. It can be complete or partial at



Uterus bicornutus is bicornuate uterus with a vagina.



Uterus assimetricus seu unicornus is asymmetric or unihorned uterus which occurs at the one-side delay of paramezonefric duct.

functional normal or functional rudimentary uterus.

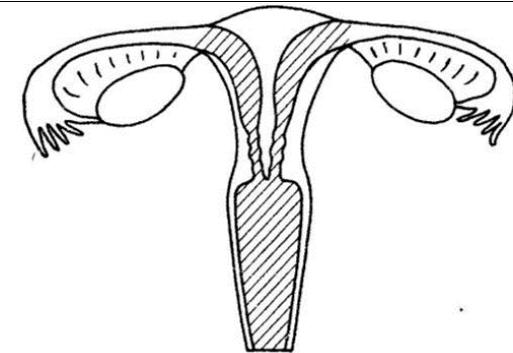
a) complete vaginal aplasia is often combined with aplasia of the uterus or a rudimentary uterus, and in 43.6% of cases - with abnormalities of the urinary system.

b) partial aplasia of the vagina is combined with the uterus, which is functioning normally. In 19.3% of cases it occurs with abnormalities of the urinary system. Maybe middle or lower third can be aplasiared.

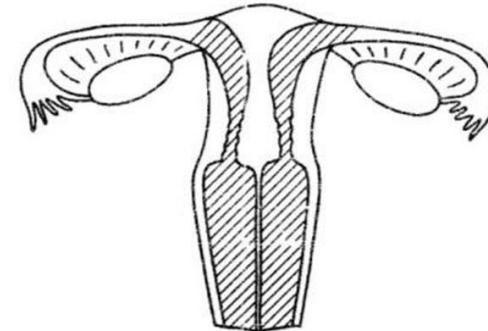
3. Atresia of vagina (Müllerian duct aplasia) occurs when the lower part of the vagina is replaced by fibrous tissue. Superior parts, cervix, body of the uterus, fallopian tubes, ovaries and external genitalia are formed correctly. At puberty, secondary sexual characteristics appear, but without menstruation, and hydrometrocolposy is possible. There are several forms: hymenal; retrohymenal, vaginal, cervical.

4. Vaginal septum (the division of the vagina) can be complete or partial, has underdeveloped epithelial and muscular layers.

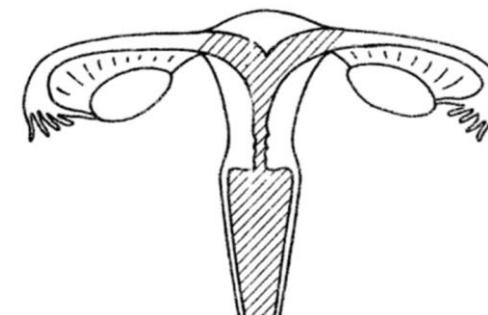
5. The doubling of the vagina (vagina duplex) is the septum between the two organs which is represented by all the layers of the wall. It is usually associated with the doubling of the vagina.



Uterus septus is a uterus divided by a septum.

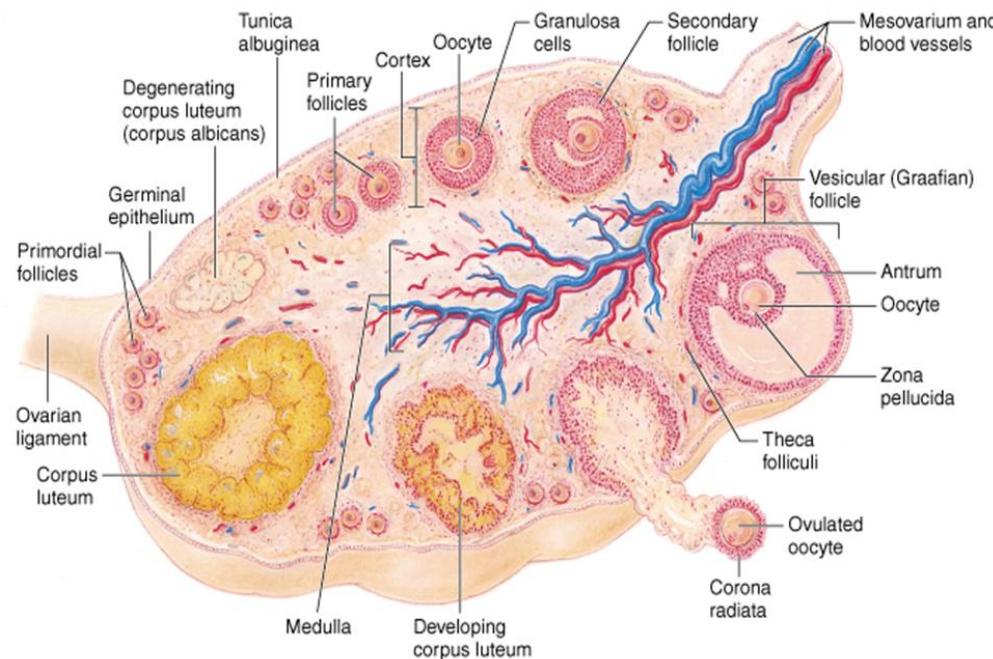


Uterus septus et vagina septa happens when uterus and vagina are separated by a septum.



*Uterus subseptus is a uterus with an incomplete septum.
Abnormal development of the vagina.*

The internal structure of the ovary.



CR!

It is noteworthy that the suspensory ligament of ovary contains the ovarian vessels and nerves that is a concern during ovariectomy.

Interior of the ovary. The ovary is lined with the germinal epithelium adherent to thin tunica albuginea, which consists of connective tissue. At the hilum, the tunica albuginea penetrates the organ to form its stroma (the ovarian stroma, stroma ovarii). The principal substance of ovary is divided into the ovarian cortex and ovarian medulla:

- the ovarian medulla, medulla ovarii is the central portion of the organ. It consists of loose connective tissue and contains blood and lymphatic vessels and nerves;
- the ovarian cortex, cortex ovarii is the outer denser portion, which contains the follicles — the parenchyme of organ.

Ovarian follicles. The ovarian follicles are subdivided into the primary and secondary. The primary follicles, folliculi ovarici primarii are fine rounded bodies, which contain primordial gametes. The primary follicles develop into the vesicular ovarian follicles. Number of primary follicles in newborn girl constitutes approximately one million in each ovary, yet vast majority of the follicles degenerate and approximately 40000 remain when she reaches puberty. Only 400-500 follicles are ovulated during woman's reproductive lifetime.

The vesicular ovarian follicles, folliculi ovarici vesiculosi are developing primary follicles, which appear during puberty. In development process, the primary follicles enlarge and develop cavity filled with follicular fluid. The follicular epithelium forms a mound supporting the developing oocyte —

the cumulus oophorus protruding into the follicular cavity. Mature follicle is rather large (4-10 mm of diameter) and well visible with naked eye in sectioned ovary.

Ovulation. Mature vesicular follicle dislodges in direction of the ovary surface to form a translucent bulge. The fluid pressure grows and the follicle eventually ruptures. Follicular fluid and oocyte extrudes into the peritoneal cavity. The whole process is called ovulation.

Why the multiparous pregnancy occurs. Usually more than one follicle reach ovulation, however only one ruptures, while the rest involutes so single pregnancy is characteristic of humans. However, several follicles may occasionally rupture and oocytes released may be fertilized to result in multiparous pregnancy.

The corpus luteum. Epithelium of emptied follicle transforms into the corpus luteum, larger in pregnant (1-2 cm). It persists throughout the pregnancy period and functions as endocrine gland, which produces hormones prerequisite for normal pregnancy course. After delivery, the corpus luteum involutes. Connective tissue substitutes reduced secretory epithelium to form cicatrix-like persistent corpus albicans.

If no fertilization occurs, the corpus luteum is smaller and called the cyclic menstrual corpus luteum, corpus luteum ciclicum menstruationis. In 10-12 days, it also regresses to leave the corpus albicans, which eventually resolves.

Rudiments. The broad ligament of uterus contains underdeveloped blind canaliculi called epoophoron and paroophoron. They are the residua of mesonephros, which correspond to epididymis and paradydimis in males.

Anomalies of the ovary.

The wrong position of the ovary (ectopia ovariorum) is an anomaly which means that one or two ovaries are located at the deep inguinal ring or protrude under the skin of the labia majora. In the last case, a union bilateral ovarian hernia (hernia ovarica) is formed. About 2 - 4% of the women can have additional (ovarii accessorii) ovaries which are located next to the normal ovary.

Clinical applications.

In order to enter the uterine cavity safely (e.g. in abortion) the cervical canal requires appropriate dilation. For this purpose the special metal dilators (Hegar dilators) increasing in diameter are used. Dilated so, canal passes necessary instruments and allows required manipulations.

Cancer developing within the tissues of the uterine cervix can usually be detected by means of a relatively simple and painless procedure called the Pap (Papanicolaou) smear test. This technique involves scraping off a tiny sample of cervical tissue, smearing the sample on a glass slide, staining it, and examining it for the presence of abnormal cells. Because this test can reveal certain types of cervical cancers in the early stages of development, when they may be cured completely, the American Cancer Society recommends that women between ages twenty and sixty-five have a Pap test every three years.

Questions:

1. A patient was diagnosed with bartholinitis (inflammation of greater vulvovaginal glands). In which organ of urogenital system are these glands localized? _____

2. While performing a woman's inguinal canal operation because of hernia a surgeon damaged the canal's contents. What exactly was damaged? _____

3. A 28-year-old woman has been diagnosed with extrauterine pregnancy complicated by the fallopian tube rupture. The blood is most likely to penetrate the following peritoneal space: _____

4. Ovarian tumour was diagnosed in the woman. Surgery was indicated. What ligament should be cut by the surgeon to disconnect the ovary and the uterus? _____

5. A woman underwent an operation because of extrauterine (tubal) pregnancy. In course of the operation the surgeon should ligate the branches of the following arteries: _____
6. Inflammatory process of modified subserous layer around cervix of the uterus caused an intensive pain syndrome. In what region of genitals does the pathological process take place? _____
7. During the examination of a patient, the presence of supportive exudation in the straight recto uterine pouch was suspected. Through what anatomic formation is it better to puncture the pouch? _____
8. A 28-year-old woman was admitted to a gynecology department with complaints of pain in the abdominal region. An ovary tumor was clinically detected and prescribed to be removed. During the operation a ligament connecting the ovary with the uterus is to be dissected. Which ligament is it? _____
9. During a gynecologic examination, a patient has endometritis (inflammation of endometrium) diagnosed. Which membrane of uterine wall is affected by the inflammatory process? _____

Topic 17: General principles of the structure of the endocrine glands. Central part of the endocrine system. The pineal gland. The pituitary gland.

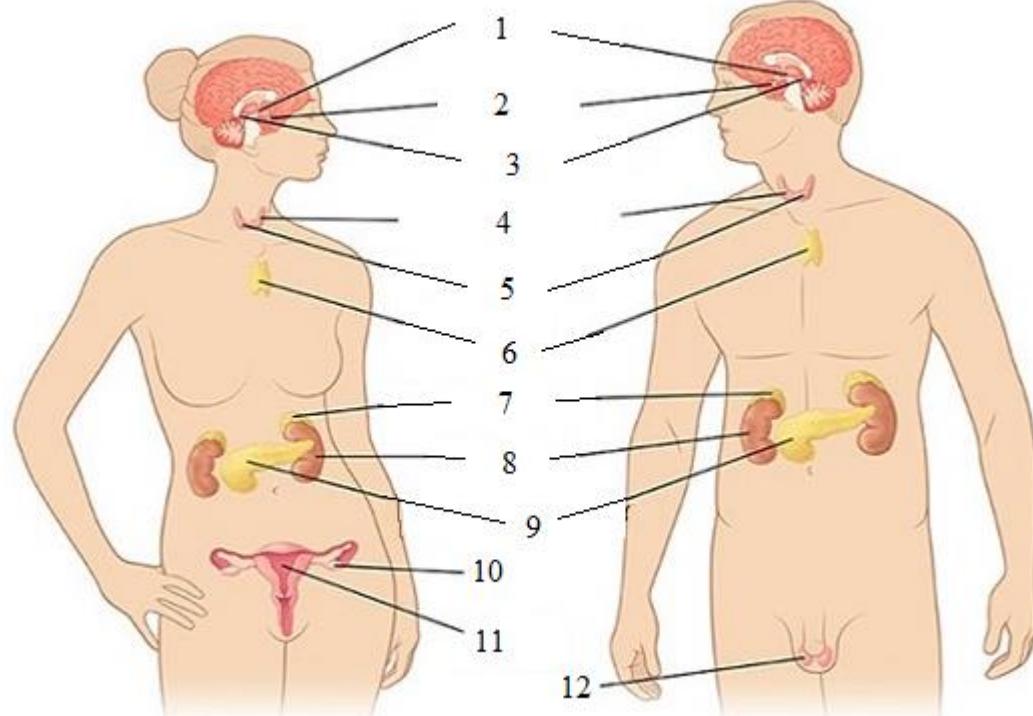
Complete the table:

Term in English.	Term in Latin.
The pineal gland	
The pyramidal lobe	
The inferior hypophisal arteries	
The thyroid gland	

Questions.

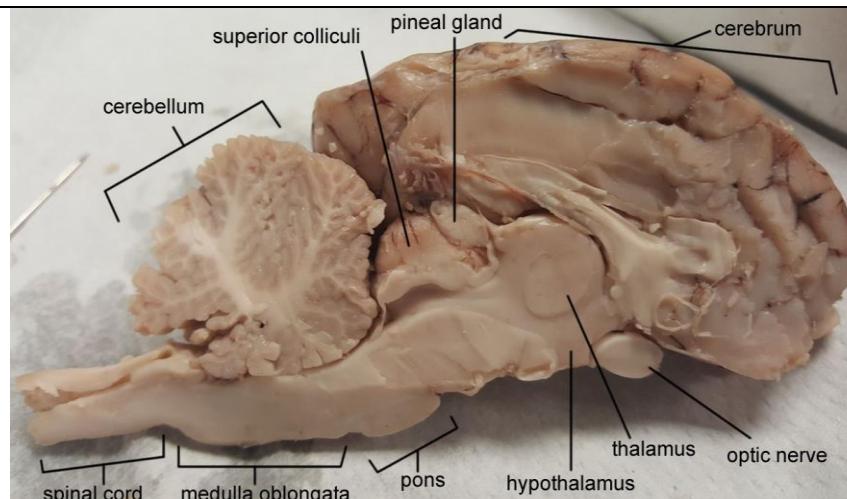
1. Name the anatomical and physiological distinctions between endocrine and exocrine glands.
2. Examination of a 32-year-old patient revealed disproportional skeleton size, enlargement of superciliary arches, nose, lips, tongue, jawbones, feet. What gland's function was disturbed? _____
3. A man after 1,5 litre blood loss has suddenly reduced diuresis. The increased secretion of what hormone caused such diuresis alteration? _____
4. A patient is very tall, has long thick fingers, big lower jaw and loppy lower lip. The increased secretion of which hormone and gland can be suspected? _____

The Endocrine Glands. Glandulae Endocrinae.

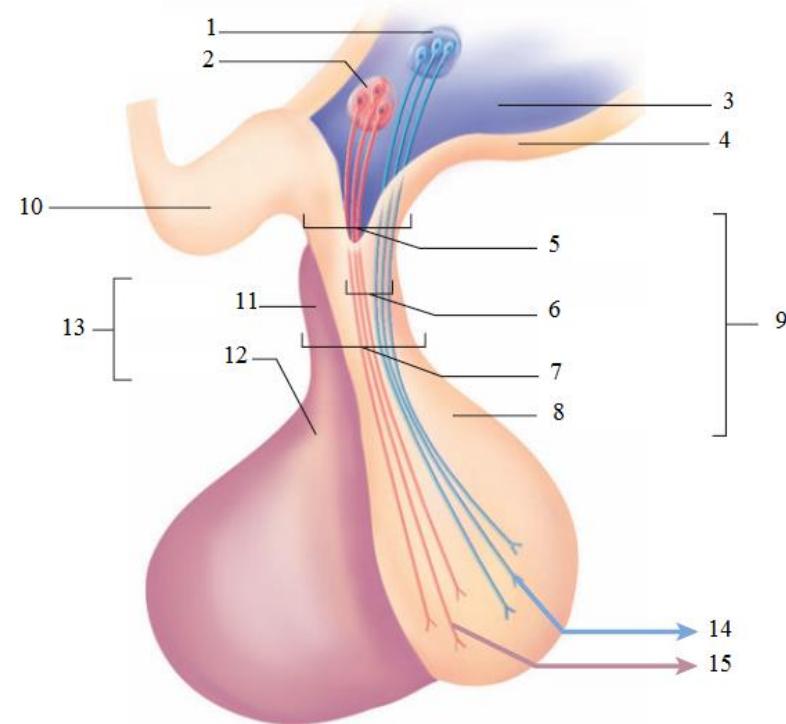


Write all anatomical structure.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____



The pituitary gland.



Write all anatomical structures.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.
- 13.
- 14.
- 15.

Nº	Source	Glands
1.	Ectodermic neurogenic	The pineal body, neurohypophysis, the cortex of suprarenal gland, paraganglia
2.	Ectodermic oral	Adenohypophysis
3.	Entodermic branchiogenic	The thyroid gland, the parathyroid glands, the thymus
4.	Entodermic midgut	Pancreatic islets
5.	Mesodermal interrenal	The medulla of suprarenal gland (interrenal system)
6.	Mesodermal mesenchymal	Endocrine portions of gonads (ovaries and testes)

Anatomical and physiological features. The endocrine glands feature as follows: 1) numerous blood supply sources providing abundant nourishing; 2) wide sinusoids-enabled capillary network, which slows the blood flow; 3) direct contact with capillary endothelium; 4) huge influence on an organism inconsistent with small size; 5) parenchymatose structure.

CR!

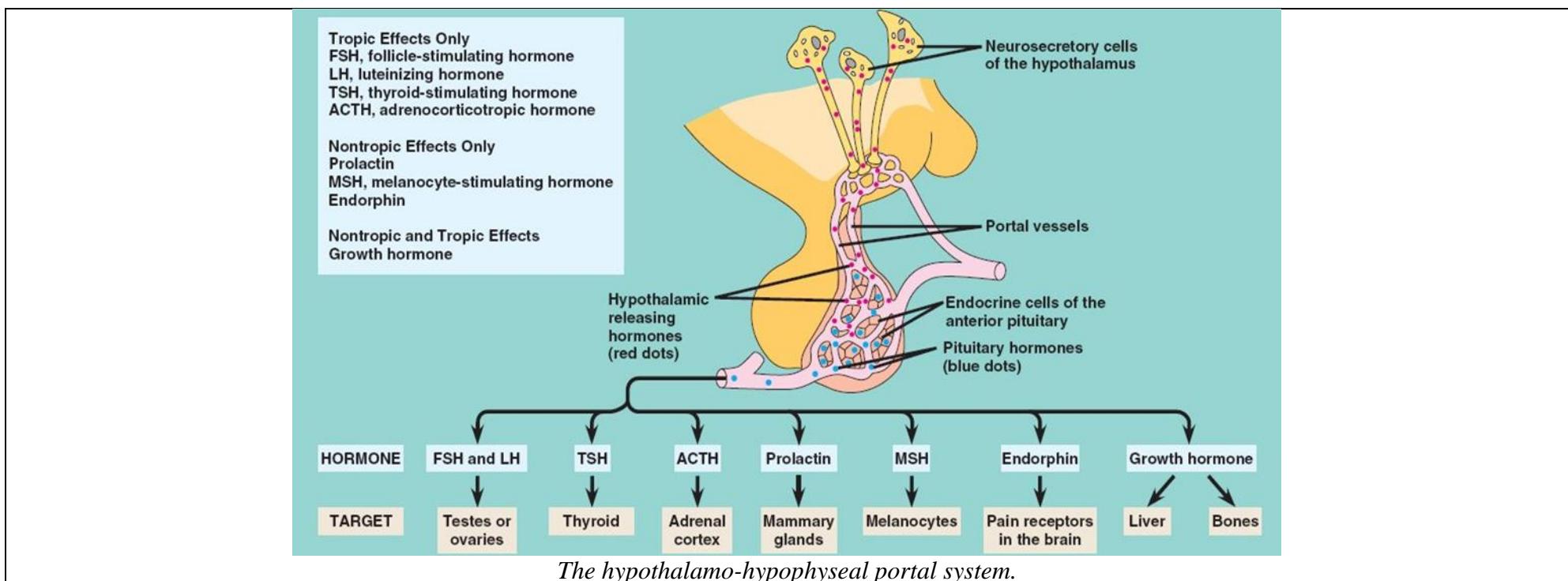
The ‘pituitary gland’ stands for ‘cerebral appendix’. In old times, the gland was thought to secrete nasal mucus. The word ‘pituitary’ later gave rise to ‘pituicytes’ — the newly discovered cells of neurohypophysis. Synonym is ‘hypophysis’. The pituitary gland occupies the hypophysial fossa in the sella turcica of sphenoid. It sizes 14x10x6 mm and weighs 0.5 g. In the course of pregnancy, the gland enlarges markedly and weighs up to 1 gram. Superiorly, the hypophyseal fossa is closed by the diaphragma sellae — the dura mater projection, which has a foramen that passes the infundibulum. The latter connects the pituitary to the tuber cinereum of hypothalamus.

The pituitary comprises two independently developed lobes: the anterior lobe (adenohypophysis) and posterior lobe (neurohypophysis).

The anterior lobe (adenohypophysis) is larger than the posterior and constitutes three thirds of the entire organ mass.

The posterior lobe (neurohypophysis) is a smaller portion of pituitary, which becomes continuous with infundibulum connected to the tuber cinereum.

The neurohypophysis develops from diencephalic evagination of the inferior wall of third ventricle, which generally gives rise to the tuber cinereum, infundibulum and neurohypophysis proper.



Growing in direction of the sella turcica, the neurohypophysis primordia reaches the adenohypo-physis to form a single organ — the pituitary gland.

Connections between the pituitary and hypothalamus. The posterior lobe is directly connected to the hypothalamus via nerve fibers (hypothalamo-hypophyseal tract) arising from the paraventricular and supra-optic hypothalamic nuclei. Neurocytes in these nuclei produce polypeptide hormones oxytocin and antidiuretic hormone (ADH, vasopressin) transported via previously mentioned nerve fibers to the posterior lobe, where stored and secreted into blood. The neuroglial cells of the posterior lobe (pituicytes) per se are unable to secrete hormones.

The anterior lobe on the contrary produces vital hormones but its functioning is under control of hypothalamus although hypothalamo- hypophysial tract is not involved into regulation of anterior lobe activities. Grafted to another place in the same organism, although living, the anterior lobe stops functioning. It was found that hypothalamus regulates anterior lobe activities by means of releasing factors transported to the target cells via special portal venous system.

The hypothalamo-hypophysial portal system. The hypophysis is supplied by the superior and inferior hypophysial arteries (the branches of the internal carotid artery) and branches of the cerebral arterial circle. The superior hypophysial arteries reach the tuber cinereum and infundibulum to split into capillary network. The capillaries in turn merge to form the veins, which run along the infundibulum down to the anterior lobe. Here they split again into sinusoid type capillaries passing between the secretory cells. The sinusoids finally collect into efferent hypophysial veins, which flow into the cerebral veins. Thus, the blood flowing in the hypophysial sinusoids first passes through the hypothalamic capillaries. The posterior lobe lacks the portal system.

Functions of the pituitary. The anterior lobe of hypophysis produces two groups of hormones. The first group regulates growth and development of an organism and metabolism processes. These hormones are as follows:

- growth hormone (GH, somatotropin), which regulate linear growth and body weight and influence cellular biosynthesis;
- lipoproteins (lipotropic factors), which mobilize fat from fat deposits and assist in its utilization;
- prolactin, which in females stimulates growth of mammary glands and stimulates lactation (postpartum secretion of milk); in males the hormone stimulates growth and development of the prostate and seminal vesicles;

The second group (otherwise called tropic factors or master hormones) regulate activities of other endocrine glands. These hormones are as follows:

- adrenocorticotrophic hormone (ACTH) promotes synthesis and secretion of steroids in the suprarenal glands;
- thyroid-stimulating hormone (TSH, thyrotropin) stimulates synthesis and secretion of thyroid hormones;
- gonadotropins (luteinizing hormone or LH and follicle-stimulating hormone or FSH); in females, FSH promotes follicles growth and ovulation and in males it regulates spermatogenesis; LH stimulates synthesis of sex hormones (estrogens in females and androgens in males);
- melanocyte-stimulating hormone (MSH) regulates pigment metabolism influencing production and redistribution of melatonin in skin, hair and eyeball tunics (iris and retina). Regulation of master-hormones secretion is subject to hormoneregulating substances (releasing and inhibiting factors exerting opposite effects on pituitary) secreted in infundibulum and tuber cinereum. The releasing factors travel via axons of secretory cells to the capillaries of infundibulum and tuber cinereum and further to the portal system and eventually reach the sinusoids to affect secretion of master-hormones. The master hormones are secreted into the same sinusoids and proceed to the blood flow.

