KHARKIV NATIONAL MEDICAL UNIVERSITY

Department of operative surgery and topographic anatomy

Lecture #1

INTRODUCTION IN TOPOGRAPHIC ANATOMY AND OPERATIVE SURGERY.

TOPOGRAPHIC ANATOMY AND OPERATIVE SURGERY OF THE CEREBRAL AND FACIAL PARTS OF THE HEAD

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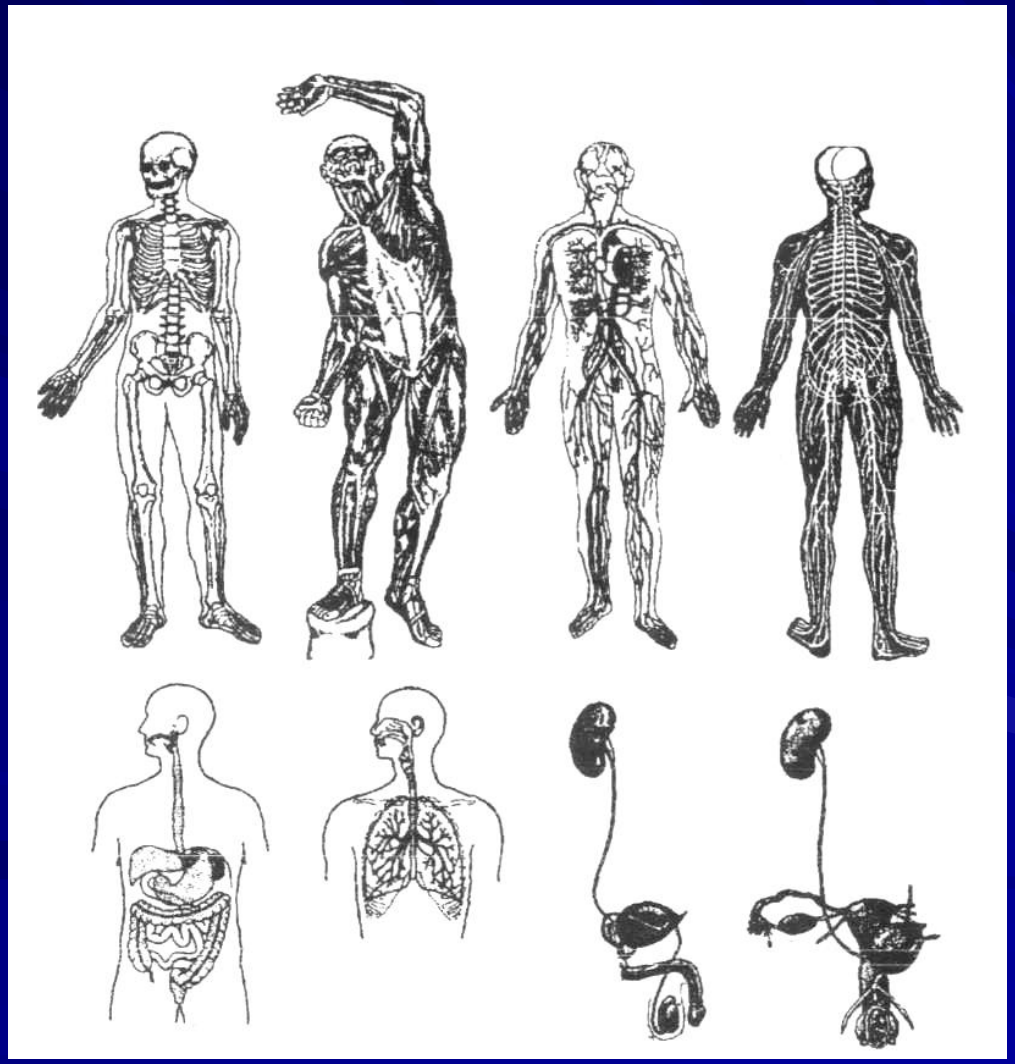
Plan of lecture

- Three approaches to the study of the human structure.
- Topographic Anatomy: definition.
- History of Clinical Anatomy in personals.
- Wounds: definition, classification.
- The operation: definition, classification.
- Surgical technique.
- Borders of the head and its cerebral and facial parts
- Regions of the cerebral part of the head
- Classification of wounds of skull.
- Peculiarities of the skull wounds and their primary surgical treatment
- Fractures of the skull
- Haematomas.
- Craniotomy.
- Regions of the facial part of the head
- Parotid salivary gland.
- Primary surgical treatment of wounds of face
- Typical cuts on face

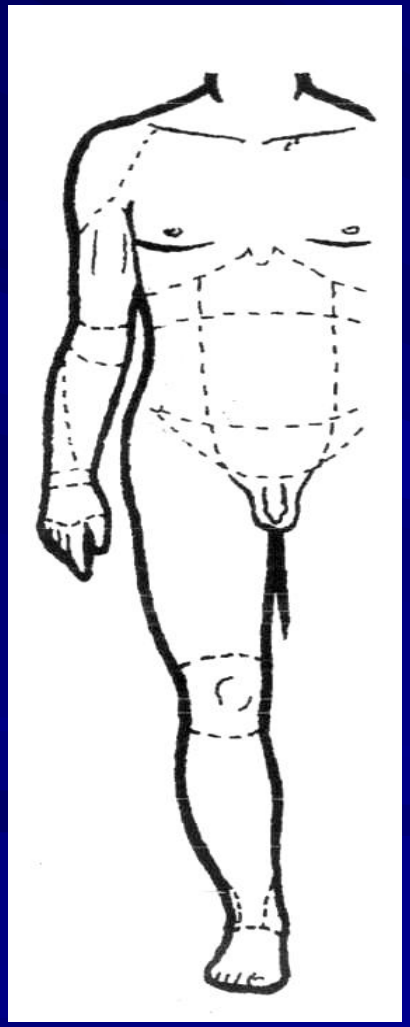
Three approaches to the study of the human structure.

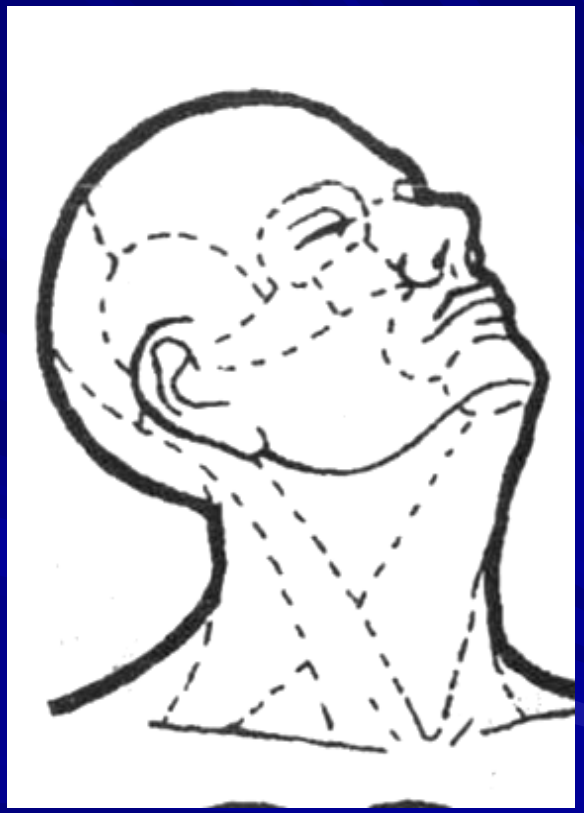
1. *Systematical;*
2. *Regional;*
3. *Topographical.*

Systematical approach to study of the Human Structure.

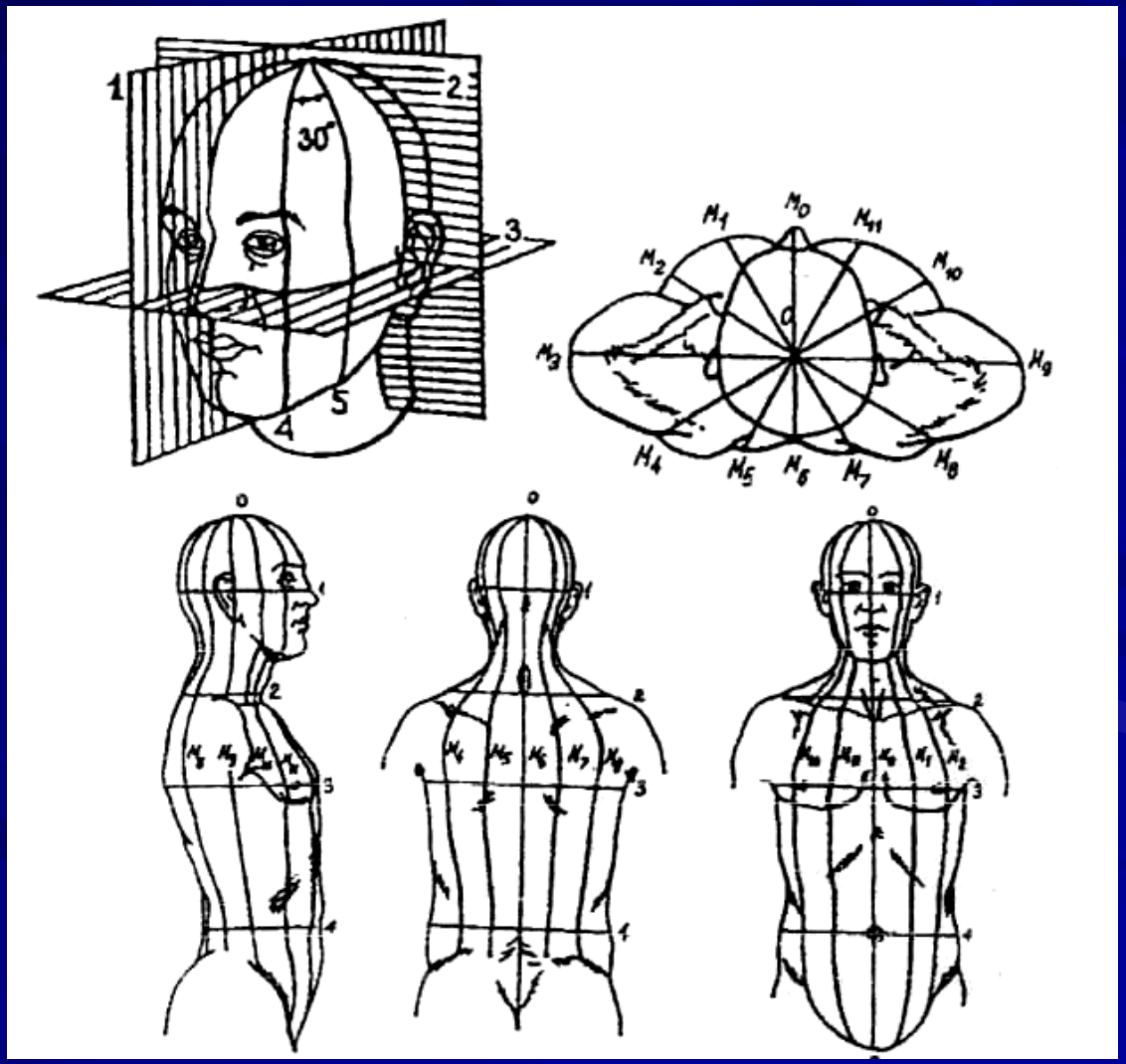


Regional approach to study of the Human Structure.





Topographical approach to study of the Human Structure.



"The Clinical Anatomy" – what does it mean?

The term originates from gr.: ***klinikos*** that means *pertaining to a bed.* **The clinic** is an establishment where patients are admitted for special study and treatment by a group of physicians practicing medicine together.

"The Clinical Anatomy" (H.Ellis, 1960-1994; K.L.Moore, 1985; R. Snell, 2000 et all.)

- is an integrative science which comprises topographic, regional, radiological, surgical and others approaches to the study of the Human Structure in application to clinics.

