MINISTRY OF HEALTH OF UKRAINE
POLTAVA STATE MEDICAL UNIVERSITY
CHAIR OF SURGICAL STOMATOLOGY AND MAXILLO-FACIAL SURGERY

Cicatrical deformations of tissues of maxillo-facial area: classification, etiology, pathogeny, diagnostics, treatment, prophylaxis. Modern principles of transplantation of tissues. Bases of cellular technologies in aesthetic surgery of face. Principles of reconstructive microsurgery.

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Lecture plan

1. Cicatrical deformations of tissues of maxillo-facial area:
   - etiology
   - pathogeny
   - diagnostics
   - treatment
   - Prophylaxis
2. Modern principles of transplantation of tissues.
3. Bases of cellular technologies in aesthetic surgery of face.
4. Principles of reconstructive microsurgery.

Scars - is visible and palpable changes in the skin that remains after healing of the skin. Atypical wound healing may be accompanied by excessive scar formation.

According to the international nomenclature and secrete abnormal normotrofical (atrophic and hypotrophic) scarring.

- There are two types of pathologic scars:
- Keloid scars.
- Hypertrophic scars.

General factors are:

- Age of the patient, with age, the processes of wound healing and scar formation much more inert and old age in humans more slow. The wounds on the skin of the fetus heal differently than adults - quickly and without scarring;
- A hereditary factor, and in recent years received are of a genetic predisposition to the formation of keloid scars;
- Immune status of the patient, known to the state of the immune system depends on the wound healing process. Inflammation develops at the damage of the skin wound, aimed at disassociation of necrotic tissue and antimicrobial defenses;
- Hormonal imbalances; noted that the systemic administration of an estrogen antagonist inhibits wound healing in humans.

Local factors that affect the process of scarring:

- Localization of the wound, and the positioning of the scar in the anatomical and topographical areas, in accordance with Langer's lines and areas of sliding and fixation

- Blood filling the walls of the wound, the higher the level of blood circulation in the tissues that form the walls of the wound, the faster the process of healing. Local hemocirculation, hypoxia contributes to the pathological scarring;

- The nature and measure of damage, the most favorable healing is considered by first intention;

- Methods of wound closure, depending on how the matched and fixed wall seams and edges skin wounds, largely depend on the quality of the scar future;

- The presence of a wound infection, which is "dormant."

The definition of "keloid" is derived from the Greek word "chele", which means crab claw. So call irregularly shaped scars that extend beyond the wound. Unlike hypertrophic keloid scars do not fade with time. Keloids usually wide with hilly, rough to the touch surface.

Clinical signs of Keloid and Hypertrophy scar

Keloid scar	Hypertrophy scar
Fibroblasts - 60-120 cells	Fibroblasts - 40-60 cells
Gigant fibroblasts are present	Gigant fibroblasts are present rarely or absent
Glycosaminoglycans are in large quantity	Glycosaminoglycans are in temperate quantity
Evident mucoid swelling of collagen fibres	Mucoid swelling of collagen fibres are less signifyied are absent

Clinical signs of Keloid and Hypertrophy scar

Keloid scar	Hypertrophy scar
Has possibilites for groth	Hasn’t possibilites for groth
Frequent recurrences after removal	No recurrences after removal
Painfull at palpation	Painless at palpation
Color is from blau to red	Color is always light
There are itching, burning	There are not itching, burning
Solid	Soft

Methods of conservative treatment of pathological scars

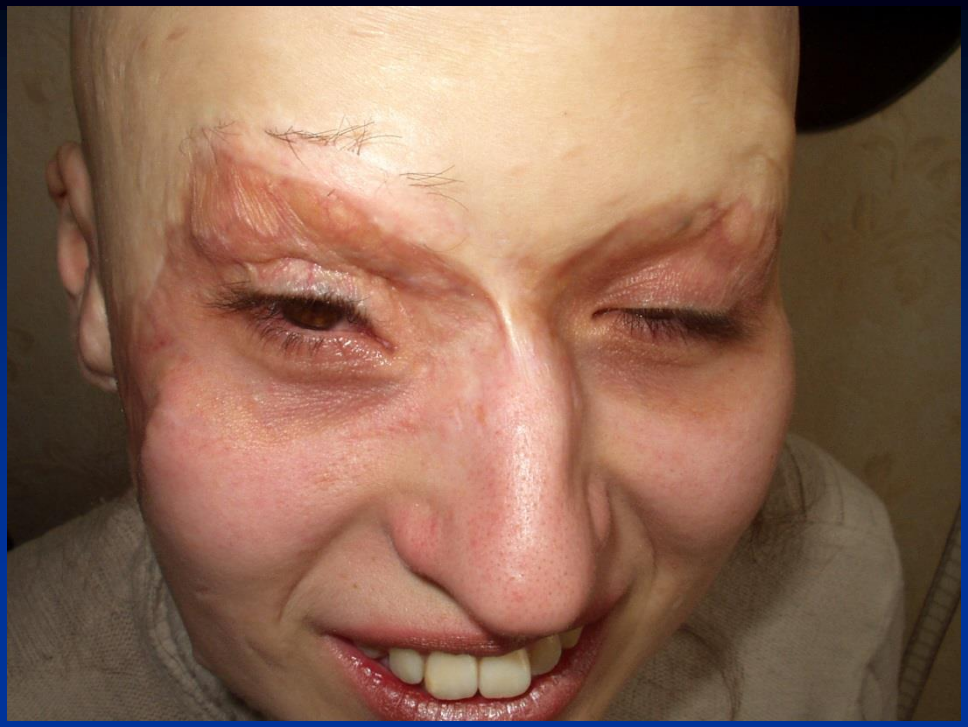
- Occlusion therapy - involves the use of silicone gels and bandages, non-silicone occlusive dressings, adhesive bandages with glucocorticoids and different anti-scarring gels, ointments, creams ("Contractubex", "Dermofibraze", "Dermatix", etc.). The mechanism of action of silicone dressings and Gaels is unclear, but it is known that they improve the shape, color and texture of the scar.
- Hormonetherapy. Injections of steroids into the thickness of the scar is considered first-line therapy for the treatment of pathological scarring of the preoperative stage. Corticosteroid injections are painful scar in the area, even in the standard recommended doses. Approximately 65% of patients develop side effects such as skin atrophy, depigmentation and telangiectasia.
- Radiation therapy (radiotherapy) for the treatment of hypertrophic scars and keloids is used as monotherapy or in combination with surgery.

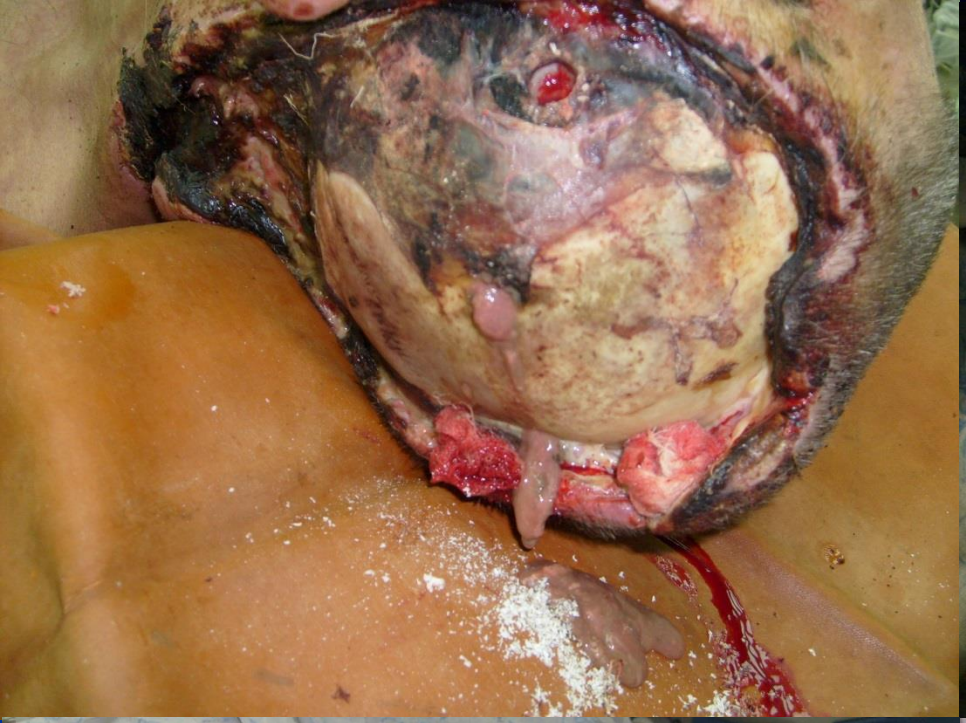
- Laser therapy is used for non-specific tissue destruction in order to reduce the reliability of pathological scarring, but it is to a large extent been discredited after the publication of the mixed results of a long study of the effectiveness of treatment of CO2 and argon laser.
- Cryotherapy. Isolated use of 2 or more sessions of cryotherapy reduces tissue keloid and hypertrophic scars. Restricting the use of cryotherapy associated with prolonged wound healing and hypopigmentation, which often develops in a cold effect.
- Compression therapy involves the use of compression clips, bandages, which are under pressure from elastic bandages and lycra, tight bandaging, slings. Recommended pressure - 24-30 mm Hg (higher than the pressure in the capillaries). Wear headbands that press for 6-12 months.

A group of authors have developed and successfully implemented in practical health scheme of conservative treatment of keloid and hypertrophic scarring of the preoperative stage. It is as follows: to the patient in the scar tissue is introduced with the expectation antihypoxant emoxipin 0.7 ml per 1 cm ^{2} of scar tissue. It is administered three times a week, the course of 15 injections. In addition, with the help of ultraphonophoresis introduced protivorubtsovy gel "Contractubex" twice a week. The course is not more than 12 sessions.

The basic principles of surgical treatment of pathological scars

Conducted only after a complex medical treatment.
Basic requirements:
Complete removal of keloid within healthy tissue.
Eliminating the tension of the wound edges.
The use of split and full-thikness skin autografts as an additional method of plastics.
Create optimal conditions for engraftment.
Careful asepsis.
Absolute tranquility in the area of surgery in the postoperative period .
Required course of conservative antikeloid therapy 7-10 days after operation.






Free transplantation of grafts with microvascular anastomoses overlay allows for the simultaneous transplantation of large areas of the skin subcutaneously - fatty tissue, fascia, if necessary - with a muscle, tendon, bone during a single operation. This method of recovery operations radically redefines the possibilities of plastic surgery and significantly shortens the rehabilitation of patients. The most important achievement of free tissue transplantation is the presence of a large number of available donor sites. This allows the surgeon to choose not only the shape of the flap, but also the type of fabric. Different donor sites are available to different types of tissues for complex and interconnected tissue reconstructions, such as vascularized nerve functioning muscle, tendon or bone, a large gland, intestine. Skin flaps of different sizes and volume can be taken in view of the similarity of color, the thickness of the skin, its type and the possibility of reinnervation, if you need the reinnervation of the flap. Free tissue transfer using microsurgical technique is a reliable method of reconstructive surgery

Selecting the donor area

- Appears more and more number of free described revaskular transplants. The surgeon has available a wide range, and may evaluate the advantages and disadvantages of one donor site as compared to another. The important parameters in choosing the flap are:
- - The length and diameter of the leg;
- - The type, thickness, texture of skin;
- - The presence of sensitive or motor nerve;
- - The inclusion of other tissues;
- - A way of closing the donor defect;
- - The experience of the surgeon in the formation of one or the other flap.

Stages of microsurgical operation

- Reconstructive plastic surgery with the use of microvascular transplants are technically complex, composed of four distinct phases:
- 1) Preparation of the recipient area.
- 2) Formation of the flap and transfer it to the site of the defect.
- 3) Application of vascular anastomoses.
- 4) Inserting a donor wound and the edges of the flap.

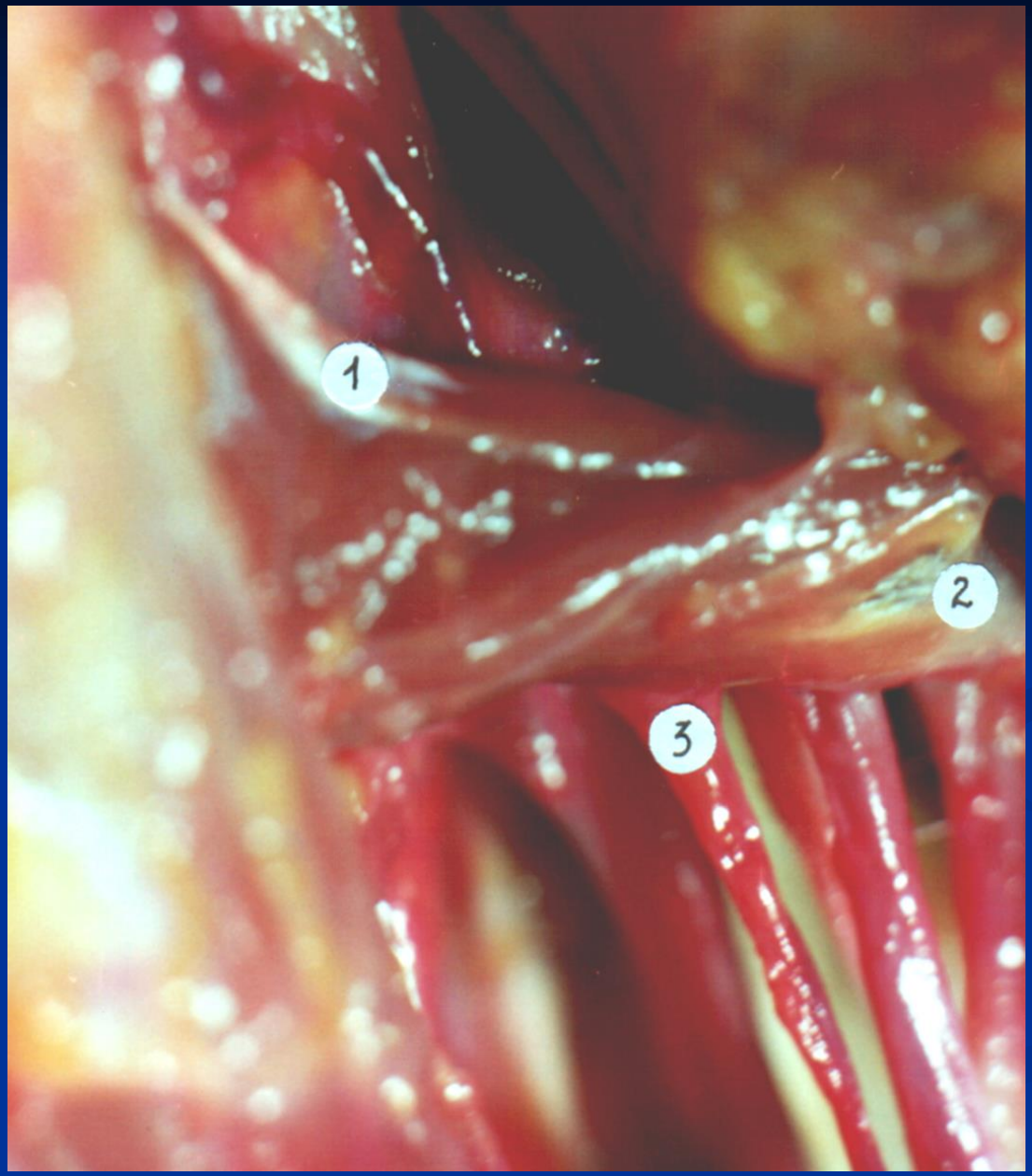
Possible complications

1. Risk of thrombosis most big for 20 minutes after the resumption of blood flow through the vessels, which are anastomosed.
This time it should wait, watching the throbbing of the arteries and blood filling sewn donor vein. To check the walk-through can end anastomosis of the vessel, which leads peretiskat forceps, tweezers carefully to others "milked" the blood of the vessel and its peretiskat below the anastomosis. If we now remove the forceps from the vessel, when the pass-through anastomosis can be seen rapid filling of the blood vessel.
2. Slow capillary reaction of tissue is transplanted flap demonstrates the inadequacy of blood flow, cyanosis of his evidence about the difficulty of venous outflow. If these symptoms for a short time does not disappear, it is necessary to resect trombing anastomosis and translate it again.
3. At the wrong anastomosis to prevent microvascular thrombosis can not be in any way, including the use of anticoagulants. If anastomotic thrombosis occurred, it indicates either gross technical error when applying microvascular sutures, or an obstacle or a rush of blood outflow due to twisting or bending vascular compression of the tissues of the flap.
4. Do not attempt to impose vascular sutures, especially on vessels greater than 5 mm, the surgeon who was trained by microsurgery.