Hormones secreted by the posterior lobe are:

- antidiuretic hormone (ADH), which causes vasoconstriction and reduces diuresis;
- oxytocin, which stimulates uterine contractions during labors and ejection of milk during lactation. In addition, it inhibits development and activity of the corpus luteum and affects tonus of GIT muscles.

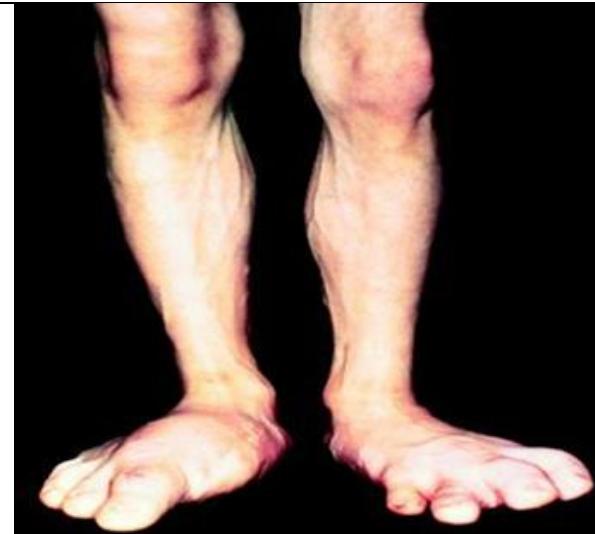
Clinical applications. The hypophysis is greatly prone to malignancies and other pathologies that cause hypo- or hypersecretion. GH hypersecretion before puberty resist in gigantism, while in adults the same condition results in acromegaly (difference lies in growth plates state). Hyposecretion of GH

and ACTH results in dwarfism (hypophyseal-type nanism) and Cushing's syndrome (manifested as irregular obesity, sexual disorders and pathological pilosis). Other common pathology is diabetes insipidus.



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Growth hormone (Hypersecretion in youth produces gigantism
Hyposecretion in childhood produces pituitary dwarfism
Hypersecretion in adult produces acromegaly).



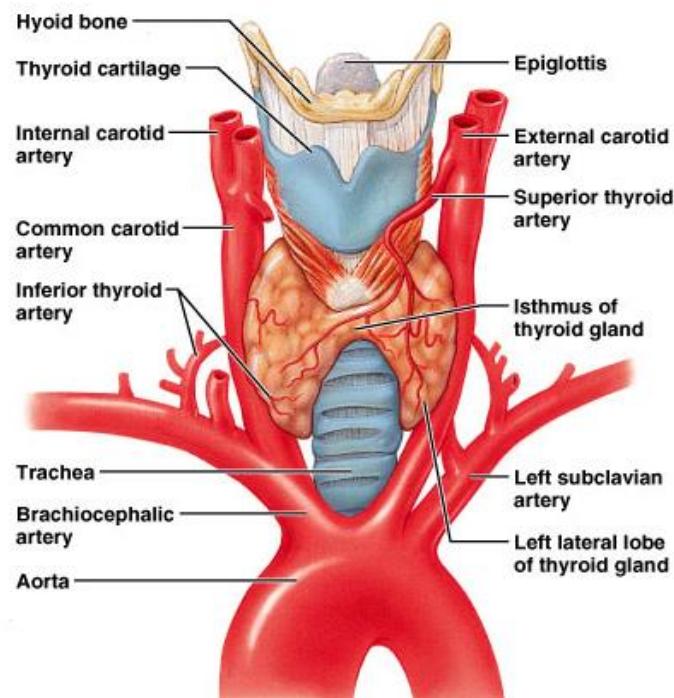
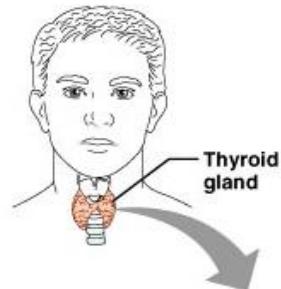
Acromegaly.

The pineal gland is an endocrine organ of ectodermic neurogenic origin, which develops from evagination of the tegmentum of third ventricle. The pineal gland belongs to epithalamus and resides between the superior colliculi of the tectum of midbrain. The gland attaches to the thalamus by means of habenulae.

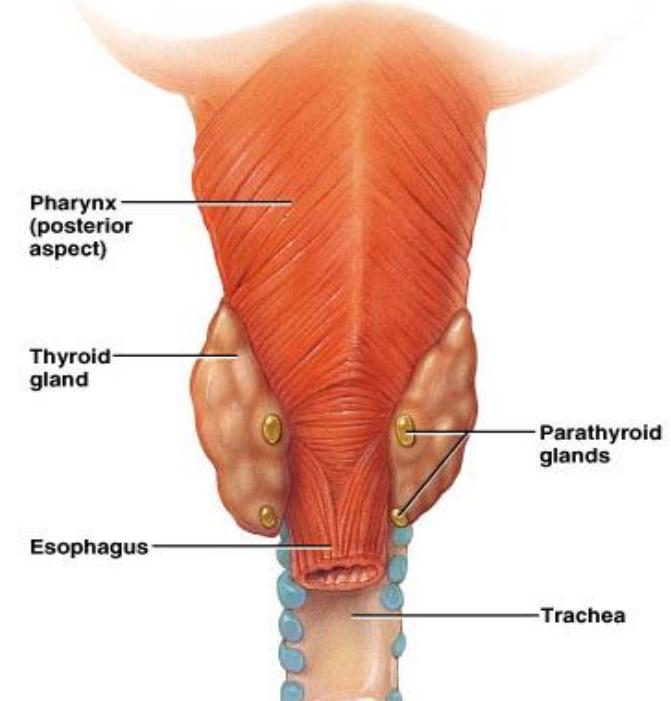
Mass and sizes of the gland are variable but average gland weighs approx. 0.2 grams and is 5-8 mm long and 9 mm wide. The gland is covered with connective tissue capsule, which gives septa radiating in depth of gland to divide the parenchyme into lobules. The lobules contain secretory pinealocytes and supporting neuroglial cells. With aging, the gland accumulates specific subcapsular deposits — the sand-like bodies, which specify its characteristic pinecone-like relief. The hormones secreted by the gland are melatonin (principal), adrenoglomerulotropin and serotonin. Lacking direct nervous connection to the rest of brain (although highly innervated by sympathetic fibers from the stellate ganglion), the gland contacts the hypothalamus and hypophysis via cerebrospinal fluid to form a joint regulatory system, which influences other glands (in part the gonads), growth and development of an organism and water-electrolyte metabolism.

Clinical applications. Production of epiphyseal hormone melatonin follows a daily illumination dependent rhythm. Direct illumination arrests secretion of melatonin. Antagonizing the melanocyte-stimulating hormone, it regulates development of gonads during childhood, inhibits action of gonadotropin and somatotropin secretion in adults. The gland also arrests secretion of biologically active substances in nearly all endocrine glands performing thus function of adaptive 'biological clock'.

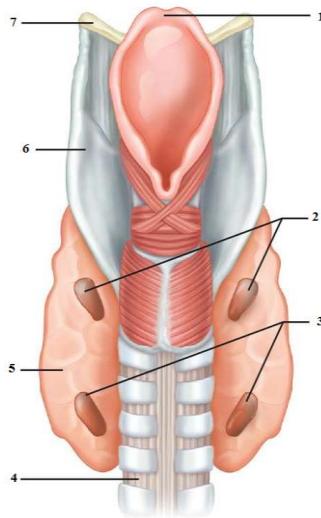
Topic 18. Peripheral part of endocrine system (the thyroid gland, the parathyroid gland, the pancreatic islets, the suprarenal gland, the endocrine part of gonads).



Thyroid gland.



Parathyroid gland.

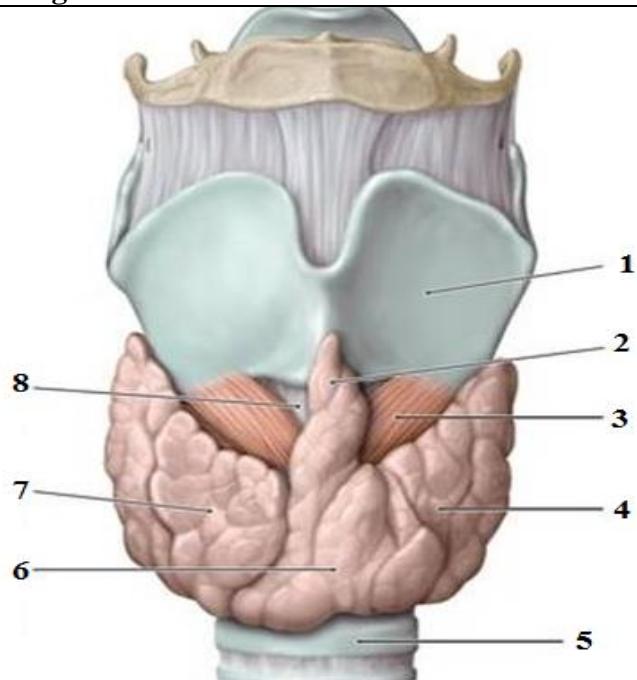


Thyroid gland. Posterior view.

Write all anatomical structures.

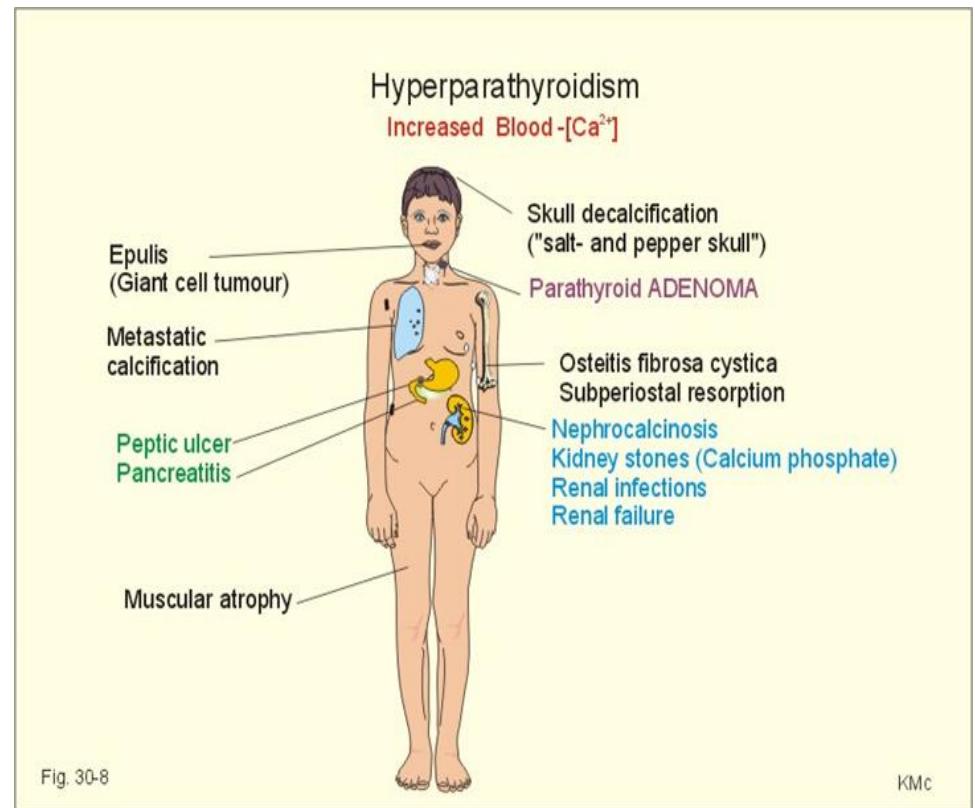
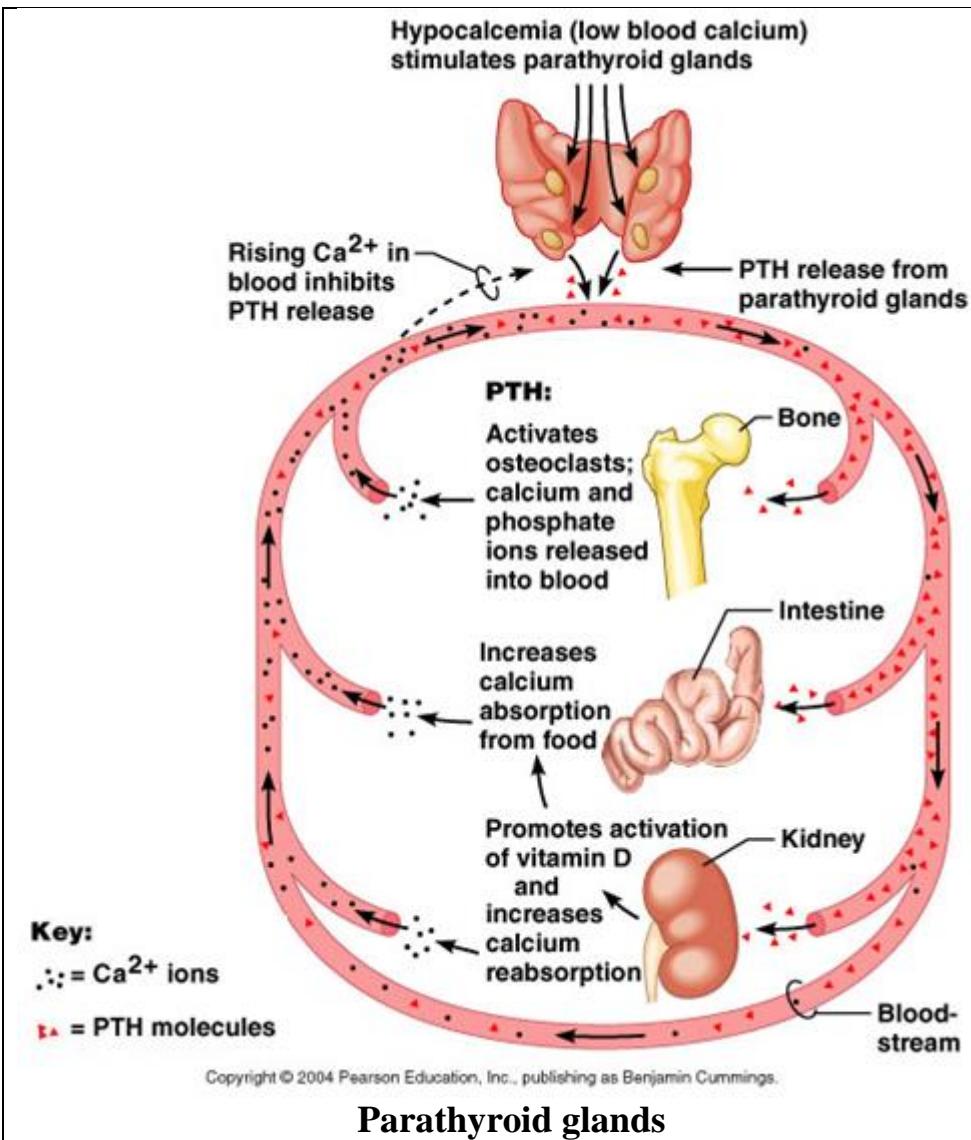
1. _____
2. _____
3. _____
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6. _____
7. _____

Thyroid gland.



Write all anatomical structures.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____



Hyperfunction of the parathyroid gland.

Clinical applications. Most common diseases affecting the thyroid are goiter (diffuse, toxic and sporadic), thyroiditis and tumors. Hypothyroidism in children results in cretinism manifested as stunted growth, mental debility and underdevelopment of gonads. Hypothyroidism in adults causes myxedema, experienced as dramatic decrease of metabolism intensity.

Hyperthyroidism causes Basedow's disease in which metabolism intensity on the contrary increases (it manifests as tachycardia, high body temperature, increased activity of suprarenal and mammal glands and gonads, increased excitability of CNS). Normal hormones synthesis requires adequate amount of dietary iodine. Therefore, people residing in iodine-deficient regions develop compensatory enlargement of thyroid called endemic goiter. Such pathological enlargement of gland requires surgery. As far as the thyroid uses exogenous iodine, it was the first organ to respond to such catastrophe as Chernobyl NPS disaster with increased incidence of thyroid malignancies. Radioactive isotope I¹³¹ is used by the thyroid as well as nonradioactive I¹²⁶, which causes abnormal irradiation of the gland.

What are some thyroid diseases?

Hyposecretion

Congenital hypothyroidism: facial thickening, low body temp, lethargy, brain damage. **Adults:** myxedema. Sluggish, sleepy, weight gain, cold, tissue swelling.



Myxedema.



Goiter (exophthalmos).

What is goiter?

Another thyroid disorder; two types

Endemic goiter: dietary deficiency of iodine

No TH produced so pituitary receives no neg. feedback and more TSH produced

Results in hypertrophy

Toxic goiter (Grave's disease)

Autoimmune disease

Abnormal antibodies mimic TSH, raising TH levels

Called thyroid-stimulating immunoglobulin

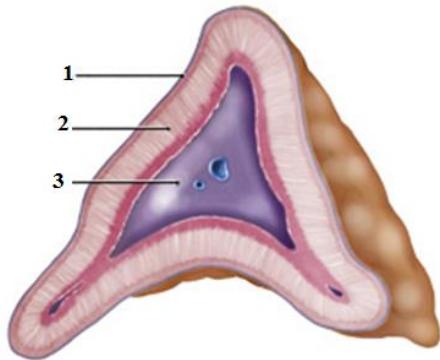
Sleeplessness, weight loss, exophthalmos

Clinical applications. Hypoparathyroidism results in blood calcium level decrease, which causes a life threatening state — tetany (a severe convulsive syndrome). The condition usually results from accidental removal of glands during surgical interference. Glands safety therefore is a concern during operation on thyroid gland and neighboring tissues.

Hyperparathyroidism (increased glands' activity) on the contrary results in releasing of excessive amount of calcium and phosphates into blood, which causes bone demineralization and calcification of blood vessels.

Functions of the suprarenal glands. The cortex produces a large number of hormones generally called the corticosteroids. The corticosteroids are divided into three groups — glucocorticoids, mineralocorticoids and gonadocorticoids (sex hormones, which supplement gonadal hormones). These hormones influence metabolism of proteins and carbohydrates, inhibit immunity (cortisone, cortycosterone and hydrocortisone), regulate sodium and potassium turnover (aldosterone) and influence reproductive system (androgens, estrogens and progesterone). The medulla produces two related hormones — epinephrine and norepinephrine, which exert the effects similar to effects produced by sympathetic part of ANS (elevation of blood pressure and acceleration of heart rate). The physiologists therefore distinguish sympatho-adrenal system. During stress situation accompanied by strong emotional reactions (fear or rage), increased secretion of epinephrine and norepinephrine is observed. However, the effect of interacting hormones may appear opposite (the effect on heart). Epinephrine counteracts insulin action and is able to influence basal metabolism. The catecholamines generally influence metabolism of proteins, lipids and carbohydrates.

Pancreas, anterior view in medial section.	Write all anatomical structures.
	1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11.

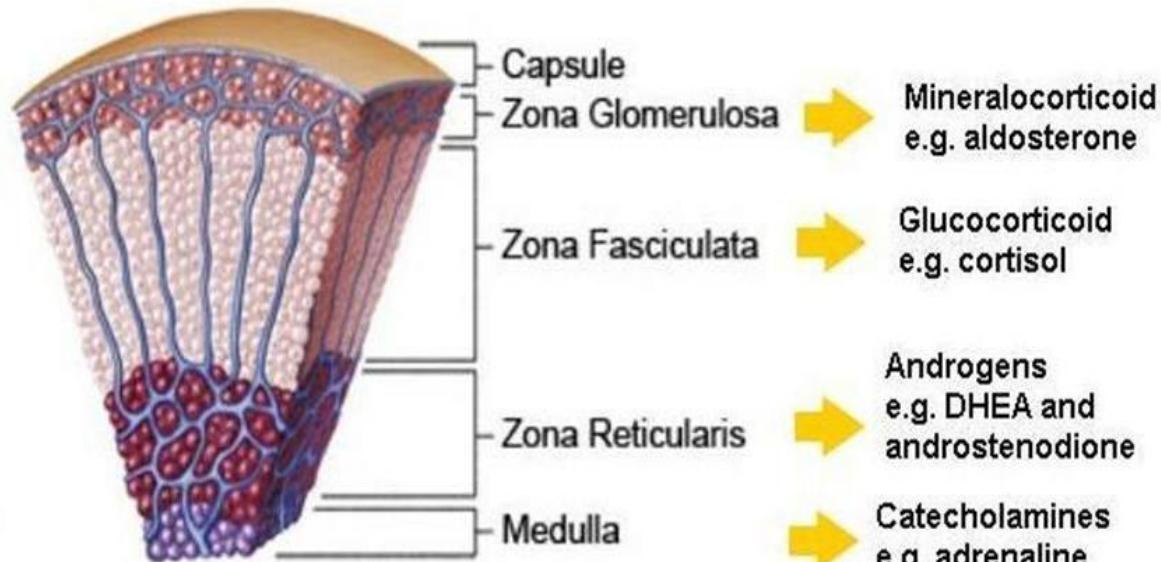


Adrenal gland. Transvers section.

Write all anatomical structures.

1. _____
2. _____
3. _____

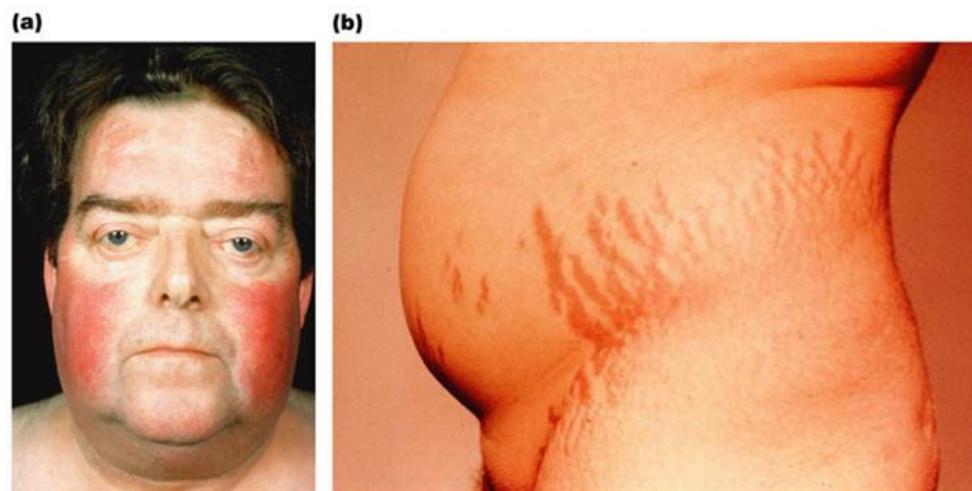
Adrenal gland in macroscopic section.





Adrenal tumor or ACTH excess

Symptoms: hyperglycemia, hypertension, muscular weakness, edema, "moon face", "buffalo hump".



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Fig. 23-5

Cushing's Disease.



Addison disease (Hyposecretion of glucocorticoids and mineralcorticoids; Hypoglycemia, Na/K imbalance, loss of stress resistance, hypotension, Bronzing b.c ACTH stimulates melanin production; Fatal if not treated with corticoids)

Clinical applications. Emotional stress may cause adrenal hyperglycemia — elevation of blood glucose level due to epinephrine emission. Hypofunction of cortex results in Addison's disease. Hormonal deficiency causes variable metabolic disorders with deranged functioning of organs and systems. Hyperfunction of suprarenal glands is associated with hormonally active tumor of medulla or cortex.

Questions

1. A patient is very tall, has long thick fingers, big lower jaw and loppy lower lip. The increased secretion of which hormone and gland can be suspected?

2. A 10-year-old girl has the signs of precocious puberty. Which endocrine gland function decline might have caused this? _____
3. A histological specimen presents parenchymal organ, which has cortex and medulla. Cortex consists of epitheliocytes bars with blood capillaries between them; the bars form three zones. Medulla consists of chromaffinocytes and venous sinusoids. Which organ has these morphological features?

4. A patient was diagnosed cretinism manifested as stunted growth, mental debility and underdevelopment of gonads. Which endocrine gland is affected?

5. A patient was diagnosed Basedow's disease in which metabolism intensity increases (it manifests as tachycardia, high body temperature, increased excitability of central nervous system). Which endocrine gland is affected? _____

Topic 19. Situation tasks.