Subdivisions of clinical anatomy:

- Regional anatomy;
- Topographic anatomy;
- Surgical anatomy.

Methods to the study of the human structure.

1. ***Syntopy;***
2. ***Skeletotopy;***
3. ***Holotopy.***

Methods to the study of the human structure.

- ***syntopy*** (from *gr.* ***syn*** *with, together* **+ topos** *place)* – the position of organ with others in any cavity*;*
- ***skeletotopy*** (from ***skeleton* + topos** *place)* – the position of organ with skeleton;
- ***holotopy*** (from *gr.: **holos** whole, entire* + ***topos*** *place)* - the position of organ to the skin surface.

Topographic Anatomy

- **Topographic Anatomy** studies the structures of the Human Body on cross-sections in application to clinical diagnostic: ultrasound images (USI), computed tomography (CT) and magnetic resonance (MR). These are tomographic (two-dimensional) slice images. Imaging technologies using X-ray, USI, CT, MR and radioisotopes can give precise anatomic delineation (M. Burykh, 1990) and as well as function.

Surgical Anatomy

- **Surgical Anatomy** studies structures of the Human Body from the surgical point of view, that is their importance to the performance of incisions and operative methods *{tomy, stomy, ectomy, resection* and so on). This also means a study of **anatomical variations** in preparation for structural differences encountered at the operating table.

History of Anatomy in personals.

Prof. NIKOLAY PIROGOV (1801-1881)

Main works:

- **"Is the ligation (vinculum) of abdominal aorta easy and nondangerous operation of inguinal aneurysms?" (Derpt, 1832);**
- **"Surgical Anatomy of Vascular Trunks and Fascia" (1837);**
- **"Complete Course of Applied Anatomy" (1844);**
- **"Atlas of topographic Anatomy in cross-sections through frozen cadavers" (1853-1859).**

History of Anatomy in personals.

Prof. VICTOR SCHEVKUNENKO (1872-1952)

Main works:

- **"Theory of individual anatomical variability";**
- **"Age and typological Anatomy" (1925);**
- **"Course of Operative Surgery and Topographic Anatomy" (1932-1952);**
- **"Atlas of Peripheral Nervous and Venous Systems" (1949).**

WOUNDS

WOUND is *a simply disruption of the normal continuity of tissue.* When tissue has been disrupted so severely that it cannot heal naturally (without complications or possible disfiguration) it must be repaired by a skilled surgeon.

Classification of wounds according to the mode of damage

1. *An incised wound is caused by a sharp instrument; if there is associated tissue tearing, the wound is said to be lacerated*;
2. *An abrasion results from friction damage to the body surface, and is characterized by superficial bruising and loss of varying thickness of skin and underlying tissues*;
3. *Crush injuries are due to severe pressure. The skin may not be breached even if massive tissue destruction is present. Oedema, characteristic of this type of injury, can make wound closure impossible and, by increasing pressure within fascial compartments, may cause ischaemic necrosis of muscle and other structures.*;

Classification of wounds according to the mode of damage

4. *Degloving injury occurs as a result of shearing forces which cause parallel tissue planes to move against each other. Large areas of apparently intact skin may be deprived of their blood supply from rupture of feeding vessels.*
5. *Gunshot wounds may be from shotgun pellets or bullets. Bullets fired from high-velocity rifles cause massive tissue destruction.*
6. *Burns are caused by heat, cold, electricity, irradiation or chemicals. They form a distinct variety of wound requiring special consideration.*

Operative wounds

1. **Clean wounds**. *They are closed by primary union and are not usually drained. No break in aseptic technique occurs during this procedure. Here the surgeon does not enter the oropharyngeal cavity or the respiratory, or alimentary or genitourinary tracts.*
2. **Clean-contaminated wounds**. *These operative wounds have usual normal flora without unusual contamination.*
3. **Contaminated wounds**. *These include fresh traumatic injuries such as soft tissue laceration, open fractures and penetrating wounds. Microorganisms multiply so rapidly that within six hours a contaminated wounds can become infected.*
4. **Dirty and infected wounds**. *These wounds have been heavily contaminated or clinically infected prior to the operation. They included perforated viscera, abscesses or old traumatic wounds in which devitalized tissue or foreign material have been retained.*

THE OPERATION

- THE OPERATION is a therapeutic procedure with instruments to repair damage or arrest disease in a living body; or any act performed with instruments or by the hands of a surgeon with the aim of diagnostic or treatment.

Clinical classification of operations:

1. The *radical operation (lat.: radix, root)* is an operation which is directed to the cause or directed to the root or source of a morbid process;
2. The *palliative operation (lat.: palliates, cloaked)* is an operation which affords relief but not cure.

Surgical operation

The *surgical operation* is a technological process which includes following components:

1) the knowledge of Clinical Anatomy (in application to surgical clinic Surgical Anatomy);
2) an operating room, general and special surgical instruments and apparatus;
3) an operating room and patient management (*aseptic procedures*; anesthesia);
4) surgical technique (*operative approach, operative method and wound closure).*

GENERAL PRINCIPLES OF SURGICAL TECHNIQUE

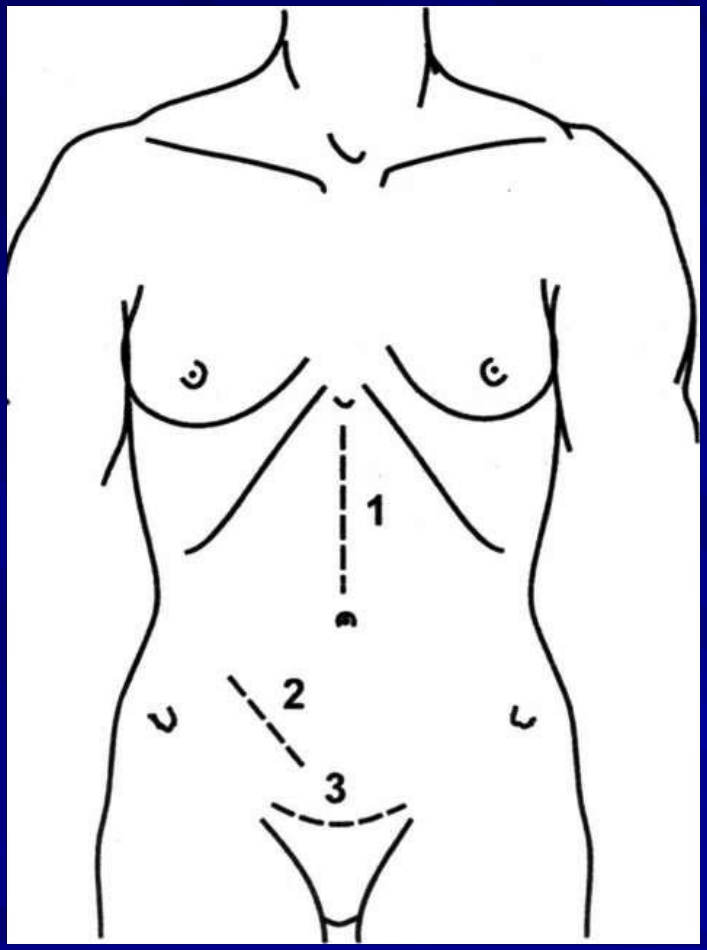
- *Dissection technique*.
- *Arrest of haemorrhage*.
- *Tissue handling.*

SURGICAL TECHNIQUE

A large operation consists of three parts:

1. **operative approach** *(lat.: operativus, pertaining to an operation)*: exposure of organs with instruments or **incision** *(lat.: in + cedere, to cut, to open through)*;
2. **operative method:** surgical acts performed with instruments, based on strong precedence rules;
3. **wound closure (**absorbable and nonabsorbable sutures *and aseptic bandage):* holding tissues in proximity with means.

Operative approaches (incisions)



Abdominal operative approaches: 1 - upper middle laparotomy; 2 - McBurney approach for appendectomy; 3 - Phannenstiel's approach for ceasarian section.

Operative approaches (incisions)

- The incision should give optimal exposure for the most difficult part of the operation and should allow for extension in the event of a greater than expected procedure being required;
- all skin incisions should be carefully planned so as to give a good view of the deeper parts and at the same time to avoid important structures;
- in general, when an incision has to be made in the neighborhood of large vessels or nerves, it should be made parallel to, and not across, their long axis;
- an incision of adequate length should always be made;
- for cosmetic reasons, however, incision on the face or neck should be placed in a natural crease, for not only will the scar be less visible, but there will be less likelihood of keloid formation.

Operative methods

There are the following surgical actions:

- ~ *tomy* (gr.: *tome*, *a cutting)*;
- ~ stomy (gr.: stomoun, to provide with an opening, or mouth);
- **~ *ectomy*** (gr.: ***ectome***, *removing)*;
- ~ *plasty* (gr.: *plassein*, *to form, mold, shape);*

Operative methods

There are the following surgical methods :

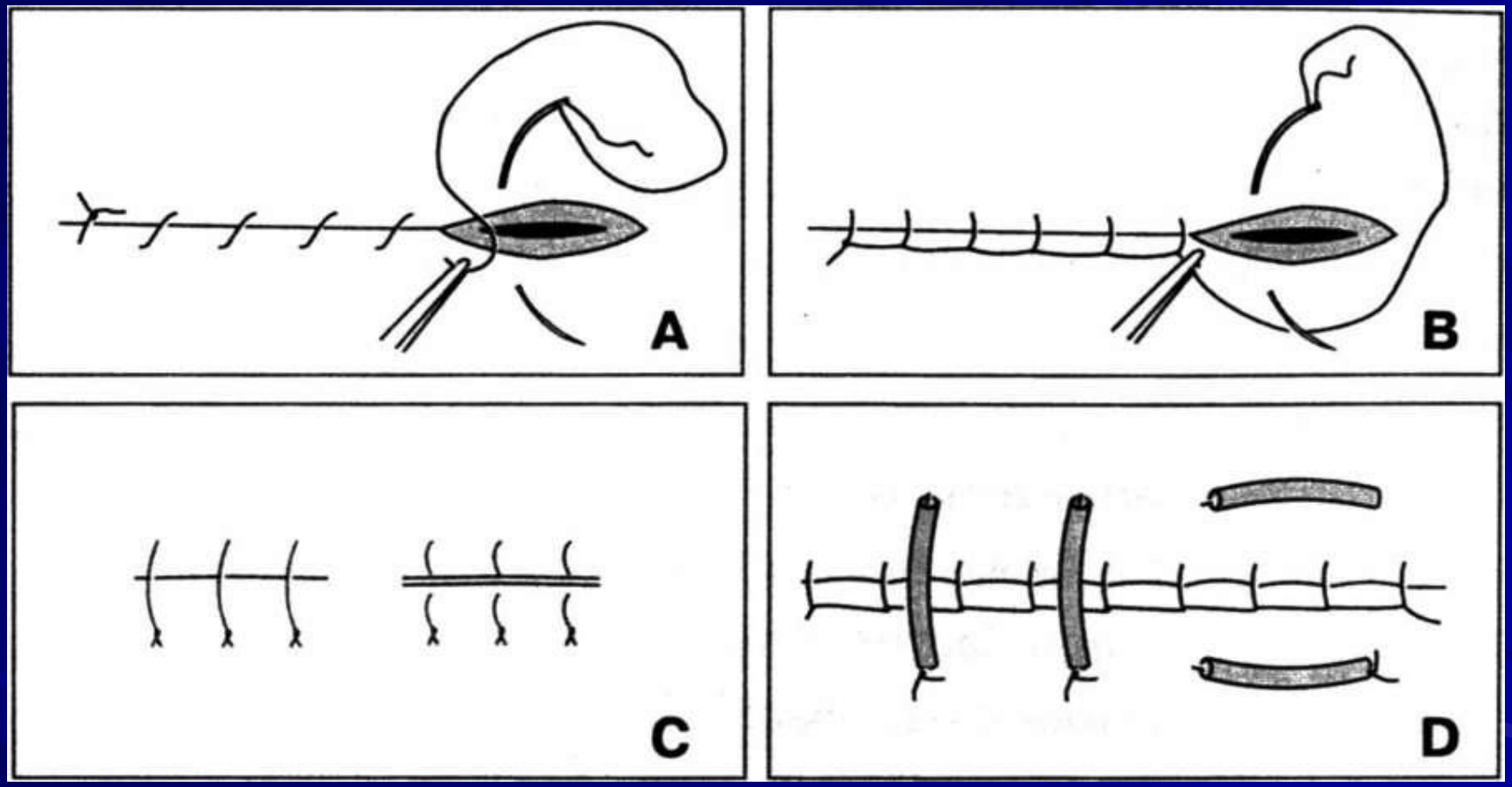
- *resection* (lat.: resecare, to cut off);
- *amputation* (lat.: *amputare*, *to cut off)*;
- *exarticulation* (lat.: *ex-, from or outside + articulus, joint or articulation);*
- *implantation* or *transplantation* (lat.: *in, trans*, *through + plan- tare*, *crop or plant).*

Wound closure

- **The surgeon's goal.** — Whether a patient has elected to have surgery or is undergoing an emergency procedure, the surgeon's ultimate goal upon closing is the same:

  to hold severed tissue in opposition (that is, to hold them together in proximity with means) until the wound has healed enough to withstand stress without mechanical support.