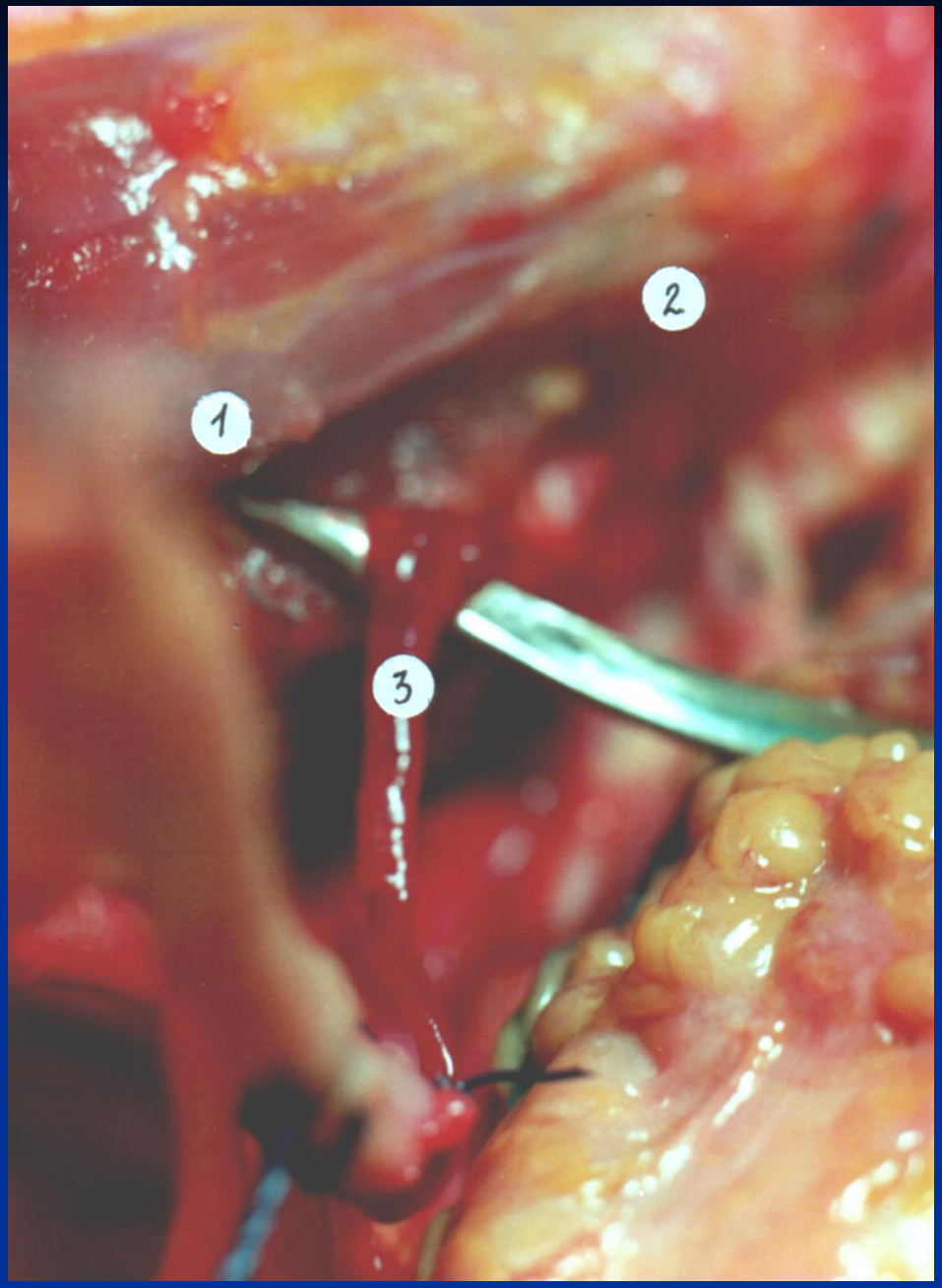
Errors in the application of microvascular seams:

- Wrong choice of suture material;
- Lack of access and inadequate mobilization of vessels;
- Overin dulgence of edges of the vessel with suture, which leads to a narrowing of the anastomosis zone;
- Rare seams, which result in leakage of the anastomosis;
- A strong tightening of nodes, which leads to the eruption of the vessel walls;
- The tension of blood vessels also leads to narrowing and eruption of seam line anastomosis.
- One of the most serious problems during microsurgical tissue transplantation is a spasm of small peripheral vessels. Strong strain leads to cardiac blood flow and can lead to death of the flap.

Bifurcation of arthery carotid communis

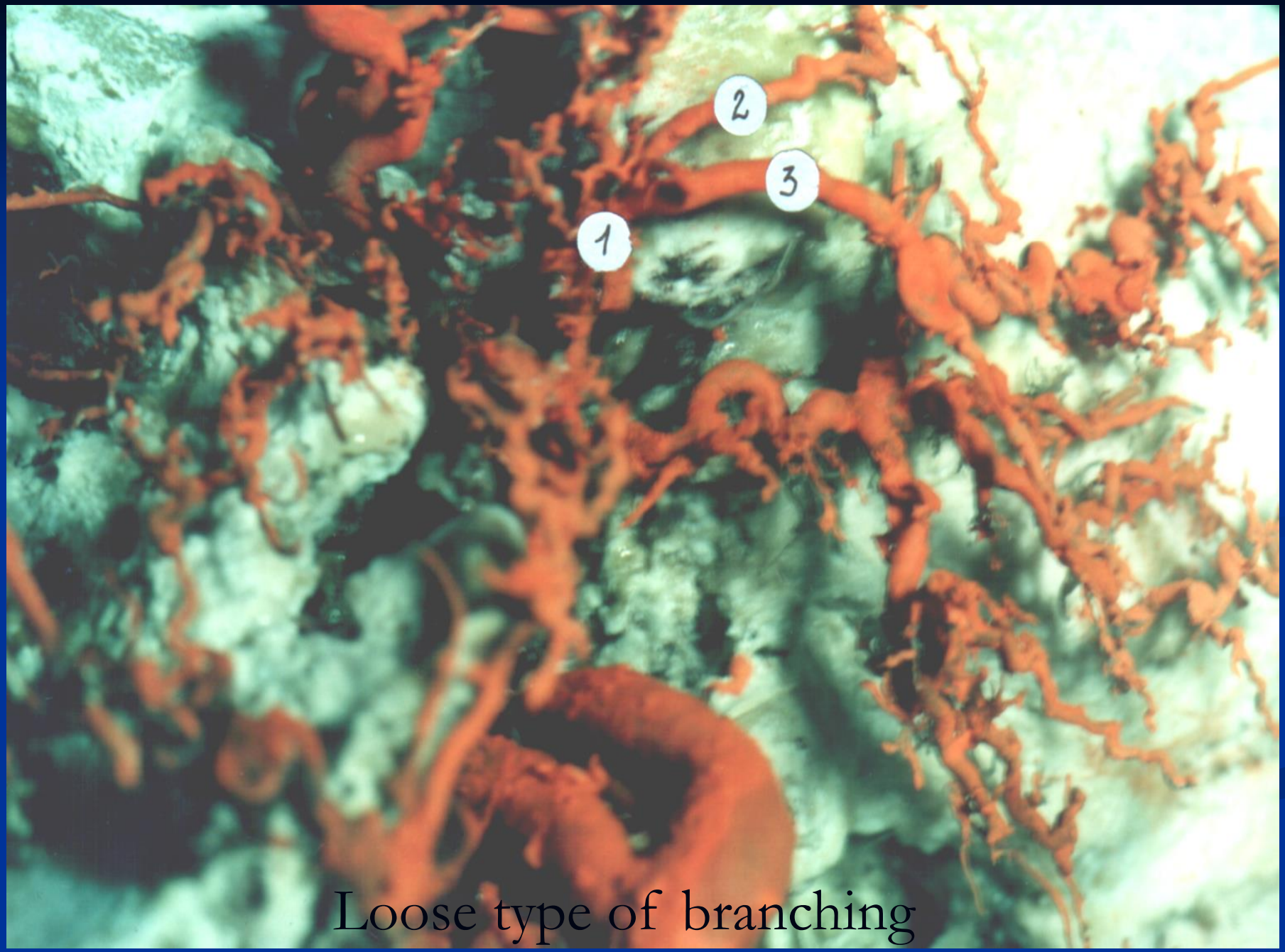


Arthery under muscule

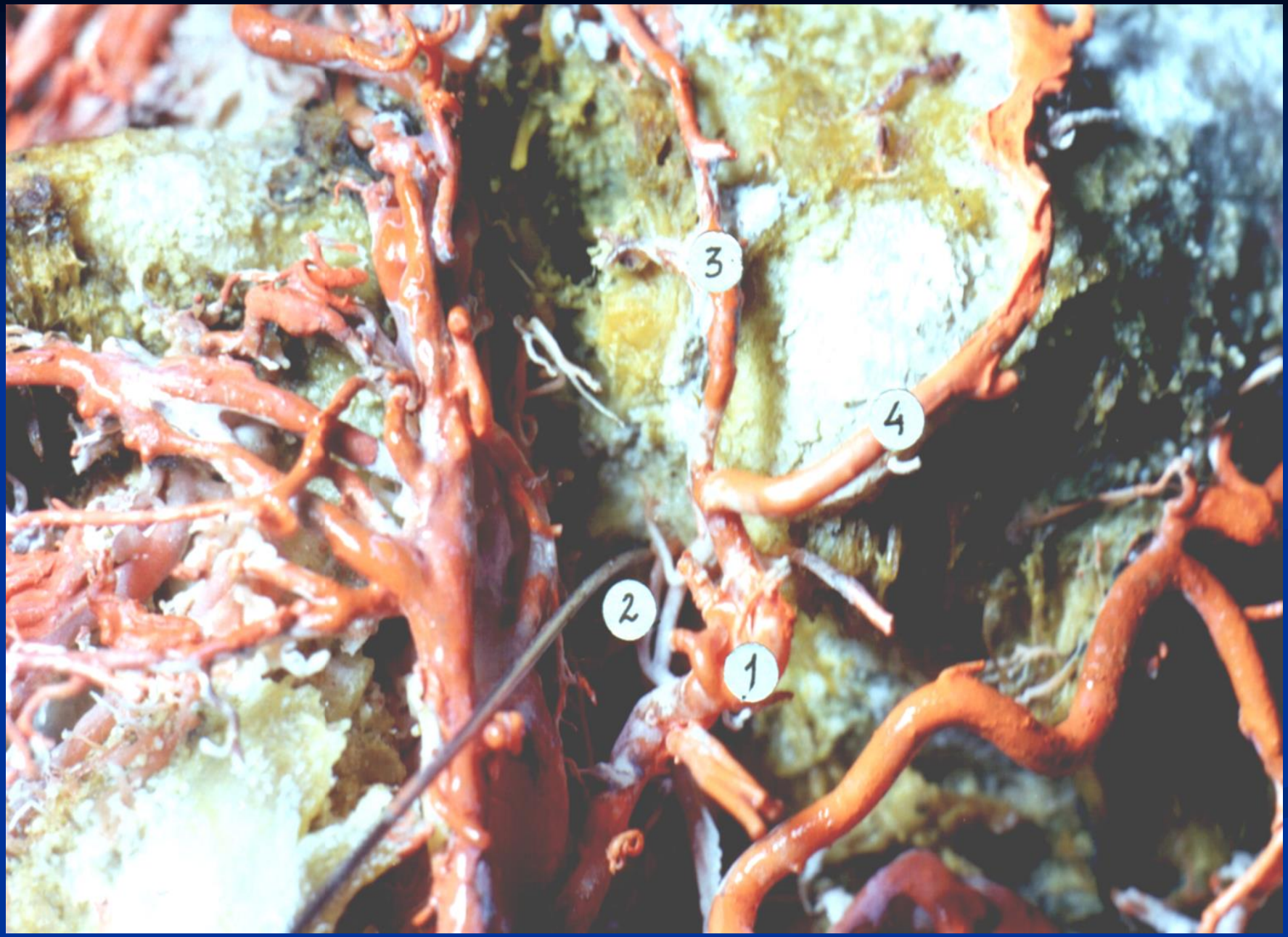


Arthery under muscule

Magistral type of branching



Loose type of branching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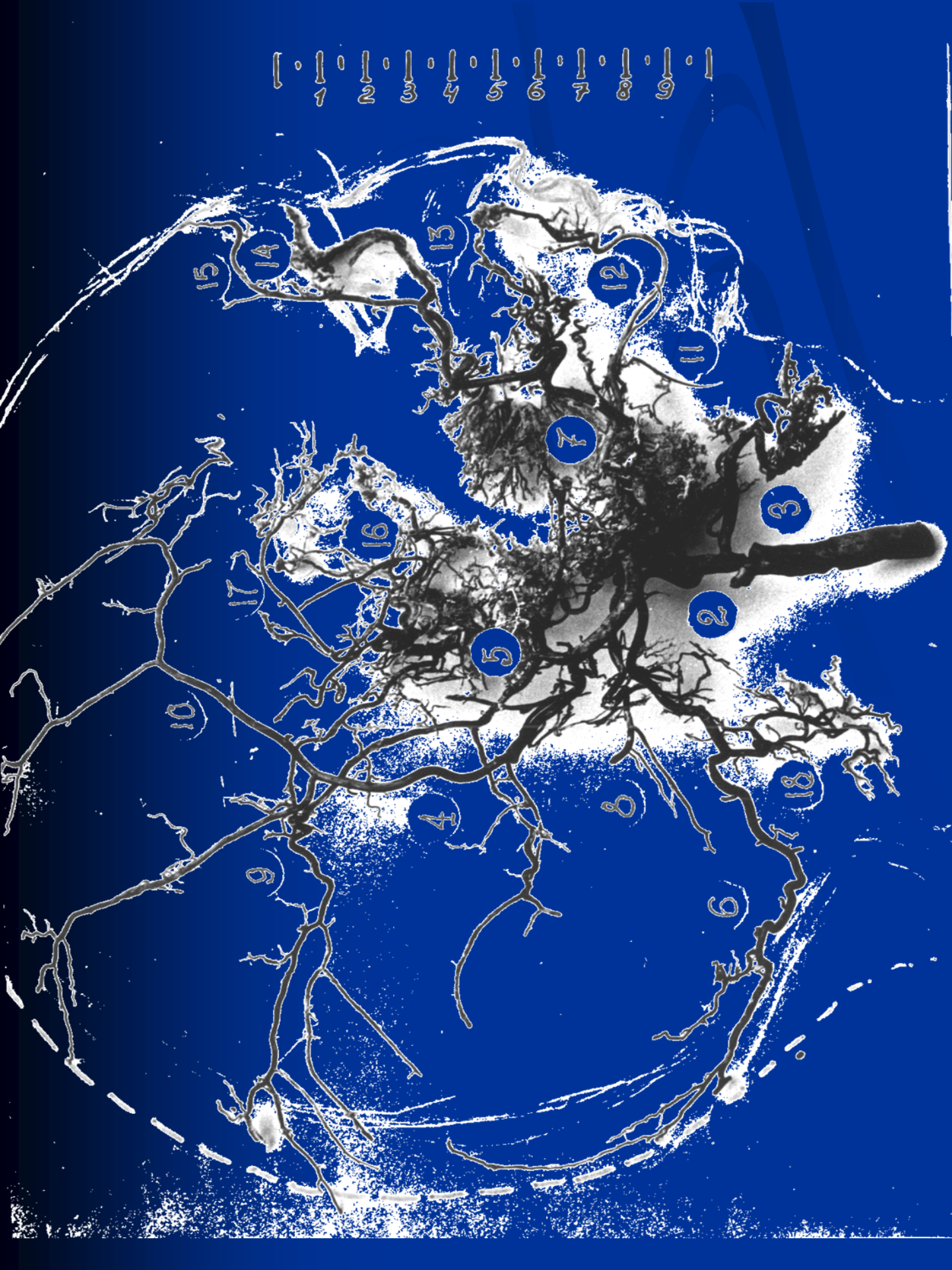
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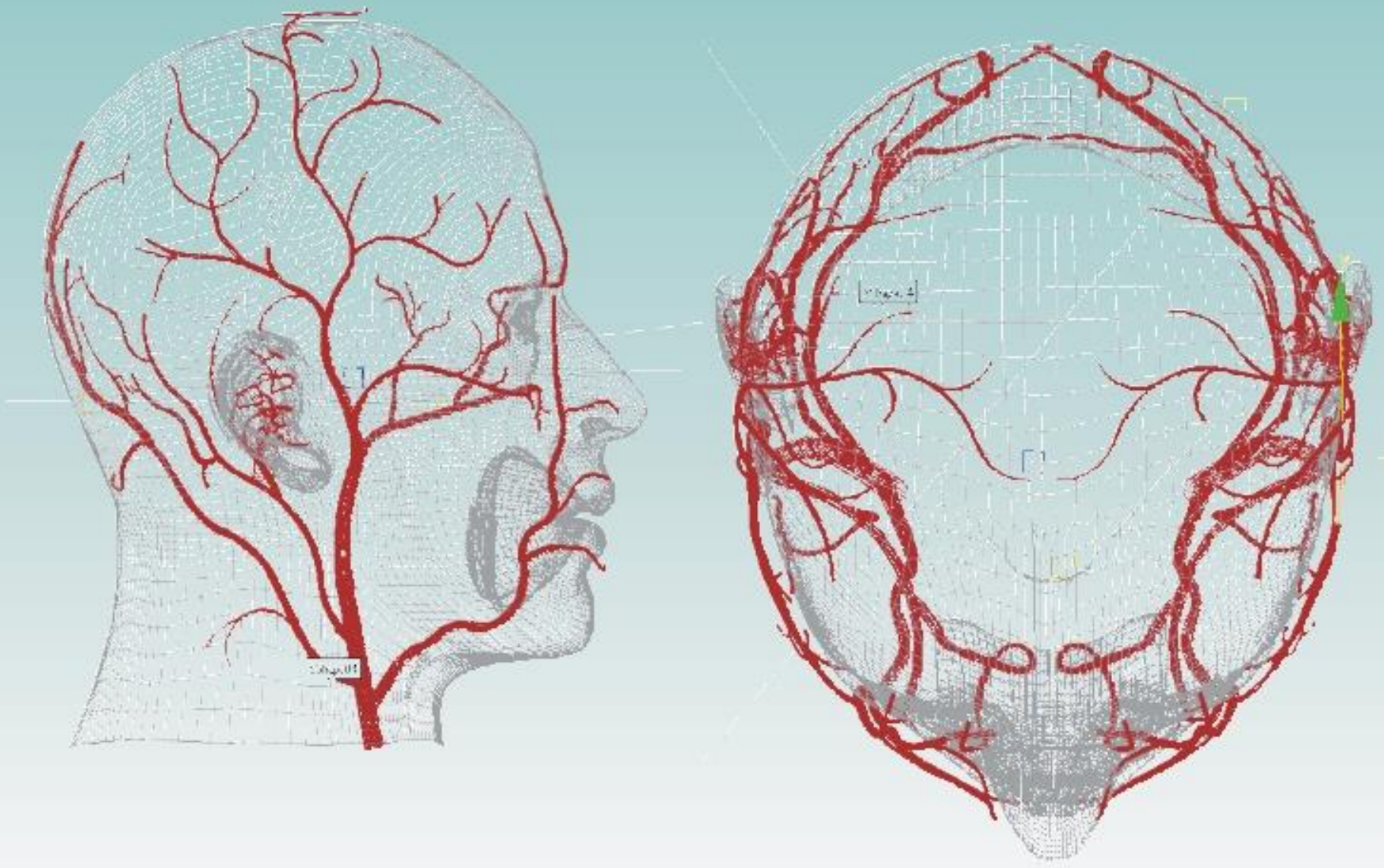
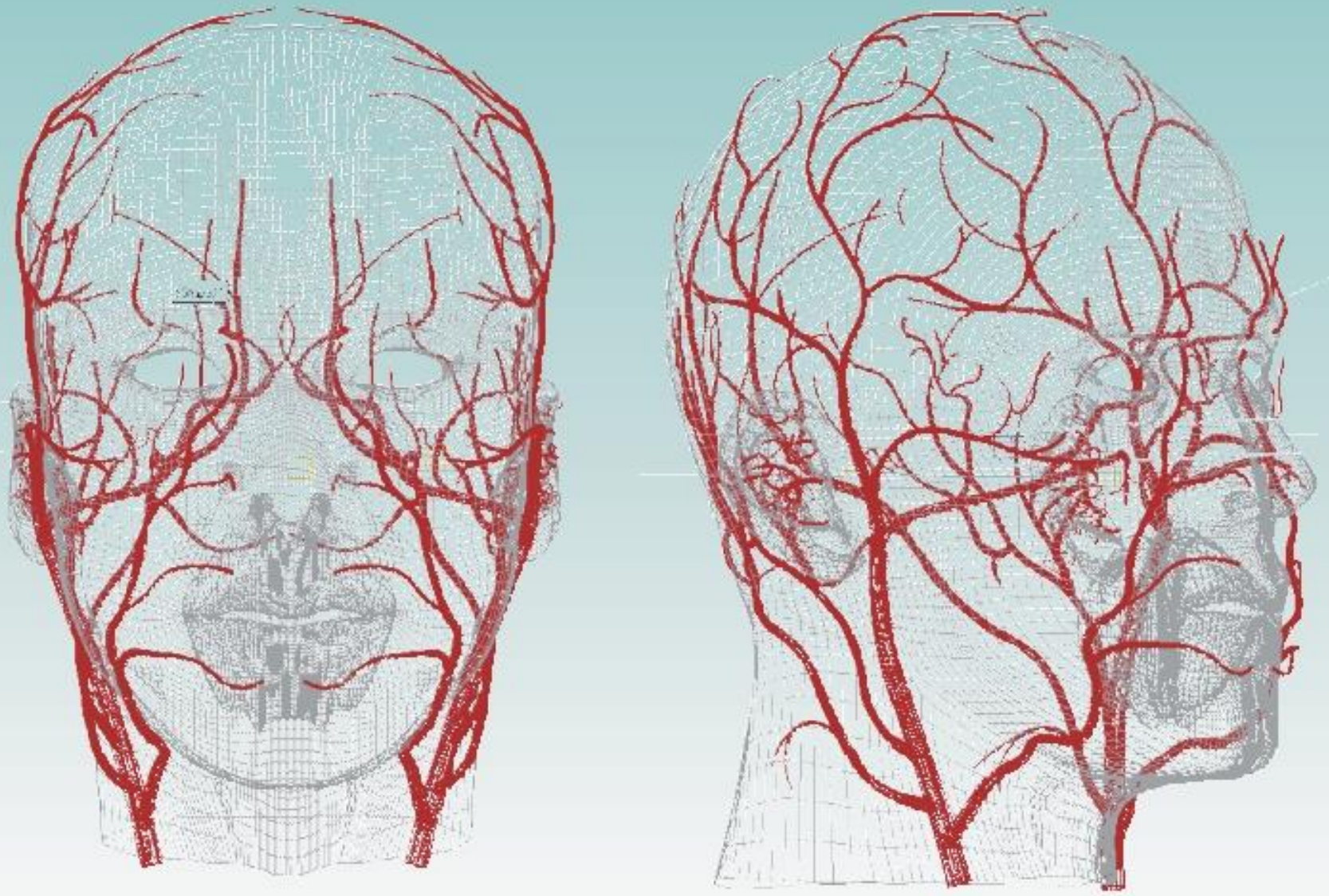