1. During the first days of a newborn child, a pediatrician detected that milk gets into the child's nasal cavity. What malformation does this fact indicate?	A. Esophageal atresia B. Diverticulum of esophagus C. Non-closed palate D. Cleft lip E. Esophagus constriction
2. A 53-year-old patient complained of pain and edema in the site of oral cavity floor. After examination, the inflammatory process in the site of the excretory duct of the parotid gland was diagnosed. Where does this duct open to?	A. Caruncula sublingualis B. Recessus gingivalis C. Foramen caecum linguae D. Vestibulum oris E. Plica sublingualis
3. On examination, vestibule of mouth dentist found redness on the buccal mucosa, opposite to the upper second molar tooth. Which major salivary gland can be damaged the first place?	A. Lingual B. Sublingual C. Palatine D. Submandibular E. Parotid
4. During the X-ray, examination of a 30-year-old patient in vertical position a doctor detected the presence of air in the stomach. What part of the stomach is it in?	A. At the fundus B. In the cardial C. In the body D. In the pyloric E. In the area of the lesser curvature
5. During a duodenal intubation, the probe does not pass from the stomach into the duodenum. What part of the stomach is an obstacle (tumor) in?	A. In the cardial part B. In the pyloric part C. In the fundus area D. In the body area E. In the area of the lesser curvature
6. Children frequently have nasal breathing affection caused by the overgrowth of the pharyngeal mucous membrane lymphoid tissue. Which tonsils excrescence may cause this?	A. Lingual B. Palatine C. Pharyngeal D. Tubal E. All mentioned
7. During the endoscopy the inflammation of a major papilla of the duodenum and the disturbances of bile secretion were found. In which part of duodenum were the problems found?	A. Upper horizontal part B. Bulb C. Lower horizontal part D. Descendent part

	E. Ascendant part
8. During fibrogastroduodenoscopy, a doctor has to examine the major duodenal papilla. What anatomic formation can serve as a landmark for its revealing?	A. Hepatoduodenal ligament B. Duodenal glands C. Duodenal cap D. Circular folds of the duodenum E. Longitudinal fold of the duodenum
9. A patient complains about impaired evacuatory function of ileum (long-term retention of food in ileum). Examination revealed a tumour of initial segment of the large intestine. Specify localization of the tumour:	A. Caecum B. Colon ascendens C. Colon descendens D. Rectum E. Colon transverses
10. A female patient with a tumour of pancreas has developed mechanic jaundice resulting from compression of a bile-excreting duct. Which duct is compressed?	A. Ductus cysticus B. Ductus choledochus C. Ductus hepaticuscommunis D. Ductus hepaticusdexter E. Ductus hepaticus sinister
11. A 45-year-old patient was admitted to the surgical department with complaints of abrupt sharp pain in the epigastric region. After examination it was diagnosed: perforated ulcer of the posterior wall of the stomach. Where did content of the stomach flow out while perforation?	A. To the pregastric bursa B. To the liver bursa C. To the omental bursa D. To the left mesenteric sinus E. To the right mesenteric sinus
12. A patient with a stab wound of the anterior stomach wall is in surgical care. What formation of abdominal cavity did the stomach contents get into?	A. Left mesenteric sinus B. Omental bursa C. Hepatic bursa D. Pregastric bursa E. Right mesenteric sinus
13. A surgeon should reach the omental bursa to perform an operation on abdominal cavity. How can he reach this part of peritoneal cavity without affecting the integrity of lesser omentum?	A. Through the left mesenteric sinus B. Through the right paracolic sulcus C. Through the left paracolic sulcus D. Through the right mesenteric sinus E. Through the epiploic foramen
14. A 28-year-old woman has been diagnosed with extrauterine pregnancy complicated by the fallopian tube rupture. The blood is most likely to penetrate the following peritoneal space:	A. Rectouterine B. Vesicouterine C. Right mesenteric sinus D. Left mesenteric sinus E. Intersigmoid sinus

15. A surgeon has to find the common hepatic duct during the operative intervention on account of concrements in the gall ducts. The common hepatic duct is located between the leaves of:	A. Venous ligament B. Hepatoduodenal ligament C. Hepatorenal ligament D. Round ligament of liver E. Hepatogastric ligament
16. In case of a penetrating wound of the anterior abdominal wall the wound tract went above the lesser curvature of stomach. What peritoneum formation is most likely to be injured?	A. Ligamentum hepatogastricum B. Ligamentum gastrocolicum C. Ligamentum hepatoduodenoale D. Ligamentum hepatorenale E. Ligamentum triangulare sinistrum
17. A 69-year-old patient has got an abscess of frontal lobe as a result of purulent infection in nasal cavity. What anatomical formation did the infection penetrate through?	A. Foramen rotundum B. Foramen ovale C. Foramen ethmoidalae posterior D. Foramen sphenopalatinum E. Foraminae cribrosae
18. Acute inflammatory process of the nasolacrimal duct mucosa of a 28-year-old has been diagnosed. Influenza was followed by 10-days' discharge from the nose. From that part of the nasal cavity could the infection get into the nasolacrimal duct?	A. Vestibule of nose B. Middle nasal meatus C. Superior nasal meatus D. Inferior nasal meatus E. Frontal sinus
19. A 37-year-old patient has suffered from pulmonary tuberculosis since childhood. Amputation of the middle lobe of the right lung has been performed. Which segments have been amputated?	A. Posterior and anterior B. Superior and anterior C. Medial basal and lateral basal D. Superior lingular and inferior lingular E. Lateral and medial
20. A 45-year-old patient was hospitalized with complaints of high temperature, pain during respiration, dyspnea and cough. Examination and radiodiagnosis diagnosed pleurisy. For exudation evacuation pleurocentesis was prescribed. In what place of the pleura cavity is the largest quantity of exudation?	A. Under the root of lungs B. In the phrenico-mediastinal sinus C. In the costomediastinal sinus D. Under the cervical pleura E. In the costodiaphragmatic recess
21. A patient was admitted to a hospital with a knife wound of the thorax on the right and pneumothorax (presence of air in the pleural cavity). Percussion has shown that the inferior right lung border at the midclavicular line rose to the III rib level. Where is it located normally?	A. IX rib B. VII rib C. VIII rib D. VI rib E. V rib
22. A patient with a knife wound in the left lumbar part was delivered to the	A. Erector muscle of spine

emergency hospital. In course of operation a surgeon found that internal organs were not damaged but the knife injured one of muscles of renal pelvis. What muscle is it?	B. Iliac muscle C. Greater psoas muscle D. Abdominal internal oblique muscle E. Abdominal external oblique muscle
23. After a significant weight loss a 70-year-old man has dull pain in the loin. The diagnose is a floating kidney. In which part of the kidney fixative apparatus have the changes taken place?	A. Lig. hepatorenalis B. Capsula fibrosa C. M. iliopsoas D. Capsula adiposa E. M. quadratus lumborum
24. Urography has shown calculi in the macroscopic parts of the kidney urinary tracts. It was detected that they are located in:	A. Minor and major renal calices, renal pelvis B. Gathering tubules, papillary ducts, minor renal calices C. Straight tubules, minor and major renal calices D. Papillary ducts, major renal calices, renal pelvis E. Papillary ducts, minor renal calices, straight tubules
25. In course of a small pelvis operation, it became necessary to ligate an ovarian artery. What formation may be accidentally ligated together with it?	A. Round ligament of uterus B. Uterine tube C. Ureter D. Internal iliac vein E. Urethra
26. During complicated labour the symphysis pubis ruptured. What organ can be damaged mostly?	A. Urinary bladder B. Rectum C. Ovaria D. Uterine tubes E. Uterus
27. During cystoscopy, mucous membrane of urinary bladder normally makes folds except for a single triangular area with smooth mucosa. This triangle is located in the following part of urinary bladder:	A. Bladder cervix B. Bladder floor C. Bladder apex D. Bladder body E. Bladder isthmus
28. A patient is diagnosed with scrotal hydrocele - an increase of fluid quantity in serous sac. Between which testicular tunics is the pathologic content located?	A. Between skin and cremaster muscle B. Between skin and dartos muscle C. Between internal spermatic fascia and vaginal tunic D. Between dartos muscle and internal spermatic fascia E. Between parietal and visceral layers of vaginal tunic
29. While performing a woman's inguinal canal operation because of hernia a	A. Lig. inguinale

surgeon damaged the canal's contents. What exactly was damaged?	B. Urachus C. Funiculus spermaticus D. Lig. teres uteri E. Broad ligament of uterus
30. A 28-year-old woman was admitted to a gynecology department with complaints of pain in the abdominal region. An ovary tumor was clinically detected and prescribed to be removed. During the operation a ligament connecting the ovary with the uterus is to be dissected. Which ligament is it?	A. Lig. suspensorium ovarii B. Lig. latum uteri C. Lig. cardinale D. Lig. umbilicalis lateralis E. Lig. ovarii proprium
31. During a gynecologic examination, a patient has endometritis (inflammation of endometrium) diagnosed. Which membrane of uterine wall is affected by the inflammatory process?	A. Mucous tunic B. Serous tunic C. Muscular tunic D. Adventitious membrane E. Parametrium
32. Examination of a 32-year-old patient revealed disproportional skeleton size, enlargement of superciliary arches, nose, lips, tongue, jaw bones, feet. What gland's function was disturbed?	A. Pancreas B. Epiphysis C. Hypophysis D. Thyroid E. Suprarenal
33. Vegetative abnormalities in the sleep, heat regulation, all kinds of metabolism, diabetes insipidus are developing in the patient due to growth of the tumour in the III ventricle of brain. Irritation of the nucleus of what part of the brain can cause this symptoms?	A. Pons cerebelli B. Cerebral peduncles (cruces cerebri) C. Mesencephalic tegmentum D. Hypothalamus E. Medulla
34. A 10-year-old girl has the signs of precocious puberty. Which endocrine gland function decline might have caused this?	A. Thyroid gland and Epiphysis B. Adenohypophysis C. Parathyroid glands D. Thymus E. Medullary substance of adrenal glands
35. A 30-year-old patient complains ' thirst and dry mouth which appeared after severe neurasthenia. Laboratory examination has shown blood sugar increase up to 10 millimoles per litre. Which endocrine gland is affected?	A. Thyroid gland B. Pancreas gland C. Sexual gland D. Adrenal gland E. Epiphysis

CLINICAL CASES

1. A 16-year-old girl comes to the gynecologist because of recurrent pelvic pain. She has menstrual cycles lasting approximately 28 days with light bleeding for 2-3 days. She is not sexually active and has never been pregnant. Her mother and older sister have been diagnosed with polycystic ovary syndrome (PCOS), so her doctor orders a transvaginal ultrasound. No ovarian abnormalities are noted, but the doctor identifies a uterine malformation. A similar example from a different patient is shown in the image. The doctor explains that this finding is unrelated to her pain, but could lead to certain complications in the future. **Which of the following clinical conditions is most likely associated with this malformation?**

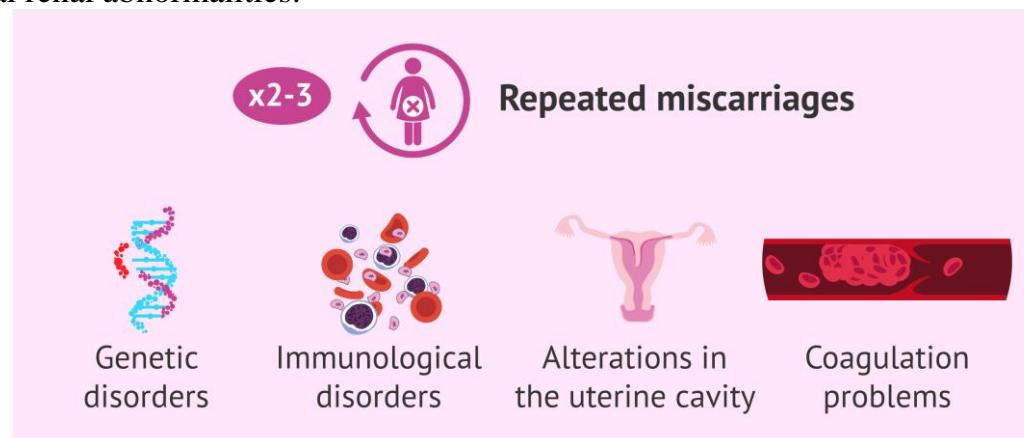
- A. Anovulation
- B. Bilateral renal agenesis
- C. Endometrial cancer
- D. Infection
- E. Recurrent miscarriage

Correct!

The image in the stem is of a bicornuate uterus, which results from incomplete fusion of the paramesonephric ducts during development. Women with this condition are usually unaware of its presence, because it does not typically cause any noticeable symptoms. However, some women can report irregular vaginal bleeding, painful menstruation, abdominal discomfort, and pain during intercourse. Diagnosis can be confirmed with ultrasonography, MRI, hysterosalpingogram, and pelvic examination.

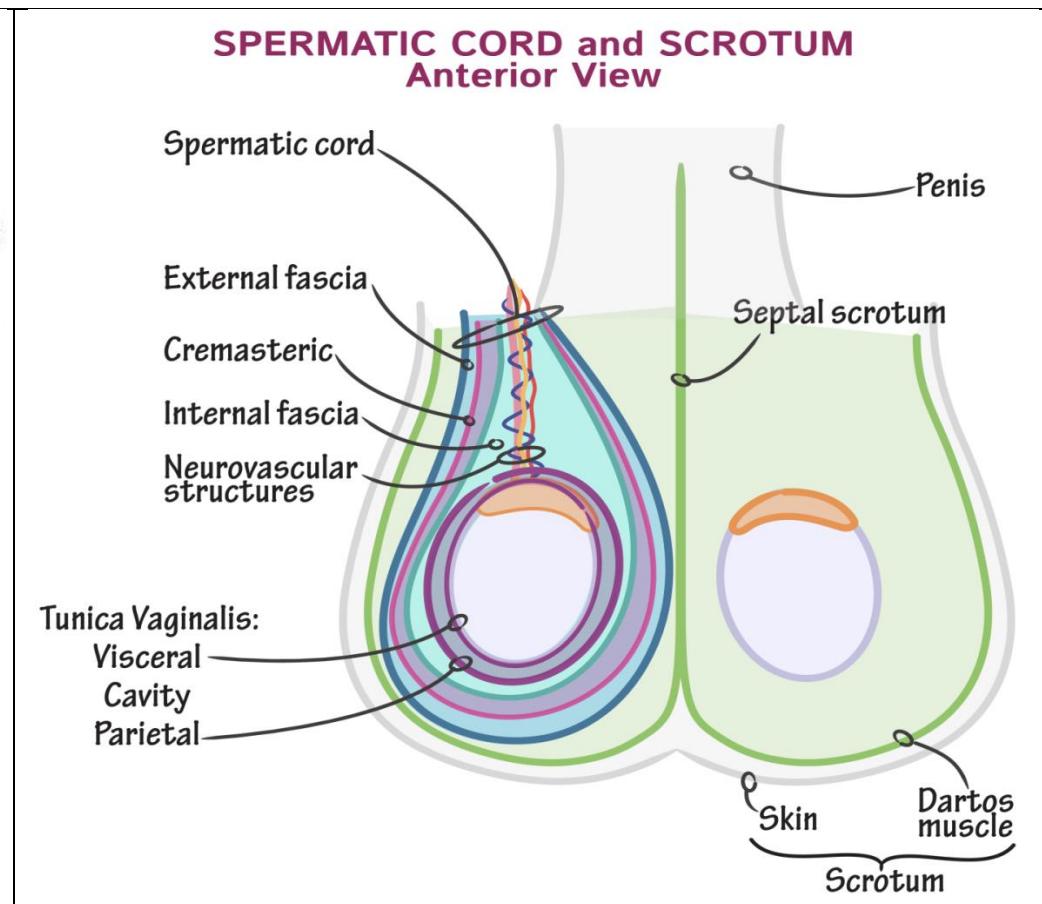
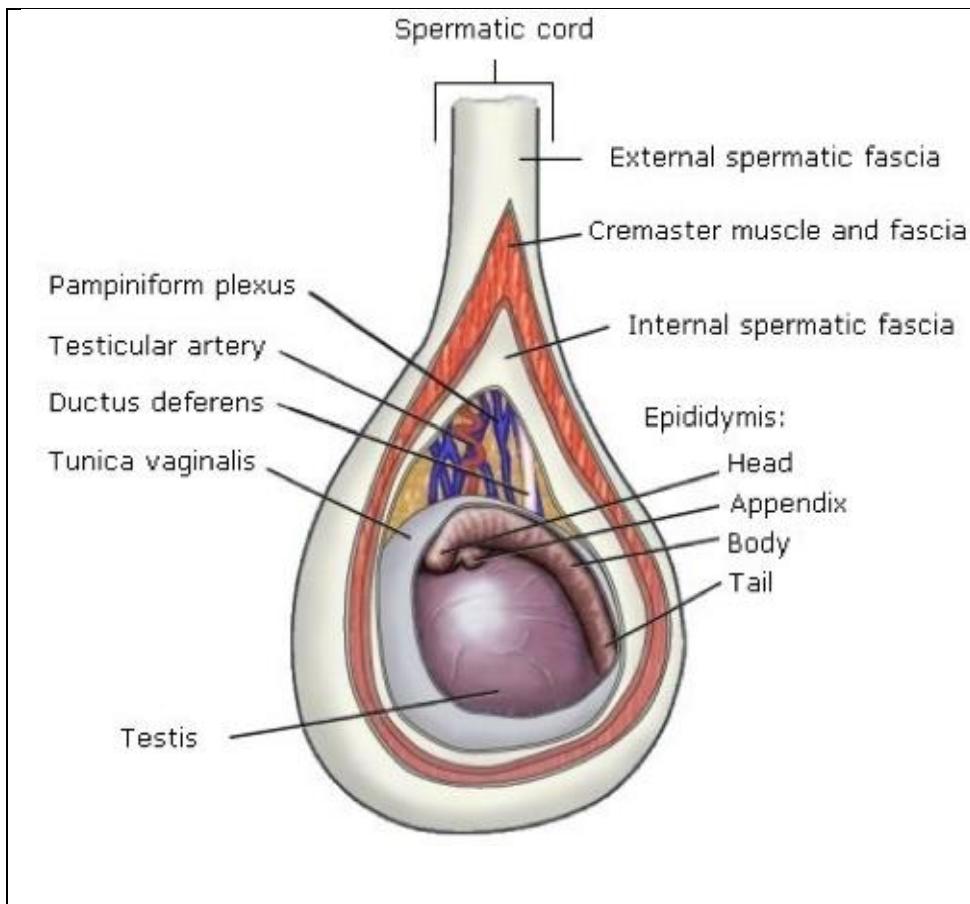
Complications can arise with pregnancy. Although pregnancies are often carried to term, women with a bicornuate uterus are at increased risk for infertility, recurrent miscarriage, preterm labor, and preterm delivery. Since development of the paramesonephric ducts and mesonephric ducts are closely related, uterine anomalies often occur alongside renal anomalies.

A bicornuate uterus is not associated with an increased risk of infection, It does not affect ovulation, or affect uterine function. A bicornuate uterus does not predispose patients to endometrial cancer. This patient's condition is less likely to result in bilateral renal agenesis than unilateral renal abnormalities.



2. A 36-year-old father of six children visits the family planning clinic for advice regarding birth control. He says that he has fathered these children with different women and that he is not interested in having any more. The patient has no significant medical or surgical history and does not smoke, drink alcohol, or use illicit drugs. Results of physical examination are unremarkable. The physician presents all the different alternatives, and after thinking about it for some time, the patient decides to have a vasectomy. **What structure is specifically targeted during this procedure to achieve permanent birth control?**

- A. Ductus deferens
- B. Epididymis
- C. Scrotum
- D. Seminal vesicles
- E. Seminiferous tubules



Correct!

This man, who does not wish to father additional children, is seeking a new family planning option. In consultation with his doctor, he chooses a vasectomy, an increasingly popular method of permanent birth control. During the procedure, the surgeon cuts through the skin, superficial scrotal fascia (dartos fascia), external spermatic fascia, cremasteric fascia and muscle, and internal spermatic fascia. The ductus deferens, the tube that transports sperm from the epididymis to the ejaculatory duct, is specifically targeted to achieve results. This structure is tied in two places and transected. The patient's ability to produce sperm is unchanged, but transection of the ductus deferens prevents the normal path of the sperm and results in permanent birth control.

The epididymis, which carries and stores sperm; the seminiferous tubules, the site of meiosis and sperm creation; and the seminal vesicles, which make semen, are not targeted during a vasectomy. These structures remain unchanged. The skin and fascia of the scrotum are cut to gain access to the target area, the ductus deferens; the scrotum itself is not the main site affected by a vasectomy.

3. A 37-year-old man is brought to the emergency department after being stabbed in the chest with a knife; the wound is superior to his right nipple. His blood pressure is 100/60 mm Hg, heart rate is 126, respiratory rate is 26, and oxygen saturation is 90% with 100% oxygen delivered via face mask. The wound is bubbling, and the skin immediately around the wound is moving in and out with respiration. Bilateral percussion of the chest reveals hyperresonance on the right. **Which of the following will most likely be found on the right side of an x-ray of this patient's chest?**

- A. Hemothorax
- B. Ninth rib fracture
- C. Pleural effusion
- D. Pneumothorax**
- E. Upper lobe consolidation

Correct!

This patient was stabbed in the right side of his chest and has mildly low blood pressure, tachycardia, tachypnea, and low oxygen saturation. He is described as having a sucking chest wound - a bubbling wound with surrounding skin moving in and out with respiration. These clinical features suggest a traumatic right pneumothorax.

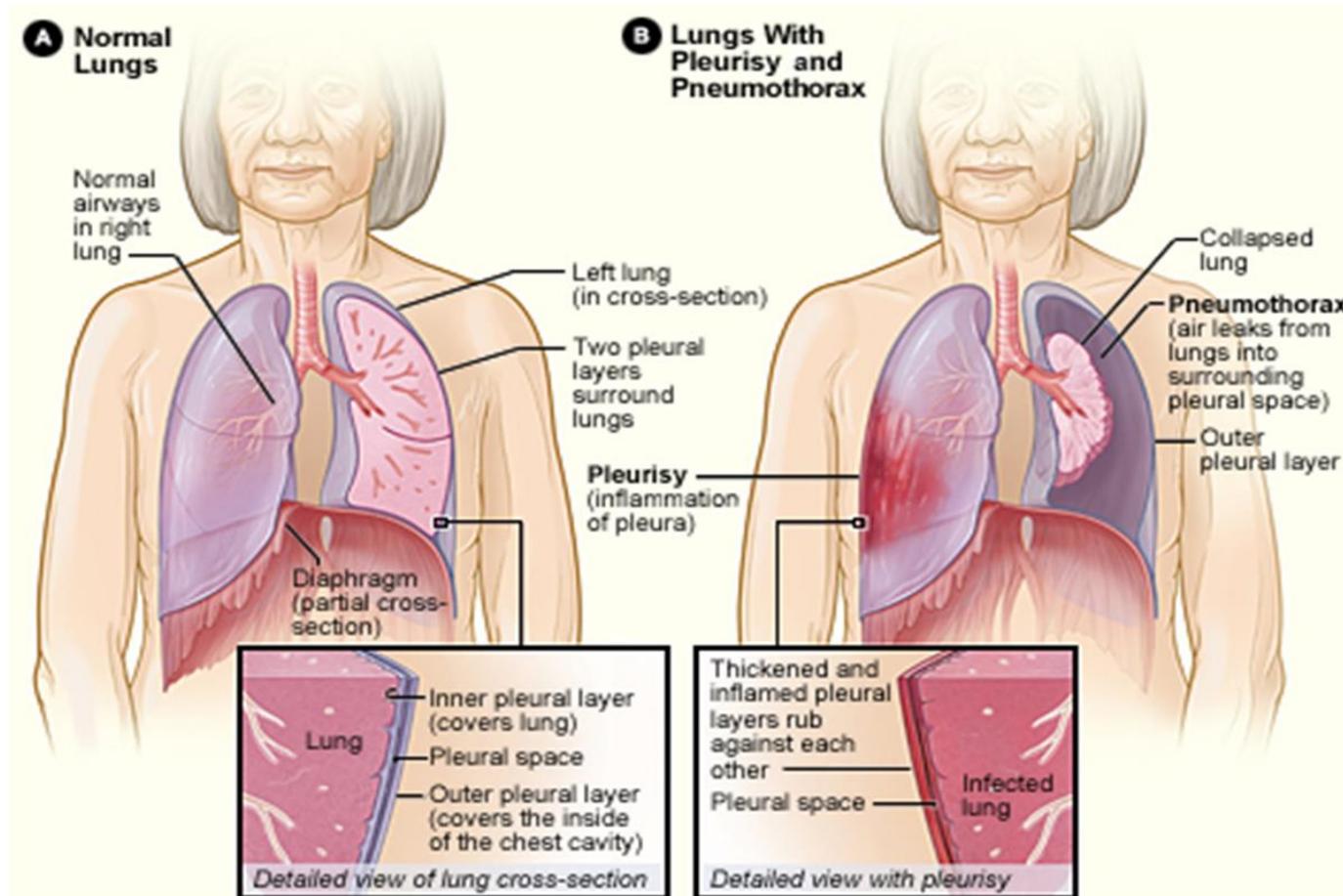
A penetrating wound to the chest can puncture the pleura, creating an opening for air to be sucked into the pleural space. With inspiration, the diaphragm descends, lowering the intrapleural pressure. If there is communication directly between the pleural space and the outside world, air is sucked into this negative pressure space and collapses the lung. Pneumothorax is seen on x-ray of the chest as a collapsed lung.