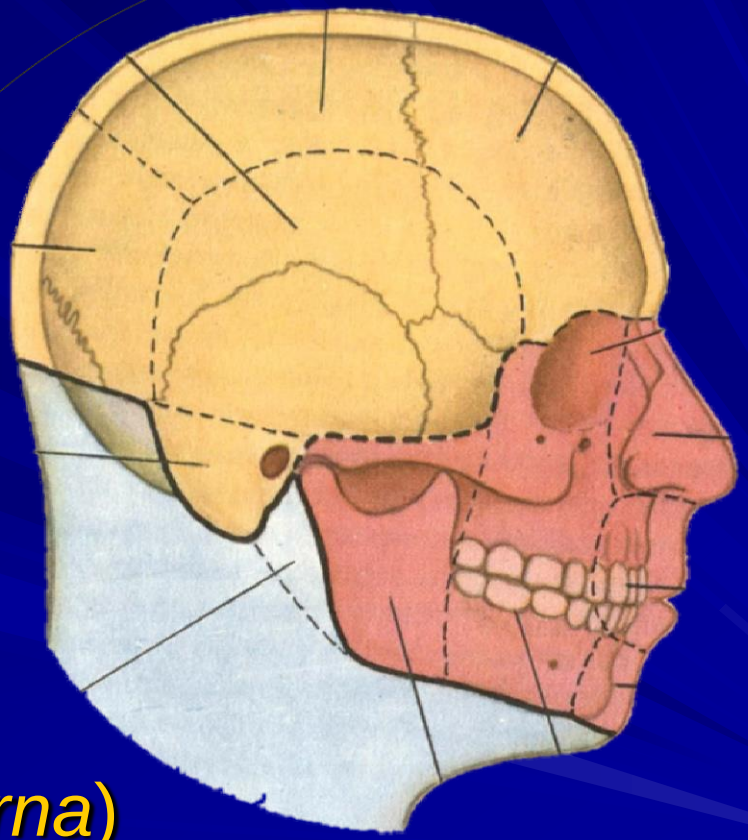
Types of surgical sutures:



A - continuous overhead suture; B - continues blanket suture;
C - ordinary interrupted suture; D - eversion interrupted suture.

Borders of the head

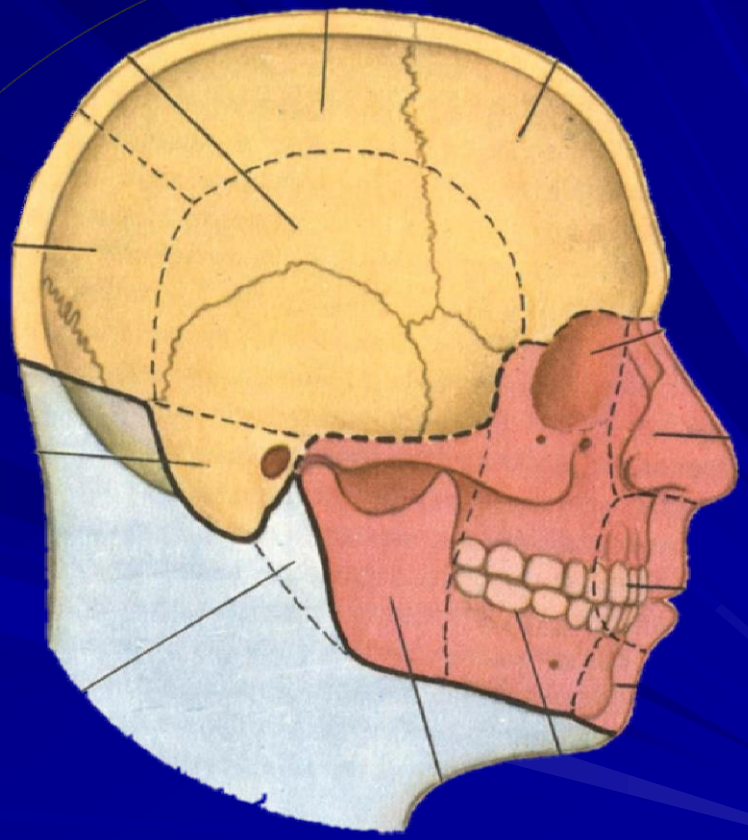
- ledge of the chin (*protuberantio mentalis*),
- foundation of the jaw (*basis mandibulae*) and its Branch (*ramus mandibulae*),
- external acoustic duct,
- mastoid process,
- linea nuchea superior,
- external occipital ledge (*protuberantia occipilalis externa*) or the most prominent point of this ledge - the Inion.



Borders of the cerebral part of the head

The *cerebral part* of the head is separated from the *facial part* by following structures:

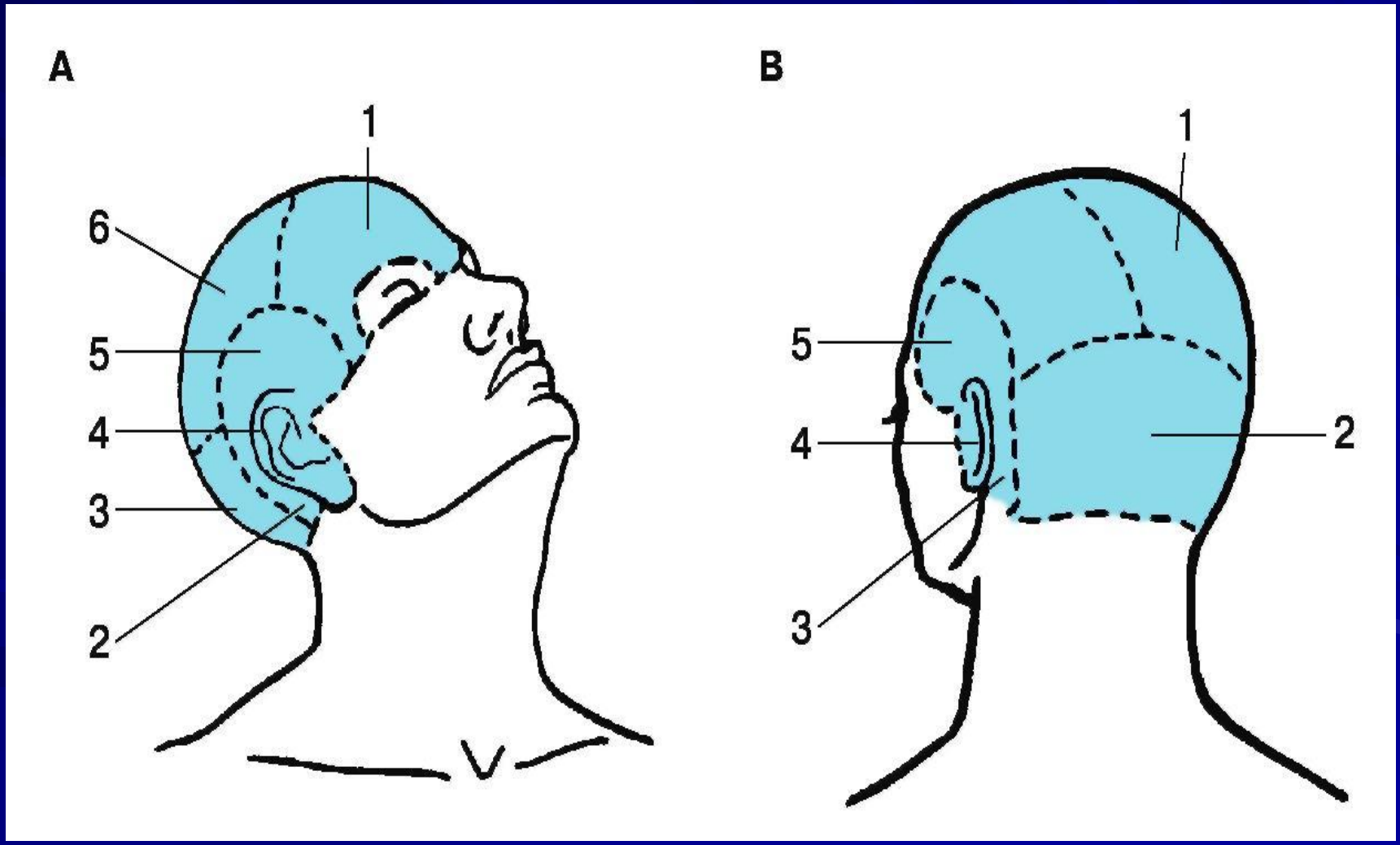
- glabella
- superior edge of the orbit
- upper edge of zygomatic arc



Regions of the cerebral part *of the head*

1. Frontal-parietal-occipital (*regio fronto-parieto-occipitalis);*
2. Temporal region (*regio temporalis*)
3. Mastoid region (*regio mastoidea)*

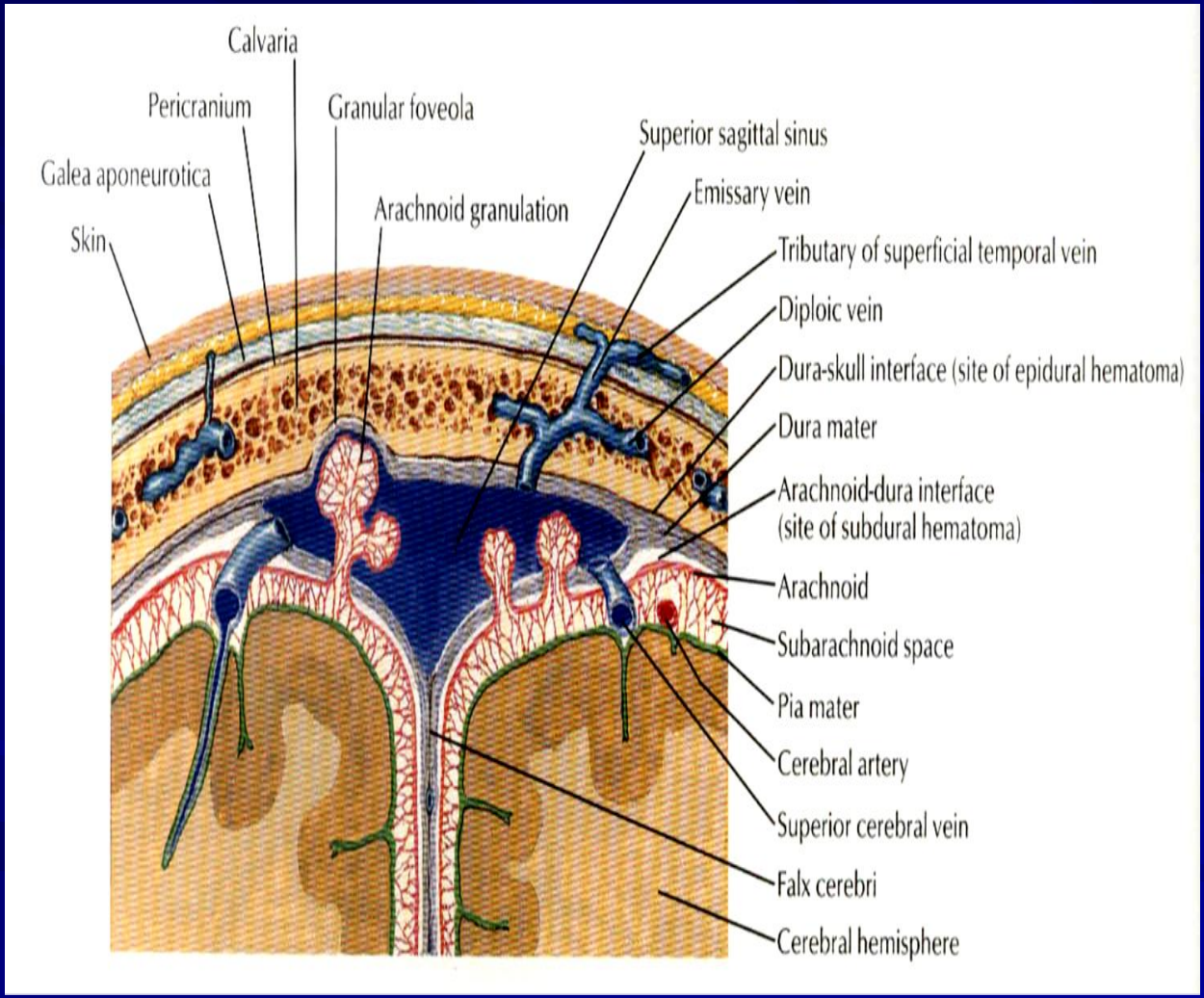
Regions of the cerebral part *of the head*