Computer modeling of branches of arthery carotid externa



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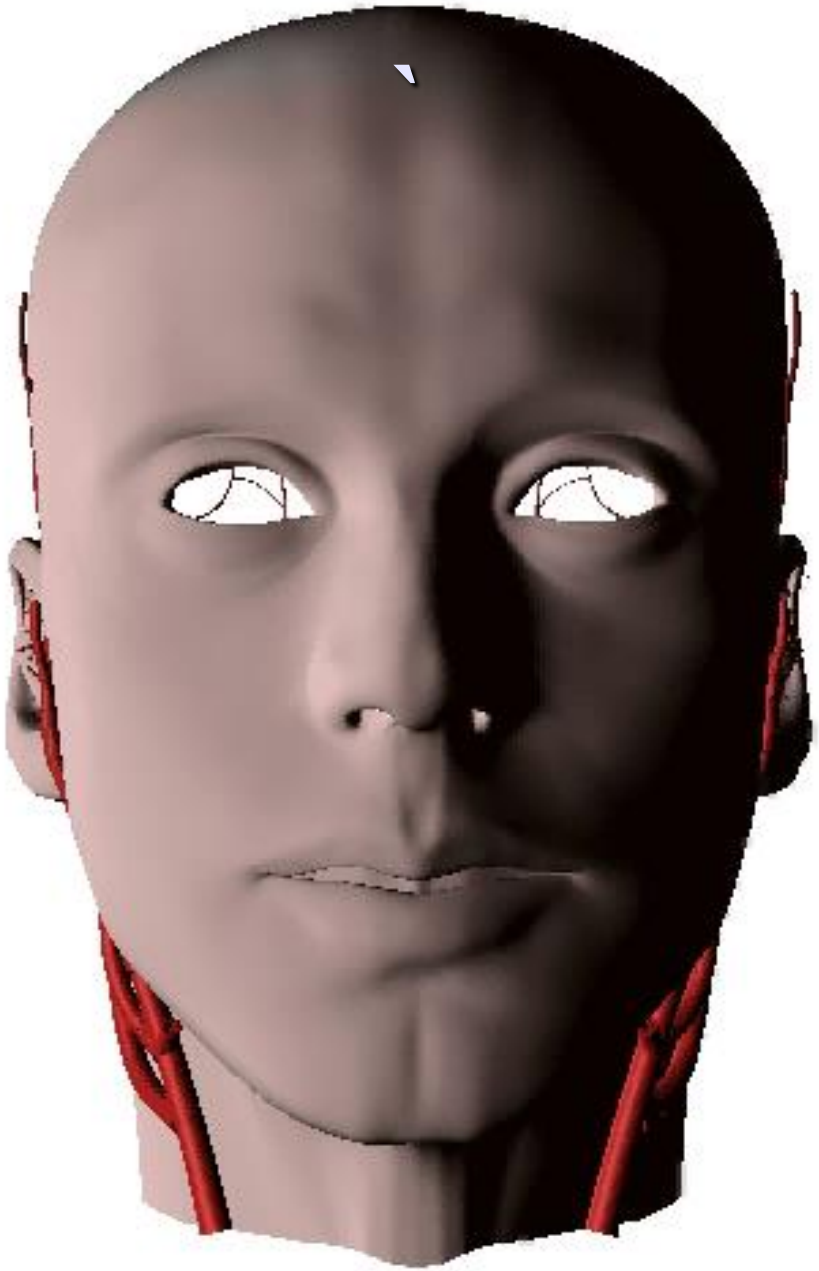

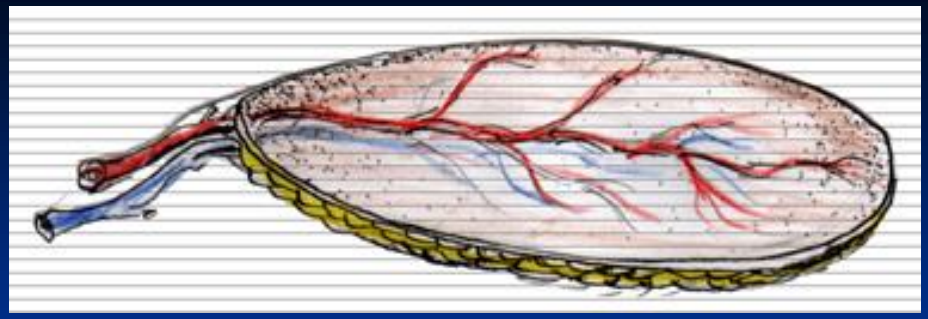

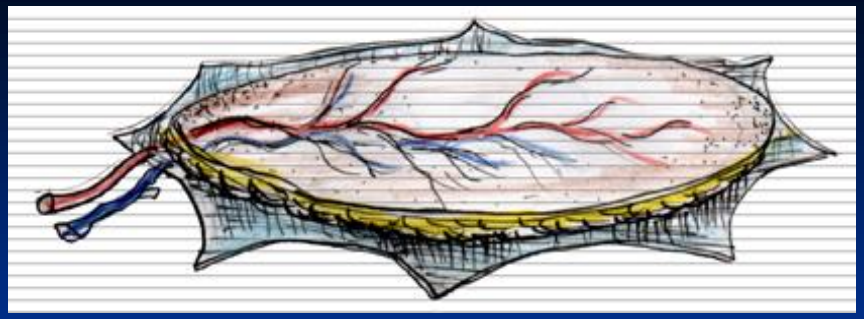

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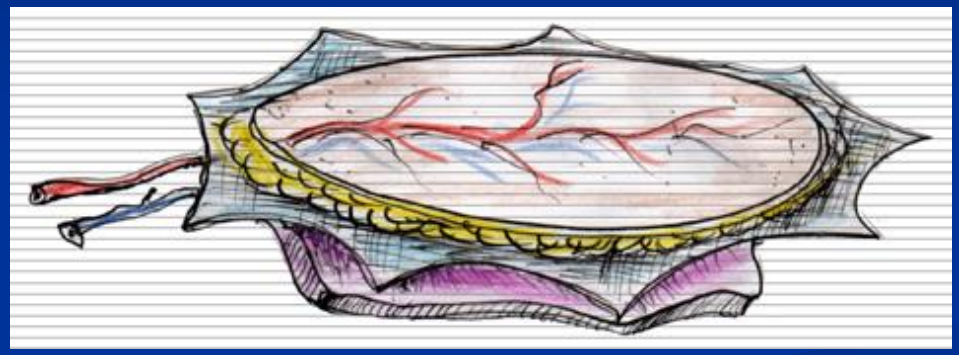

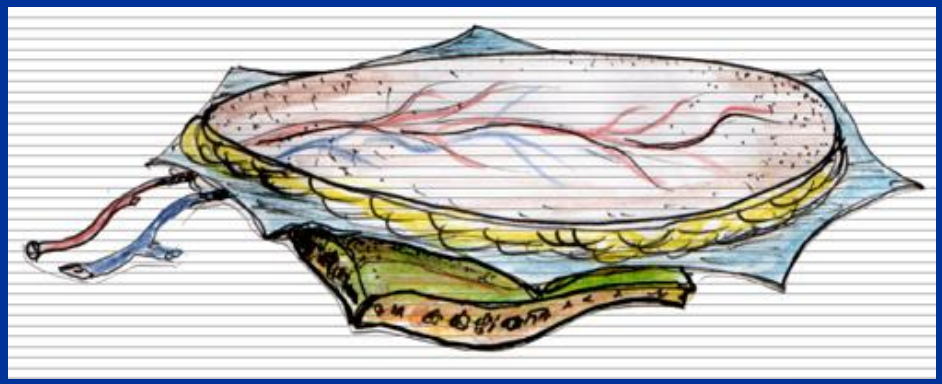

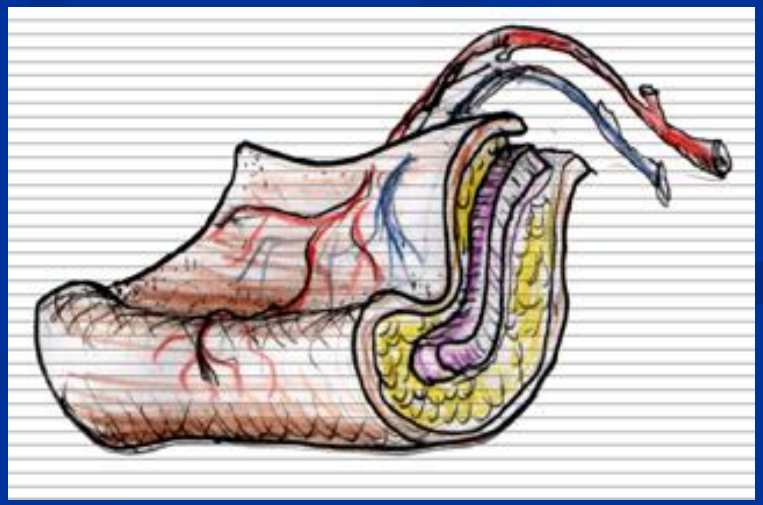

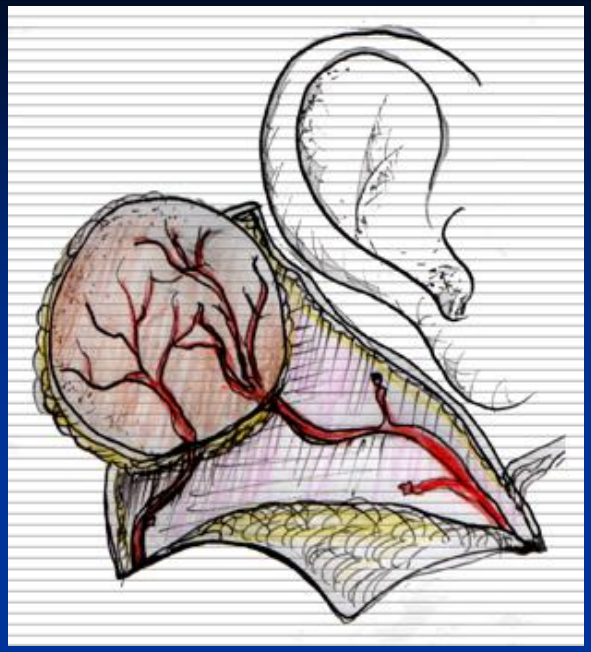

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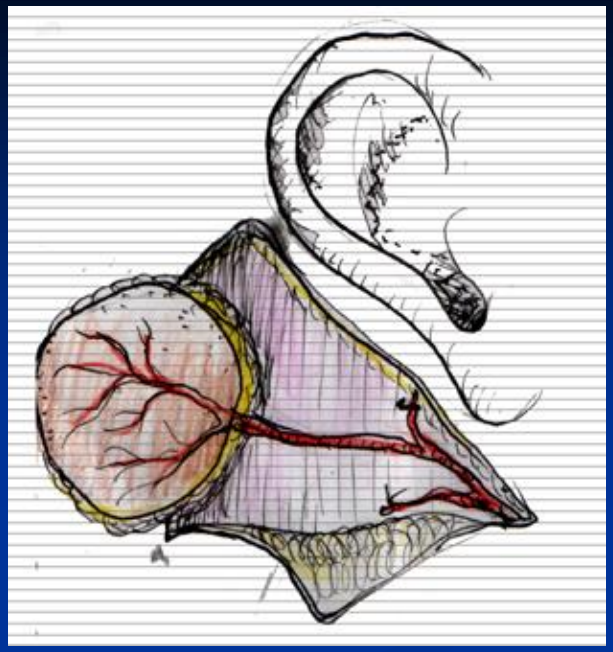

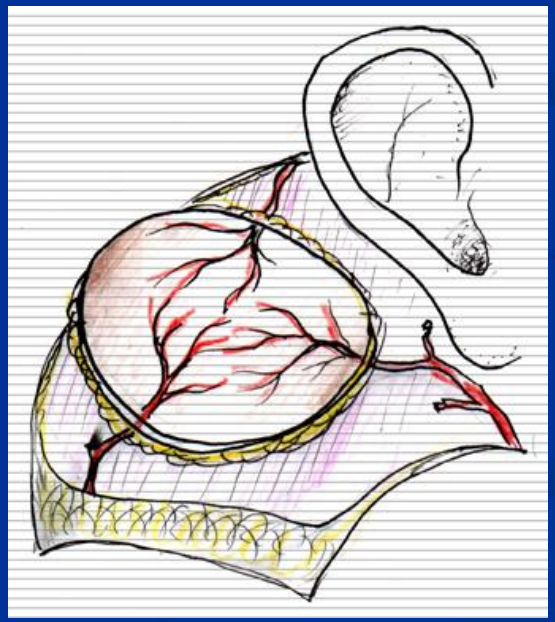

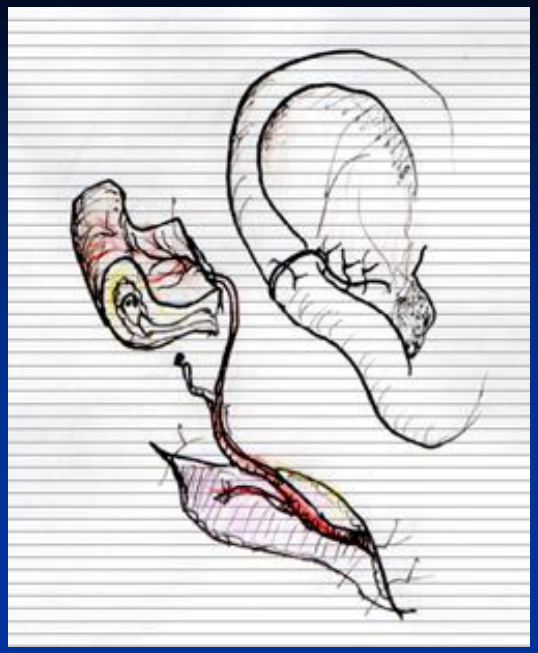

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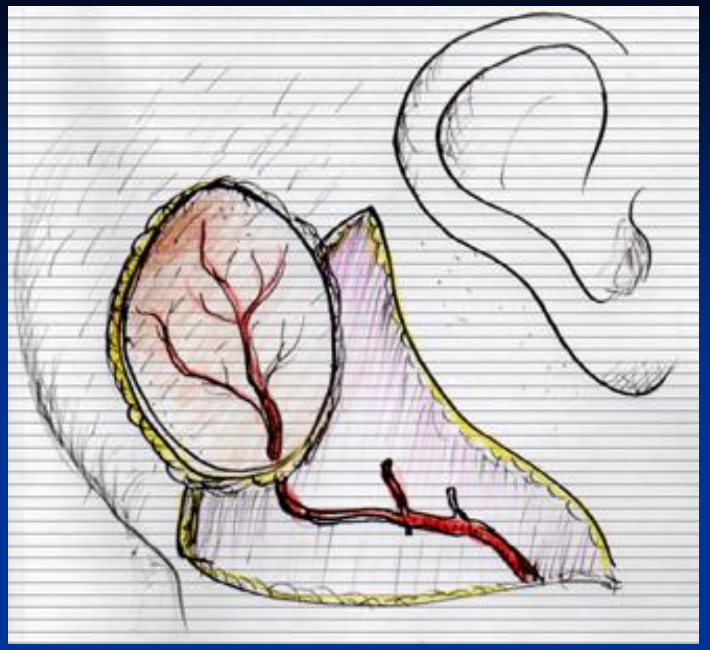