In tension pneumothorax, the mediastinum is shifted away from the collapsed lung because of a buildup of positive pressure in the pleural space. This finding is a medical emergency. A patient with a pneumothorax should be assessed for signs and symptoms of hemodynamic compromise. This patient, for example, has hypotension, tachycardia, and tachypnea and therefore requires immediate

treatment.

A hemothorax would cause dullness, rather than hyperresonance on percussion, and blood would be leaking out of the chest wound.

Ninth rib fracture is anatomically very unlikely, given that the patient was stabbed in the area of the nipple (fourth and fifth ribs). Pleural effusion and right upper lobe pneumonia develop more progressively and are very unlikely to be caused by a chest wound or to present suddenly.



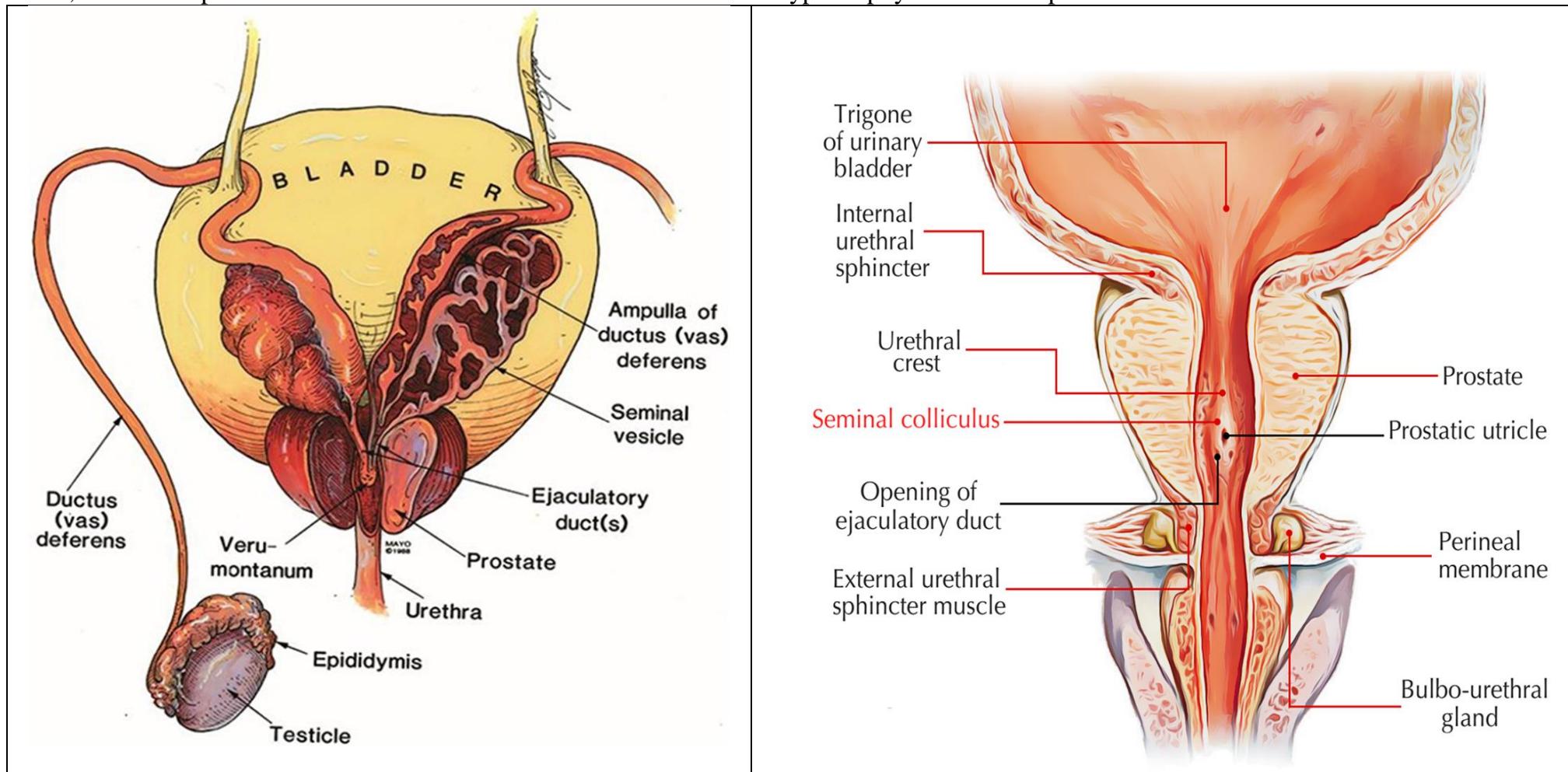
4. A 68-year-old man comes to the physician complaining of bladder fullness despite urinating 8–10 times per day. He states he often has problems initiating the flow of his urine and has had significant decrease of his urine stream. On digital rectal examination, the physician palpates a smooth, enlarged prostate with no nodularity. Imaging shows an enlarged, hypertrophied bladder. **Which of the following is a risk factor for this condition?**

- A. Advanced age

- B. Decreased serum dihydrotestosterone levels
- C. Exposure to aniline dyes
- D. Significant alcohol use
- E. Significant smoking history

Correct!

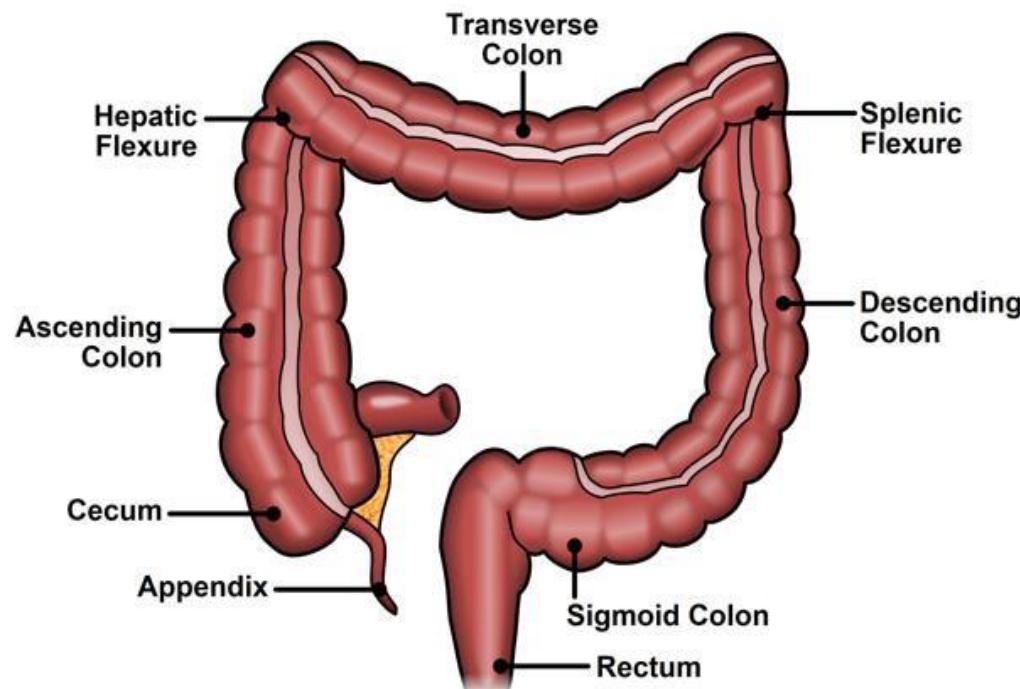
Benign prostatic hyperplasia (BPH) is caused by hyperplasia of the glandular and stromal components of the prostate as a result of excess dihydrotestosterone. It is very common in older men, and the risk of developing symptoms progressively increases with age. Typically it presents with urinary frequency, difficulty starting and stopping urination, and a sense of bladder fullness. BPH occurs in the transitional zone, which compresses the urethra and obstructs urine flow. Bladder hypertrophy often develops because of chronic obstruction.



5. A 19-year-old man is brought to the emergency department with a penetrating stab wound to the right upper back. The patient is hypotensive and has decreased breath sounds on the right side. A chest tube is placed and drains 1.5 L of bloody fluid. The patient is taken to the operating room for thoracotomy. Initial CT of the abdomen shows no abnormalities, and there is no intestinal perforation. During this time, the patient requires large amounts of IV fluids, blood replacement, and pressors. The next day, he becomes severely acidotic and reports left-sided abdominal pain. Physical examination reveals a soft and nondistended abdomen with tenderness on the left side and bright red blood on rectal examination.

Injury to which of the following locations is most likely causing this patient's abdominal pain?

- A. Cecum
- B. Hepatic (right colic) flexure of the large intestine
- C. Ileum
- D. Jejunum
- E. **Splenic (left colic) flexure of the large intestine**
- F. Stomach



Correct!

This patient presents with hypotension, decreased breath sounds, and a penetrating stab wound in the right upper back. Given the patient's history of hypotension, followed by acidosis, ischemic bowel is the most likely cause of his abdominal pain (rather than traumatic injury). The patient also demonstrated left-sided abdominal pain and hematochezia, which are both nonspecific but associated with ischemia at the splenic flexure.

The splenic (left colic) flexure of the large intestine is most vulnerable to ischemia from hypoperfusion, because it is at the borderline of an area between the junction of two vascular territories: the superior and inferior mesenteric arteries. The patient develops acidosis because of ischemia, leading to an anaerobic metabolism and resulting production of lactic acid.

Similar areas of the body susceptible to hypoperfusion include the:

- ACA/MCA/PCA boundaries in the brain
- Subendocardium in the heart
- Straight segment of the proximal tubule of the kidney
- Thick ascending limb in the medulla of the kidney
- Area around the central vein (zone III) in the liver

The cecum is supplied by the superior mesenteric artery, and it may be the location of a volvulus or obstruction. The hepatic (right colic) flexure of the large intestine is supplied by the superior mesenteric artery and is not commonly associated with other pathologic states. The ileum and jejunum are supplied by the superior mesenteric artery. They can both be the location of malabsorptive diseases. The stomach is richly supplied by the celiac trunk.

6. A 33-year-old professional basketball player is brought to the emergency department because of intermittent, excruciating pain in the right flank that radiates to his inner thigh and scrotum. The pain is accompanied by nausea, and the patient notes that he is having difficulty urinating and seeing blood in his urine. Physical examination elicits guarding to deep palpation but no rebound pain. Vital signs are all within normal limits. A urinalysis reveals envelope- and dumbbell-shaped crystals. RBCs are 20/hpf. Urinalysis is negative for leukocyte esterase, nitrites, ketones, and casts.

Which of the following is the most likely diagnosis?

- A. Acute appendicitis
- B. Acute pyelonephritis
- C. Biliary colic
- D. Cystitis
- E. **Nephrolithiasis**
- F. Testicular torsion



Correct!

The patient is a 33-year-old male athlete presenting at the emergency department with excruciating right flank pain that radiates to his inner thigh and scrotum, which is accompanied by dysuria, nausea, and hematuria.

Urinary tract stones (nephrolithiasis) typically present with unilateral flank pain radiating to the groin. The pain is usually intermittent ("colicky") and so severe that the patient is unable to lie still ("writhing in pain"). Urinalysis usually detects hematuria due to damage in the urinary tract caused by the jagged crystals. Prevention and initial treatment of renal stones is rehydration with the goal of urinary dilation and increase in urinary flow. Calcium-containing stones are by far the most common type of renal stones and are radiopaque on x-ray. Patients with recurrent calcium stones can take thiazide diuretics, which reduce the calcium concentration in the urine. Uric acid stones are radiolucent and commonly seen in patients with gout or high serum uric acid concentration (eg, patients with dehydration or those with high levels of uric acid in their diet). Struvite stones (also called magnesium ammonium phosphate) are also radiopaque, but are far less common.

Biliary colic can present with intermittent pain, but the distribution of the pain would be in the right upper quadrant and would not radiate to the groin. Urinalysis is normal without hematuria.

In cystitis, flank pain radiating to the groin would not be present.

In acute pyelonephritis, symptoms such as fever, chills, and pyuria would accompany the flank pain.

In testicular torsion, the focal point of the pain would be in the testes, while flank pain would be uncommon. Urinalysis is normal without hematuria.

7. A 41-year-old previously healthy woman gives birth to a full-term baby boy after a spontaneous vaginal delivery. The delivery is complicated by a midline perineal tear that is repaired at the bedside by the midwife. Hours after the birth, the mother reports soiling herself with stool in the bed. **Which of the following structures was most likely damaged during delivery?**

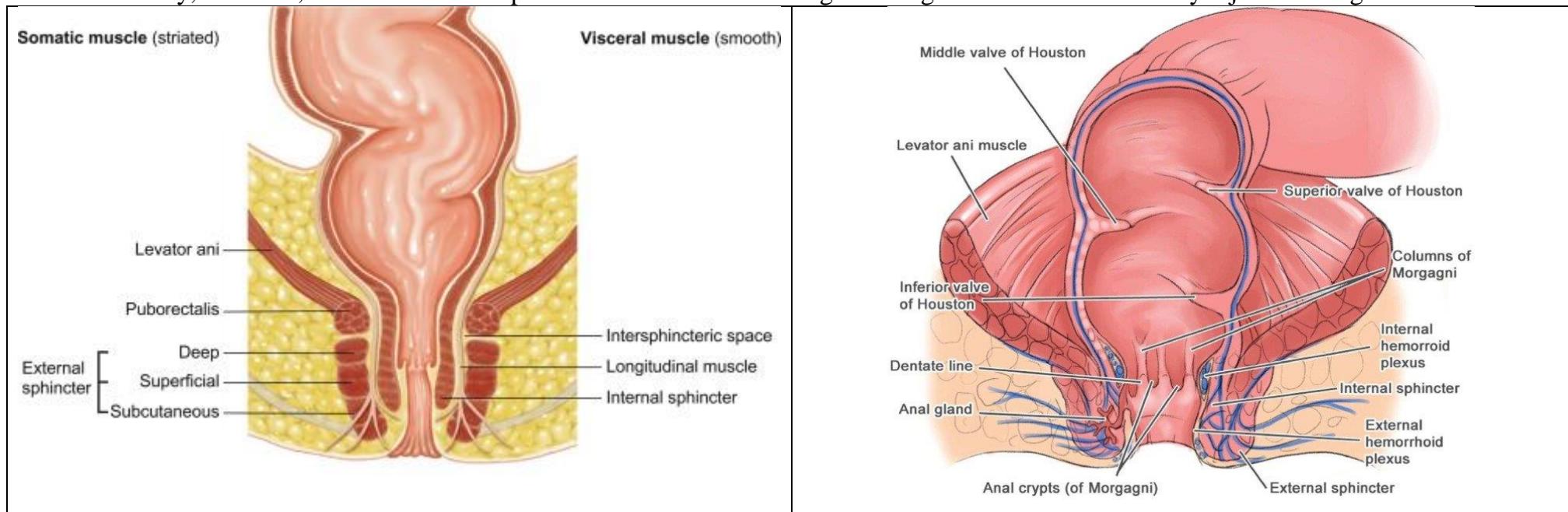
- A. Coccygeus muscle
- B. **External anal sphincter**
- C. Levator ani muscle
- D. Piriformis muscle
- E. Sphincter urethrae

Correct!

The patient in the vignette suffered a perineal tear during delivery, and several hours later experienced fecal incontinence. She likely damaged her external anal sphincter.

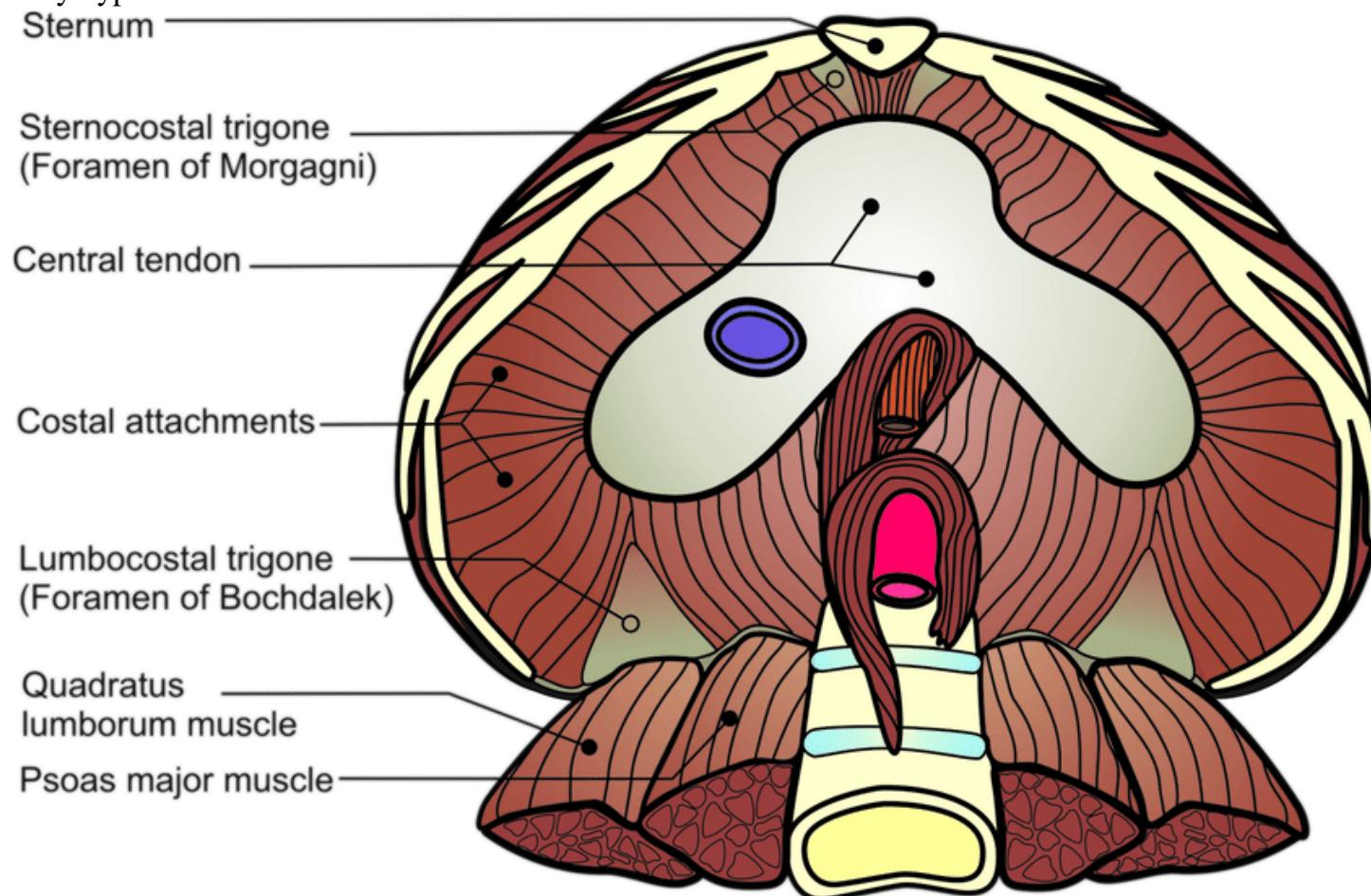
As shown by the red circle in the image, the perineal body is the site of convergence of several muscles of the urogenital diaphragm anterior to the anus: the bulbospongiosus, external anal sphincter, and perineal muscles. A severe perineal laceration in the midline may result in damage to the anal sphincter, leading to fecal incontinence. Perineal tears are common during vaginal deliveries, particularly in the setting of prolonged labor, babies large for gestational age, and in older mothers, as indicated in this vignette.

The coccygeus muscle is a muscle of the pelvic wall. Damage to the levator ani muscle or sphincter urethrae during parturition would result in urinary, not fecal, incontinence. The piriformis muscle lies in the gluteal region and is not commonly injured during childbirth.



8. A neonatologist receives an emergency call from the nursery about an infant girl who presents with dyspnea and cyanosis on arrival from the delivery room. The mother of the girl never received prenatal care; however, the infant was born at 39 weeks' gestation and was the product of a normal delivery. During the physical examination, the infant appears to have a scaphoid abdomen and severe dyspnea, and intercostal retractions are noted. On auscultation of the left side of the chest, breath sounds are absent, and positive peristaltic bowel sounds are present. **Which of the following is the underlying anatomic malformation that led to the development of this patient's symptoms?**

- A. Congenital malformation of the bronchial tree
- B. Failure of primitive foregut to separate from airway
- C. Failure of the duodenal lumen to recanalize
- D. Failure of the pleuroperitoneal canal (foramen of Bochdalek) to close**
- E. Persistent pulmonary hypertension of the newborn



Correct!

This infant presents with dyspnea, cyanosis, and respiratory distress (intercostal retractions) immediately after birth. On examination, she has a scaphoid abdomen, and bowel sounds, instead of breath sounds, are heard on the left side of the chest. This is a classic presentation of a congenital diaphragmatic hernia. Congenital diaphragmatic hernia (shown in the x-ray provided with the question) usually represents failure of the pleuroperitoneal canal to close completely, leading to protrusion of the abdominal viscera into the chest. This causes a scaphoid abdomen and bowel sounds heard in the chest. A congenital diaphragmatic hernia is usually located on the left side, since the left pleuroperitoneal membranes fuse with the septum transversum at a later time and are the ones to be affected by nonfusion.

Pulmonary hypoplasia is the most common cause of death in these patients, which develops because of lack of space for the lung to grow. This manifests as respiratory distress, dyspnea, cyanosis, and unilateral absence of breath sounds, all of which are seen in this patient. Of clinical importance, bag-mask ventilation is contraindicated in these patients because air can be forced into the intestines and cause them to inflate, further reducing lung capacity.

Failure of the duodenal lumen to recanalize results in duodenal atresia. Persistent pulmonary hypertension of the newborn is failure of the normal circulatory transition that occurs after birth. Bronchogenic cysts are congenital malformations of the bronchial tree. Failure of primitive foregut to separate from the airway results in a tracheoesophageal fistula with esophageal atresia.

9. A 71-year-old woman is diagnosed with non-Hodgkin lymphoma. She undergoes chemotherapy and is given prochlorperazine for adverse effects. **This medication targets which of the following areas?**

- A. Area postrema
- B. Median eminence
- C. Pineal gland
- D. Posterior pituitary
- E. Subfornical organ

Correct!

This patient recently began chemotherapy to treat her non-Hodgkin lymphoma. She is also placed on prochlorperazine, a typical antipsychotic agent that is more often used for its antiemetic properties and thus is useful for treating severe nausea and vomiting after chemotherapy. It functions as a dopamine D2 receptor blocker at the chemoreceptor trigger zone (CTZ). Due to its antidopaminergic activity, it has many adverse effects, including sedation, anticholinergic effects, and extrapyramidal symptoms such as tardive dyskinesia.

The CTZ lacks the blood-brain barrier, which is critical to its role in detecting toxic substances in the circulation (including chemotherapy agents). The CTZ is located in the area postrema in the medulla, located on the floor of the fourth ventricle. CTZ releases dopamine and serotonin, which in turn stimulates the medullary vomiting center. This induces nausea and vomiting.