Frontal-parietal-occipital region

- *Frontal-parietal-occipital region* is limited from the front side by superior edge of the orbit and glabella, posteriorly - by the upper occipital line (*linea nuchae superior*), from sides - by the upper temporal line (*linea temporalis superior).*

Layers of the frontal-parietal-occipital region



S - skin

C - connective tissue

A - aponeurosis

L - loose fatty tissue

P - pericranium

Temporal region

- *Temporal region* corresponds to the limits of the temporal muscle. It is limited from the front side by the frontal process of zygomatic bone; below - zygomatic arc, above and behind – upper temporal line (*linea temporalis superior*).

Layers of temporal region, frontal section :

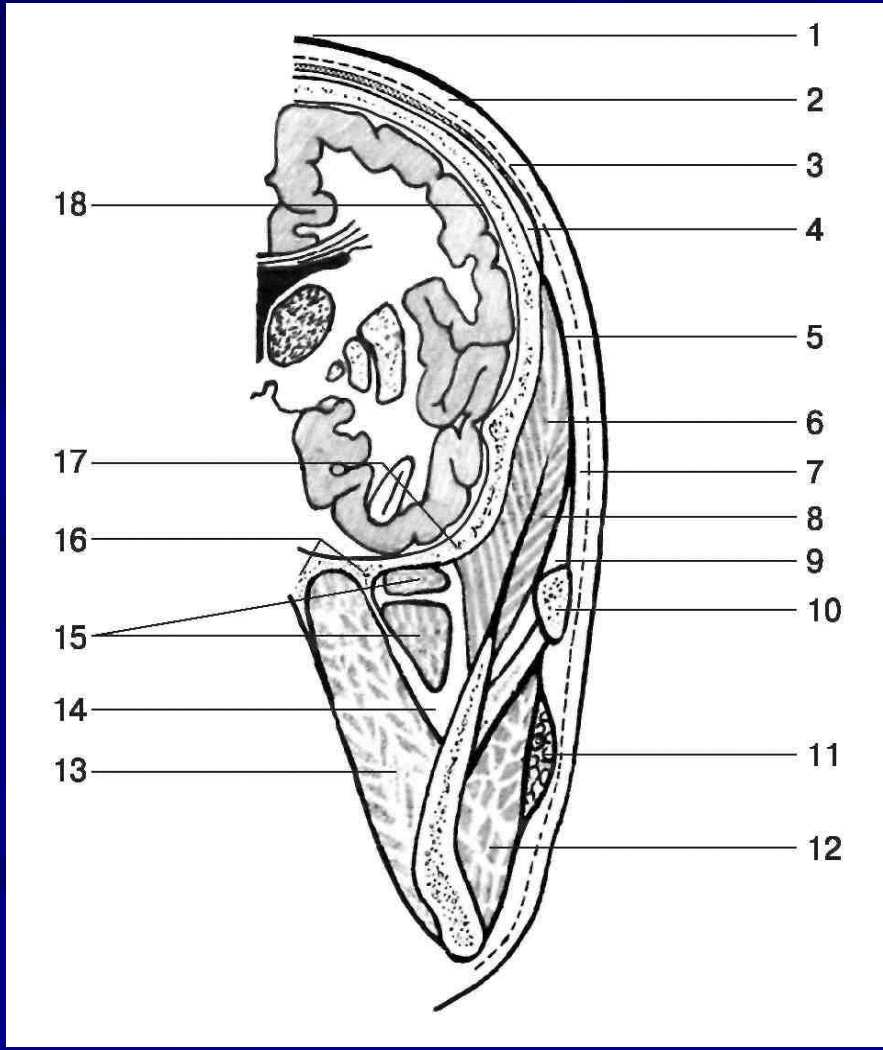
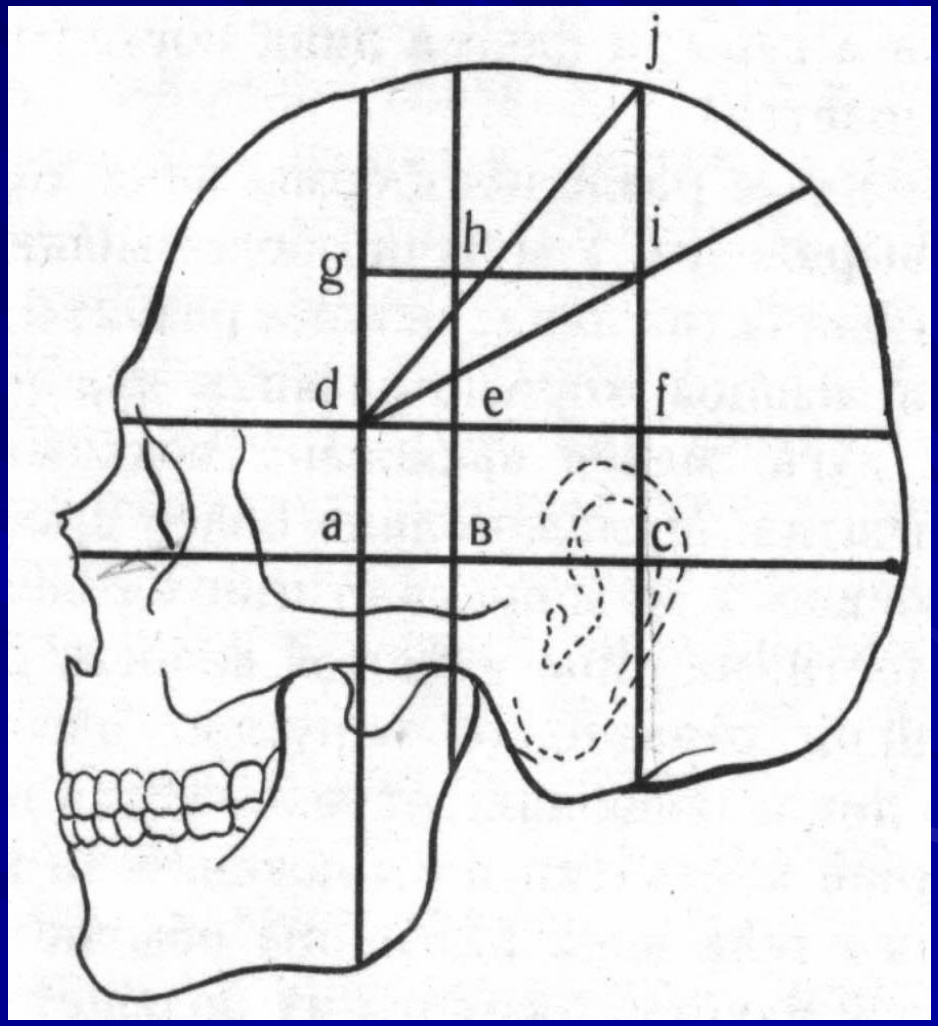


CHART OF CRANIO-CEREBRAL TOPOGRAPHY

a - projection of basic trunk of a.meningea media

d - projection of front branch of a.meningea media

f - projection of back branch of a.meningea media



Mastoid region

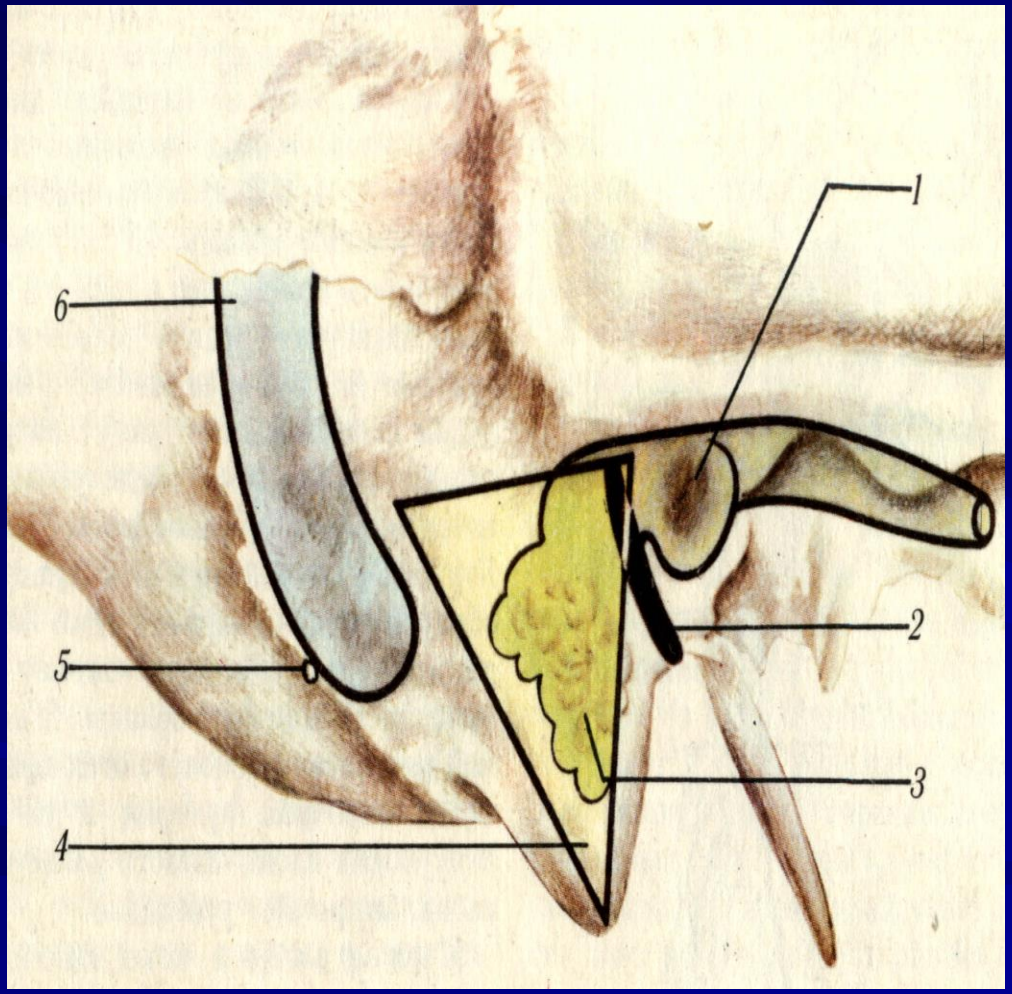
Mastoid region is limited by mastoid process of the temporal bone.