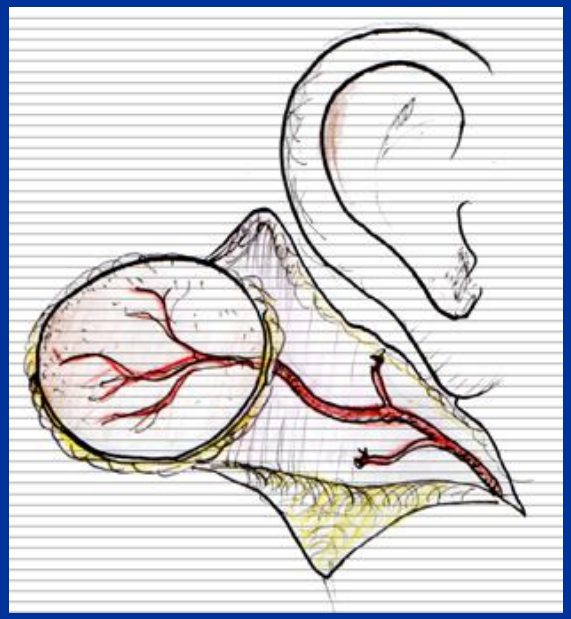

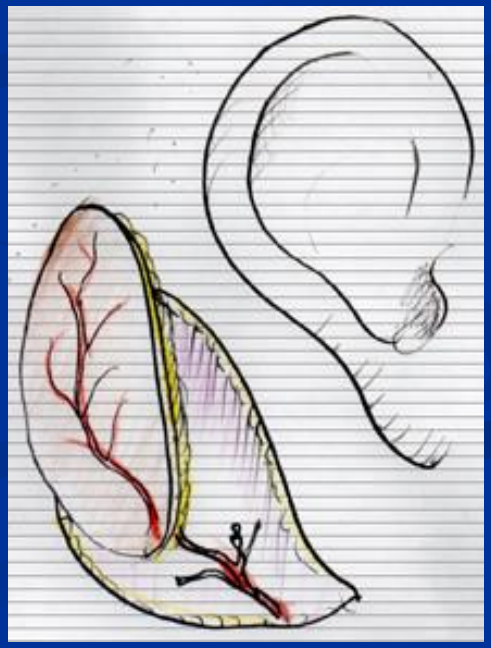

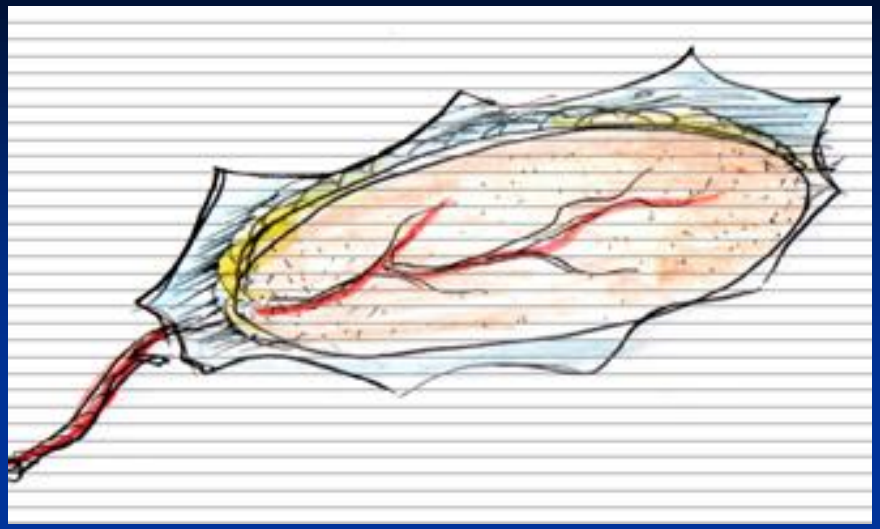

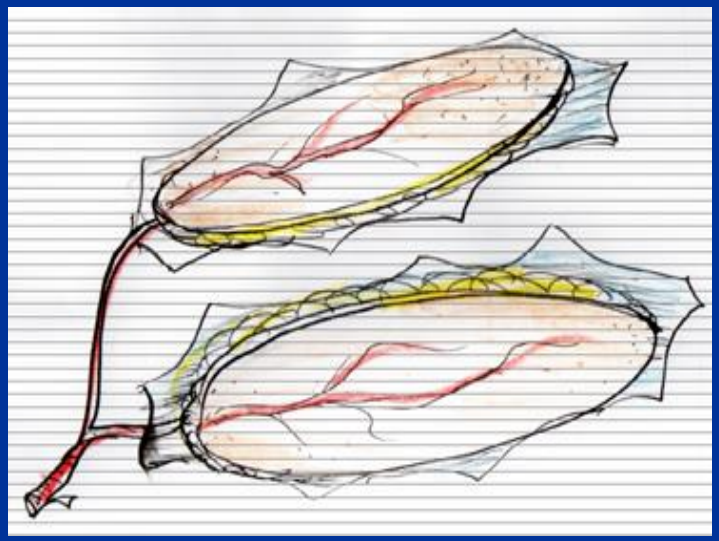

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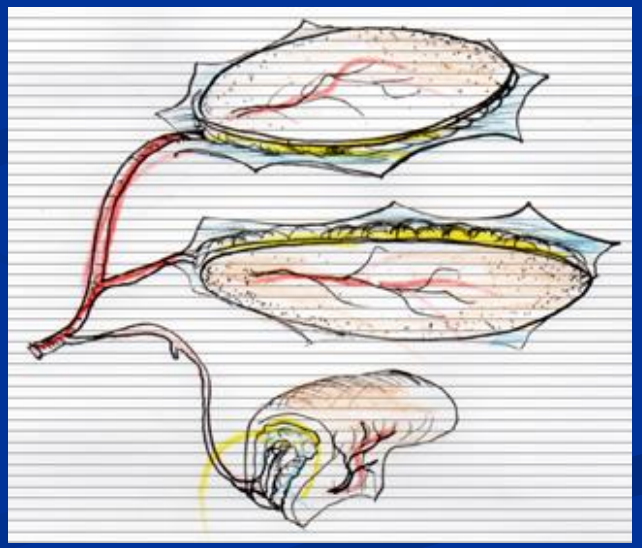

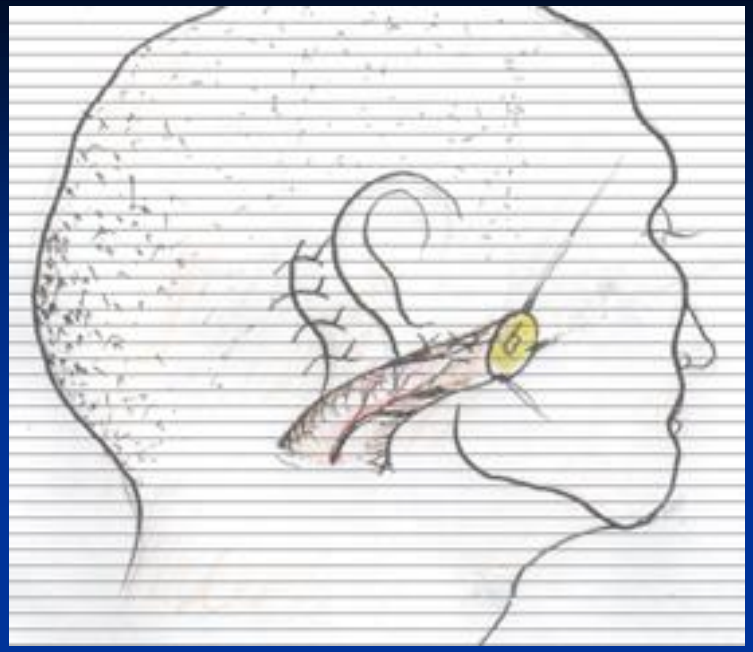

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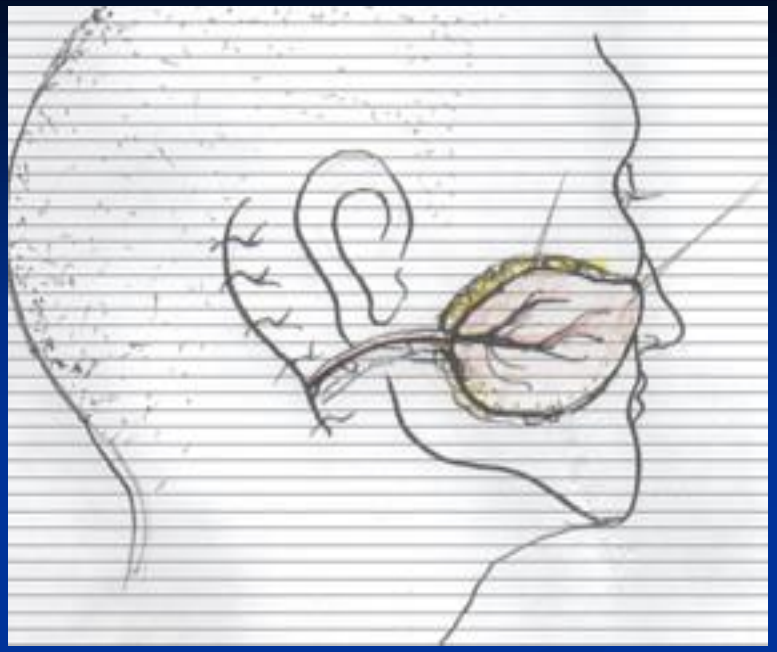
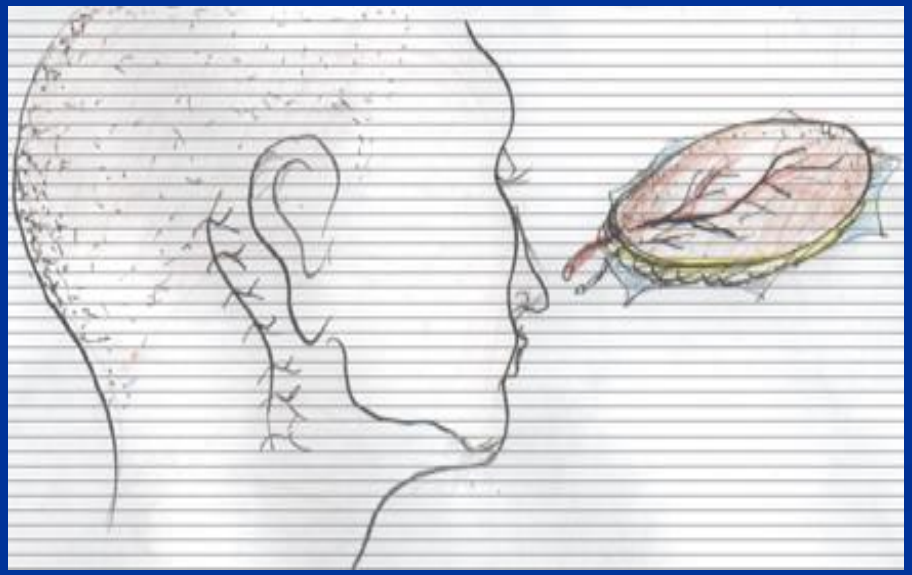
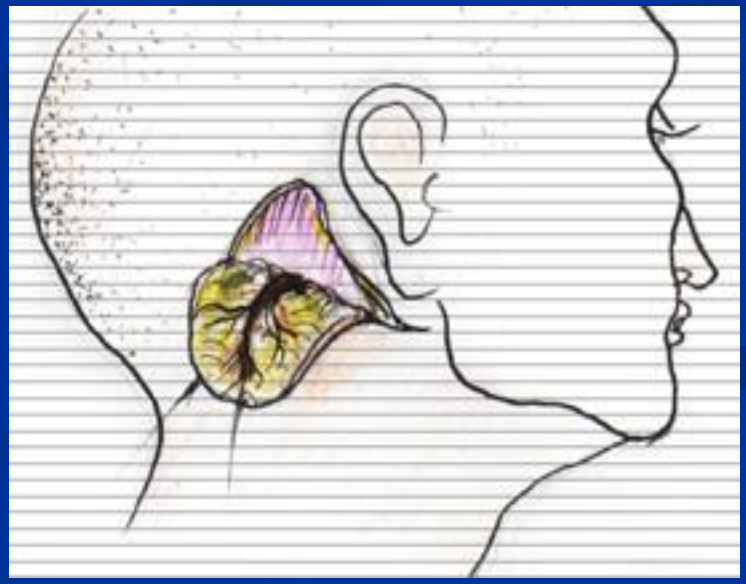
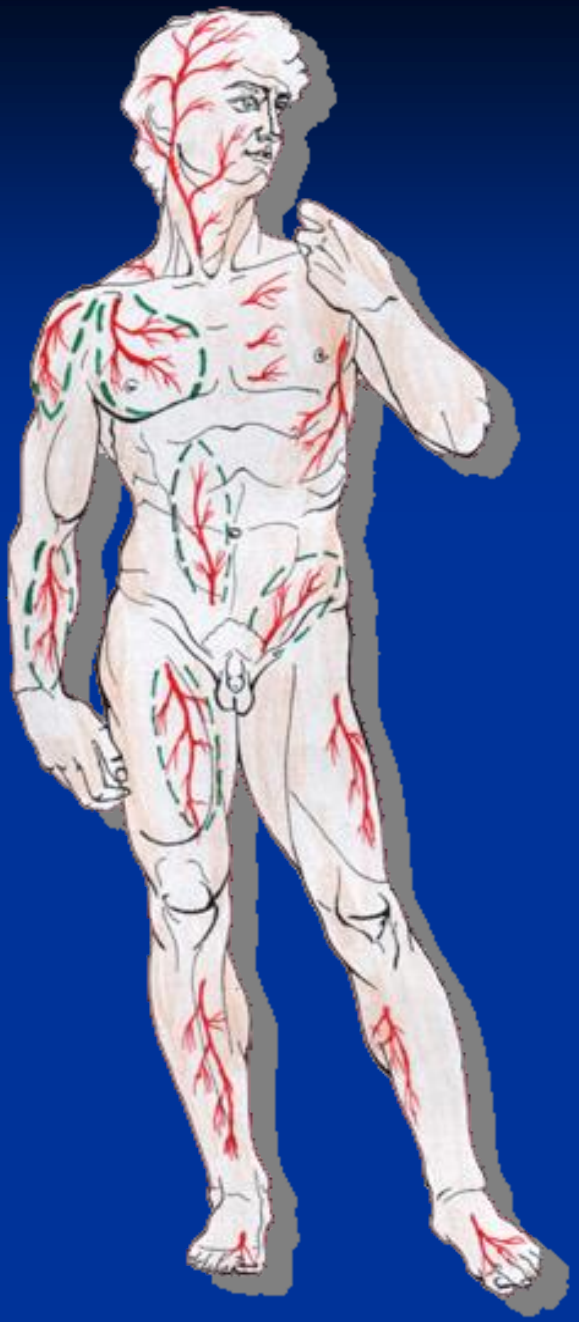
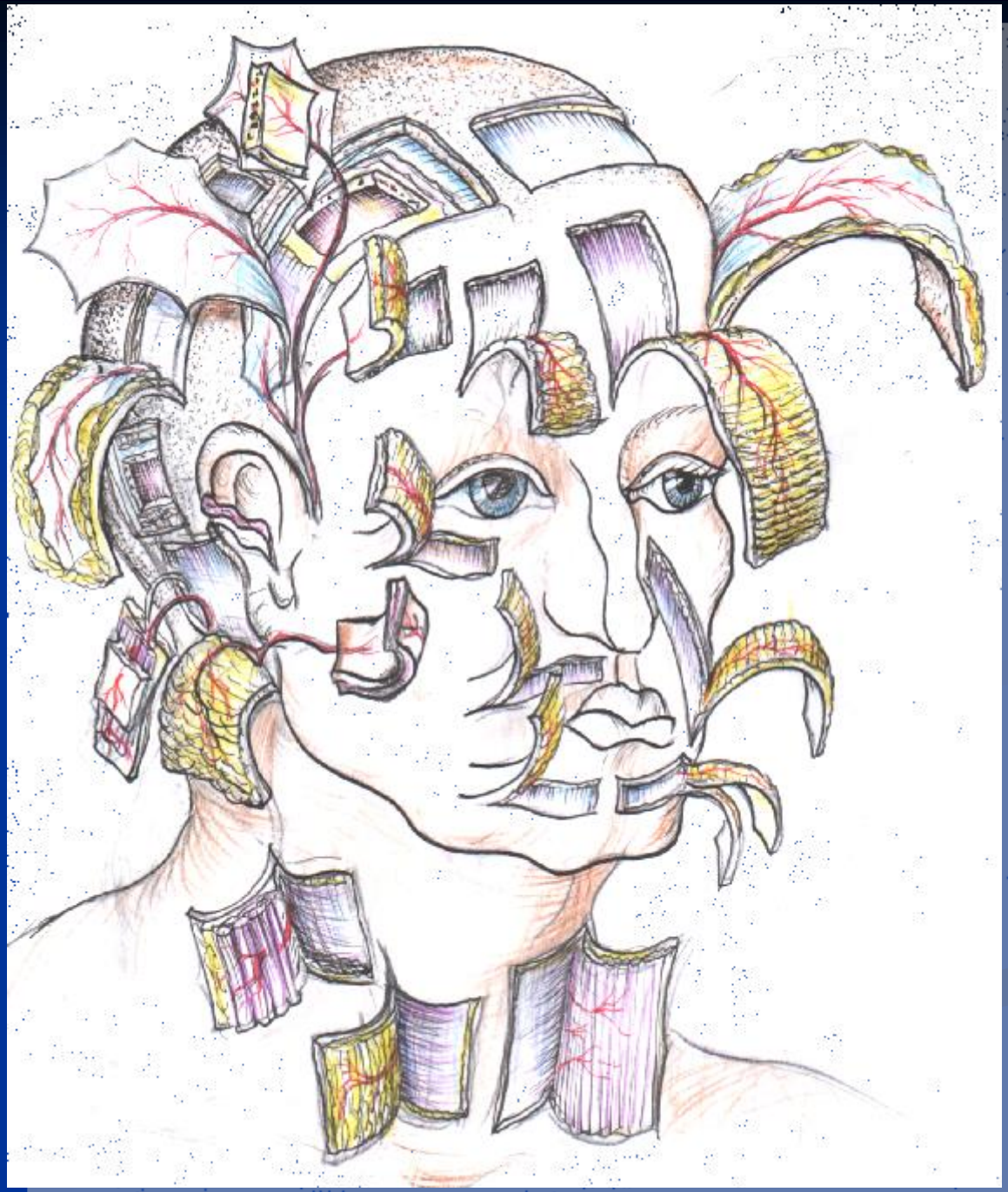
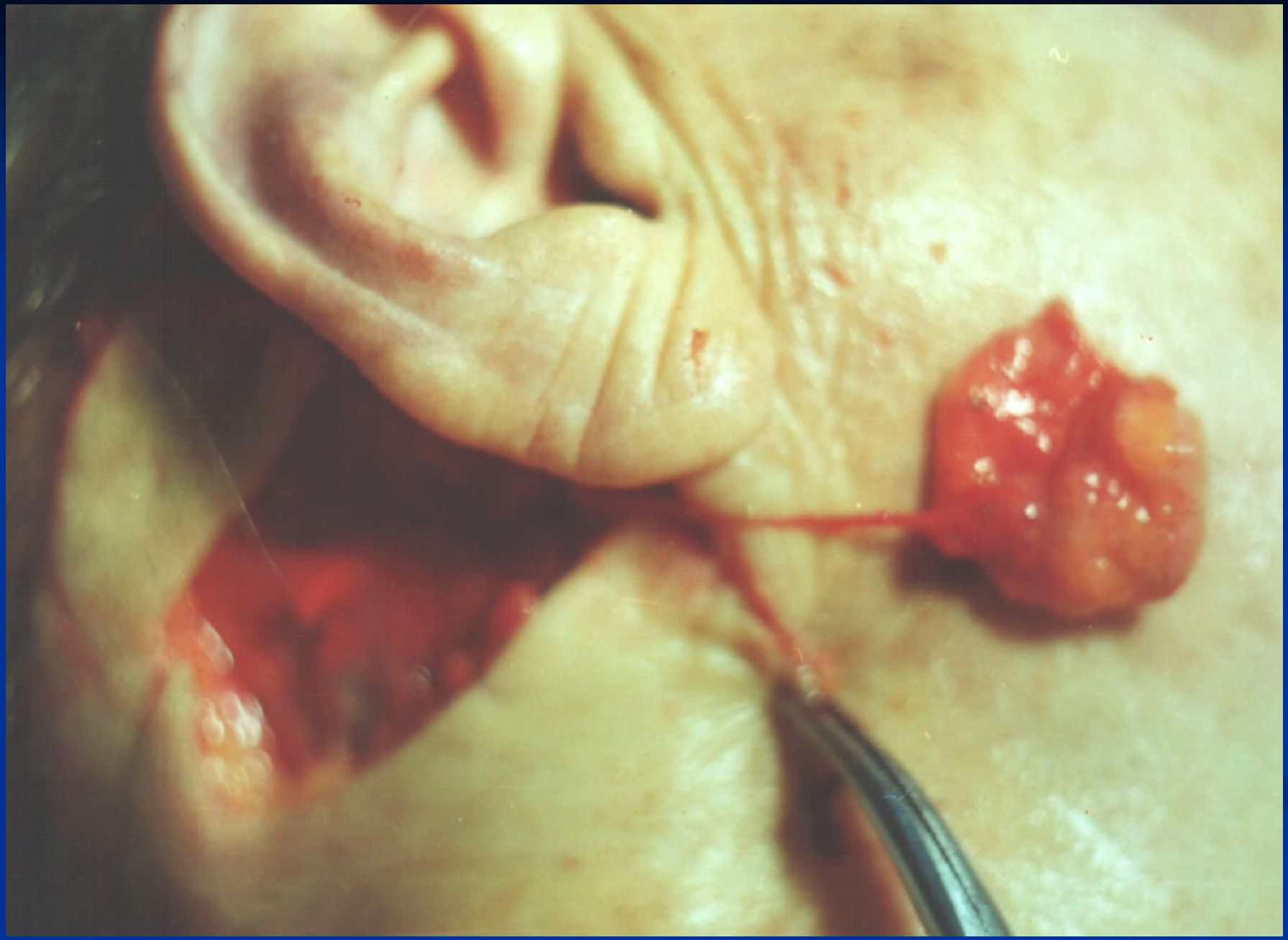