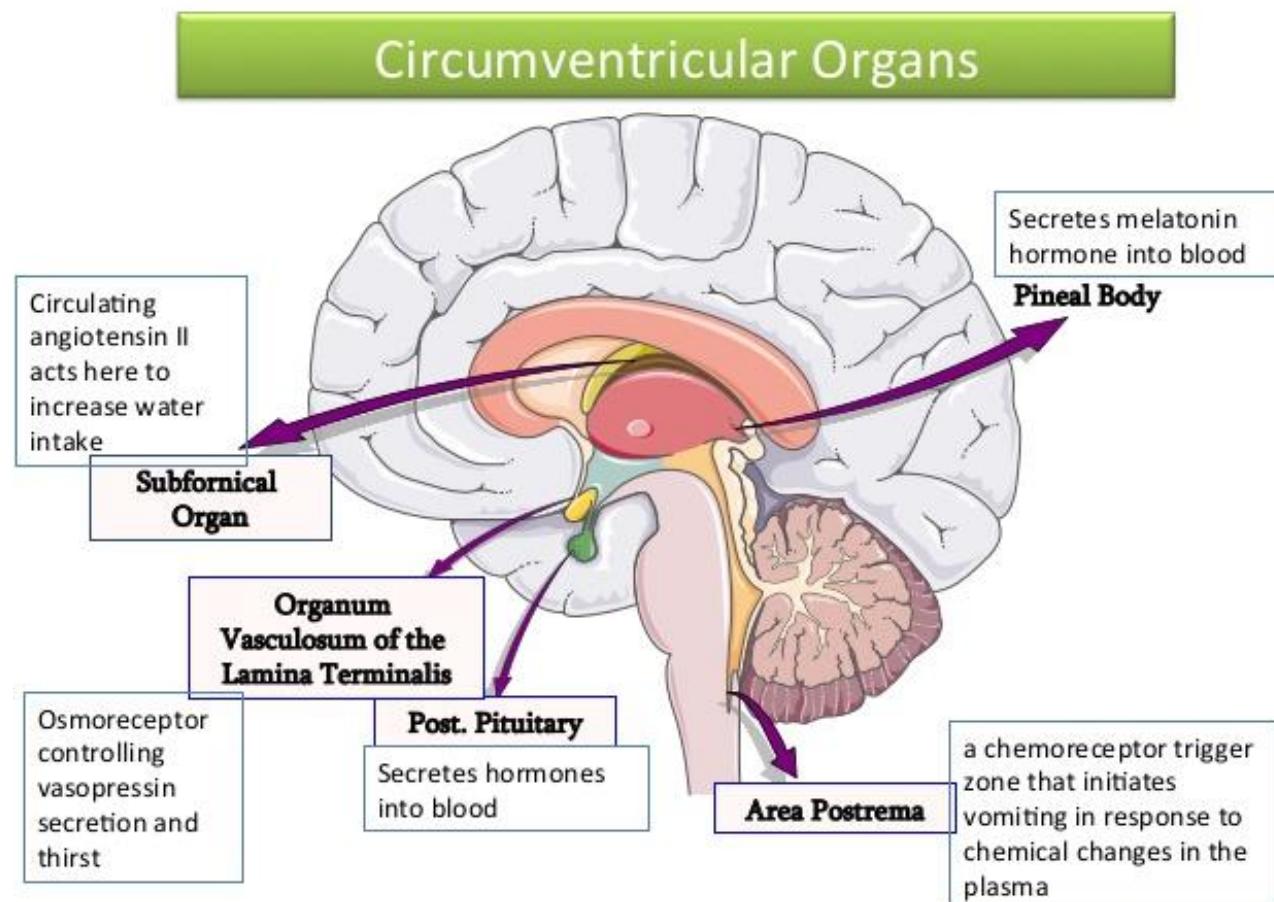
The area postrema as well as these other distractor options are all circumventricular organs. These structures are characterized by excessive vasculature and blood supply from highly permeable fenestrated vessels. Due to this, the blood-brain-barrier is absent in these organs, and allows for their sampling of chemicals in peripheral circulation:

The subfornical organ (SFO) is a sensory organ located in the lamina terminalis. It is involved in bodily processes such as energy homeostasis, osmoregulation, and cardiovascular regulation.

The pituitary gland consists of two lobes: the anterior pituitary and the posterior pituitary. The anterior pituitary secretes GH, LH, FSH, TSH, prolactin, and ACTH, which control growth, sexual development, metabolism, and human reproduction. The posterior pituitary secretes oxytocin and the hormone ADH, which governs fluid balance.

The pineal gland primarily functions to secrete melatonin and plays a role in regulating sleep-wake cycles.

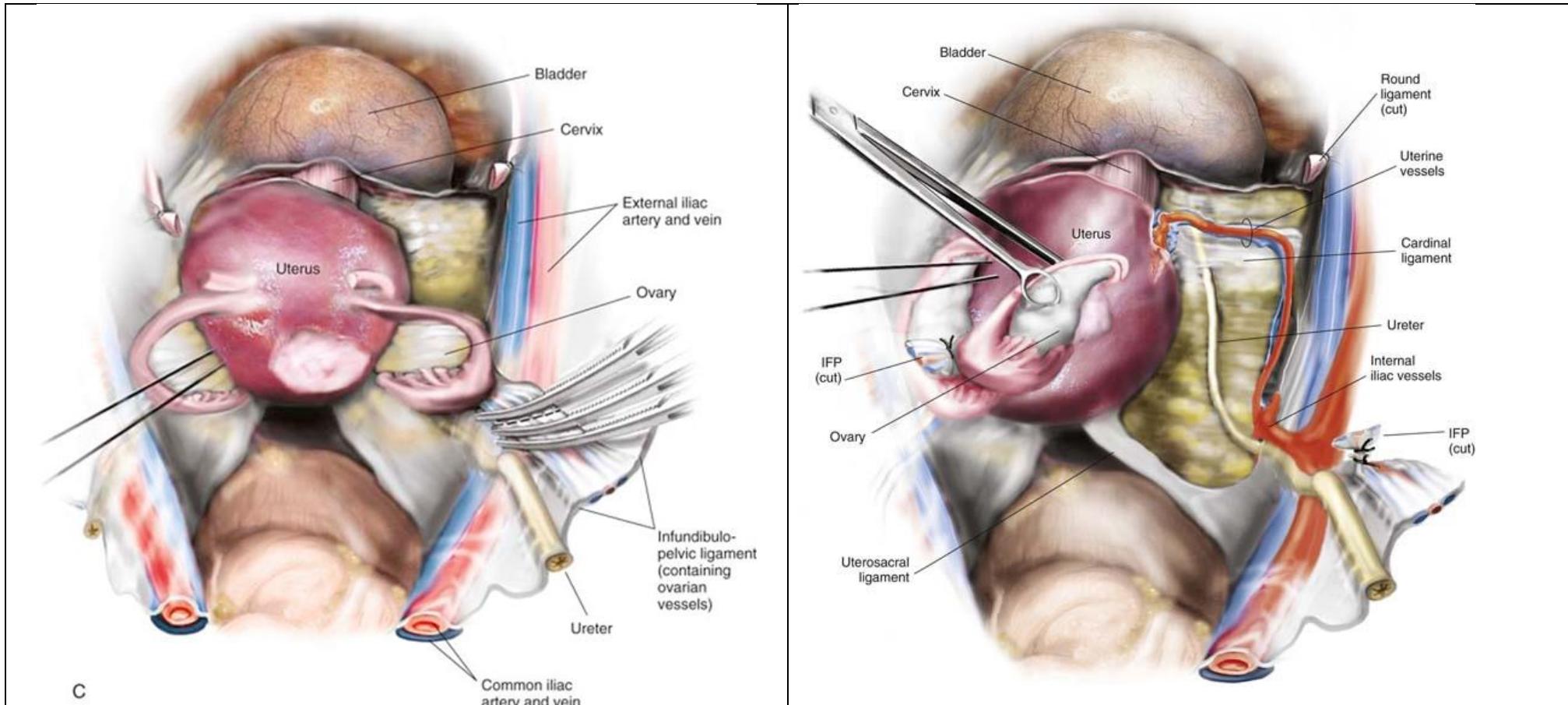
The median eminence is a secretory organ that collects secretions of the hypothalamus (eg. CRF, GnRH, TRH, GHRH) before they enter the general circulation.



10. A 43-year-old, obese woman with type 2 diabetes mellitus and a history of polycystic ovary syndrome is undergoing a total abdominal hysterectomy for treatment and staging of endometrial carcinoma. The surgical team finds the tumor. They believe the tumor is localized to the myometrium. Electrocautery is used in the tissue inferior to the broad ligament.

The tissue is sent with the tumor specimen for pathologic study, due to concern that cancer may have gone entirely through the uterine wall to the surrounding tissue. The pathology report details endometrial carcinoma confined to the myometrium. Additionally, an isolated area of transitional epithelium is seen in the connective tissue. **Which of the following best accounts for the findings?**

- A. Concomitant adenocarcinoma of the sigmoid colon
- B. **Excision of the ureter during dissection of the broad ligament**
- C. Metastatic endometrial carcinoma
- D. Ovarian teratoma
- E. Transitional cell carcinoma of the urethra



Correct!

This patient presents with endometrial cancer that is staged and treated with total abdominal hysterectomy. While the cancer seems localized to the myometrium, the surgical team sends the tumor specimen as well as tissue inferior to the broad ligament for pathologic study. The histology described in the connective tissue is transitional epithelium, which is found in the urinary tract and ureters.

In women, the ureter courses just inferior to the uterine arteries at about 2 cm above the ischial spine (see diagram). This puts the ureter at high risk for inadvertent injury when the uterine arteries are ligated during surgery, potentially leading to acute postoperative renal failure. The cardinal ligament is located inferior to the broad ligament and contains the blood vessels. Blind dissection of the inferior aspect of the cardinal ligament, which contains the uterine arteries, can result in damage to the ureter. This can be remembered with the mnemonic “water under the bridge” (water is the ureter, which runs under the uterine vessels, or the bridge). In this case, the inferior portion of the ureter was excised with the connective tissue, which explains the histopathologic findings, since the ureter and bladder are lined with transitional epithelium.

Concomitant adenocarcinoma of the sigmoid colon would appear as glandular structures, simple and tubular in appearance and lined with columnar epithelium. Metastatic endometrial carcinoma would have penetrated the myometrium and spread to the surrounding adventitia. Ovarian teratomas contain mature, normal tissue originating from all three types of embryonic tissue (ectoderm, endoderm, and mesoderm). Ureteral transitional cells arise only from mesoderm. Transitional cell carcinoma of the urethra is unlikely because the urethra is not near the broad ligament.

11. A newborn boy delivered via uncomplicated vaginal delivery at full term has rattling sounds during inspiration and copious white, frothy mucus in his mouth. The baby’s mother states that he has severe episodes of coughing and choking, which are worse during feedings, and he often turns blue. On physical exam, there is gastric distension with tympanic sounds appreciated on percussion of the stomach. A frontal X-ray of the chest and abdomen reveals gas in the stomach. **Which of the following is the most likely cause of this patient’s condition?**

- A. Esophageal atresia with distal tracheoesophageal fistula
- B. Esophageal atresia with double tracheoesophageal fistula
- C. Esophageal atresia with proximal tracheoesophageal fistula
- D. Isolated esophageal atresia
- E. Isolated tracheoesophageal fistula

Correct!

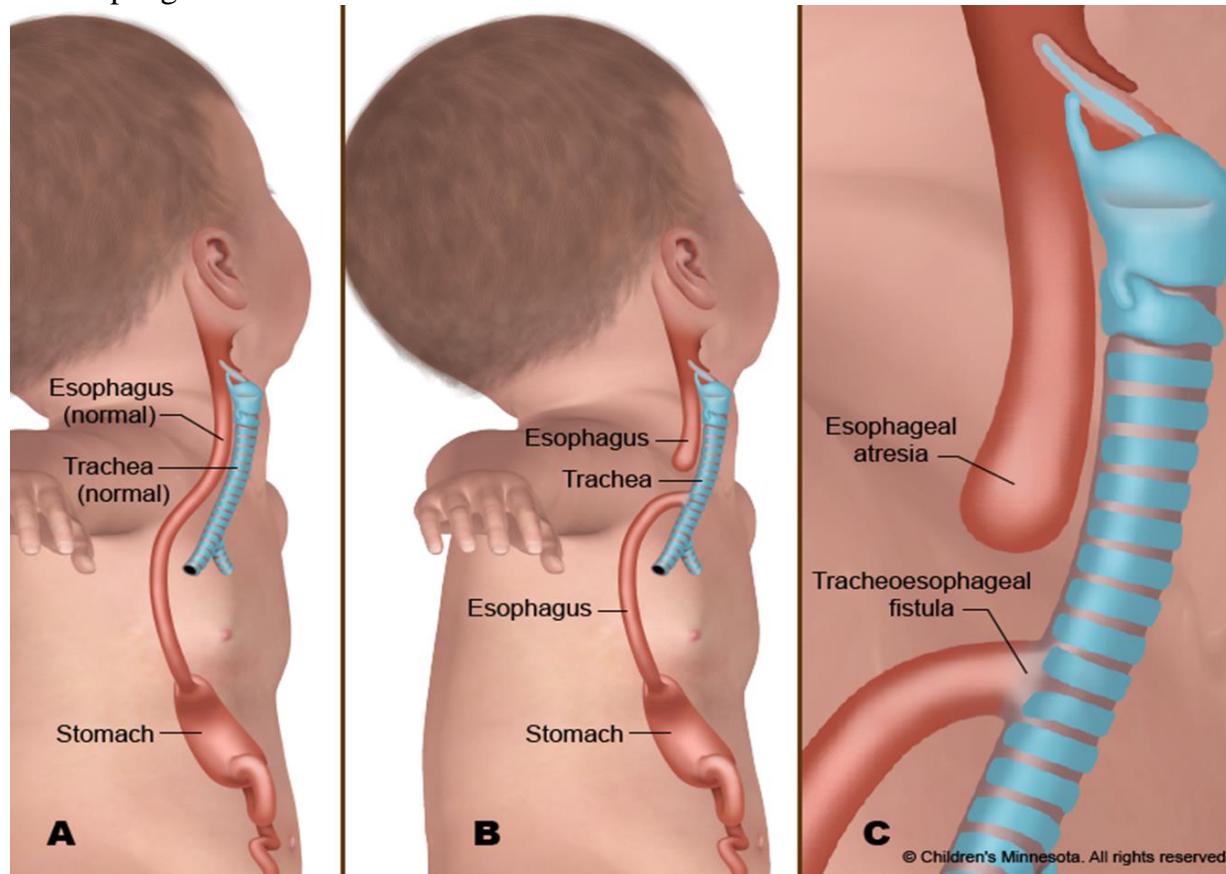
This newborn has copious mucus and signs of aspiration (rattling sounds during inspiration, coughing, choking, and cyanosis), as well as evidence of air in his stomach (gastric distension and tympanic sounds). Excess saliva with aspiration suggest that normal secretions and/or breast milk are unable to pass normally through the esophagus to the stomach, which in a newborn is most likely due to congenital esophageal atresia (ie, an esophagus that does not connect all the way from the mouth to the stomach). Air in his stomach further suggests that there is most likely an extra connection between the airway and the gastrointestinal tract, as may occur with a tracheoesophageal fistula (ie, an opening joining the trachea and esophagus).

Five types of tracheoesophageal anomalies may occur congenitally, as shown in the illustrations. Any one of these would likely

manifest with significant coughing, choking, and cyanosis, because fluids either pass from the esophagus to the trachea through a proximal fistula or overflow from the proximal blind-ended esophageal pouch into the nearby trachea. Given this infant's presentation with air in his stomach, the only possible variants are those that also involve a distal connection from the trachea to the stomach: Esophageal atresia with distal transesophageal fistula, isolated transesophageal fistula, and esophageal atresia with double transesophageal fistula.

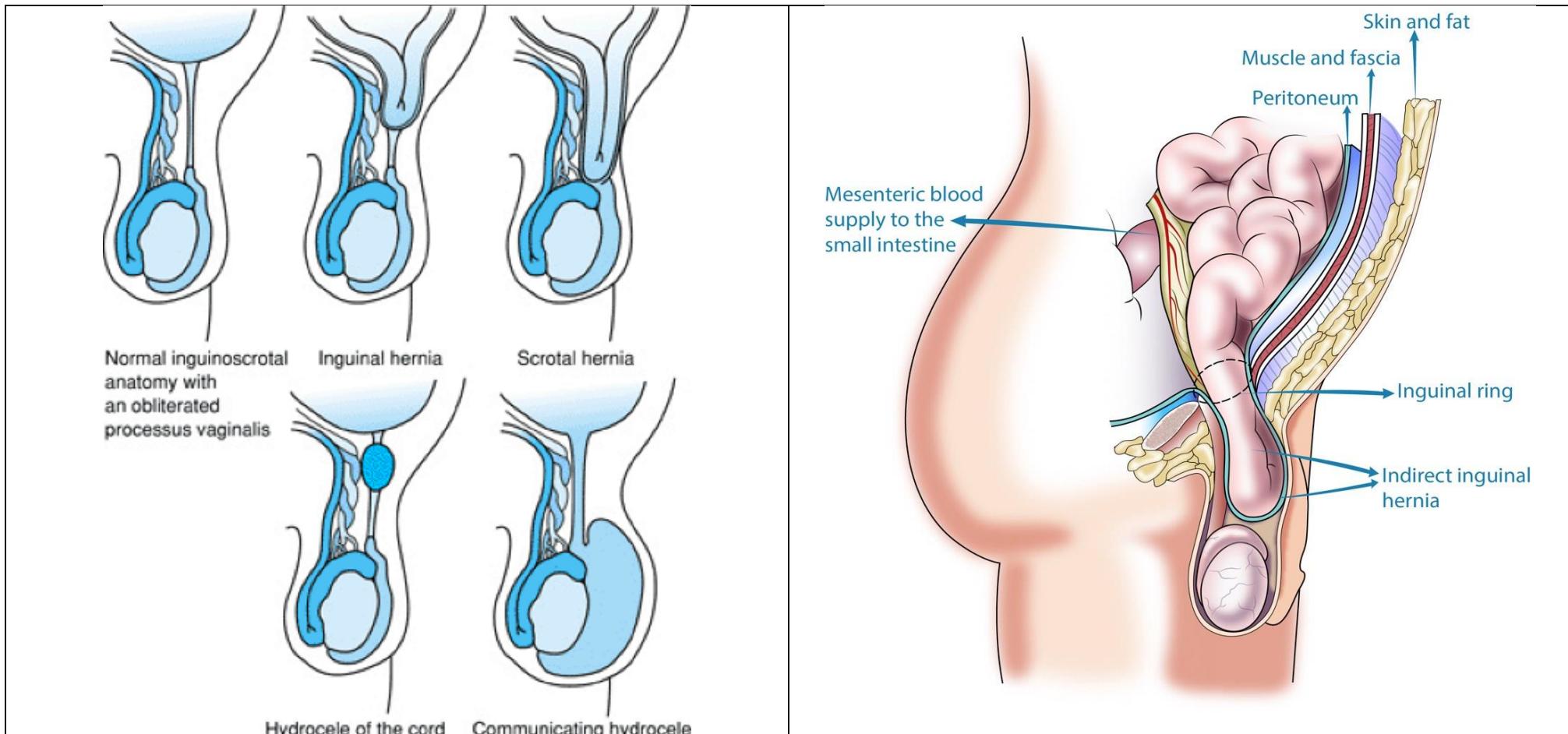
Of the five types, the most common variant in newborns is esophageal atresia with distal transesophageal fistula. The presenting signs and symptoms also fit this diagnosis. So, this is the most likely cause of the patient's condition.

Isolated esophageal atresia involves two blind-ended pouches that do not communicate with the trachea. Isolated transesophageal fistula involves an esophagus that extends continuously across the full length from mouth to stomach, but has a hole connecting it to the trachea. Esophageal atresia with proximal transesophageal fistula involves a proximal connection between esophagus and trachea with a distal blind-ended esophageal pouch budding from the stomach. Esophageal atresia with double transesophageal fistula involves both a proximal and distal connection between esophagus and trachea.



12. A 1-month-old boy presents to the emergency department because of a low-grade fever, irritability, and vomiting over the past 12 hours. On questioning, the parents reveal that they have noticed an intermittent bulge in the groin that is more noticeable whenever their son cries. The boy has not passed a bowel movement in 2 days. On exam, the boy cries whenever the physician palpates the abdomen. Abdominal distension and scrotal swelling are noted. Bowel sounds are high pitched. A bulge in the inguinal region is soft but not compressible. **Which of the following is most likely to have led to this patient's condition?**

- A. Enlarged external (superficial) inguinal ring
- B. Enlarged femoral ring
- C. Exaggerated cremasteric muscle contraction
- D. Failed closure of the processus vaginalis**
- E. Weak abdominal wall musculature



Correct!

This patient presents with fever, irritability, and vomiting, and an intermittent bulge in the groin. Also, he has also not passed a bowel movement in 2 days. The boy most likely has an indirect inguinal hernia, shown in the image. An indirect inguinal hernia is caused by a congenital defect of the processus vaginalis when it fails to close, or a failed fusion of internal spermatic cord space. This creates a potential space through the internal (deep) inguinal ring and spermatic cord, in which abdominal contents can herniate. The result can be incarceration, or an inability to reduce the hernia, which can lead to strangulation and bowel necrosis if the blood supply is compromised. Necrotic bowel, as depicted in the vignette, is a surgical emergency.

Indirect inguinal hernias are the most common type of hernias. Primary inguinal hernias occur more often in boys than girls. The incidence is highest in the first year of life, with a higher frequency noted in infants born prematurely or with low birth weights. It is more commonly noted on the right side in both sexes and appears to be related to the later descent of the right testicle and later obliteration of the processus vaginalis in boys.

Exaggerated cremasteric muscle contraction is the cause of pseudocryptorchidism, not an inguinal hernia. An enlarged external (superficial) inguinal ring does not play a role in hernia development, since bowel must first protrude through the abdominal wall or the internal inguinal ring to reach the external ring. Enlarged femoral ring predisposes to femoral hernias, not inguinal hernia. Weakened abdominal wall musculature is the cause of direct inguinal hernias, not indirect hernias.

13. A 27-year-old woman comes to the emergency department and reports sudden onset of left lower abdominal pain accompanied by nausea and vomiting. She states that her last menstrual period was more than 2 months ago. Physical examination reveals hypotension and tachycardia with abdominal muscle spasm and guarding, as well as tenderness of the left iliac fossa. Culdocentesis shows free intraperitoneal nonclotting blood. Results of a pregnancy test are positive. The patient is rushed to the operating room for emergency surgical exploration, where the surgeon determines that the patient has an ectopic tubal pregnancy. **In order of frequency (most frequent to least frequent) where do tubal pregnancies most commonly occur?**

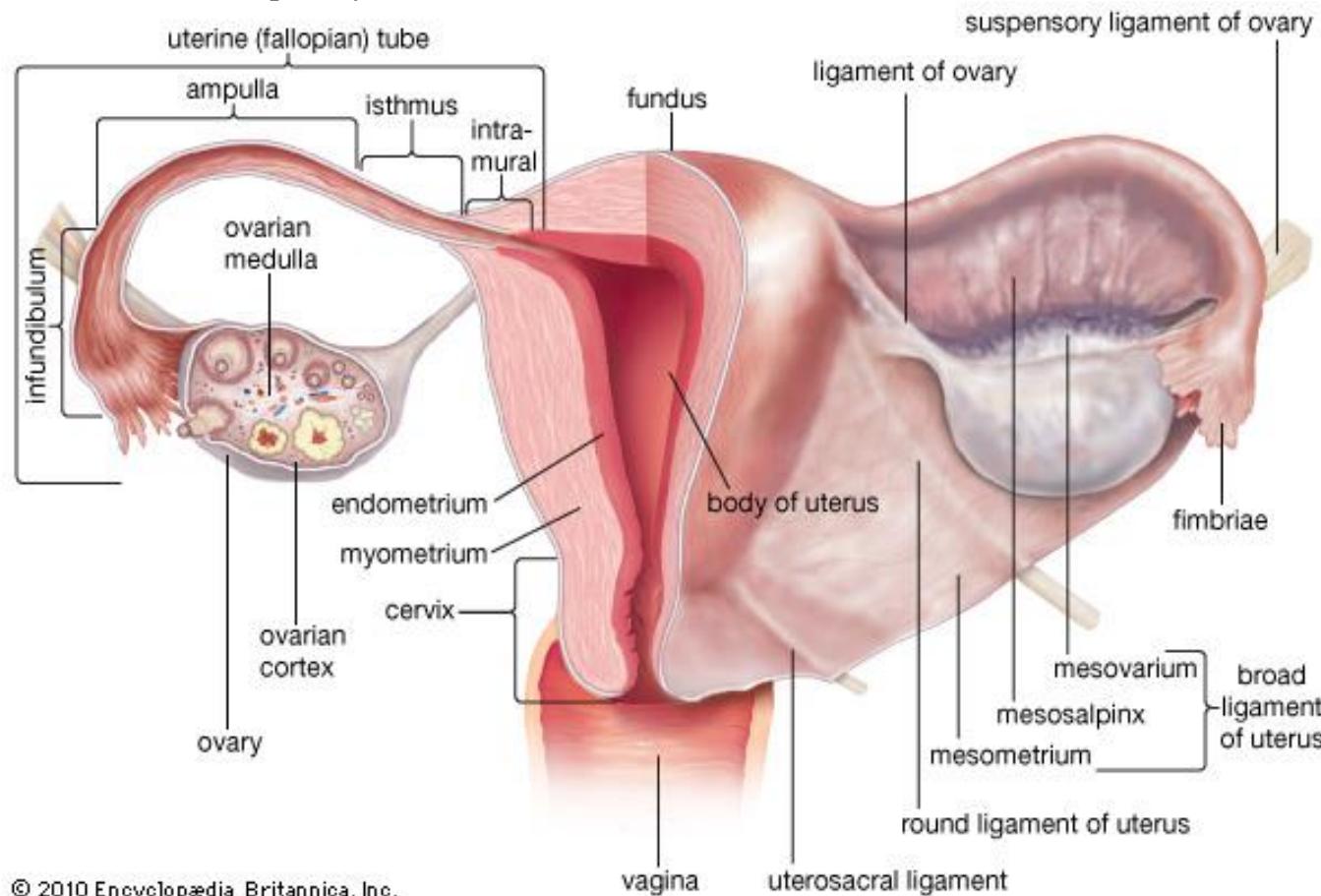
- A. Ampulla, fimbriae, isthmus, and interstitium
- B. Ampulla, isthmus, fimbriae, and interstitium**
- C. Fimbriae, isthmus, interstitium, and ampulla
- D. Isthmus, ampulla, interstitium, and fimbriae
- E. Isthmus, fimbriae, ampulla, and interstitium

Correct!