Types of mastoid process*:*

- *pneumatic* (many cells occupies all process)
- *sclerotic* (cells are not present or they are poorly developed)

Among these cells a large one is distinguished, its name is mastoid cavity (*antrum mastoideum*).

Mastoid process



1- external acoustic duct

2- facial nerve

3-cellulae mastoideae

4-crista mastoidea

5-foramen mastoideum

6- sigmoideus sinus

Trepanation of mastoid process (*antrotomy*)

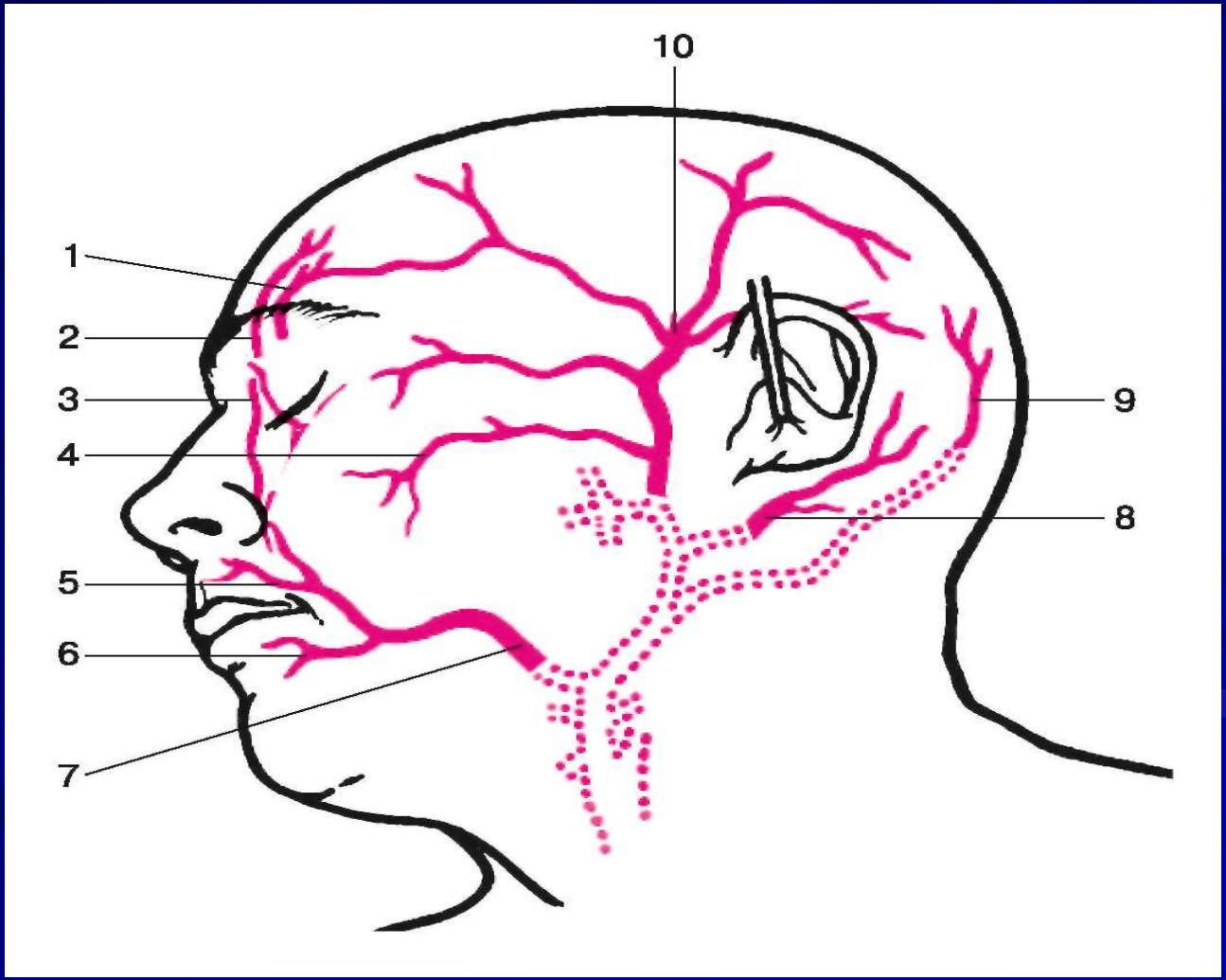
The indication of operation for the purulent inflammation of the middle ear complicated by purulent inflammatory cells of the mastoid process.

Shipot’s triangle (for antrotomy)

Borders of the triangle:

- upper - the horizontal line which is the continuation of the zygomatic arc;
- anterior - the line from the back edge of the external acoustic duct to the top of the mastoid process
- posterior - crista mastoidea

Arteries of the cerebral part of a head



WOUNDS OF THE CEREBRAL PART OF THE HEAD

- They are accompanied by large amount of bleeding
- They are widely opened (gape)
- Infection can penetrate to the cranial cavity by emissary veins
- They have quick reparation
- Wounds of the skull are divided into penetrated and nonpenetrated.

Clinical classification of fractures:

1. *Linear*
2. *Comminuted* – in fragments
3. *Depressed*.

Haematomas

Haematoma is the tumor after damage of vessels.

Types:

- *External*
- *Internal*

External haematomas

- *Subcutaneous haematoma* lies in the hypodermic space and visually it has the shape of a bump with clear margins.
- *Subaponeurotical haematoma* spreads extensively beneath the aponeurosis and is only limited by the attachment of the aponeurosis.
- *Subpericranial haematoma* has the shape of a bone, which is located above, because subpericranial space is bordered by bone sutures, between which it is situated.

Internal haematomas

Internal haematomas (*epidural, subdural, subarachnoid*) are named according to their spaces.

Craniotomy

A craniotomy (trepanation of the skull) is a type of brain surgery.

Reasons:

- removal of brain tumor
- removal of blood clot (*haematoma*),
- to control hemorrhage from damaged place,
- to prevent leaking of blood vessels (*cerebral aneurysm*),
- to repair arteriovenous malformations (*abnormal connections of blood vessels*),
- to drain abscess,
- to relieve pressure inside the skull,
- to perform a biopsy or to inspect the brain.

Operative approach to craniotomy

- For the craniotomy incision is semicircular in shape
- Skin-aponeurotical flap must include large artery, vein and nerve.

Operative methods of craniotomy

There are 2 main methods of craniotomy:

- osteoplastic

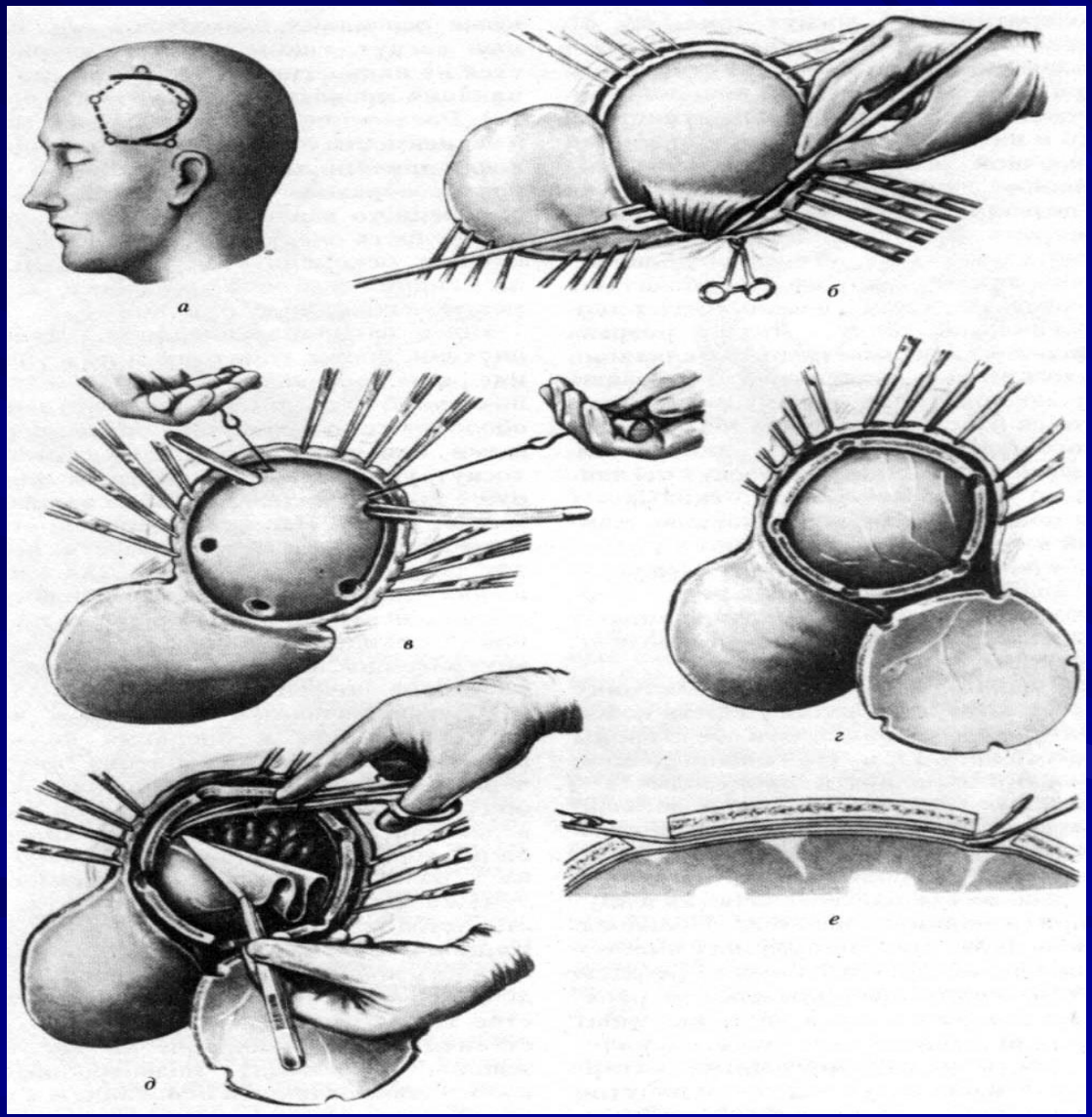
- decompressive

Osteoplastic craniotomy

Osteoplastic (*bone-plastic*) trepanation (two flap method on Olyverkron operation**)** consists of three main stages:

1. The cutting out of the skin-aponeurotic to form a flap.
2. The second stage is the cutting out of the bone to form a flap.
3. The third stage: wound closure

Osteoplastic craniotomy



Decompressive craniotomy (*resection trepanation):*

Indications:

- increase of intracranial pressure when there is a considerably large tumor,

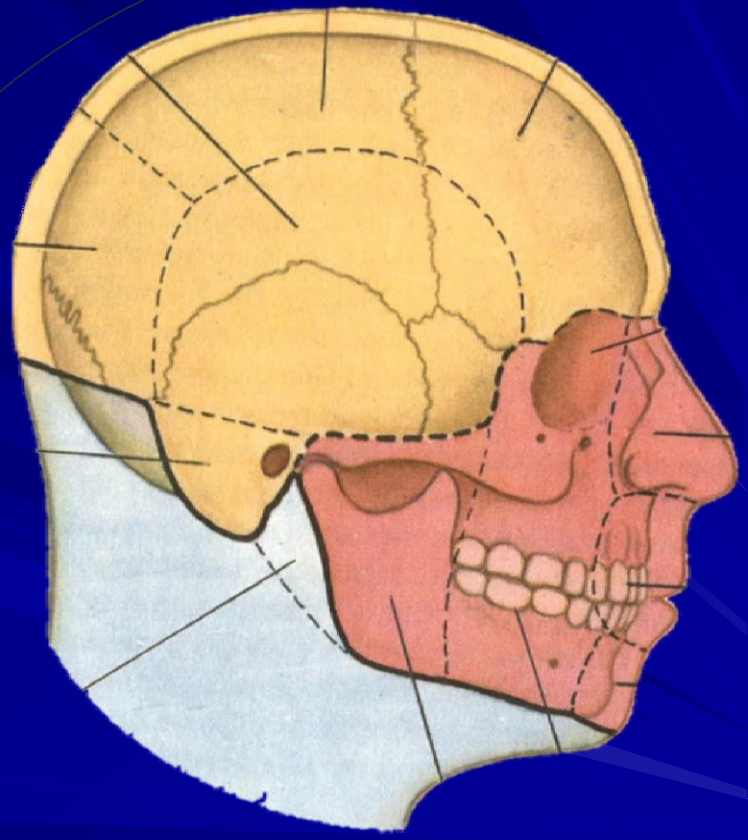
- hydropsy and other diseases of brain in cases where their is impossible to eliminate the basic pathological agent,

- increasing oedema,

- swelling of brain.