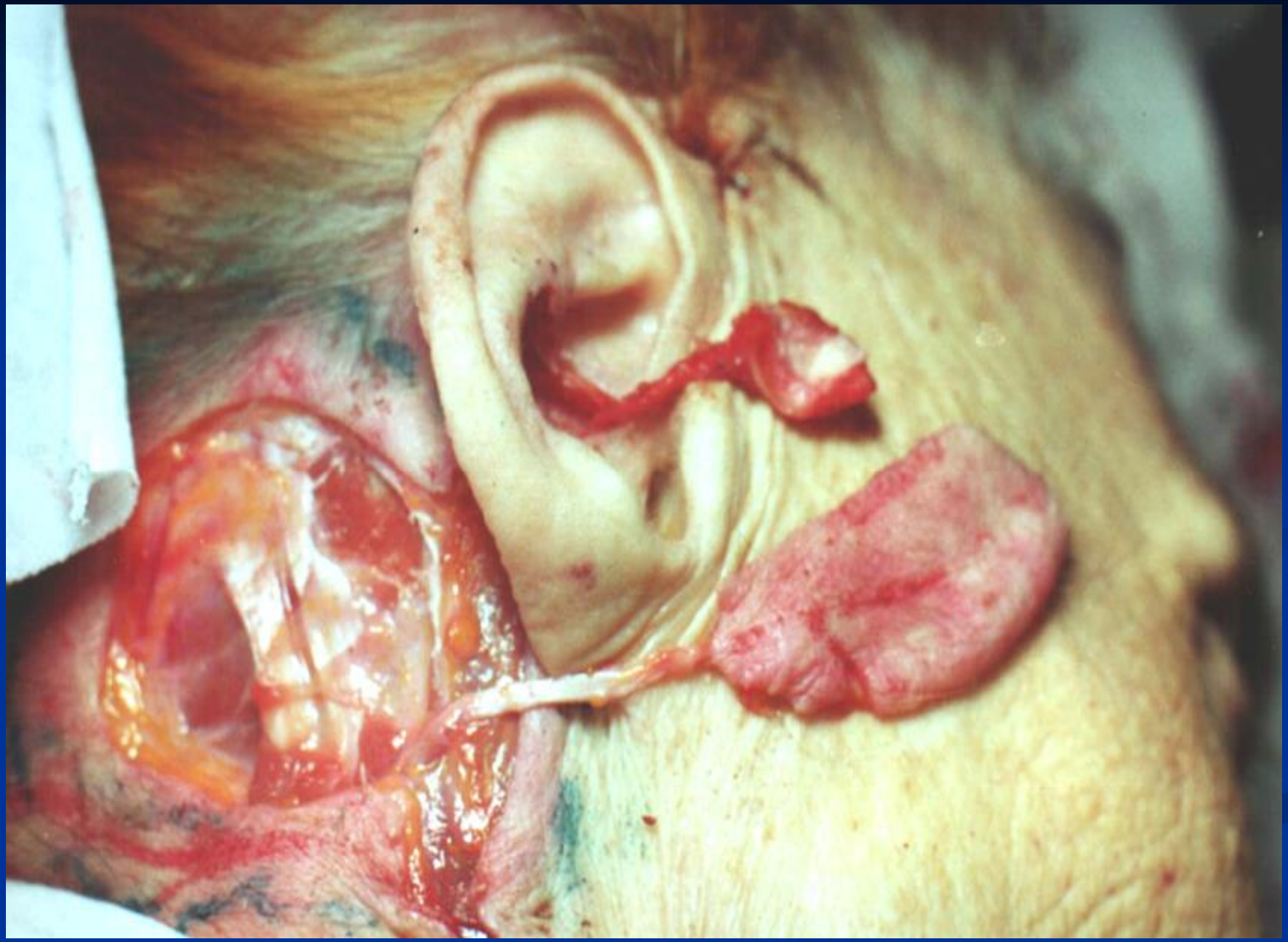


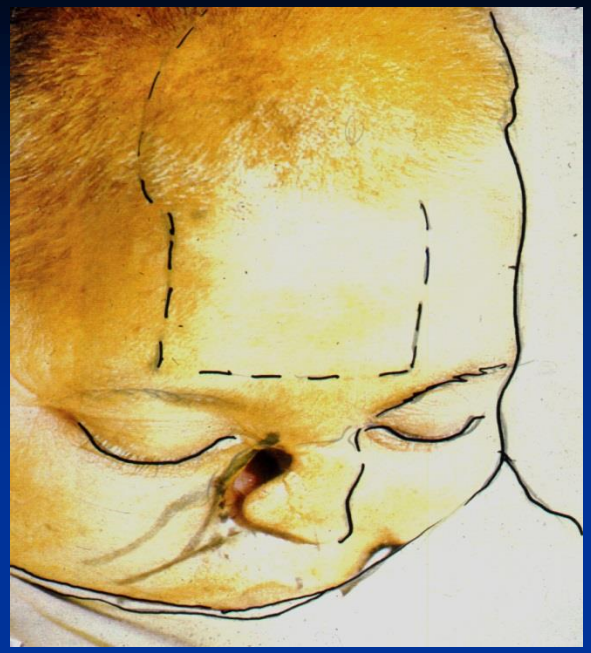


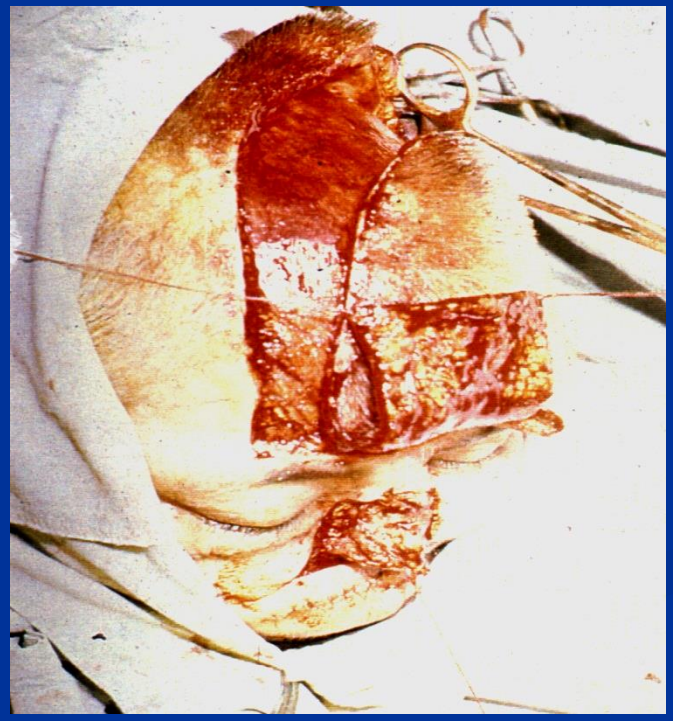


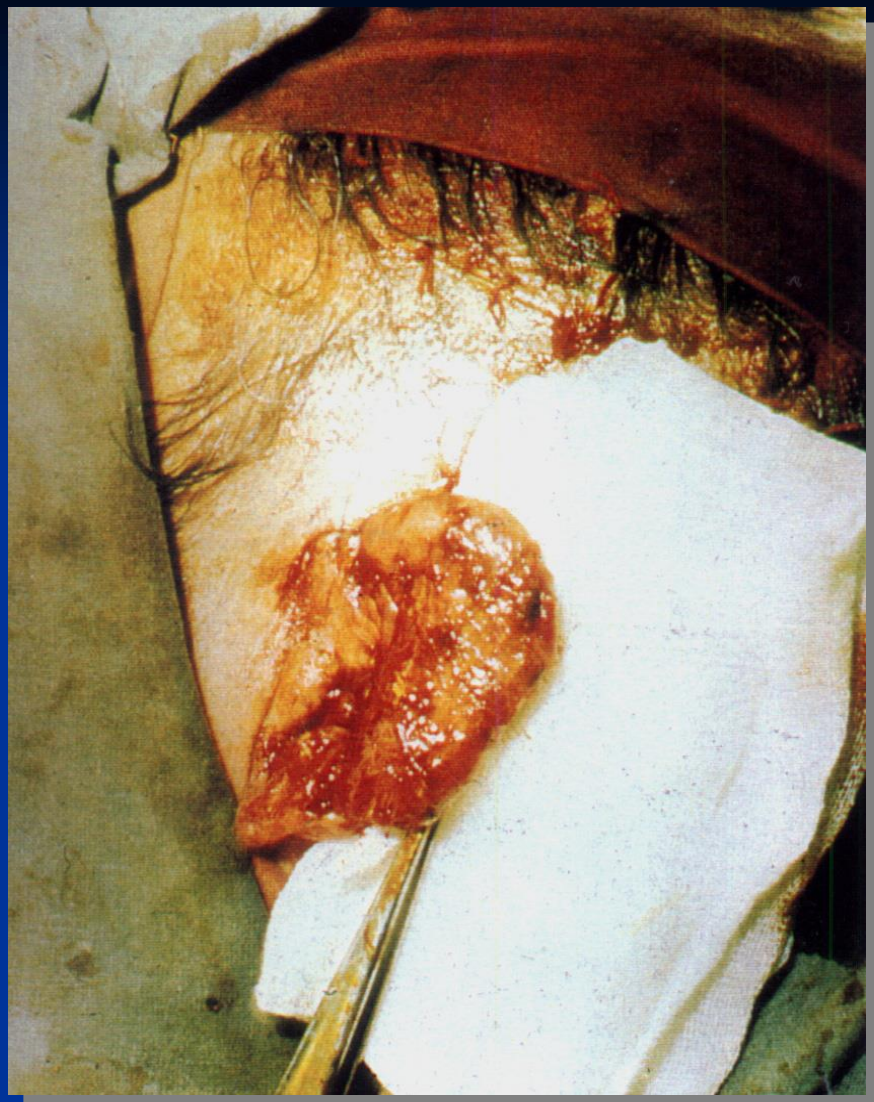




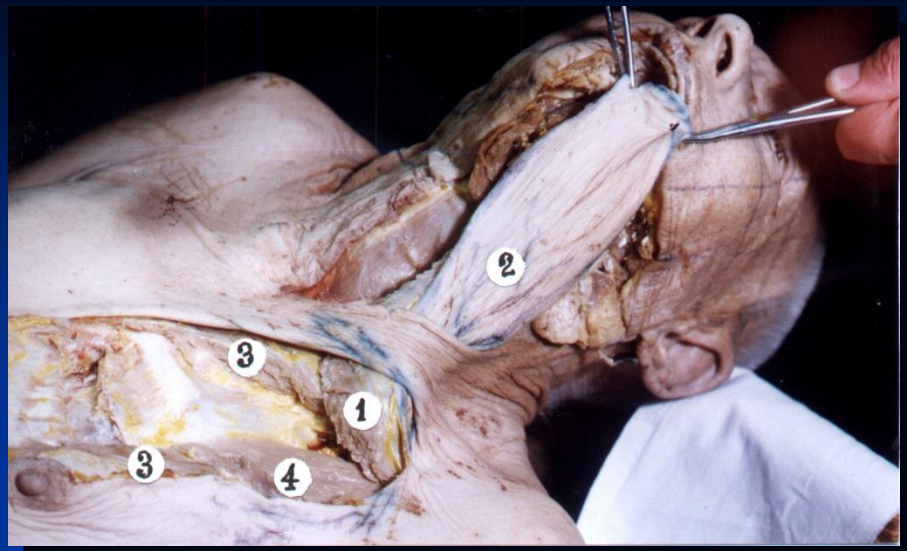








Plastic of defects of lower part of face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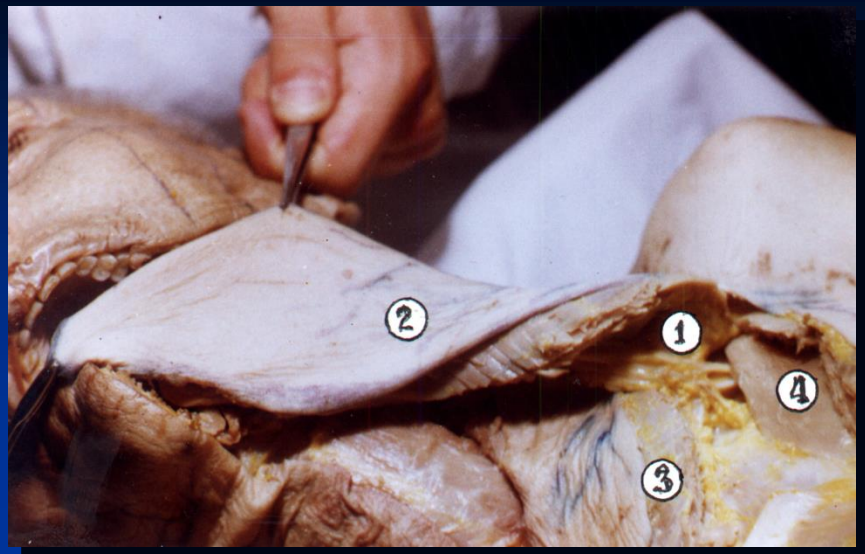
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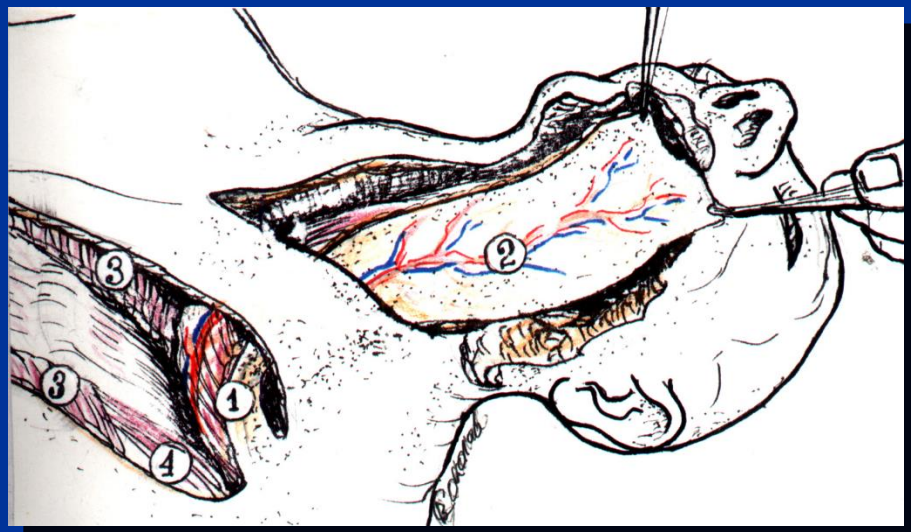
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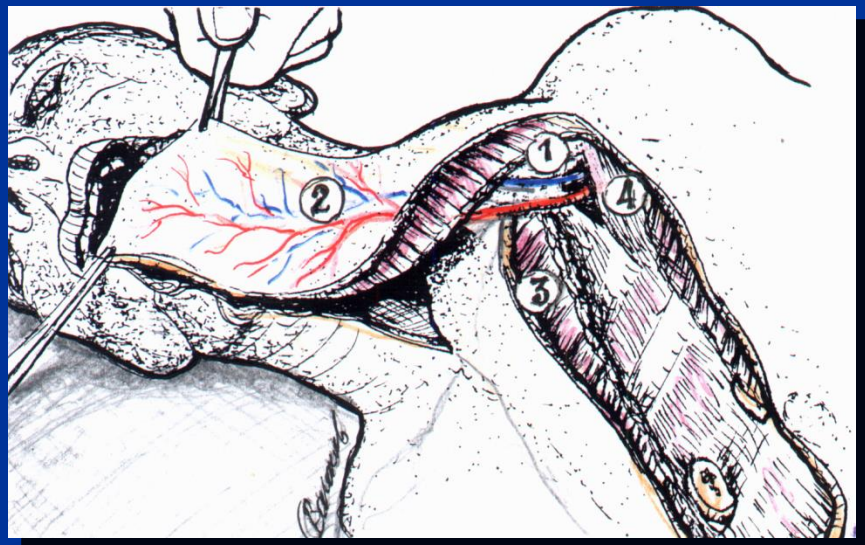
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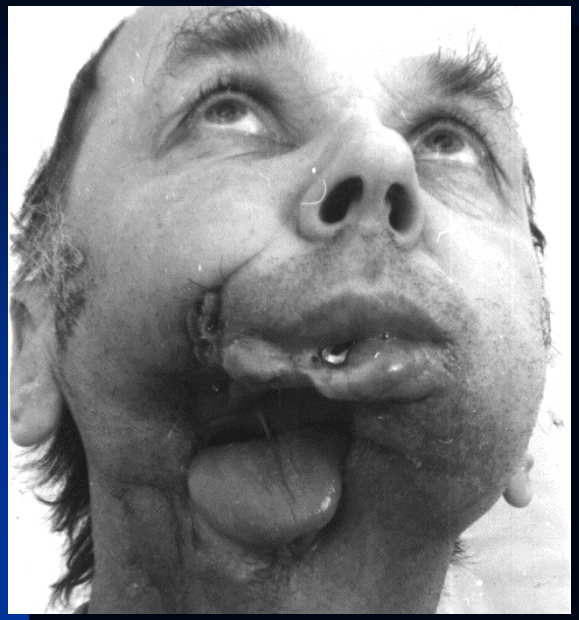