This patient has left lower abdominal pain, nausea and vomiting. The results of her physical examination and pregnancy test confirm that she is pregnant, and further surgical investigation proves that it's an ectopic pregnancy. Ectopic pregnancy refers to extrauterine locations of the fetus. An ectopic pregnancy may be tubal, abdominal, or intraligamentous (broad ligament). Risk factors for ectopic pregnancy include previous history of pelvic inflammatory disease, prior ectopic pregnancy, tubal pelvic surgery, and exposure to teratogens.

In order of decreasing frequency, tubal pregnancies most commonly occur in the ampulla, isthmus, fimbriae, and interstitium, as

illustrated in the image. The other choices portray an incorrect order.



14. A 48-year-old woman presents to her gynecologist because she has experienced excessive menstrual bleeding for several years. Imaging studies confirm uterine fibroids, and the woman decides to undergo a hysterectomy. During the procedure, the surgeon must clamp the uterine artery and then cut the cardinal ligament when removing the uterus. **Which of the following structures is most likely to be accidentally clamped or cut during this procedure?**

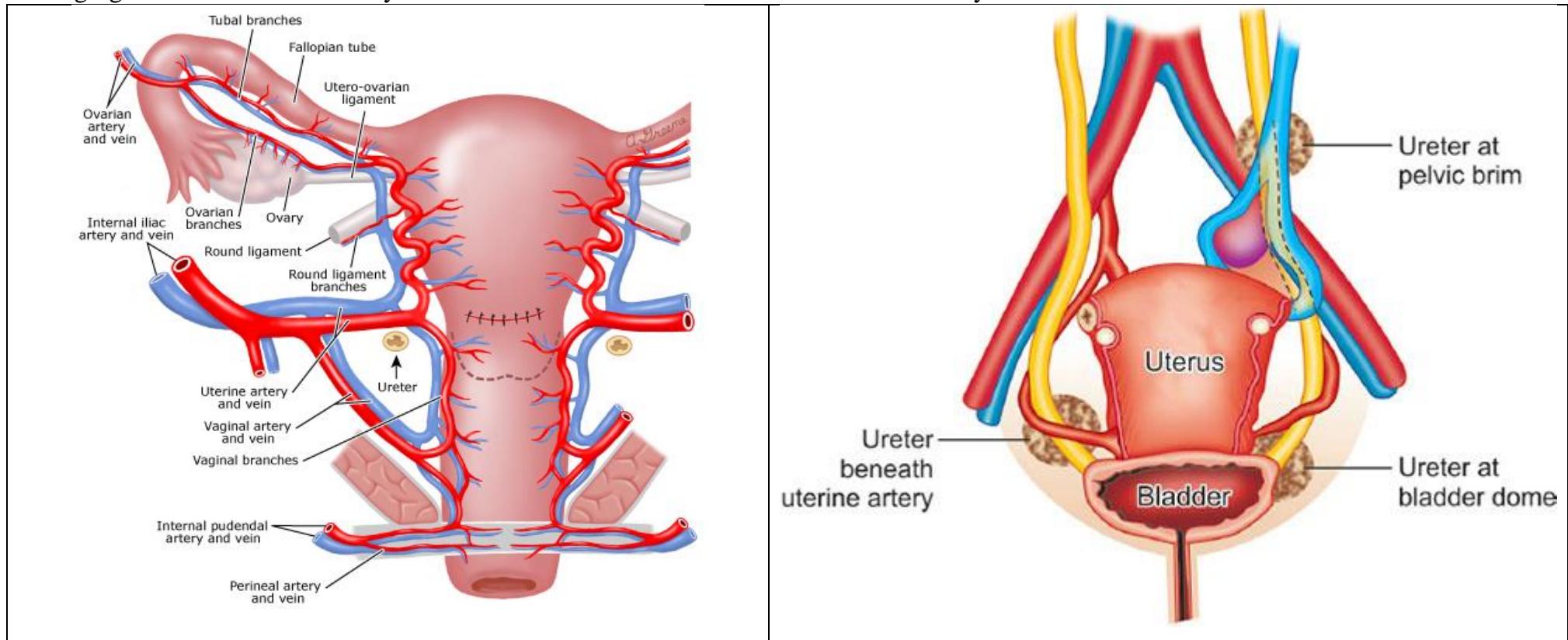
- A. Internal iliac artery
- B. Ovarian (gonadal) artery
- C. Ovarian ligament
- D. Pudendal nerve
- E. Ureter

Correct!

A woman presents to her gynecologist with excessive menstrual bleeding and uterine fibroids. During the hysterectomy, the surgeon must cut the cardinal ligament, which connects the cervix to the side wall of the pelvis and contains the uterine arteries. As shown in the diagram, the ureters pass directly inferior to the uterine arteries as they course from the kidneys to the bladder ("water under the bridge"). When a hysterectomy is performed, care must be taken during clamping and ligation of the uterine arteries to avoid damage to one of the ureters because of their proximity.

The ureters originate bilaterally at the renal pelvis and course inferiorly toward the bladder, anterior to the psoas major muscle, after which they cross the pelvic brim (inlet) anterior to the common iliac artery and enter the pelvis. The ovarian (gonadal) artery and vein cross anterior to the ureter midway from the kidney to the pelvic brim (inlet). They reach the ovary via the suspensory ligament of the ovary lateral to the ovary, at a distance from the uterus.

The internal iliac artery is at a distance from the uterus because its uterine branch is usually quite long, and it is therefore unlikely to be damaged during ligation of the uterine artery. Damage to the ovarian (gonadal) artery, ovarian ligament, or pudendal nerve is unlikely to occur during ligation of the uterine artery because these structures are not near the uterine artery.



15. A 15-year-old boy visits the emergency department complaining of gradual onset of increasingly severe abdominal pain. The pain is sharp and focused in his right lower abdomen. There is no notable history of trauma or food poisoning. On physical examination, the patient is a well-nourished and well-developed boy who is diaphoretic and in significant distress, lying very still on the gurney with both hips flexed. The patient reports significant pain when the examiner bumps the gurney.

Laboratory tests show:

Hematocrit: 44%

Hemoglobin: 14.6 g/dL

Mean corpuscular volume: 89 μm^3

Platelet count: 350,000/mm³

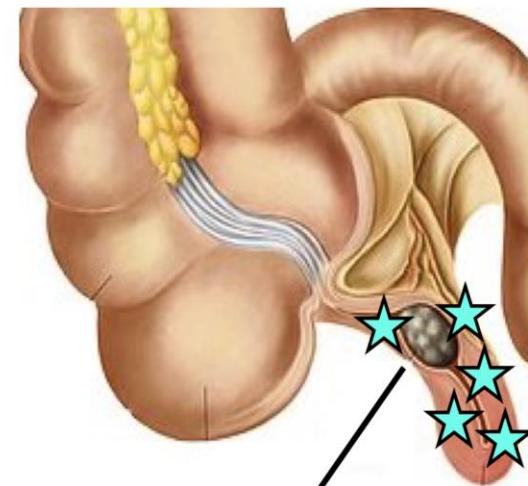
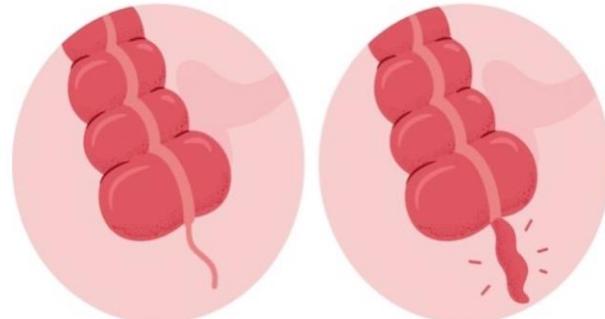
WBC: 15,000/mm³

What is the most likely cause of his pain?

- A. **Fecalith impaction leading to obstruction**
- B. Inguinal hernia
- C. Intussusception of intestine
- D. Renal calculi
- E. Volvulus of intestine

Causes

Obstruction - Fecalith
Lymphoid Hyperplasia



Fecalith

Correct!

This patient presents with severe acute abdominal pain and lab findings that indicate an elevated white blood count (WBC). Together, these findings raise concern for appendicitis. Acute inflammation of the appendix is a common cause of severe acute abdominal pain, and the typical cause of obstruction of the appendiceal lumen is often lymphoid hyperplasia or fecalith impaction leading to obstruction.

Patients initially experience dull periumbilical pain, nausea, and anorexia. This pain then migrates to the right lower quadrant, generally becoming sharper. The pain can be localized to the McBurney point, a landmark that is located two-thirds of the way from the umbilicus to the anterior superior iliac spine (as illustrated in this image).

The patient's position—lying still with hips flexed - is a sign of peritoneal inflammation. The patient's position minimizes pressure on the peritoneum that is provoked upon bumping the gurney. Another sign of peritonitis is rebound tenderness, in which the patient reports more severe pain when the abdomen is palpated and pressure is rapidly released.

Patients with renal calculi usually present with sudden onset of severe flank pain, along with agitation and hematuria. Protrusion of the intestine through weakened muscle is a sign of a hernial sac, seen in inguinal hernia and femoral hernia. Symptoms of intussusception (telescoping of intestine) include vomiting, bloody diarrhea, hyperactive bowel sounds, and a palpable mass around the ileocecal junction. Volvulus of intestine most often involves large redundant loops of sigmoid colon.

16. A 2-month-old boy is brought to the pediatrician by his mother for a well-baby visit for the first time since his birth. He was born 2 weeks prematurely and is at the 40th percentile for birth weight. On examination, the doctor palpates two small bilateral masses in the inguinal canal. The anus is patent, there is no evidence of hypospadias, and the testicles are not palpated in the scrotal sac. **This patient is at increased risk for developing which of the following conditions?**

- A. Extragonadal germ cell tumors
- B. Hypogonadotropic hypogonadism
- C. Low testosterone levels
- D. Spermatocele
- E. **Testicular cancer**

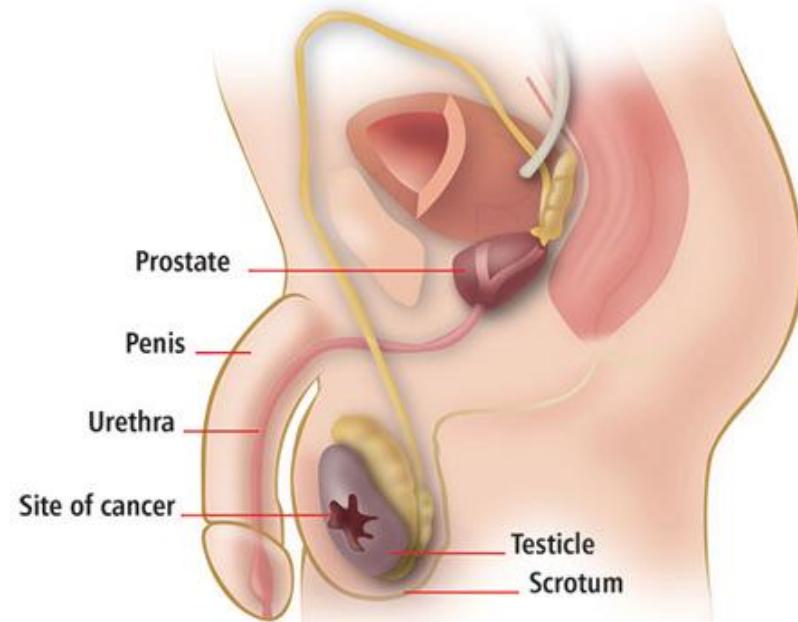
Correct!

This 2-month-old boy has two small bilateral masses in the inguinal canal, and the testicles are not palpated in the scrotal sac. The testicles normally reside within the scrotum. When the testicles fail to drop from the abdomen into the scrotum during gestation, this is called cryptorchidism. Prematurity increases the risk of cryptorchidism.

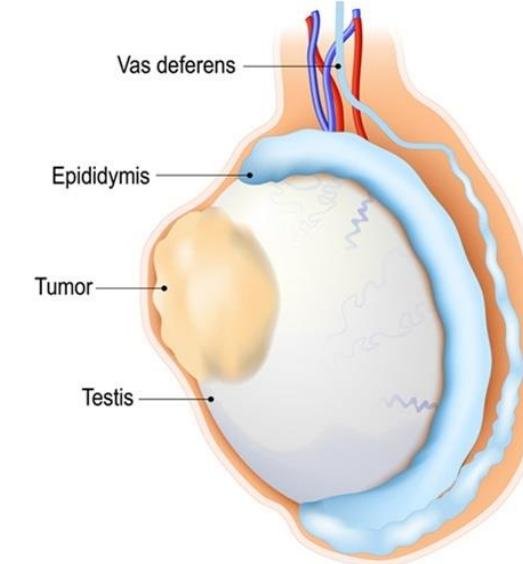
Normally, testicles need to be several degrees cooler than body temperature to produce sperm. Undescended testicles remain too warm, compromising spermatogenesis and reducing fertility. Patients with cryptorchid testicles are also at increased risk for testicular germ cell tumors.

In a patient this young, the best management of cryptorchidism is watchful waiting, given the high likelihood that the testes will descend on their own. If this has not occurred after 4–6 months, then surgery to bring the testes into the scrotal sac (orchiopexy) is the gold standard of treatment. Spontaneous descent is rare after 6 months of age.

Cryptorchidism increases the risk of testicular torsion and infertility, but testosterone levels are usually normal. Also, cryptorchidism is not associated with endocrine disorders such as hypogonadotropic hypogonadism, neoplasms outside of the gonads, or anatomic defects such as varicocele, hydrocele, or spermatocele.



Testicular cancer



17. A 71-year-old woman comes to the clinic because frequent urination. She states that for the past 6 months she has had trouble making it to the bathroom because of sudden, uncontrollable urges to urinate. She notices that when she does make it to the bathroom, the urine stream is usually a weak dribble. Her medical history includes three uncomplicated vaginal deliveries; she also sustained a stroke one year ago. She takes diphenhydramine (as needed for sleep), aspirin, lisinopril, and atorvastatin. On physical examination, her temperature is 37.1° C (98.7° F), blood pressure is 153/80 mmHg, pulse is 88/min, and respiratory rate is 14/min. Her abdomen is soft and nontender. Pelvic examination reveals pale and dry vulvovaginal mucosa. Urinalysis is negative for leukocytes or nitrites. Her post-residual volume is 30 mL. **Which of the following is the most likely cause of the patient's condition?**

- A. Detrusor muscle weakness
- B. Functional incontinence
- C. Medication side effect

D. Pelvic floor laxity

E. Uninhibited bladder contraction

Correct!

A 73-year-old patient with a history of multiple vaginal deliveries and stroke presents with a urinary urgency (“sudden urge” to urinate) in the setting of low post-residual volume (normal <150 ml). This is most suggestive of urge incontinence. Urge incontinence is the result of detrusor muscle overactivity. Patients present with sudden urges to void and may endorse a history of dribbling or complete soaking of their garments. Urge incontinence can be idiopathic or can result from neurological damage (causing detrusor hyperactivity due to decreased activity of descending spinal inhibitory pathways) or urinary tract infection. A low post-residual volume, which indicates lack of obstructive/overflow pathology, often supports this diagnosis.

Common etiologies of incontinence are summarized in the table below:

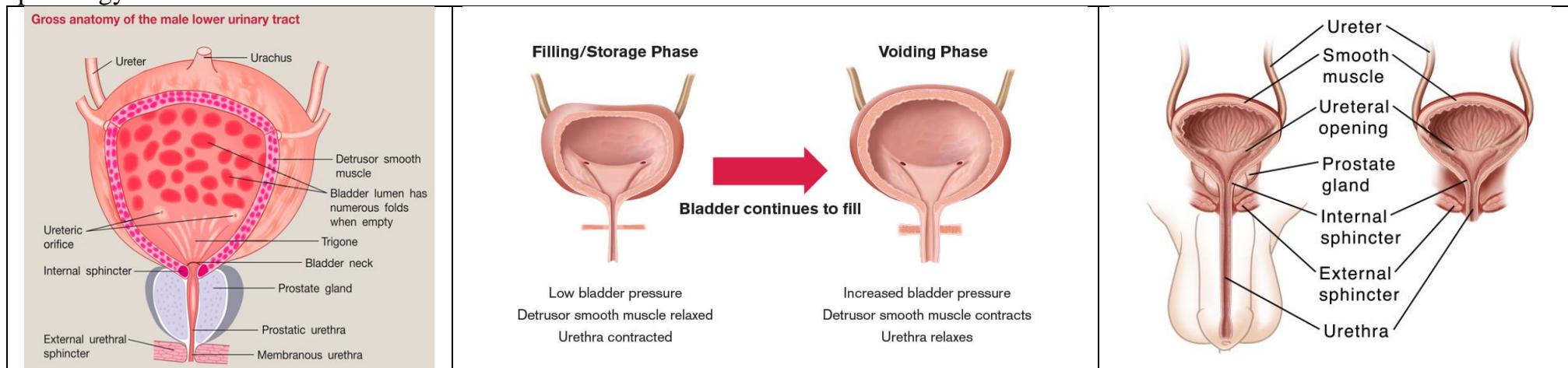
Why the incorrect answers are wrong:

Detrusor muscle weakness describes overflow incontinence, which can be seen in patients with neurologic disease (ie, history of stroke). Patients present with urinary dribbling in the setting of a high post-void residual volume rather than a sudden urge to urinate and low post-residual volume, as seen in this patient.

Pelvic floor laxity is a common cause of stress incontinence. Patients with a history of multiple vaginal births or a complicated gynecologic history may have incontinence secondary to pelvic floor damage or urethral hypermobility. However, stress incontinence is typically characterized as leakage of urine with increased intra-abdominal pressure (ie, coughing), not incontinence with sudden uncontrollable urges, as seen in this patient.

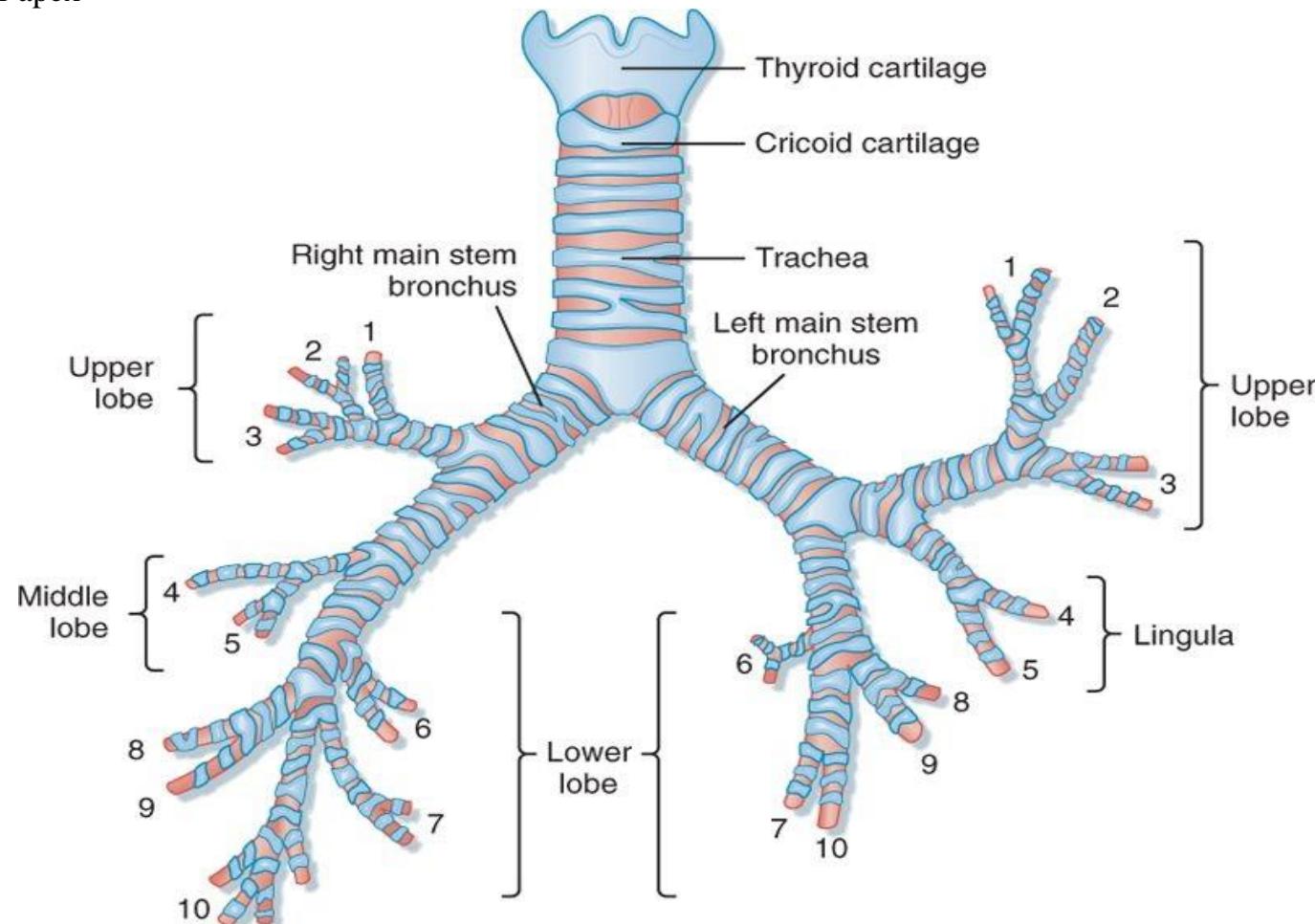
Although the patient is taking diphenhydramine, this medication’s anticholinergic activity would cause urinary retention (and may even present similarly to overflow incontinence, described above). Thus, medication side effect is unlikely to be the cause in this case.

Functional incontinence refers to an inability to physically transport oneself to the bathroom. There is no underlying urinary tract pathology.



18. A 3-year-old boy is brought to the hospital by his parents because he is having difficulty breathing. His mother says he was sitting in the playground, playing with toys in a sandbox, when she noticed him coughing. Physical examination reveals chest retraction with use of accessory respiratory muscles. Wheezing is heard on lung auscultation. Before this incident he was healthy. His vaccinations are up to date, and he takes no medications. **Which portion of the lung is most likely to be affected?**

- A. Left basilar bronchioles of the lower lobe
- B. Left primary bronchus
- C. Lingula
- D. Medium-sized airways in the right lower lobe**
- E. Right posterior apex



Correct!

This patient presents with difficulty breathing and wheezing after playing with toys while sitting in a sandbox. Acute shortness of breath in healthy young children is most often due to aspiration of small objects, such as that indicated by the arrow in the image. The right main bronchus is wider than the left and more vertical, making aspirated objects more likely to lodge in the right side of the respiratory tree than the left.

If the object is sufficiently small, it may continue inferiorly into the intermediate bronchus, a common stem for the right middle lobar and inferior lobar bronchi. As a result, aspiration pneumonia contracted when an individual is in an upright position is most common in the right lower and middle lobes. On a chest x-ray, the right lower lobe may appear collapsed as a result of foreign object aspiration. If the child were supine when the object was aspirated, it would most likely land in the airways of the posterior lobes because of gravity.

The left lung is less likely to trap aspirated objects because of the shape and angle of the left main bronchus relative to the right. The downstream regions of the left main bronchus, including the left basilar bronchioles of the lower lobe and the lingula, are not the most likely regions to collect aspirated material. The right posterior apex would be a plausible location for aspiration of a foreign object if the patient had been in a supine position.

19. A 25-year-old woman visits the clinic because she is experiencing pain both during menstruation and sexual intercourse. The pain has worsened during the past 3 months. She does not have any children and her last menstrual period was 2 months ago. Recently she has also had pain while defecating. The patient does not drink alcohol, use tobacco, or take illicit drugs.