Borders of the Facial part of the Head

- **ledge of the chin (*protuberantio mentalis*);**
- **foundation of the jaw (*basis mandibulae*) and its branch (*ramus mandibulae*);**
- **upper edge of zygomatic arc (or trago-orbital line);**
- **superior edge of the orbit;**
- **glabella.**



Facial part of the head: Regions

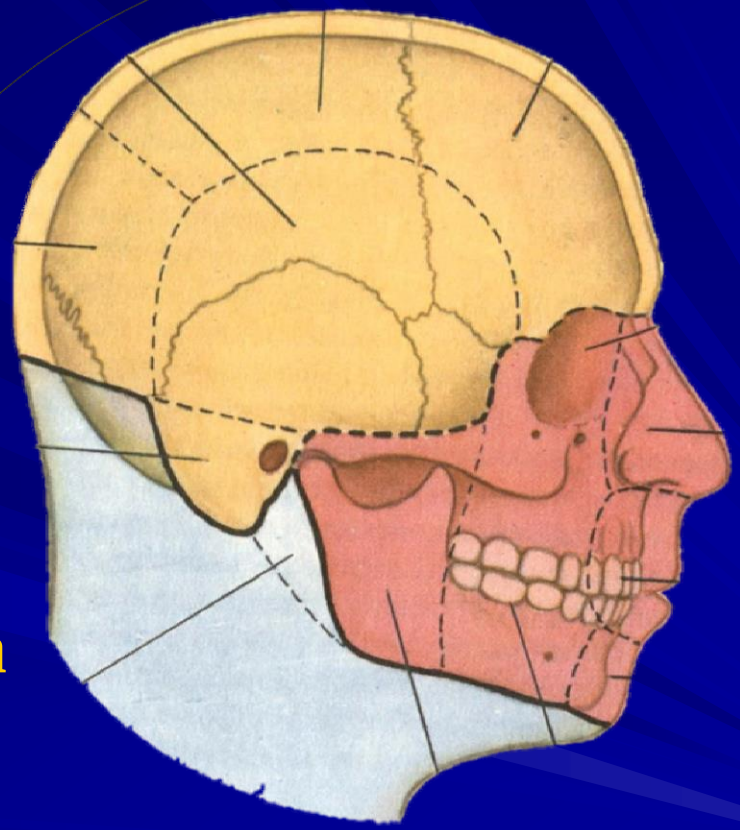
1. **Lateral part** of the face consists of four regions:
- cheek (*regio buccalis*),
- parotidomasseteric (*regio parotideomasseterica*)
- infraorbital region (*regio infraorbitalis*)
- zygomatic region (*regio zygomatica*)

2. **Anterior part** of the face consists of following regions:
- orbital (*regio orbitalis)*,
- nasal (*regio nasalis)*,
- oral (*regio oralis)*,
- mental (*regio mentalis).*

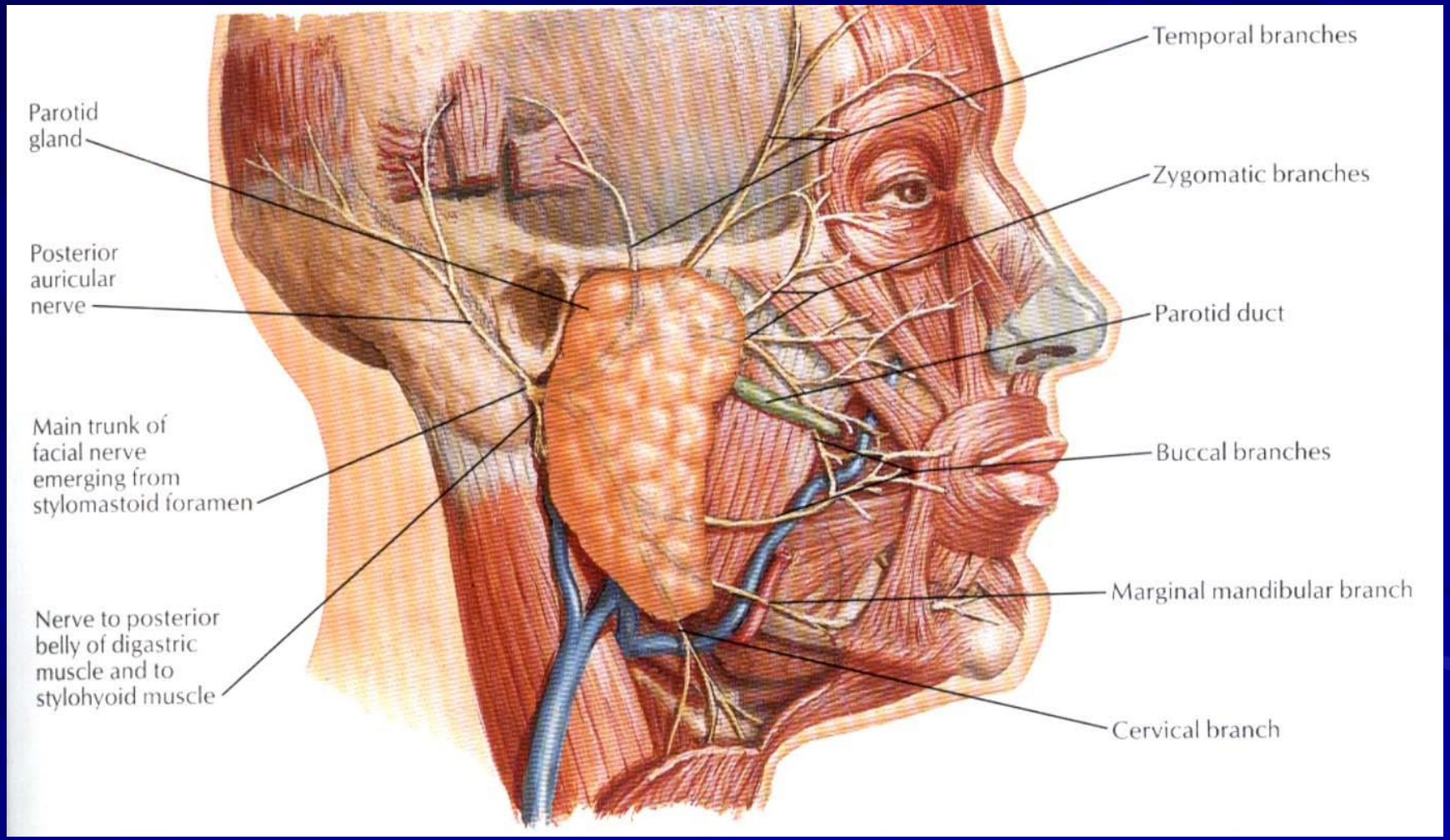
3. **Deep region** of the face (*regio facialis profunda*)

Borders of Lateral Region of the Face

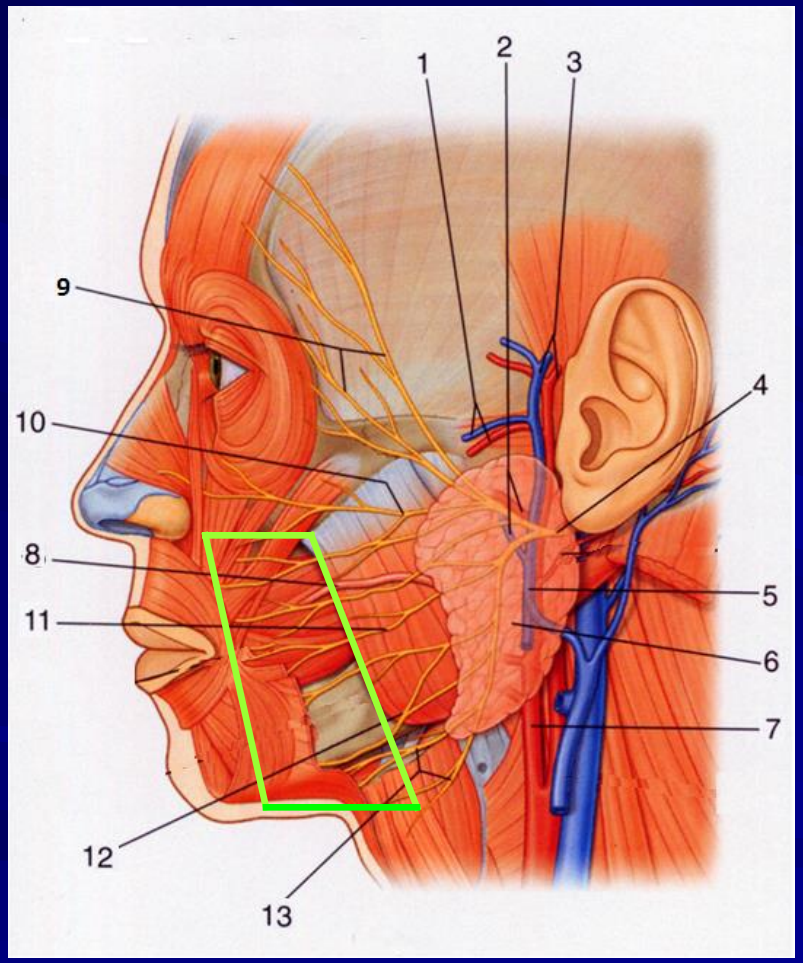
- Inferior margin of orbita
- Trago-orbital line
- Temporo-mandibular joint
- Posterior surface of ramus mandibulae
- Angle of Mandibula
- Inferior margin of Mandibula
- Mental process
- Nasoorbital, nasooral and oromental folds



Lateral part of the face



Buccal region: Borders



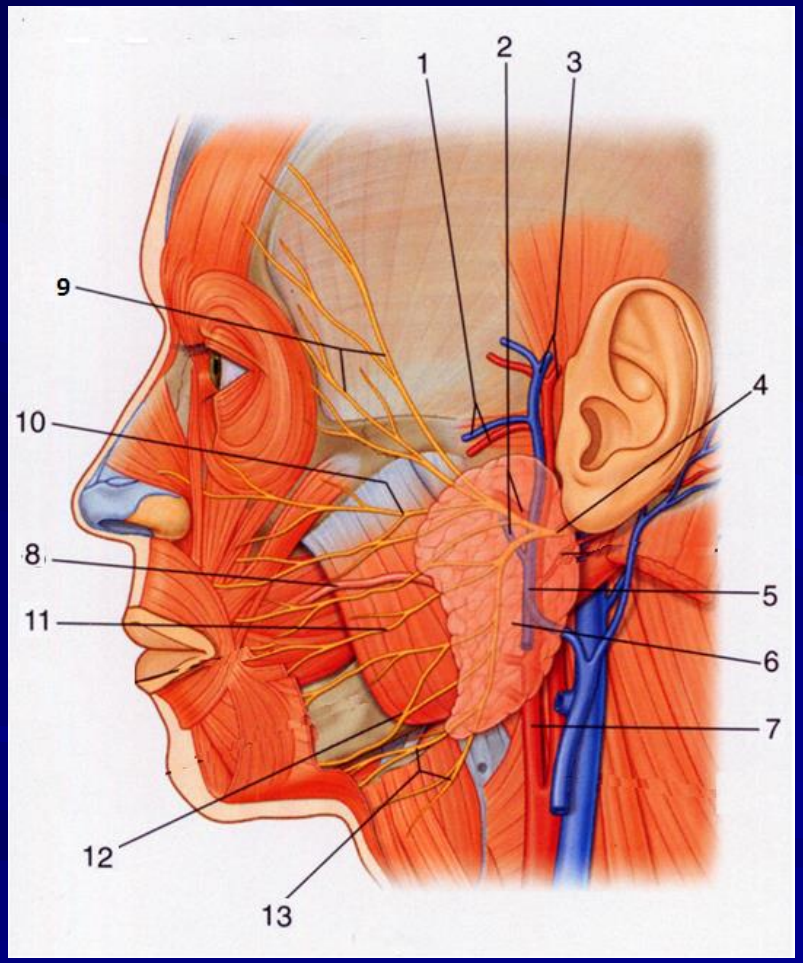
Superior — horisontal line which pass through inferior point of the nose