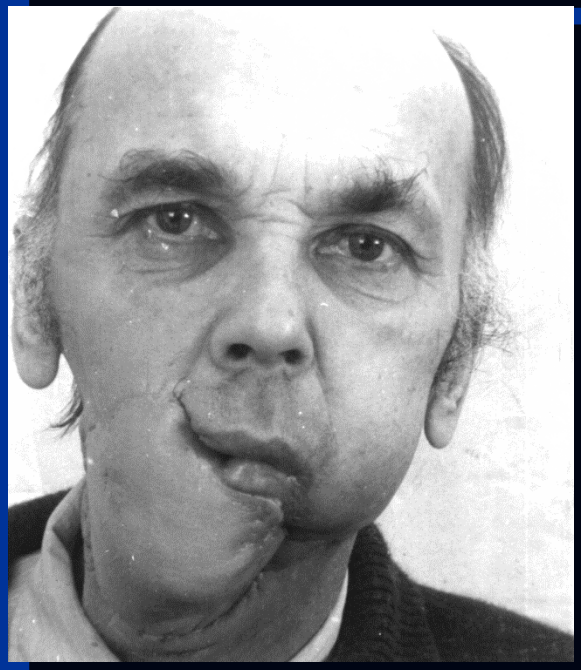

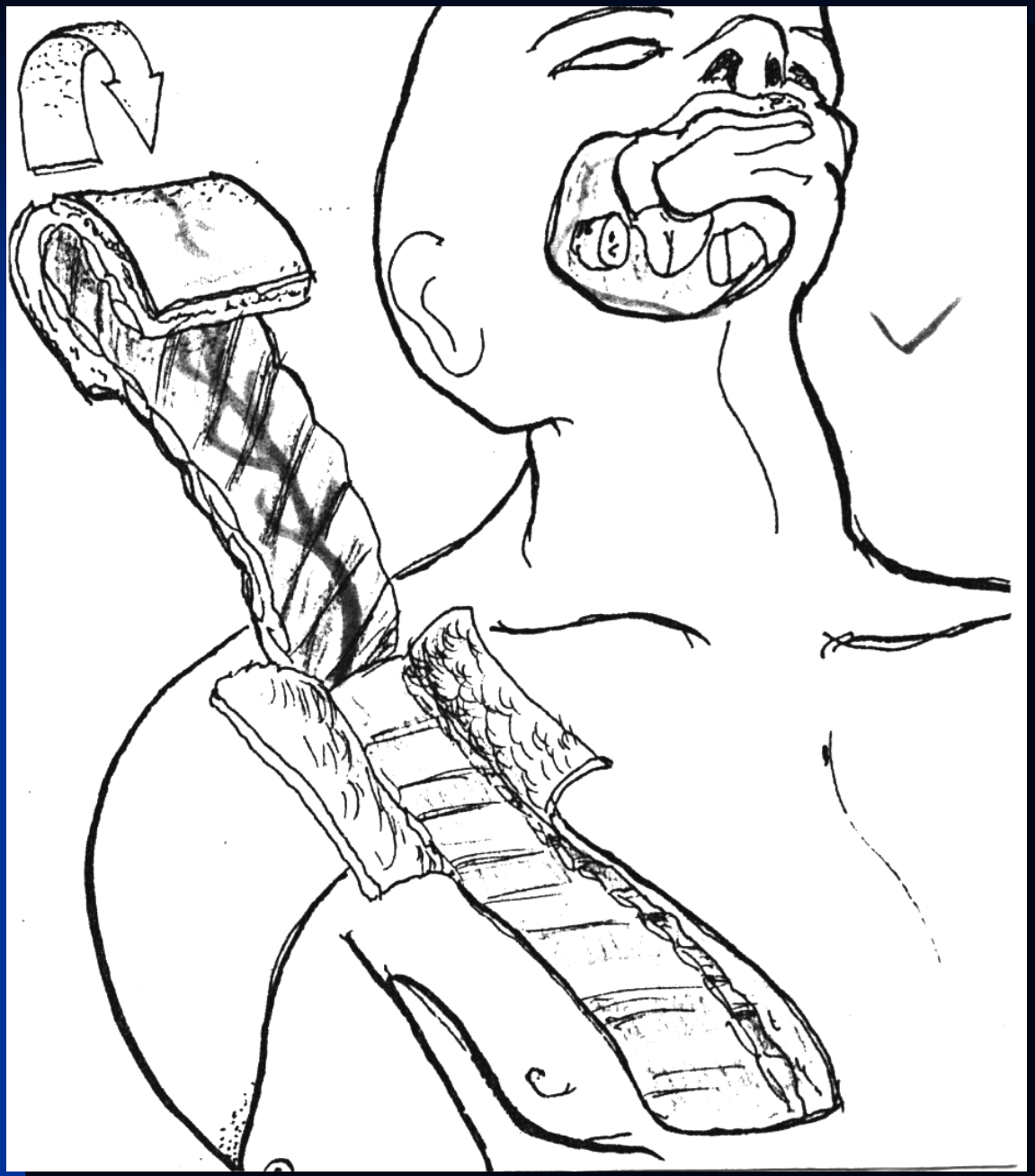

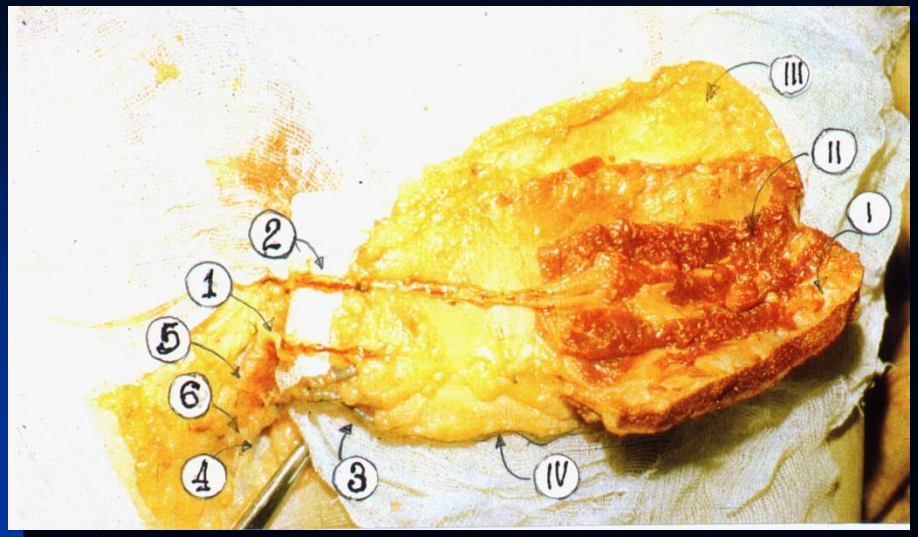
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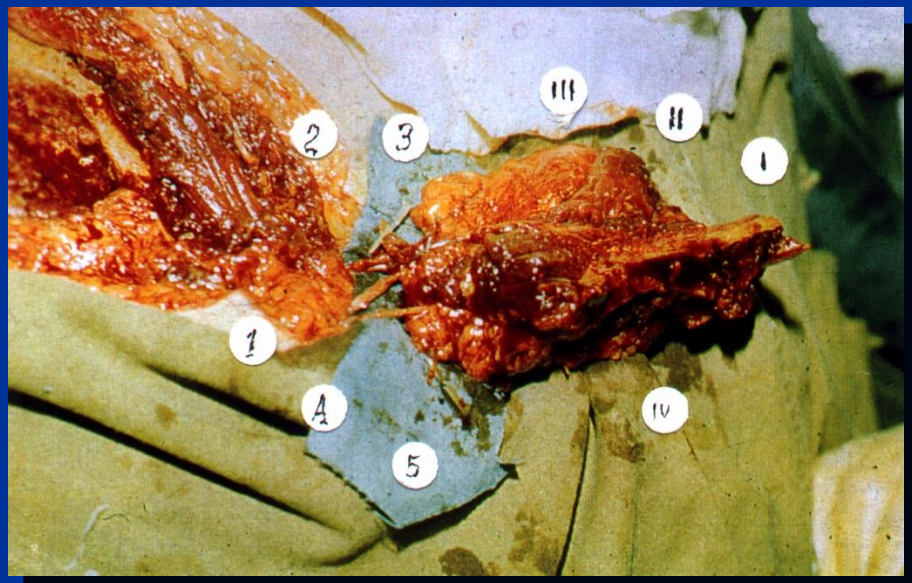
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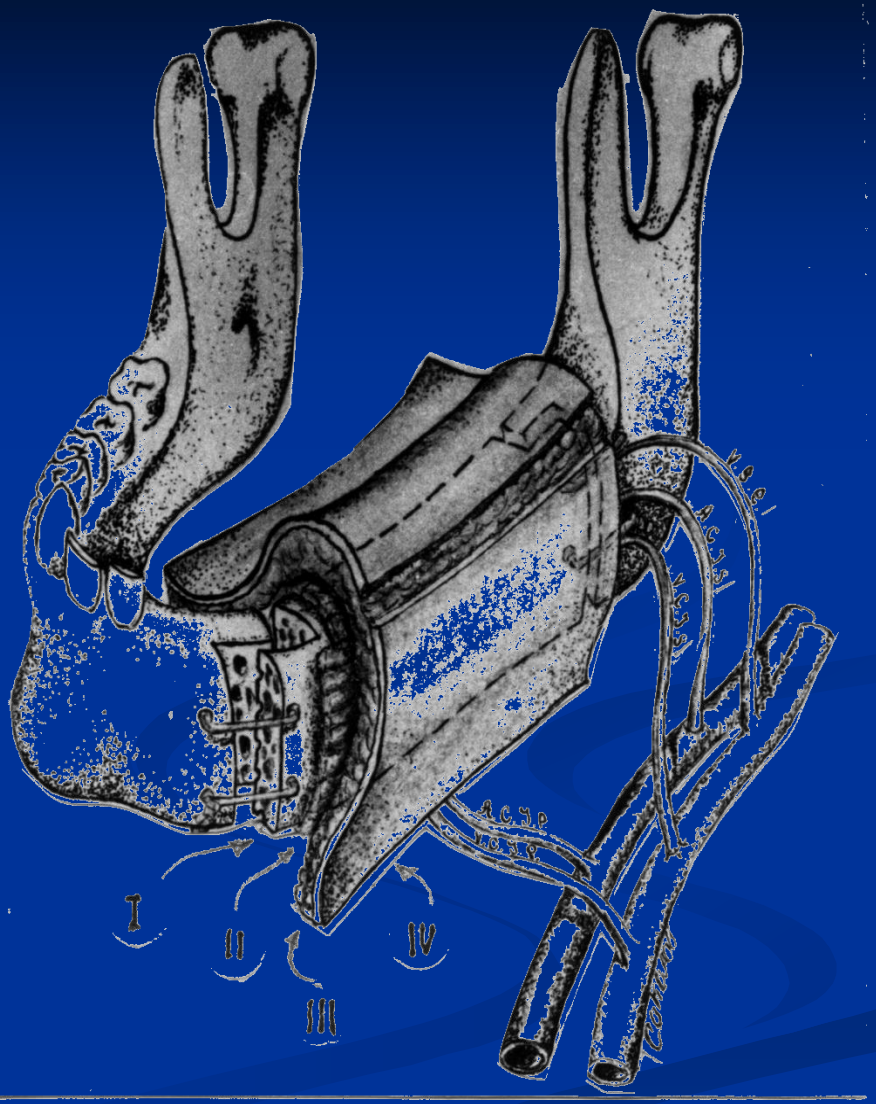
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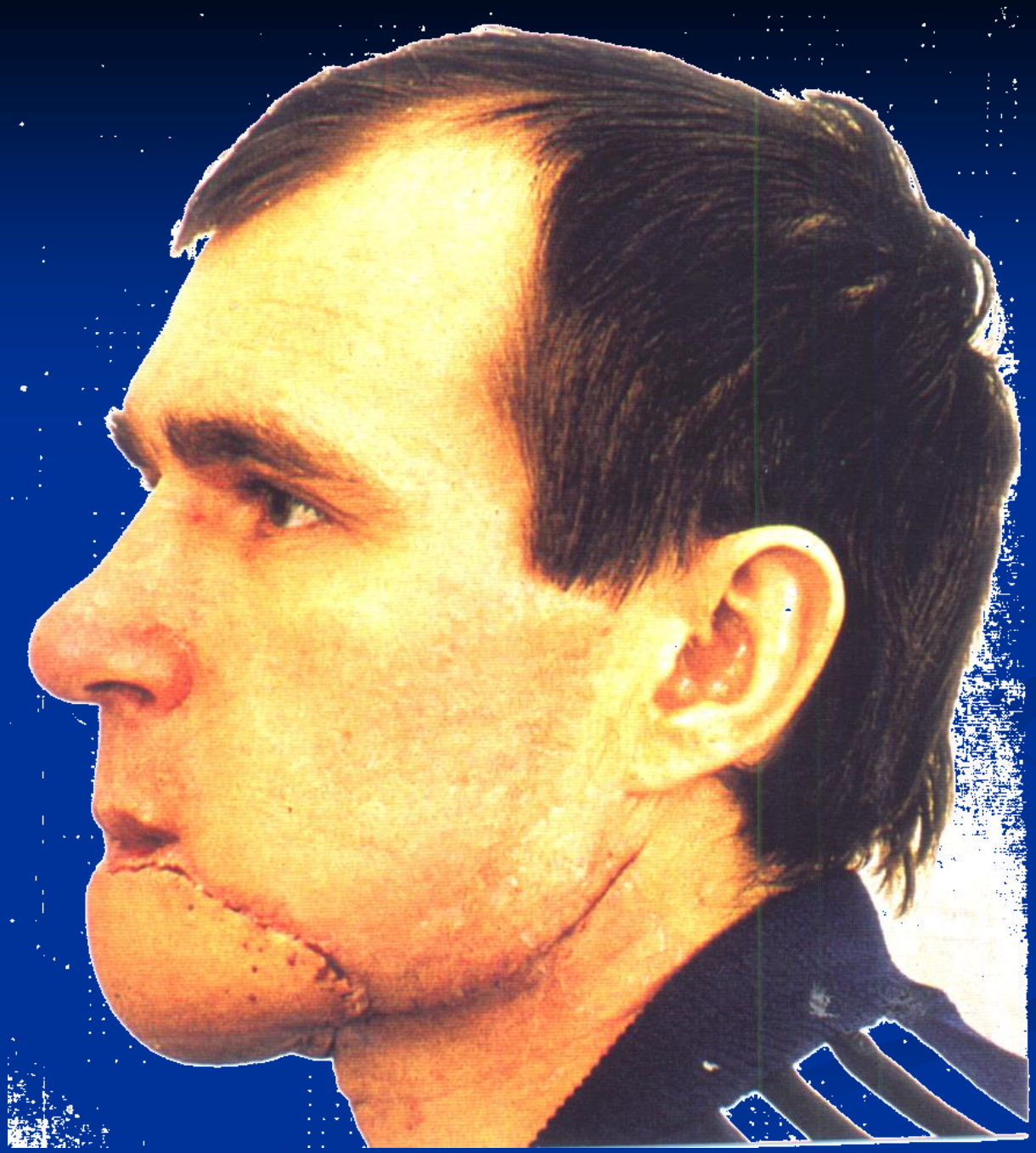