During the physical examination, some nodularity along the uterosacral ligament is detected. A tentative diagnosis of endometriosis is made, and the physician explains that further investigation is needed for confirmation. **Where is the ectopic tissue most likely to be found based on the patient's presentation?**

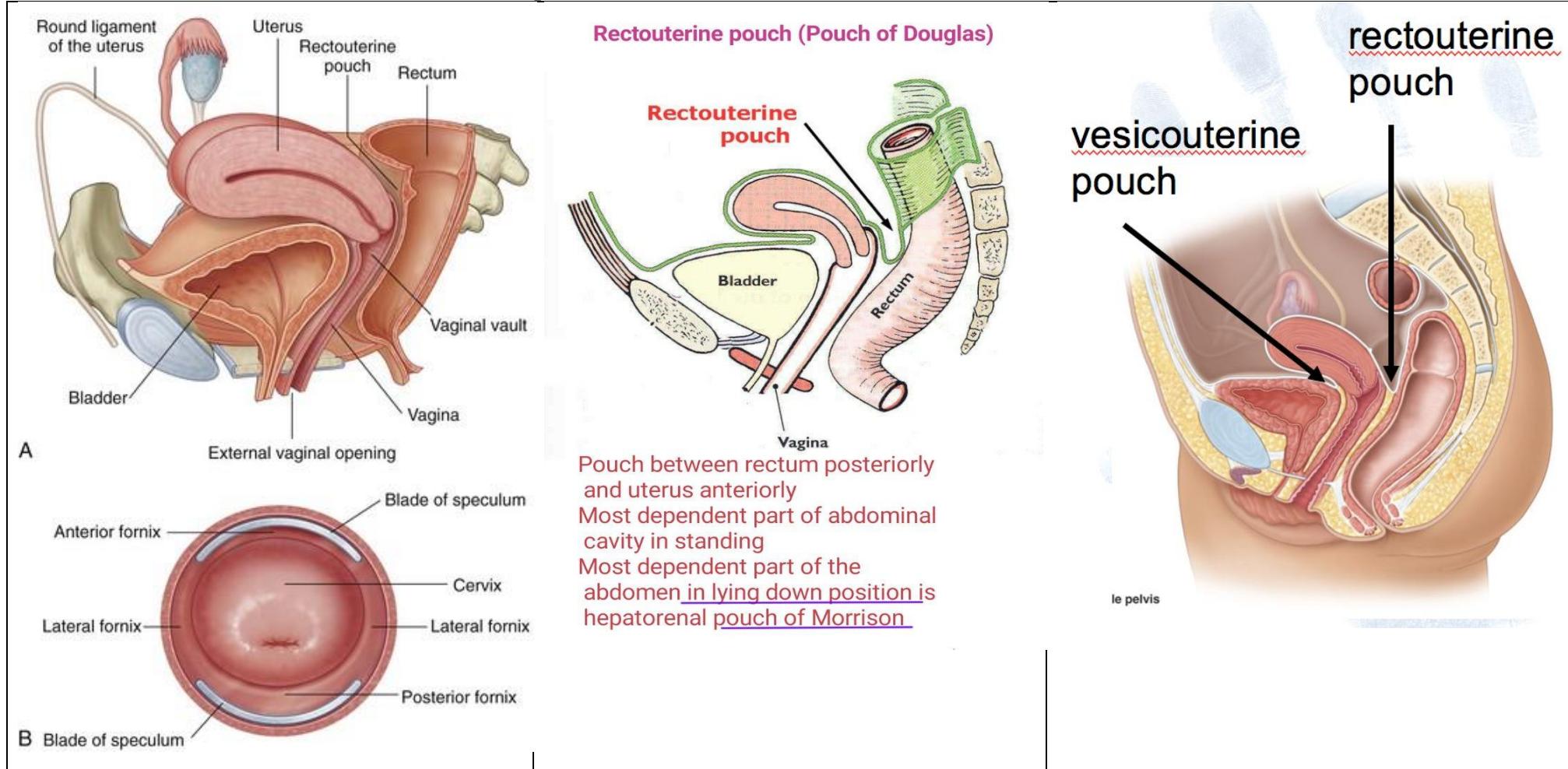
- A. Cervix
- B. Fallopian tubes
- C. Ovaries
- D. Rectouterine pouch**
- E. Uterus

Correct!

This patient is experiencing dyschezia (painful defecation), dyspareunia (pain during sexual intercourse), and dysmenorrhea (painful menstruation). As the physician has noted, the physical exam findings of nodularity along the uterosacral ligament, in association with her symptoms, point to a diagnosis of endometriosis. This condition is characterized by the presence of endometrium-like glands and stroma outside the uterus. Endometriosis is most commonly found in the ovaries, followed by the anterior and posterior cul-de-sac (also known as the rectouterine pouch), broad ligaments, uterosacral ligaments, uterus, fallopian tubes, sigmoid colon, appendix, and round ligaments. These sites are highlighted in the illustration. This patient's difficulty on defecation suggests that the ectopic tissue is present in the posterior cul-de-sac, as this site is closest to the colon.

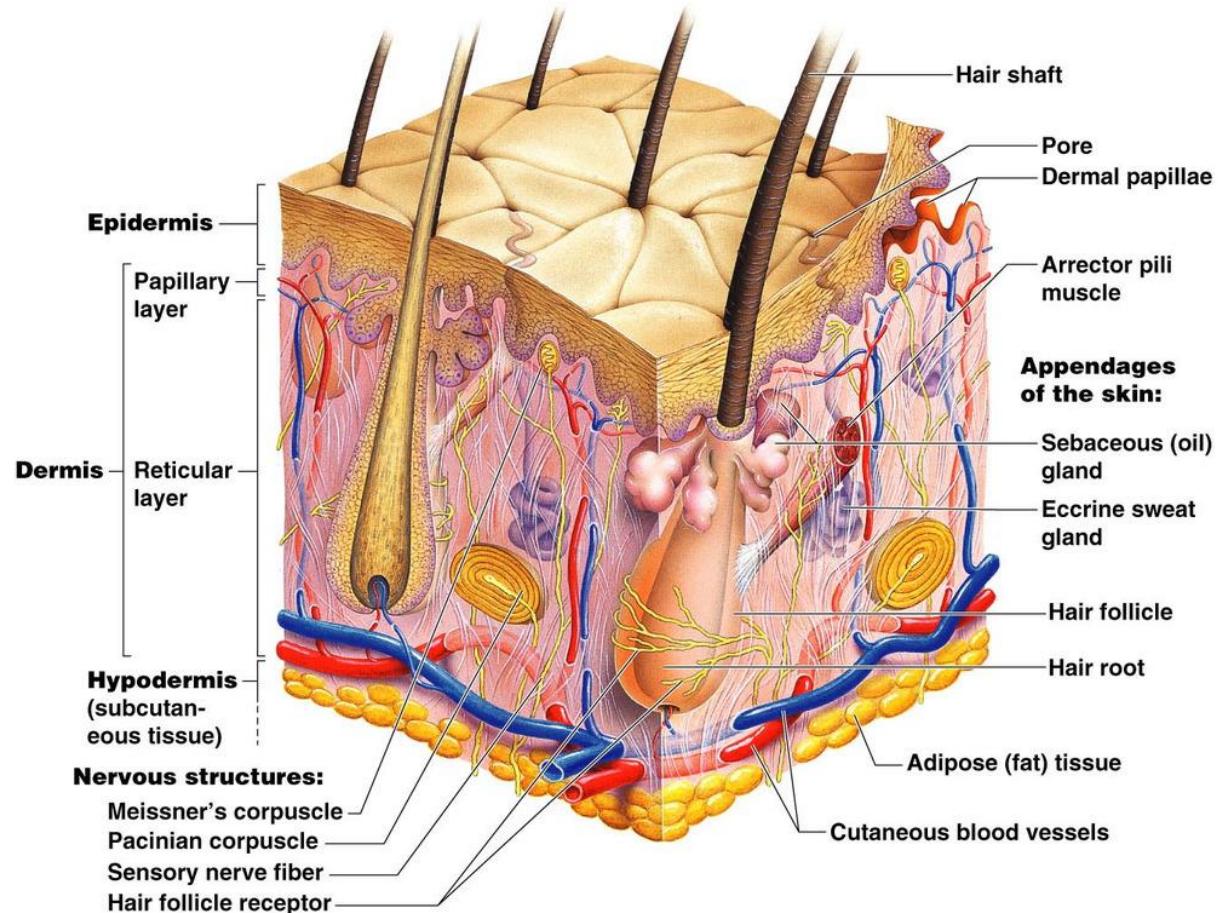
Complications of endometriosis consist of bowel and ureteral obstruction resulting from pelvic adhesions. Ectopic endometrial glandular tissue is influenced by ovarian hormones and undergoes cyclic bleeding. The earliest visible manifestations of endometriosis are whitish peritoneal plaques. Endometriosis can be observed laparoscopically as small subserosal nodules with a brown appearance. Over time the repeated hemorrhaging can produce extensive fibrosis surrounding the endometrial tissue, which can result in adhesions to adnexal structures or to bowel and can obliterate the posterior pelvic cul-de-sac (pouch of Douglas).

The cervix is not commonly involved in endometriosis and is seen in fewer than 1% of cases. Ectopic tissue in the fallopian tubes would not cause dyschezia, as this is not the closest site to the colon. The ovaries are the most common sites for ectopic tissue in endometriosis, but this patient's presentation points more towards the posterior cul-de-sac. The uterus is the normal location of the endometrium and is not considered to have ectopic endometrial tissue.



20. A 65-year-old man with a 20-year history of type 2 diabetes presents to his physician for regular follow-up. His medications include metformin and long-acting insulin at night. Over the past 3 months, he has noticed calluses developing at several locations on his feet. Results of neurologic testing are significant for decreased vibratory sense in the feet bilaterally. **Which of the following is most likely to be damaged in this patient?**

- A. Golgi tendons
- B. Meissner corpuscles
- C. Nociceptors
- D. Pacinian corpuscles**
- E. Thermoreceptors



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Correct!

The patient says that he has noticed calluses developing in several places on his feet over the past 3 months, and neurologic testing reveals decreased vibratory sense in the feet.

The history of diabetes and decreased vibratory sense in his feet suggest that the Pacinian corpuscles are damaged. These receptors are mainly involved in perception of pressure, coarse touch, high-frequency vibration, and tension. They are often damaged in patients with diabetic neuropathy. Pacinian corpuscles are large, ovoid receptors, 1–2 mm long × 0.1–0.7 mm in diameter, and are found primarily in deeper layers of the skin, at joint capsules, serous membranes, and mesenteries.

Several mechanisms are involved in the pathophysiology of this condition. However, microvascular disease appears to be the most prominent contributor.

Other mechanoreceptors in the skin are specialized for different stimuli. For instance, Golgi tendons are encapsulated mechanoreceptors involved in muscle reflexes and proprioception. Meissner corpuscles are myelinated receptors found in the dermal papillae of the glabrous (hairless) skin and are responsible for perception of light discriminatory touch. Nociceptors are pain receptors responsive to cytokines, such as bradykinin and histamine; temperature; and mechanical stresses, such as pressure. Finally, thermoreceptors, which are the naked endings of small unmyelinated nerve fibers, detect changes in temperature.

None of these receptors are involved in the perception of vibration.

21. A 1-year-old male child has become increasingly fussy over the past 3 days with episodes of inconsolable crying. He is asymptomatic in between episodes. The child has vomited during these episodes and has passed one stool in the past 2 days, which contained frank blood and mucus. The mother relays that the child has no significant past medical history. He has achieved all age-appropriate milestones and has gained weight appropriately.

Vital signs show tachycardia, fever to 102.1°F (38.9°C), and tachypnea. On physical examination, the abdomen is distended and very tender, and bowel sounds are absent. A radiograph of the abdomen reveals dilated loops of small bowel. **Which of the following is the most likely diagnosis?**

- A. Appendicitis
- B. Duodenal atresia
- C. Hirschsprung disease
- D. Intussusception**
- E. Pyloric stenosis

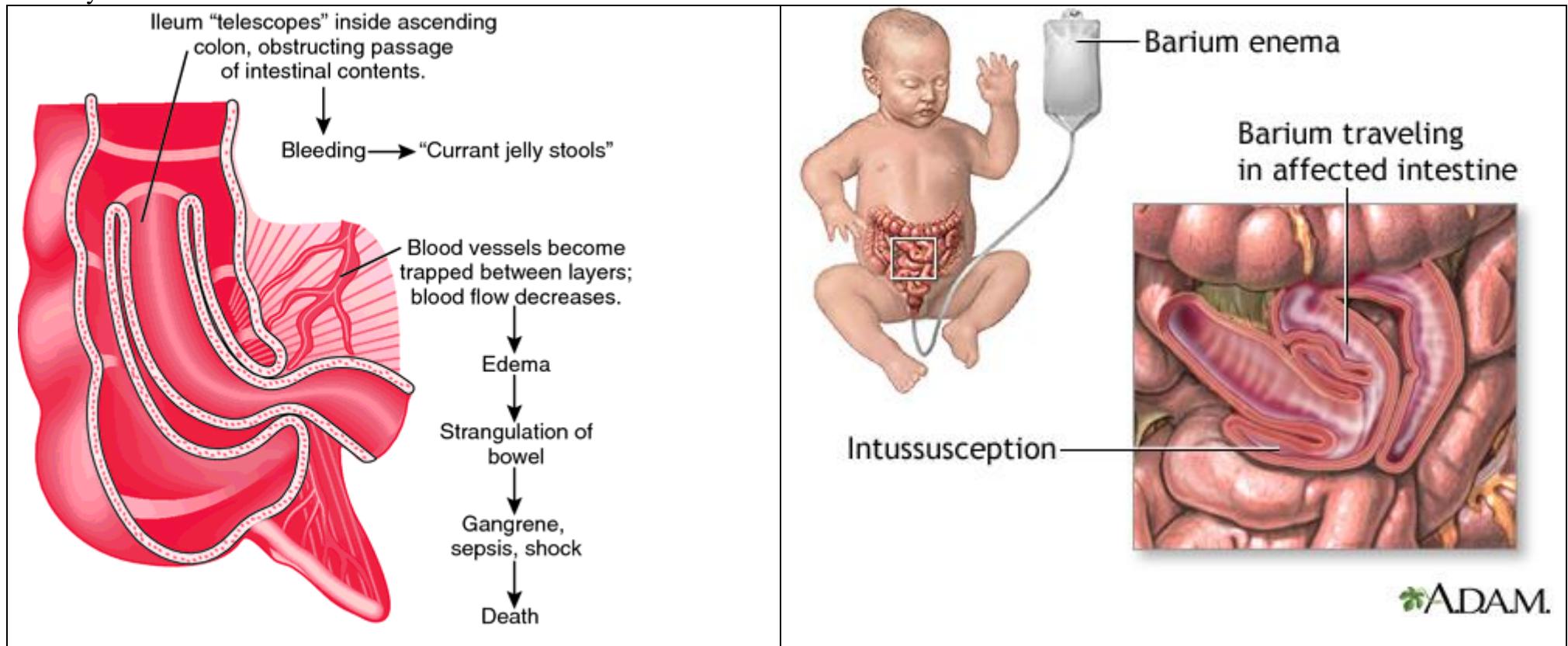
Correct!

This child presents with vomiting, stool with frank blood and mucus, and episodes of crying. These symptoms in addition to the radiographic evidence suggest idiopathic intussusception. The image shows a proximal segment of bowel telescoping into a distal segment. The arrow in the image indicates the distended loop of the bowel.

When the proximal bowel invaginates into the distal segment, it brings its attached mesentery with it, which leads to lymphatic

obstruction, swelling, and decreased perfusion of the affected bowel. This produces intermittent, colicky pain in young children who are otherwise healthy. If left untreated, venous and lymphatic congestion results in intestinal edema and can cause ischemia, perforation, and peritonitis.

Duodenal atresia, Hirschsprung disease, pyloric stenosis, and appendicitis do not manifest with colicky pain and hematochezia, as in this 1-year-old.



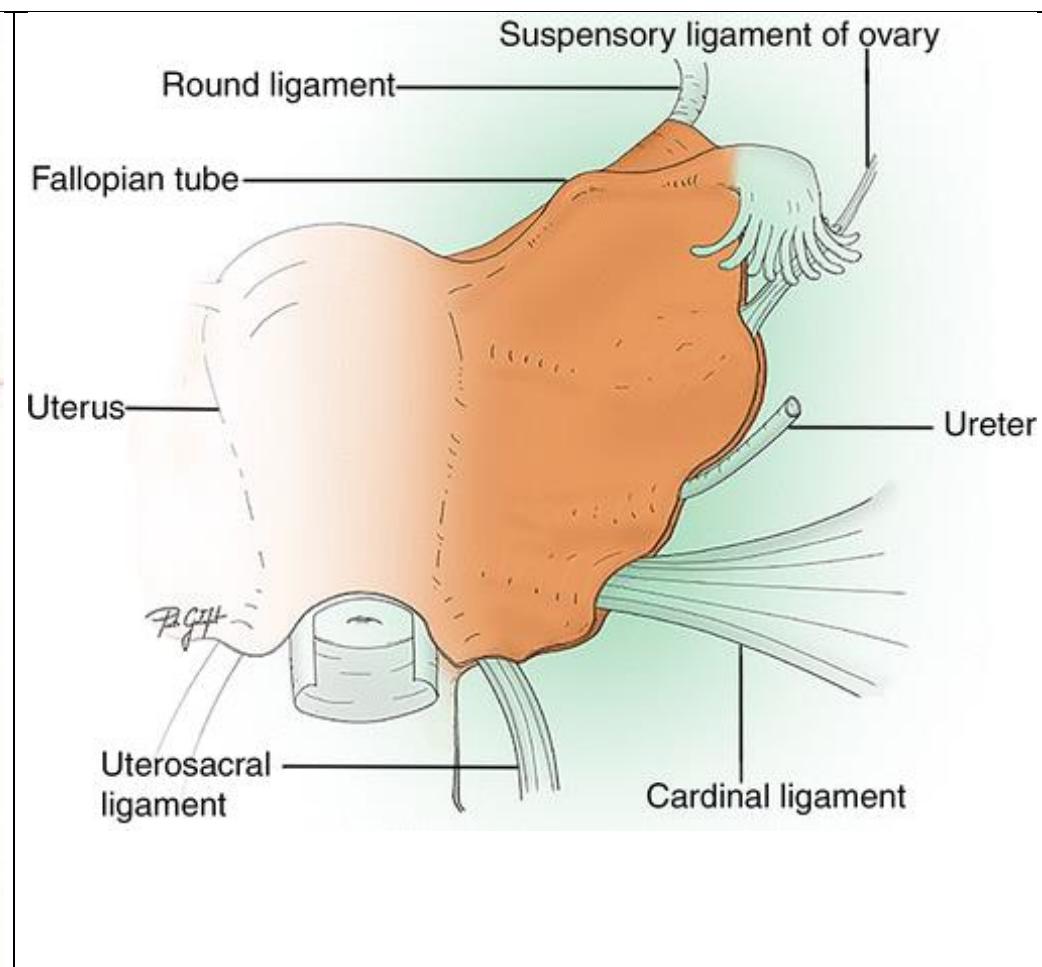
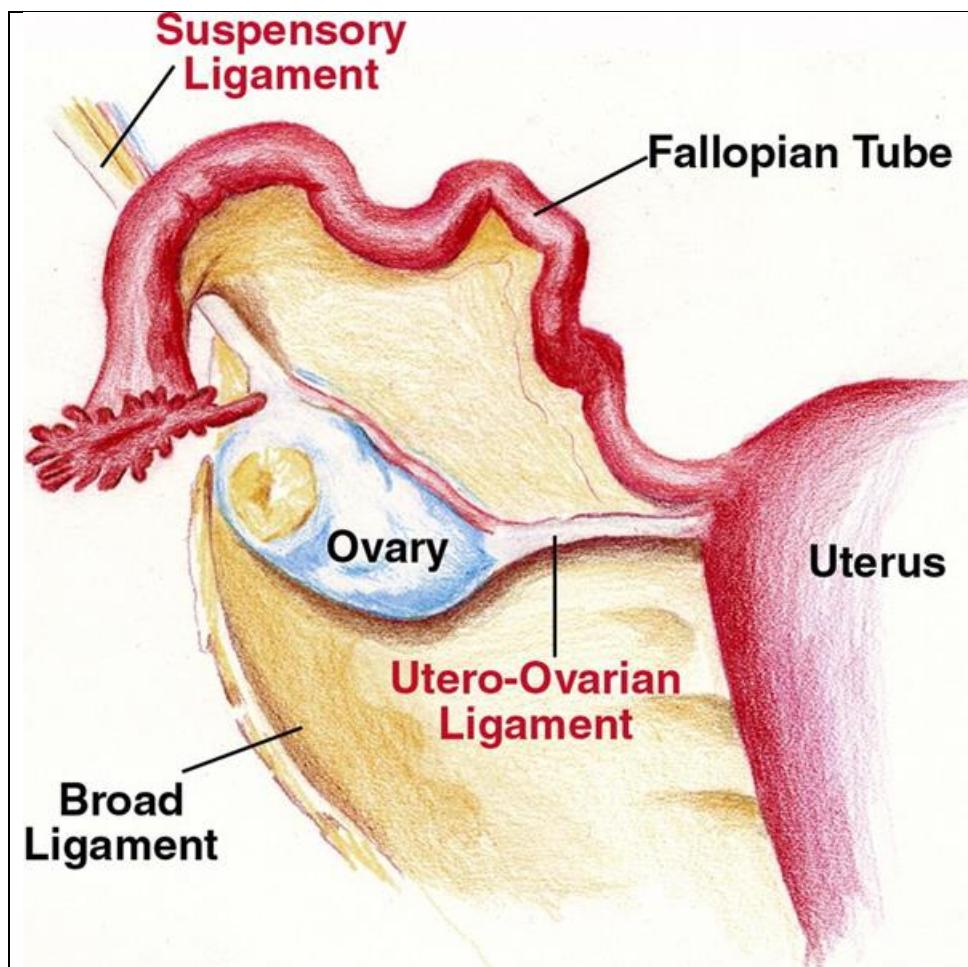
22. A 42-year-old G2P2 woman follows up with her gynecologist about her multiple uterine fibroids. Her last ultrasound demonstrated two 5-cm fibroids, and three 2-cm fibroids. She has been using a progesterone IUD for the last 6 months, to help shrink the fibroids so they do not cause her as much pain during her menses. Today, she states that her pain is not well controlled, and a new pelvic ultrasound shows no change from the previous. Since she no longer wishes to have children, she decides to have an elective hysterectomy. **Severing which of the following structures during surgery would most severely disrupt blood flow to the ipsilateral ovary?**

- A. Cardinal ligament

- B. Fallopian tube
- C. Ovarian ligament
- D. Round ligament
- E. Suspensory ligament**
- F. Ureter

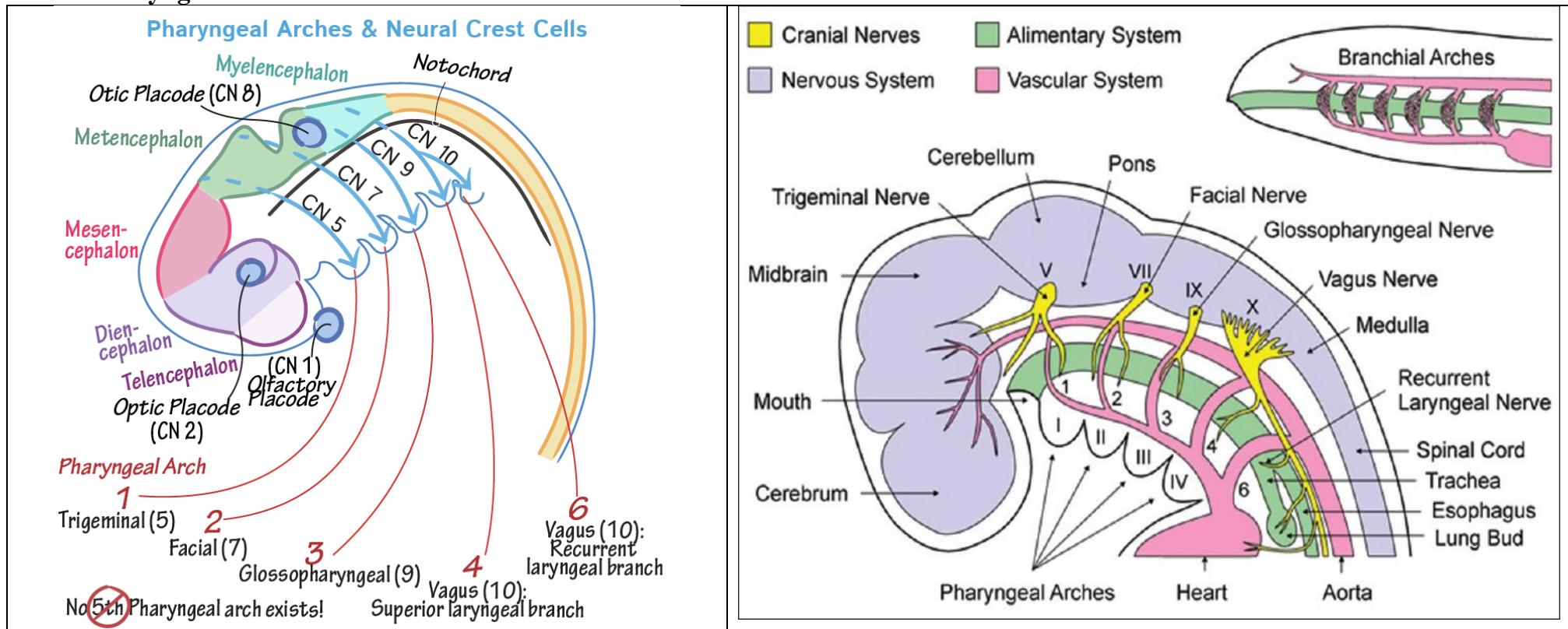
Correct!