Inferior — inferior margin of mandibula

Anterior — m. orbicularis oris

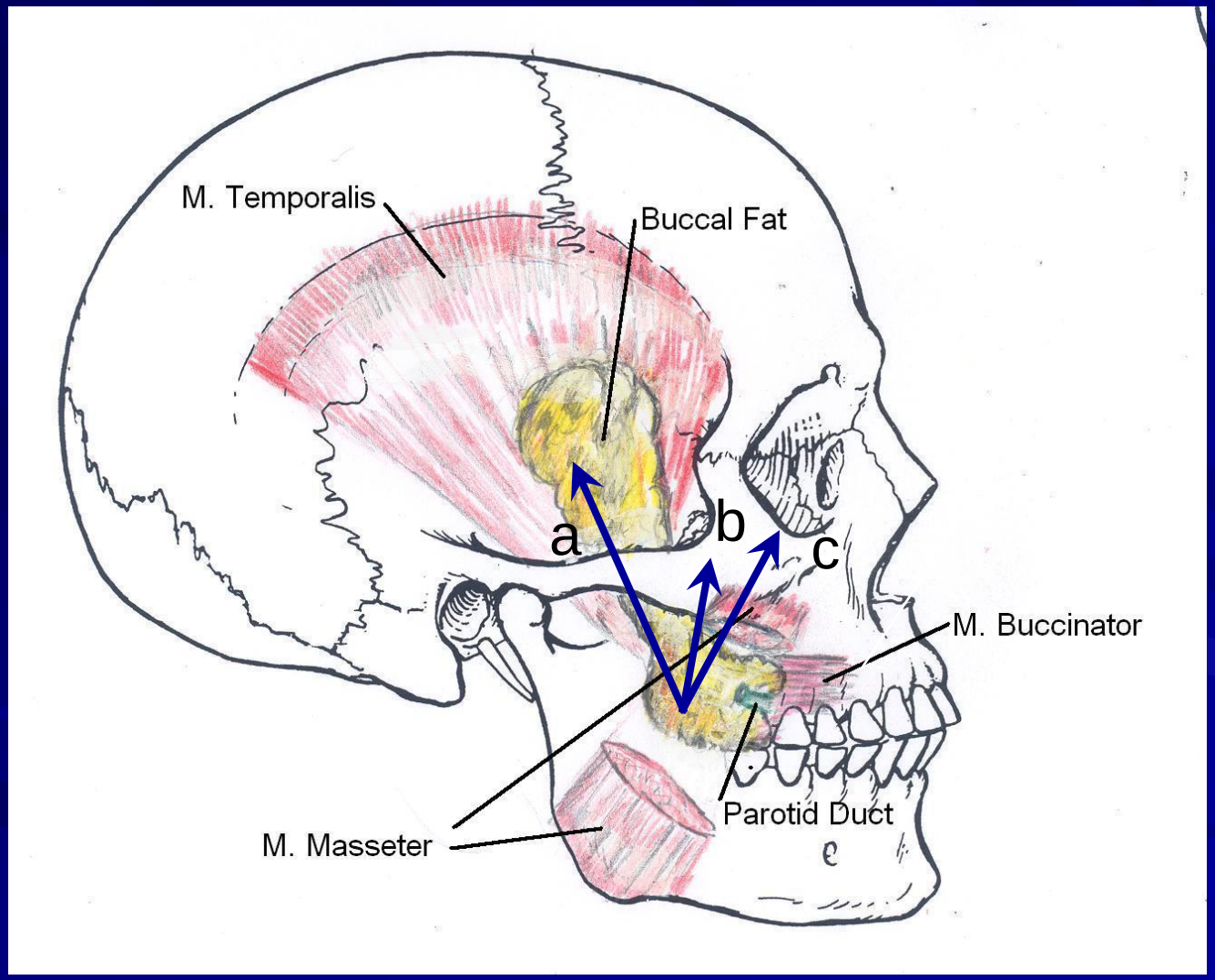
Posterior — anterior margin of m. masseter.

Buccal region: Layers



1. **Skin**
2. **Subcutaneous tissue**
3. **Mimic muscles**
4. **The fatty body of cheek** (*Bichat's fat pad*)
5. **A.&v. Facialis**
6. **Fascia buccopharingea**
7. **M.buccalis**
8. Submucosa of vestibulum oris
9. Mucosa of vestibulum oris

Processes of the fatty body of cheek



a – Temporal

b – Pterigo-palatine

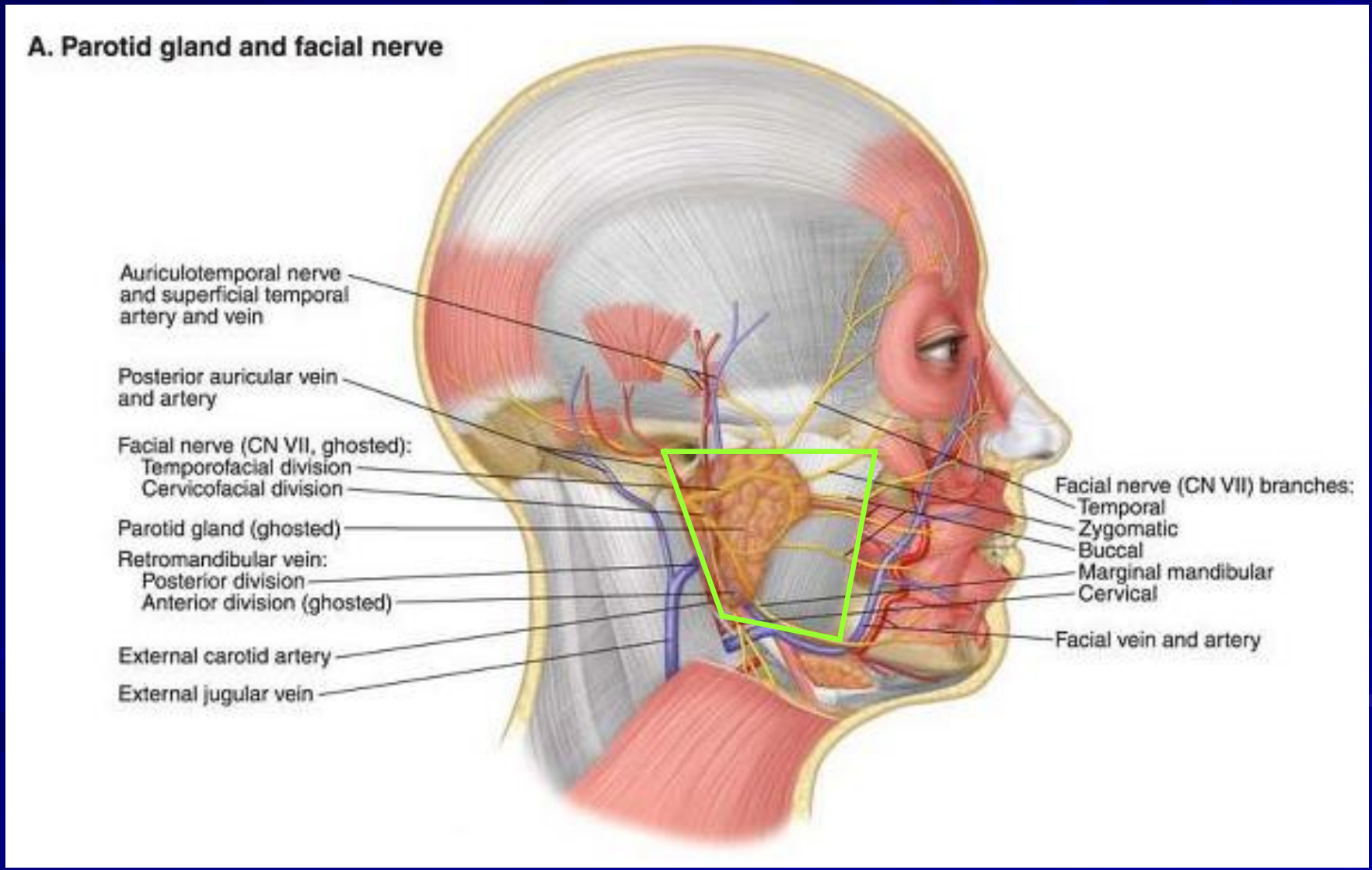
c – Orbital

Regio parotidomasseterica

Borders:

- Inferior margin of the zygomatic arc
- Anterior margin of the masseteric muscle
- Inferior margin of the mandibula
- Anterior margin of the m.sternocleidomastoideus and mastoid process
- Temporo-mandibular joint