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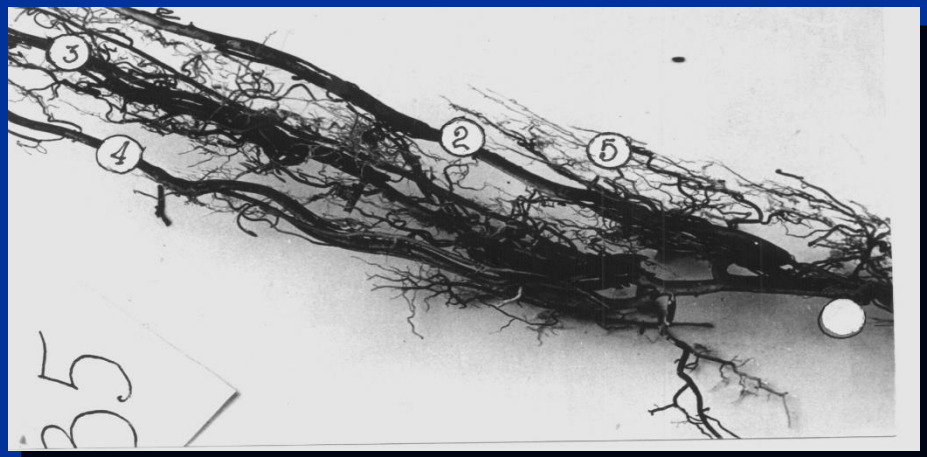
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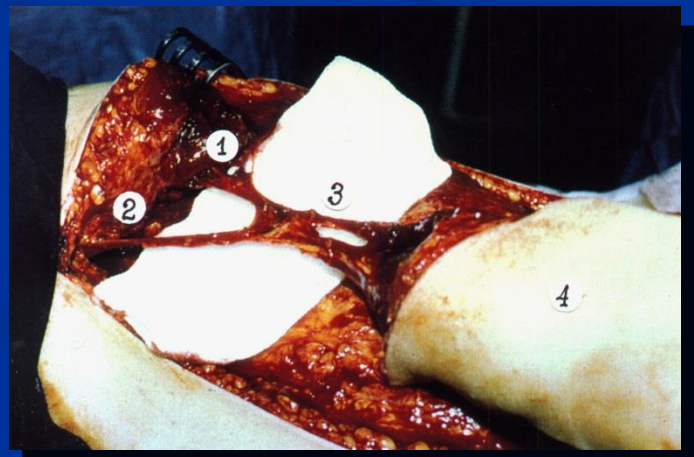
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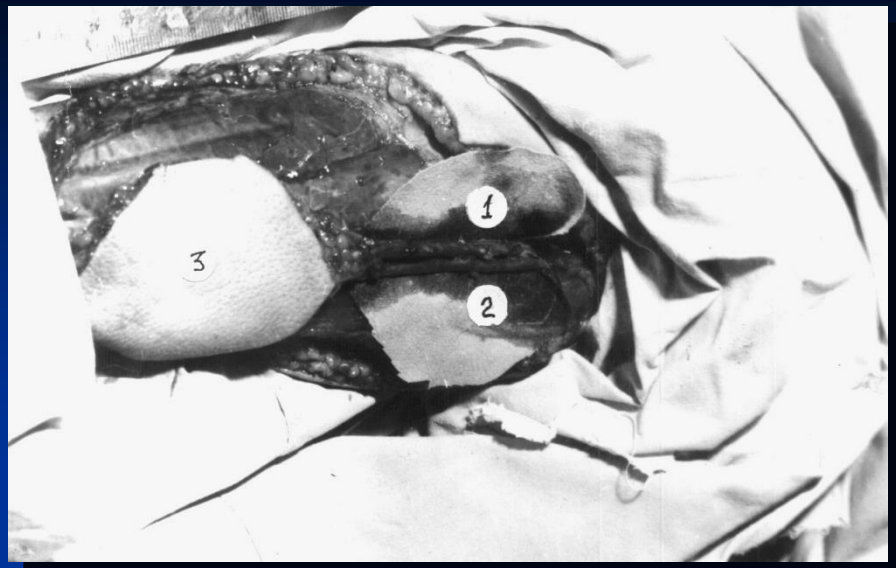
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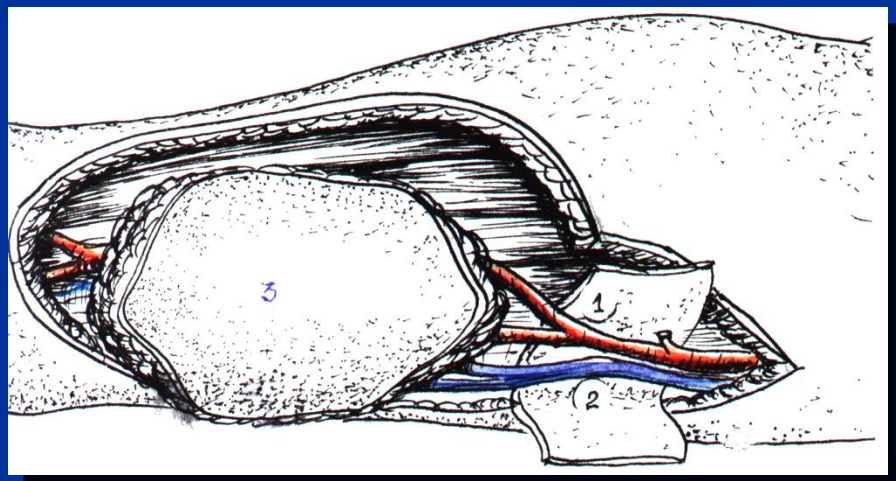
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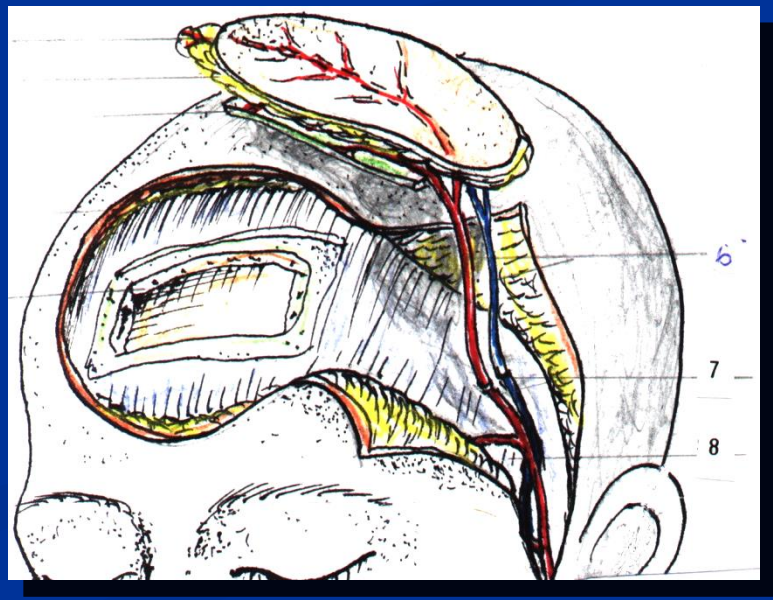
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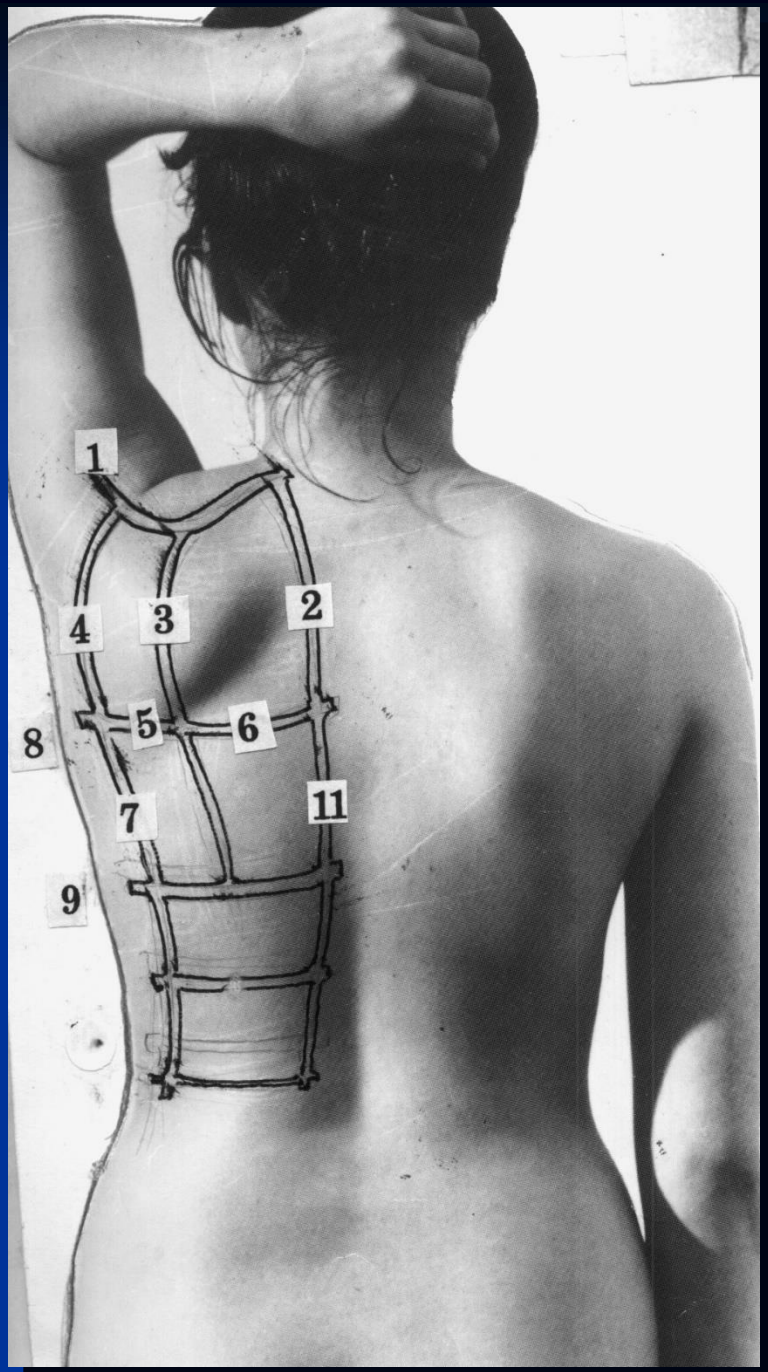
Back-lateral surface of breast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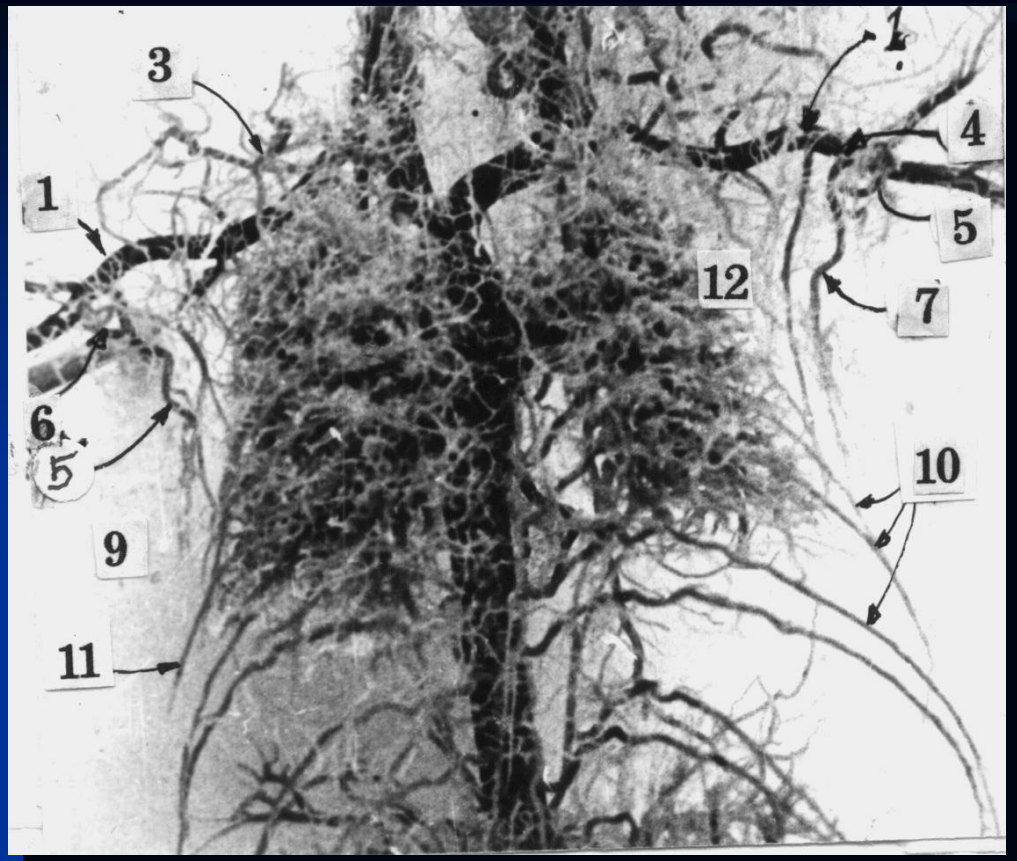
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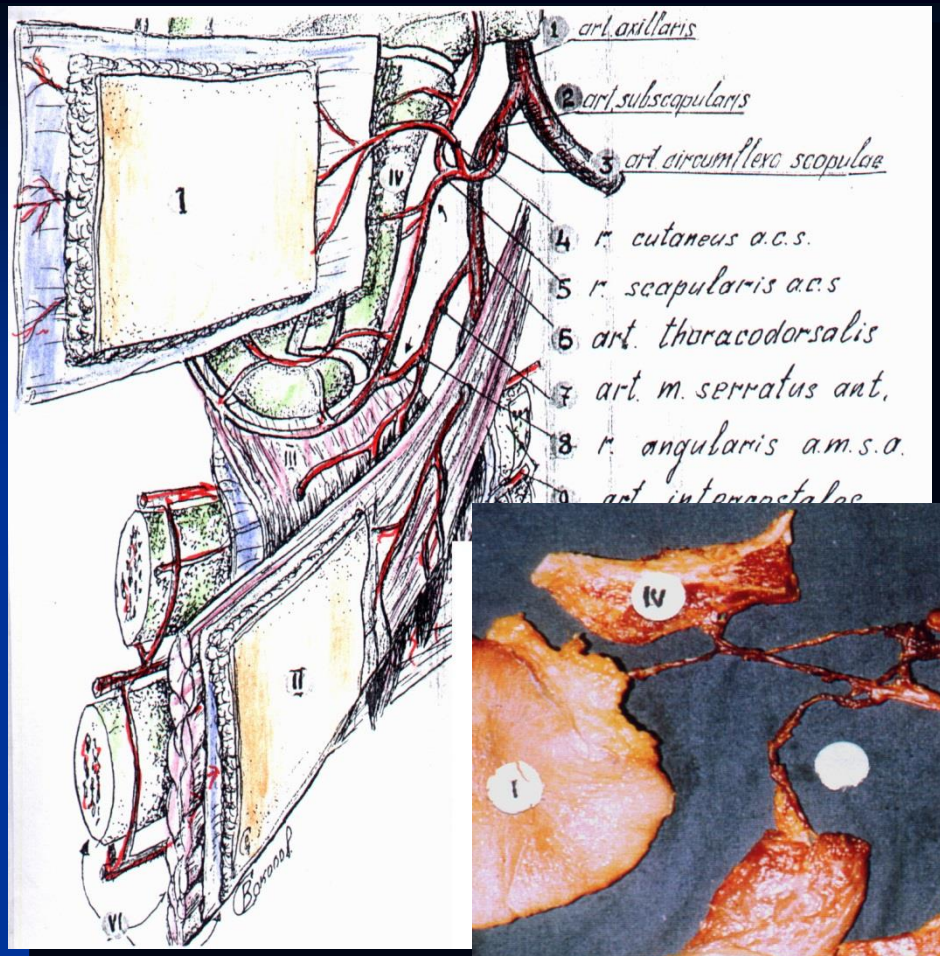
1 art. axillaris
2 art. subscapularis
3 art. circumflexa scapulae
4 r. cutaneus a.c.s.
5 r. scapularis a.c.s
6 art. thoracodorsalis
7 art. m. serratus ant.
8 r. angularis a.m.s.a.
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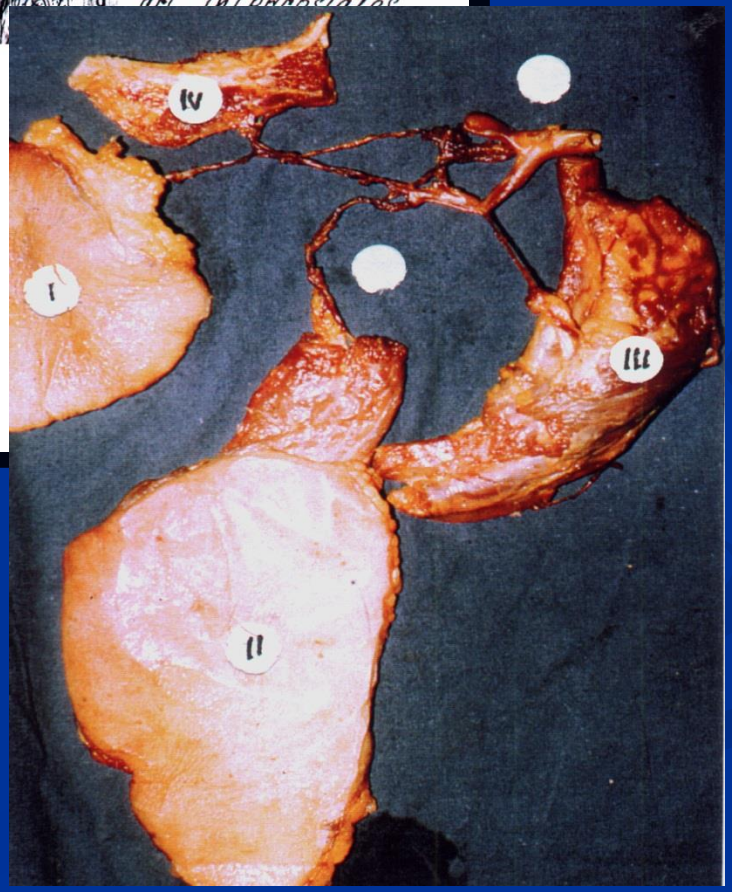
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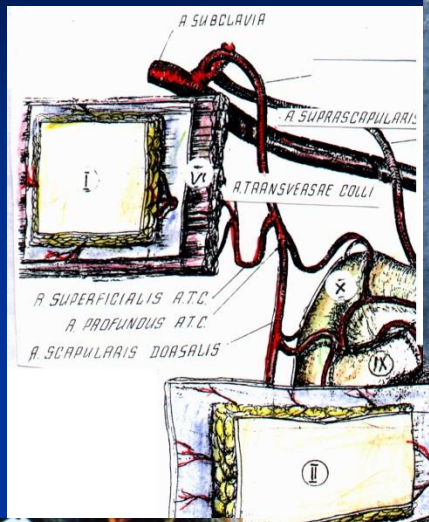
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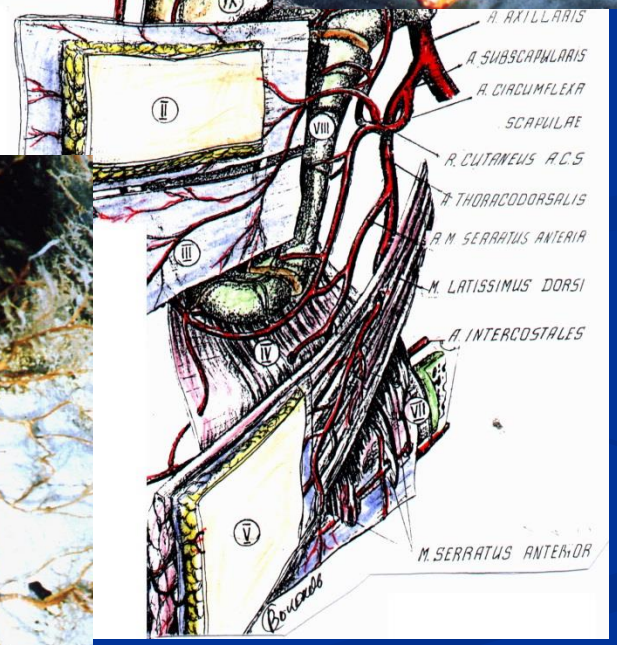
A. SUPRASCAPULARIS
A. TRANSVERSAE COLLI
A. SUPERFICIALIS A.T.C.
A. PROFUNDUS A.T.C.
A. SCAPULARIS DORSALIS
I
VI
X
IX