The suspensory ligaments (also known as the infundibulopelvic ligaments) contain the ovarian arteries and veins, which are responsible for the direct blood supply to the ovaries. The ovaries also receive collateral flow from the uterine arteries that travel in the cardinal (transverse cervical) ligament at the base of the broad ligament.



23. A 40-year-old woman is being evaluated for rapid weight loss and heat intolerance after unintentionally losing 20 lb in 4 months. Her pulse is 105/min. Physical examination reveals a nodular goiter and +3 patellar reflexes. Laboratory values are within normal limits except for a low TSH level. Ultrasound of the thyroid reveals a solid mass, and fine-needle aspiration biopsy of the nodules is consistent with thyroid malignancy. After discussion of her treatment options, she elects to undergo thyroidectomy. At her 2-month postoperative follow-up visit, she complains of hoarseness. Laryngoscopy shows that the left vocal cord is shortened and held in adduction. **The nerve that was most likely injured during the surgery is derived from which of the following pharyngeal (branchial) arches?**

- A. Pharyngeal arch 1
- B. Pharyngeal arch 2
- C. Pharyngeal arch 3
- D. Pharyngeal arch 4
- E. Pharyngeal arch 5
- F. **Pharyngeal arch 6**



Correct!

When a patient develops hoarseness after total thyroidectomy, nerve damage must be suspected. In this patient, laryngoscopy showed the inability of the left vocal cord to abduct (as it remained adducted), indicating cord paresis/paralysis. The posterior cricoarytenoid muscle is the only abductor of the vocal cords, and it is innervated by the recurrent laryngeal nerve (RLN). Damage to the RLN manifests as dysphonia (hoarseness), breathy voice, and the inability to effectively cough and clear secretions. Bilateral vocal cord paralysis is rare, but it is life threatening due to airway obstruction and respiratory compromise.

The RLN is a branch of the vagus nerve (CN X). The left RLN takes a longer course around the aortic arch, making it more prone to injury than the right RLN. The RLN arises from the 6th pharyngeal arch, and it innervates all the intrinsic muscles of the larynx, except the cricothyroid.

Damage to the external branch of the superior laryngeal nerve - which arises from the 4th pharyngeal arch and innervates the cricothyroid muscle - could also cause mild hoarseness. However, it most often manifests as an inability to produce high-pitched sounds, which is most noticeable when trying to sing. In addition, laryngoscopy would show some vocal cord dysfunction, but abduction should largely be intact as the cricothyroid functions to adduct the vocal cord (vs. the lack of abduction seen in this patient).

The nerves originating from pharyngeal arch 1 are the maxillary branch (sensory only) and the mandibular branch of the trigeminal nerve (CN V), which innervate the muscles of mastication, mylohyoid, anterior belly of the digastric muscle, tensor tympani, tensor veli palatini, and anterior two-thirds of the tongue (sensation). Difficulty with mastication (chewing) would ensue from injury to the mandibular nerve.

The nerve originating from pharyngeal arch 2 is the facial nerve (CN VII), which innervates the muscles of facial expression, the stapedius, stylohyoid, the posterior belly of the digastric muscle, and the anterior two-thirds of the tongue (taste). Injury to the facial nerve manifests as facial droop and ptosis (signs of Bell palsy).

The nerve originating from pharyngeal arch 3 is the glossopharyngeal nerve (CN IX), which innervates the stylopharyngeus muscle and the posterior one-third of the tongue (general and taste sensation). In a gag reflex test, if sensation is intact, the inability to cough or swallow is more likely due to the efferent branch of the reflex, which here would be a lesion of the vagus nerve (CN X).

Finally, pharyngeal arch 5 makes no major developmental contributions.

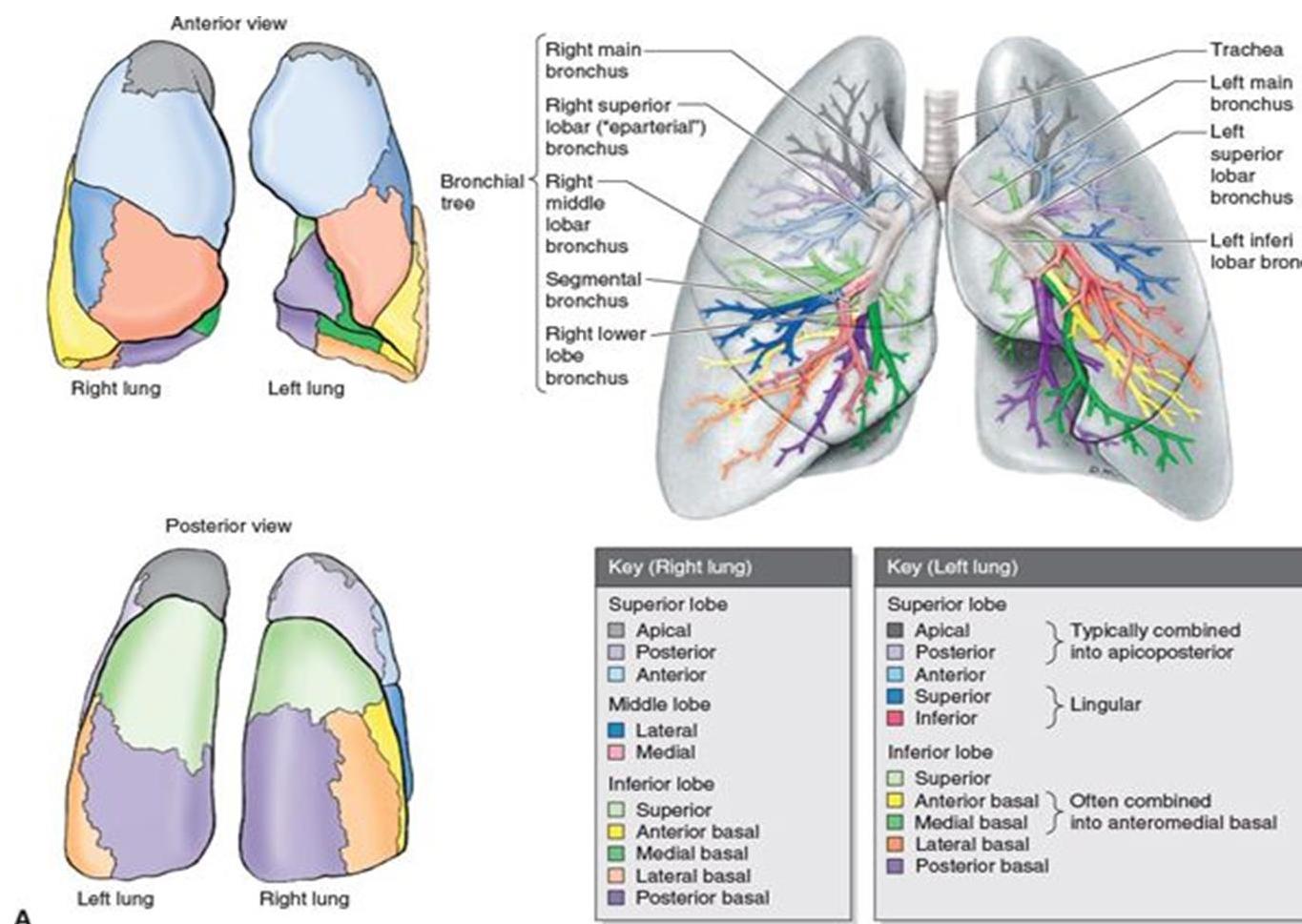
24. An 18-year-old man is brought to the emergency department with a stab wound to the left side of the thorax. The knife handle can still be seen protruding from his anterior chest wall. Physical examination reveals that the knife has been inserted horizontally midway between the second and third ribs, just medial to the midclavicular line. **Which of the following structures has most likely been damaged by the knife?**

- A. Aortic arch
- B. Heart
- C. Phrenic nerve
- D. Superior lobe of left lung**
- E. Thoracic duct

Correct!

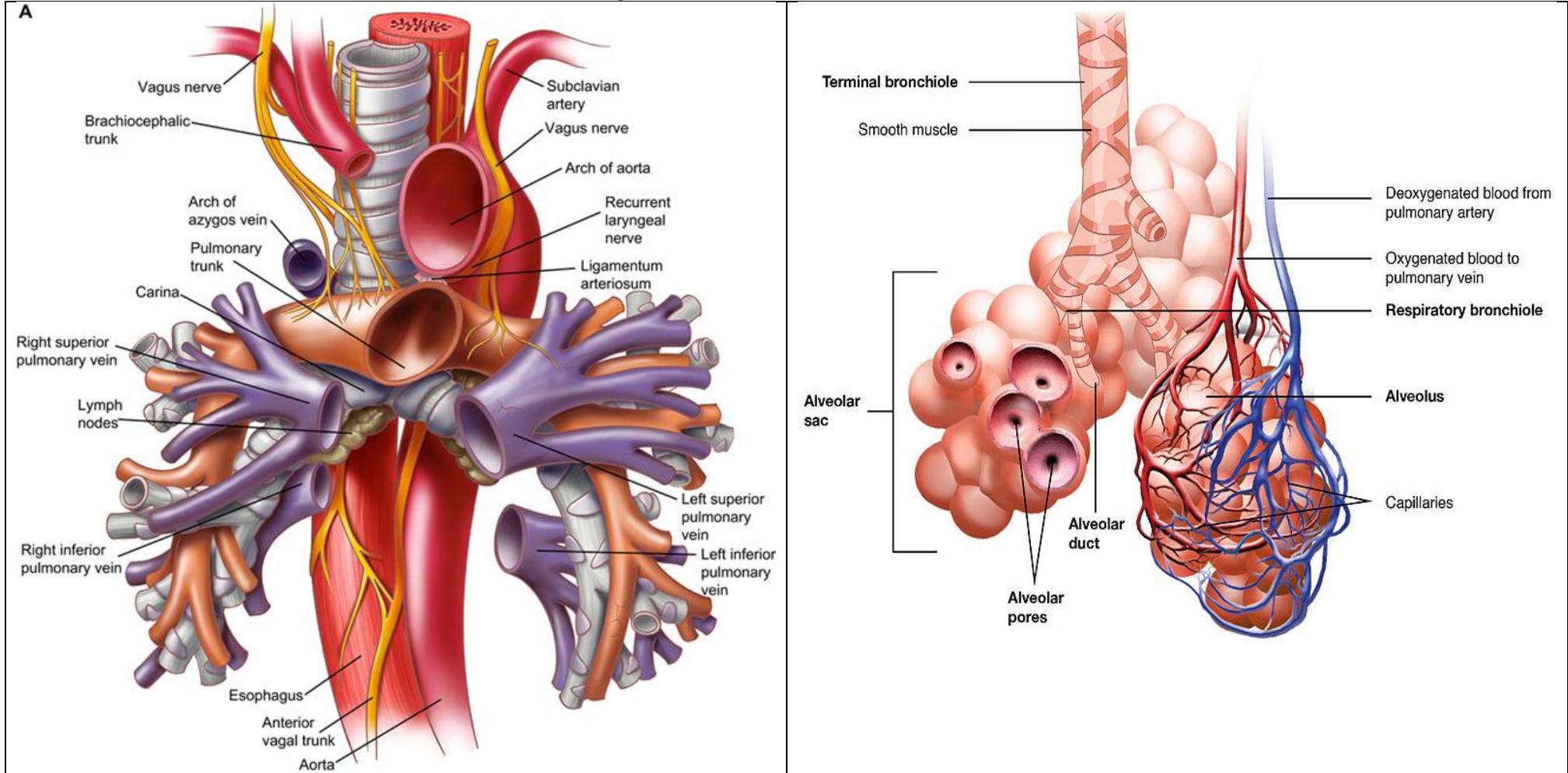
A man is brought to the emergency department with a stab wound to the left side of the thorax. A penetrating stab wound involving the second intercostal space near the midclavicular line would penetrate the superior lobe of the left lung, and not the heart, a major vessel, or a nerve. In fact, this is why when a patient presents with a tension pneumothorax on the left side, a large-bore needle is inserted into this location to remove air from the pleural space without risking damage to other structures in the thorax.

The location of the stab wound in this patient is too inferior to hit the thoracic duct or phrenic nerve; those injuries are more commonly seen in penetrating neck wounds, rather than thoracic wounds. The stab wound is too lateral to involve the aortic arch and too superior to involve the heart.



25. A group of medical students is assigned to an educational outreach event at a high school summer science camp. They decide to present some basic lung anatomy as part of a broader lesson on the harmful effects of smoking on the lungs. The students present an overview of the lungs and teach the campers that each bronchopulmonary segment in the lung is supplied by a tertiary bronchus, two arteries, veins, and lymphatics. **What is the relationship of the arteries to the other anatomic structures in a bronchopulmonary segment?**

- A. Arteries run with the airways at the periphery in the intersegmental space
- B. **Arteries run with the airways in the center of the segments**
- C. Arteries run with the lymphatics at the periphery in the intersegmental space
- D. Arteries run with the veins at the periphery in the intersegmental space
- E. Arteries run with the veins in the center of the segments



Correct!

The left lung and the right lung have 8 and 10 bronchopulmonary segments, respectively. Each segment functions as a separate unit and is supplied by a tertiary bronchus and two arteries (a bronchial artery and a pulmonary artery), all of which run together in the center of the segments. Veins and lymphatics drain together along the edges of the segments. The image shows the pulmonary artery running along the center of the segment with the pulmonary vein at the peripheral edge.

Lung segments need their own arterial blood supply to maintain activity and function, so the arteries must run with the airways in each lung segment. Thus any description that indicates that the arteries run with the veins or lymphatics would be incorrect. It would not make sense for the airways to run only along the periphery of the lung segments, since it would make respiration more difficult if the lungs were structured this way. Because the arteries must run with the airways, they also run centrally.

Literature

1. Bilash VP, Hryn VH, Hryn KV. Tendentsiyi y napryamy v dystantsiyniy osviti. [Trends and directions in distance education]. Realiyi, problemy ta perspektyvy vyshchoyi medychnoyi osvity: materialy navch.-nauk. konf. z mizhnar. uchastyu. Poltava, 2021:26-28. (Ukrainian).
2. Cherkasov VH, Bobryk II, Humins'kyj YUY, Koval'chuk OI. Mizhnarodna anatomichna terminolohiya (latyn's'ki, ukrayins'ki, rosiys'ki ta anhliys'ki ekvivalenty) [International Anatomical Terminology (Latin, Ukrainian, Russian and international equivalents)]. Vinnytsya: Nova knyha; 2010. 392 p. (Ukrainian).
3. Deyneha TF, Svintsyts'ka NL, Rohulya VO, Hryn VH. Napryamky udoskonalenna pidhotovky maybutnikh likariv u suchasnykh umovakh na kafedri anatomiyyi lyudyny. [Directions for improving the training of future doctors in modern conditions at the Department of Human Anatomy]. Osnovni napryamky udoskonalenna pidhotovky medychnykh kadrov u suchasnykh umovakh: materialy Vseukr. nauk.-prakt. konf. z mizhnar. uchastyu. Poltava, 2015. P. 71-73. (Ukrainian).
4. Hryn VH, Svintsytska NL, Sherstiuk OO, et al. The use of morphological study technique for investigation of labial and palatine glands. Wiadomości Lekarskie. 2017; 5: 934-7.
5. Hryn VH, Svintsytska NL, Piliuhin AV, et al. Report on the study of spatial organization of the human prostate glands. Wiadomosci Lekarskie. 2017; 6: 1034-6.
6. Hryn VH, Sherstiuk OO, Piliuhin AV, et al. Multilayer plastic reconstruction in the three-dimensional study of the human lacrimal gland. Svit medytsyny ta biolohiyi. 2018; 1(63): 113-6.
7. Hryn VH, Sherstiuk OO, Svintsytska NL, et al. Morphofunctional characteristic of the appendix of newborns and infants. Health Education. 2017; 6 (2): 1481-7.
8. Hryn VH, Svintsytska NL, Piliuhin AV, et al. The use of injection-corrosive method in the study of extraorganic bloodstream of human intact stomach. Wiadomosci Lekarskie. 2017; 4: 742-4.
9. Hryn VH, Bilash VP. Navchal'nyy naochnyy posibnyk dlya studentiv medychnykh fakul'tetiv zakladiv vyshchoyi osvity MOZ Ukrayiny. Oporno-rukhovyy apparat lyudyny. [Locomotor apparatus of Human]. Poltava: FOP Myron I.A; 2019. 144 p. (Ukrainian).
10. Kostylenko YuP, Starchenko II, Pryluts'kyj OK, Hryn VH. Anatomiya lyudyny (kurs lektsiy). [Human Anatomy (course of lectures)]. Navch. posib. dlya studentiv stomatolohichnykh fakul'tetiv vyshchykh medychnykh navchal'nykh zakladiv Ukrayiny IV rivnya akredytatsiyi. Poltava. 2015. 188 p. (Ukrainian).
11. Sherstiuk OA, Piliuhin AV, Deinega TF. et al. Anatomicheskiye i stereomorfologicheskiye osobennosti sleznykh i malykh slyunnykh zhelez cheloveka [Anatomical and stereomorphological features of the human lacrimal and minor salivary glands of the person]. Poltava, 2017. 148 p. (Russian)
12. Sherstiuk OA, Svintsytska NL, inventors; Higher State Educational Institution «Ukrainian Medical Stomatological Academy», assignee. Method of study of human gastric glands. Ukraine patent 45821. 2009 November 25. (Ukrainian).
13. Sherstiuk OA, Svintsytska NL, Deinega TF, inventors; Higher State Educational Institution «Ukrainian Medical Stomatological Academy», assignee. Method of morphological study of small salivary (labial and palatine) glands of a human. Ukraine patent 116621. 2017 May 25. (Ukrainian).
14. Sherstiuk OA, Svintsytska NL, Tarasenko YaA, et al. Izuchenie trehmernoy organizatsii parenhimatoznyih i polyih organov cheloveka pri pomoschi inyektionno-korrozionnogo metoda [Study of the three-dimensional organization of human parenchymal and hollow organs]. Svit medytsyny ta biolohiyi. 2012; 2: 205-9. (Russian)

15. Sherstyuk OA, Svintsitskaya NL, Tsvetkova YaA. Zakonomernosti i osobennosti stroeniya, a takzhe raspredeleniya zvenev gemomikrotsirkulyatornogo rusla v stenke zheludka cheloveka v norme [The regularities and structural features, as well as the distribution of the links of the hemomicrocirculatory bed in the wall of the human stomach in norm]. Visnik problem biologiyi i meditsini. 2011; 2: 197-199. (Russian)
16. Sherstyuk OO, Hryni VH, Bilash VP, Severyn YuM, Katsenko AL. Eponimichni nazvy vnutrishnikh orhaniv [Eponimic names of internal organs]. Svit medytsyny ta biolohiyi. 2014;2(44):226-8. (Ukrainian).
17. Sherstyuk OO, Pidluzhna SA, Svintsits'ka NL ta in. Zastosuvannya suchasnykh zasobiv navchannya na kafedri anatomiyi lyudyny. [Application of modern teaching aids at the Department of Human Anatomy]. Realiyi, problemy ta perspektivy vyshchoyi medychnoyi osvity: materialy navch.- nauk. konf. z mizhnar. uchastyu. Poltava, 2021:294-296. (Ukrainian).
18. Svintsitska NL, Hryni VH. Morfofunctional structure of the skull: study guide. Poltava, 2016. 172 p.
19. Svintsitska NL, inventors; Higher State Educational Institution «Ukrainian Medical Stomatological Academy», assignee. Method of the research of human stomach bloodstream. Ukraine patent 45755. 2009 November 25. (Ukrainian).
20. Svintsitska NL, Sherstiuk OA, inventors; Higher State Educational Institution «Ukrainian Medical Stomatological Academy», assignee. Method of the investigation of the gemomicrocirculatory bloodstream of human stomach. Ukraine patent 45757. 2009 November 25. (Ukrainian).
21. Svintsitskaya NL, Sherstiuk OA, Deynega TF, et al. Klassicheskie i sovremennye predstavleniya o krovosnabzhenii intaktnogo zheludka cheloveka [Classical and modern presentations about the blood supply to the intact human stomach]. Aktualni problemi suchasnoyi meditsini: Visnik Ukrayinskoj medychnoyi stomatologichnoyi akademiyi. 2009; 4: 256-61. (Russian)
22. Svintsitskaya NL, Sherstiuk OA, Soldatov OK. Perevagi protitokovo-perehreschenogo metodu inyektuvannya sudin dlya napovnennya krovonosnogo rusla shlunka lyudini [Advantages of the countercurrent-cross method of vascular injection for filling the bloodstream of the human stomach]. Problemy ekologiyi ta meditsini. 2012; 1-2: 38-39.
23. Svintsits'ka NL, Sherstyuk OO, Deyneha TF, Rohulya VO, Hryni VH. Vplyv naukovykh doslidzhen' vykladacha na formuvannya suchasnoho likarya. [Influence of scientific researches of the teacher on formation of the modern doctor]. Osnovni napryamky udoskonalennya pidhotovky medychnykh kadrov u suchasnykh umovakh: materialy Vseukr. nauk.-prakt. konf. z mizhnar. uchastyu. Poltava. 2015;213-214. (Ukrainian).
24. Svintsitska N. L. Morphofunctional characteristic of the skull with a clinical aspects: study guide / N. L. Svintsitska, V. H. Hryni. O. I. Kovalchuk. – Poltava, 2020. – 205 p.
25. Svintsits'ka NL, Hryni VH, Katsenko AL. Osoblyvosti formuvannya profesynoho rozvytku inozemnykh studentiv pid chas vyvchennya dystsypliny «Anatomiya lyudyny». [Features of the formation of professional development of foreign students during the study of the discipline "Human Anatomy"]. Aktual'ni pytannya medychnoyi (farmatsevtychnoyi) osvity inozemnykh hromadyan: problemy ta perspektivy: navch.-nauk. konf. z mizhnar. uchastyu. Poltava. 2018;81-83. (Ukrainian).
26. Svintsits'ka NL, Kohut IV, Ustenko RL ta in. Prosvitnyts'ka rol' anatomichnoho muzeyu u formuvanni zdorovoho sposobu zhyttya sered molodi. [Educational role of the anatomical museum in the formation of a healthy lifestyle among young people]. Fizkul'turno-ozdorovchi ta sportyvni tekhnolohiyi v osvitn'omu prostori: teoriya i praktyka: kolektivna monohrafiya za zah. red. OO Momot, YuV Zaytsevoi. Poltava: PNPU im. V.H. Korolenka, 2020. P. 225-243. (Ukrainian).
27. Svintsitska NL, Korchan NO, Hryni VH ta in. Orhanizatsiya dystantsiynoho navchannya z dystsypliny «Anatomiya lyudyny». [Organization of distance learning in the discipline «Human Anatomy】. Materialy Mizhnarodnoyi naukovo-praktychnoyi konferentsiyi «Metodyka navchannya pryrodnychych dystsyplin u seredniy ta vyshchii shkoli» (XXVIII KARYSHYNS'KI CHYTANNYA). Poltava: Astraya. 2021:276-278. (Ukrainian).

28. Ustenko RL, Sherstyuk OA, Svintsytska NL, et al. Stereomorfologicheskiy podhod k izucheniyu mikroanatomiceskikh struktur prostatyi cheloveka [Stereomorphological approach to the study of microanatomic structures of the human prostate]. Visnik problem biologiyi i meditsini. 2013; 2 (101): 213-218. (Russian)
29. Ustenko RL, Sherstyuk OA, Svintsitskaya NL. Stereomorfologicheskie osobennosti zhelez perifericheskoy zonyi prostatyi cheloveka [Stereomorphological features of the glands of the peripheral zone of the human prostate]. Tavricheskiy mediko-biologicheskiy vestnik. 2013; 1: 193-7. (Russian)
30. Ustenko RL, Svintsytska NL, Kobets AA. Three-dimenisional organization of the glands of peripheral zone of the human prostate gland. Aktual'ni pytannya teoretychnoyi ta klinichnoyi medytsyny: zbirnyk tez dopovidey Mizhnarodnoyi naukovo-praktychnoyi konferentsiyi studentiv ta molodykh vchenykh, m. Sumy, 10-12 kvitnya 2013 r. / Vidp. za vyp. M.V. Pohoryelov. Sumy: SumDU, 2013. P. 20.
31. Ustenko RL, Sherstyuk OA, Svintsytska NL, inventors; Higher State Educational Institution «Ukrainian Medical Stomatological Academy», assignee. Method of study of human prostate gland. Ukraine patent 83435. 2013 October 09. (Ukrainian).