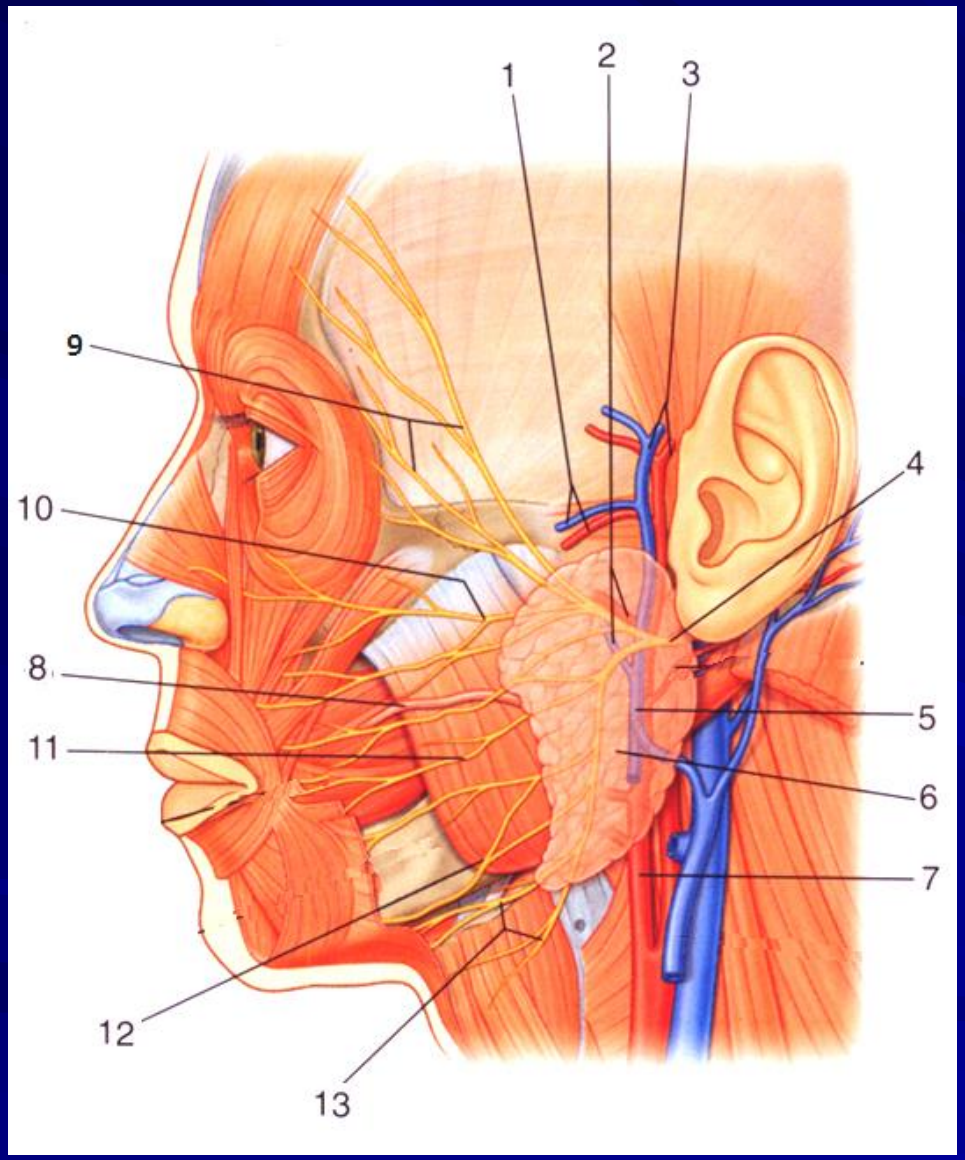
Regio parotidomasseterica



Regio parotidomasseterica: Layers

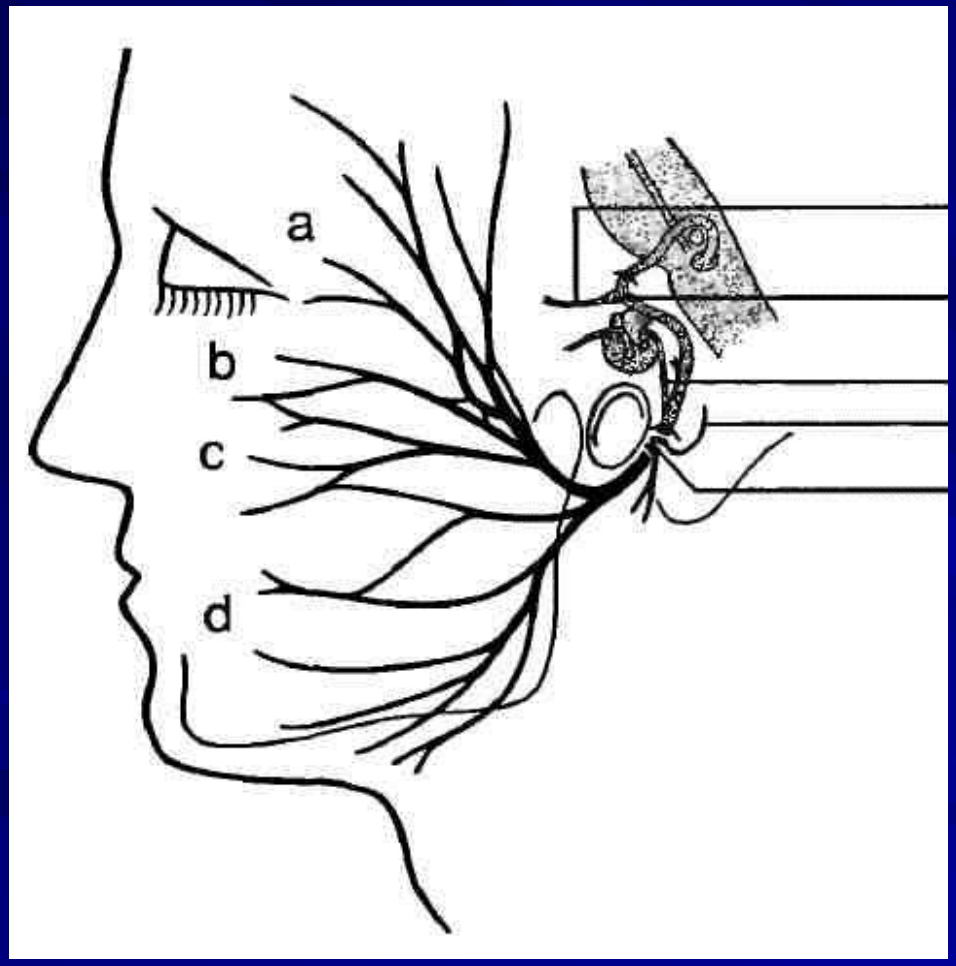
- Skin
- Subcutaneous cellulose
- Superficial fascia
- Capsula parotidea (external sheet)
- Glandula parotidea
- Capsula parotidea (internal sheet)
- M.masseter
- Periosteum

Glandula parotidea



1 – a.&v. transversa facii
2 – a.&v. facialis
3 – a.&v. temporalis superficialis
4 – n. facialis
5 – v.retromandibularis
6 – glandula parotidea
7 – a. carotis externa
8 – ductus of the parotid gland
9 – r.temporalis n. faciales
10 – r.zygomaticus n. faciales
11 – r.buccalis n. faciales
12 – r.marginalis mandibulae n.faciales
13 – r. cervicalis n. faciales

Facial nerve, the main branches

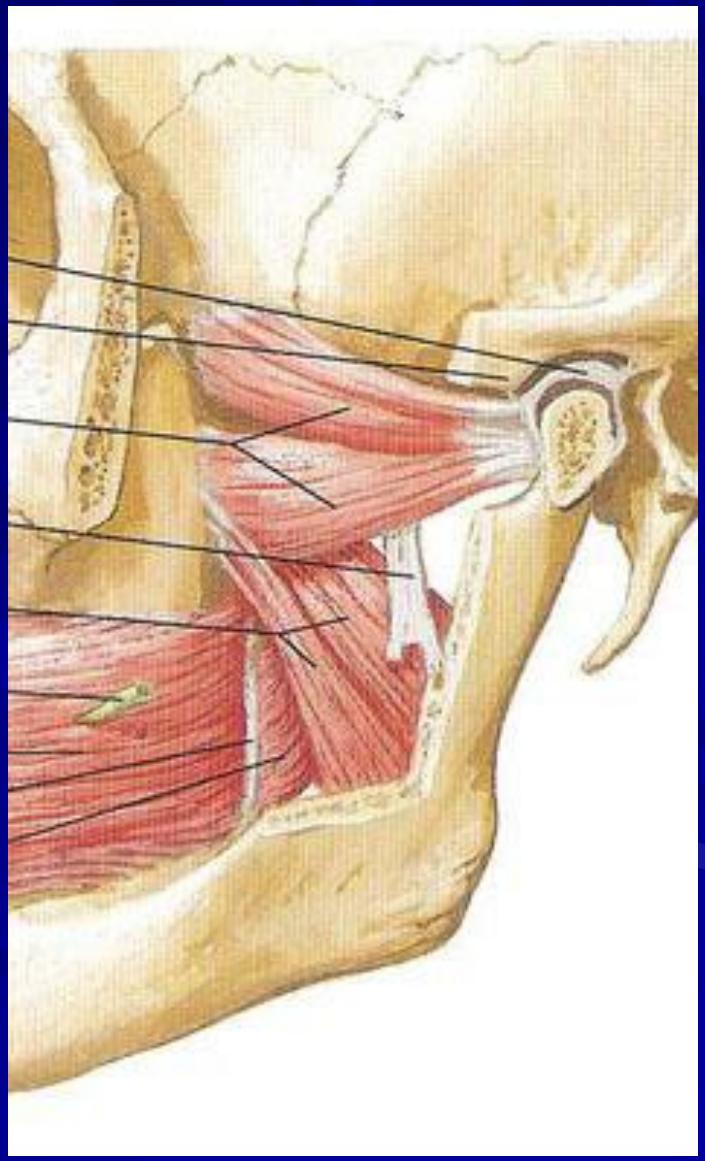


a - r.temporalis,
b - r.zygomaticus,
c - r.buccalis,
d - r.marginalis mandibulae,
e - r.colli.

Deep region of the Face

Adipose spaces:

- *temporopterygoid,*
- *interpterygoid,*
- *pterygopalatinal.*



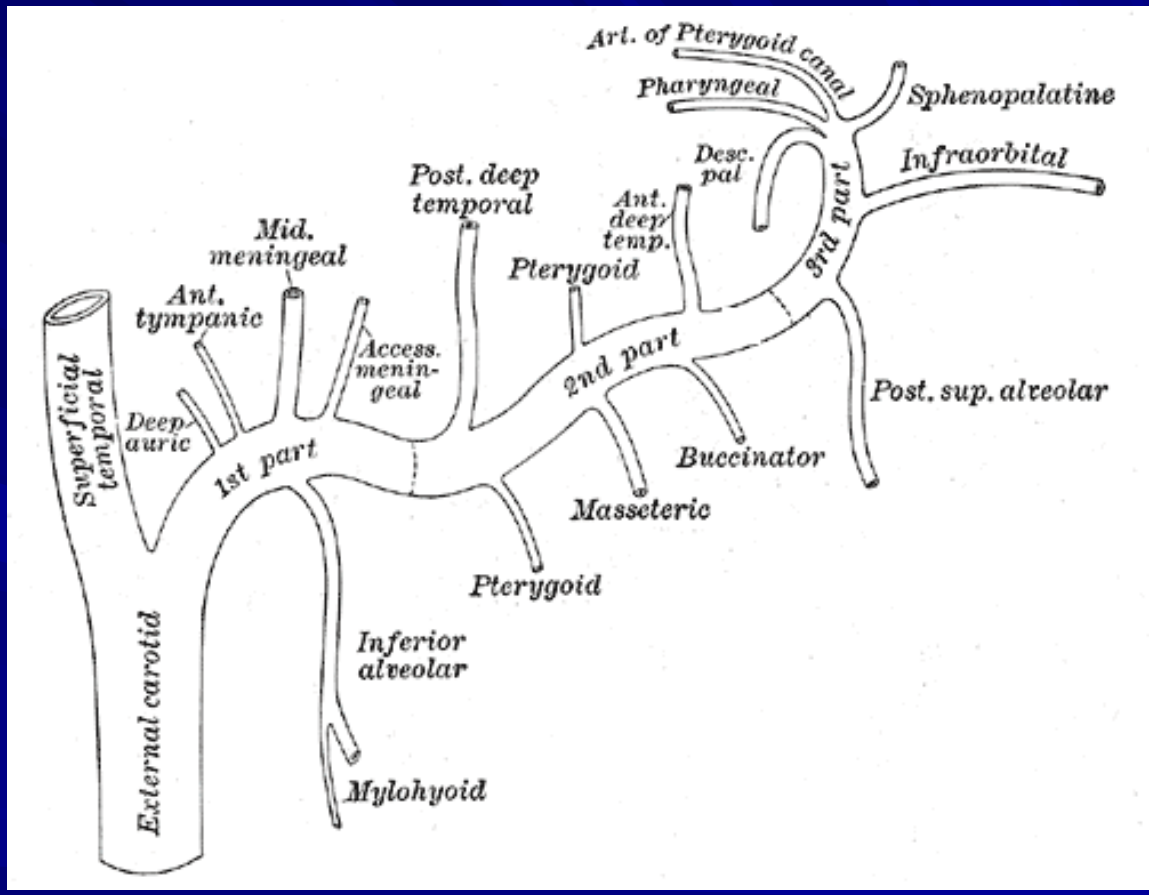
Deep region of the Face

Parts of the maxillary artery

1. Mandibular part: - a. auricularia profunda
   - a. tympanica anterior
   - a. alveolaris inferior
   - a. meningea media

2. Pterigoid part: - a. masseterica
   - a. pterigoidea lateralis
   - a. pterigoidea medialis
   - a. temporalis profunda
   - a. temporalis media
   - a. buccalis
   - a. alveolaris superior posterior

3. Pterigopalatinal part: - a. infraorbitalis
   - a. palatina descendens
   - a. sphenopalatina

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Thank you for attention!
Have a nice day!