A. AXILLARIS
A. SUBSCAPULARIS
A. CIRCUMFLEXA SCAPULAE
R. CUTANEUS A.C.S.
A. THORACODORSALIS
A. M. SERRATUS ANTERIA
M. LATISSIMUS DORSI
A. INTERCOSTALES
M. SERRATUS ANTERIOR
II
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IV
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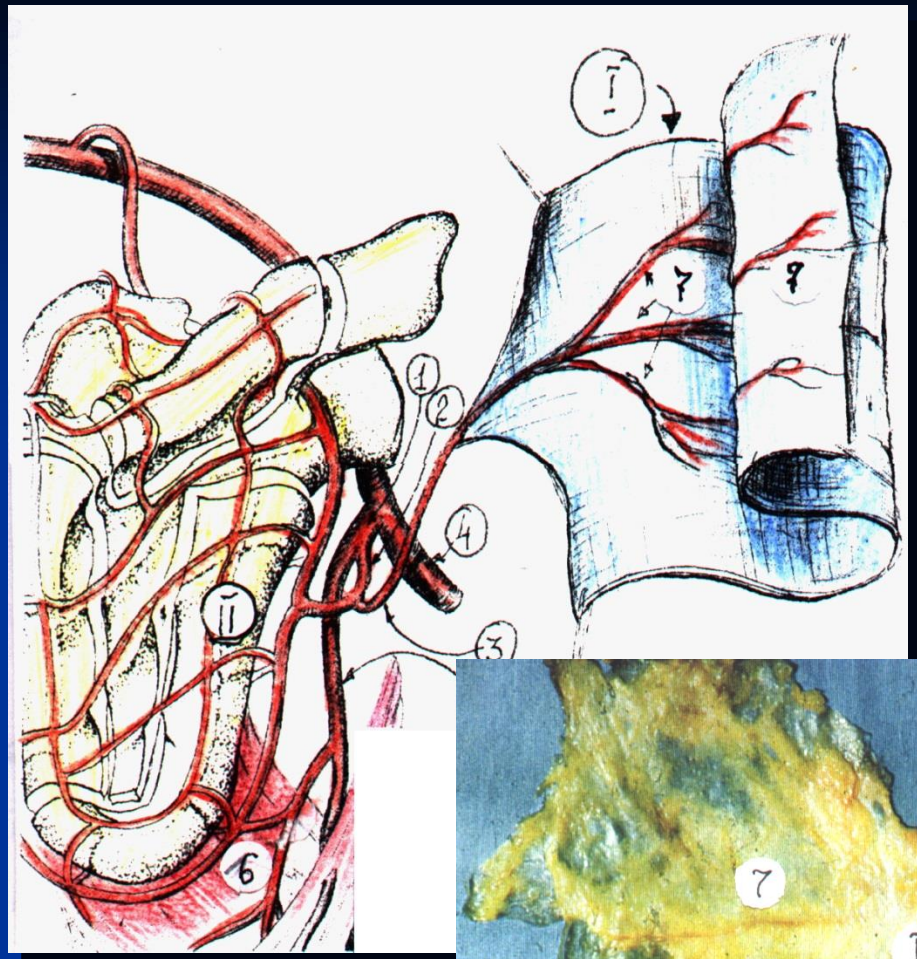
VII
VIII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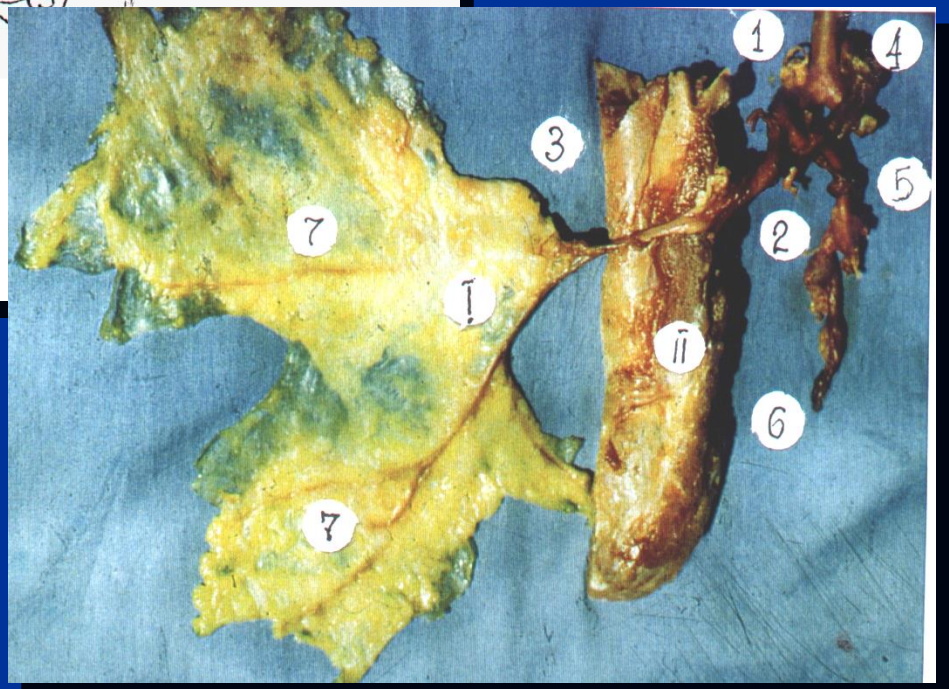
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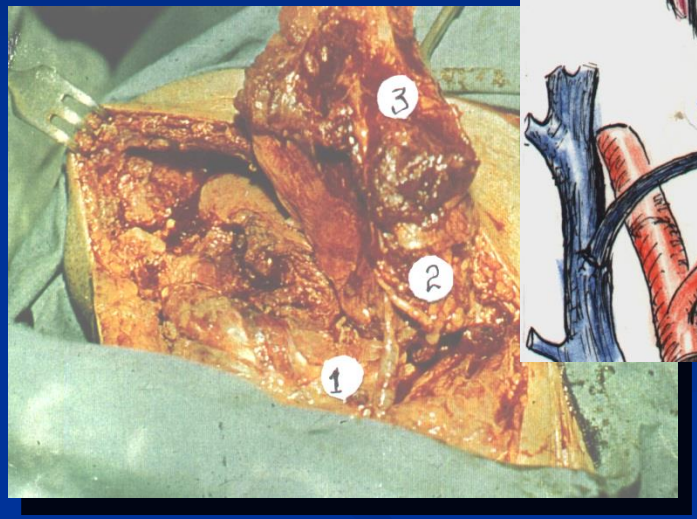
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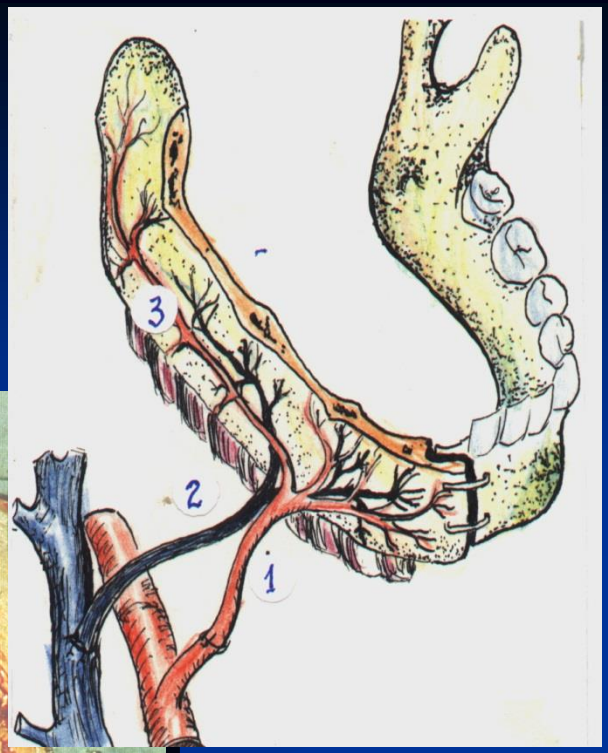
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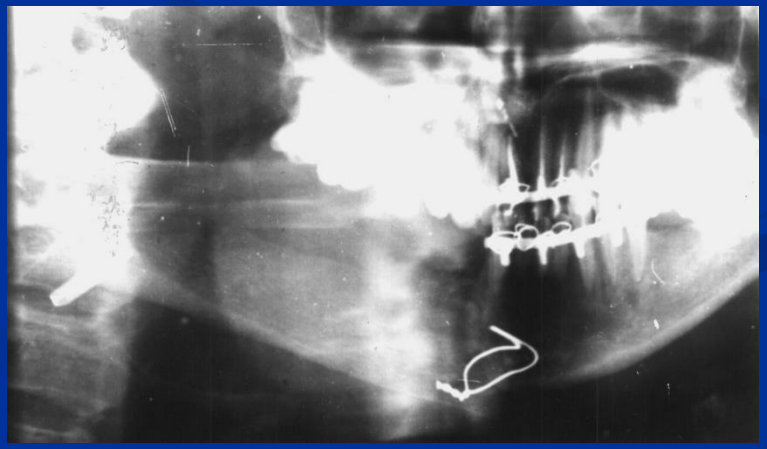

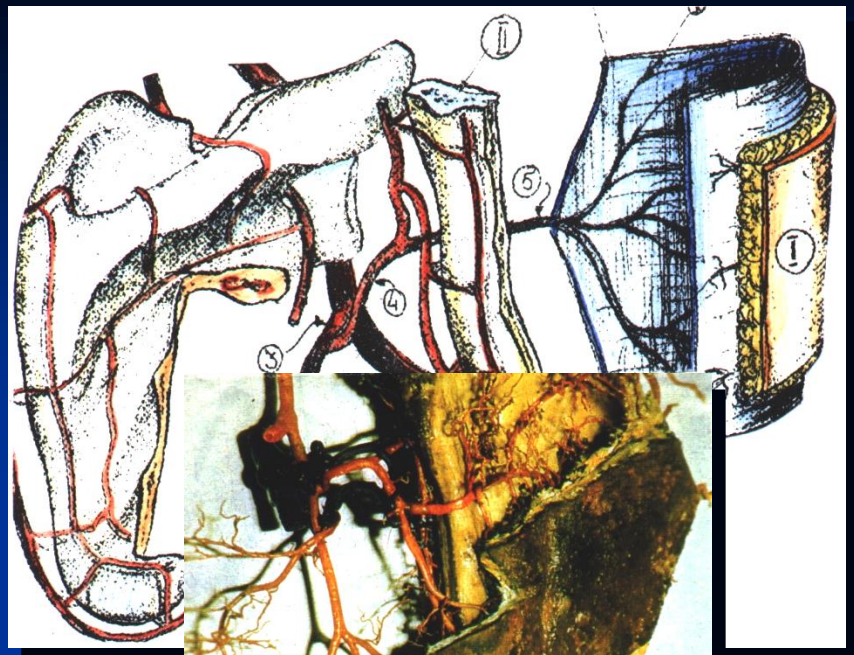
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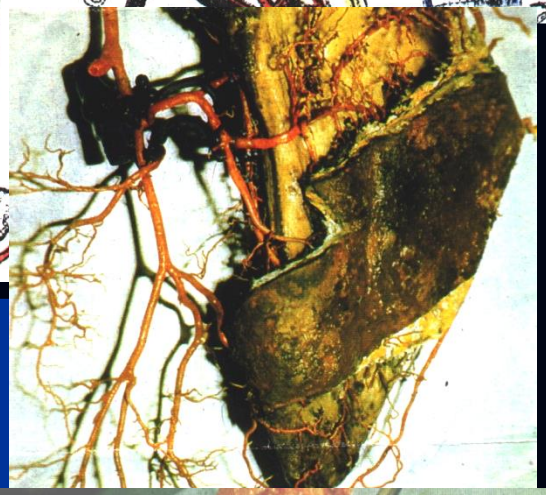

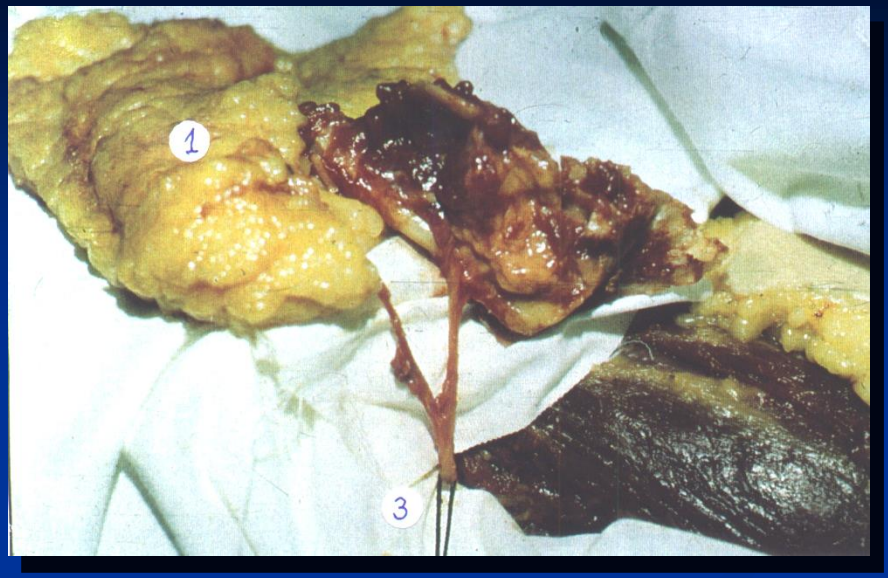
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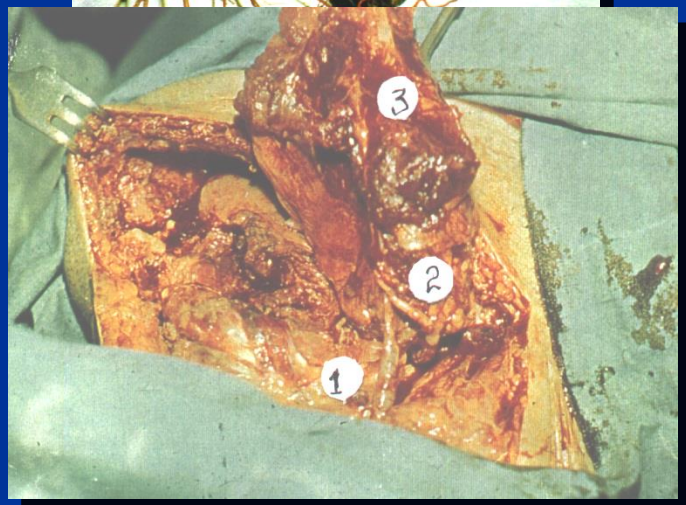
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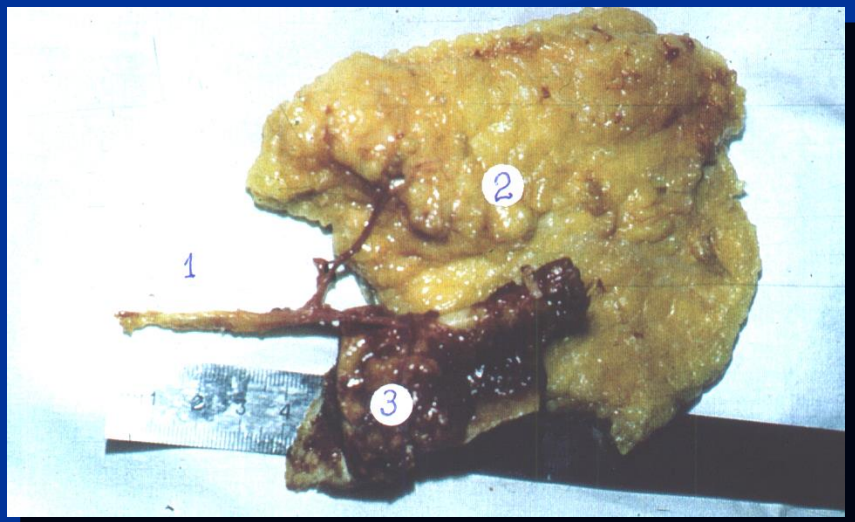
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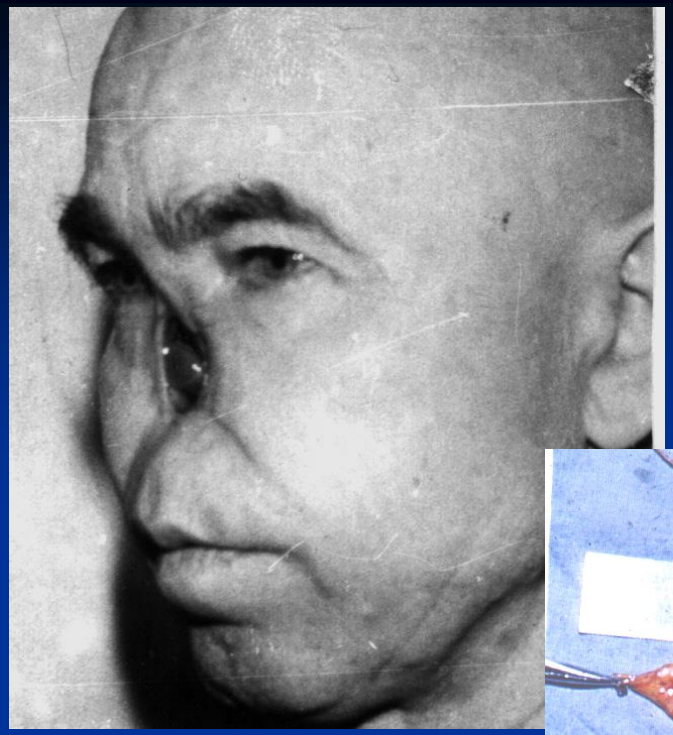

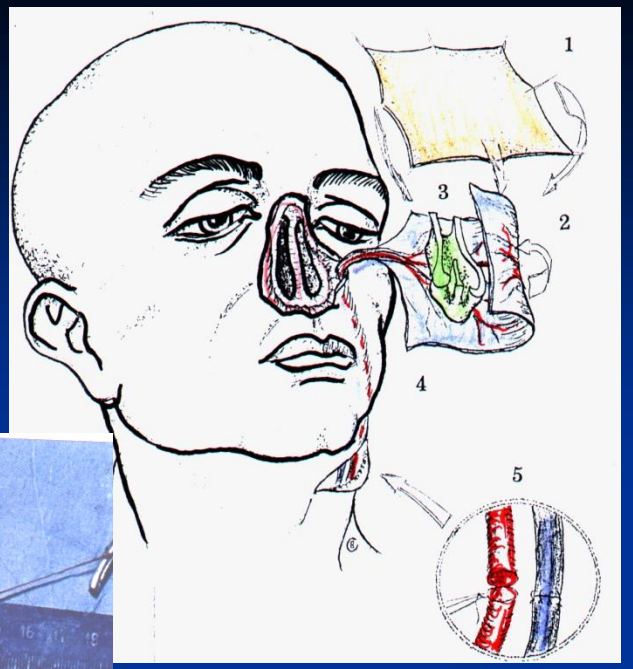
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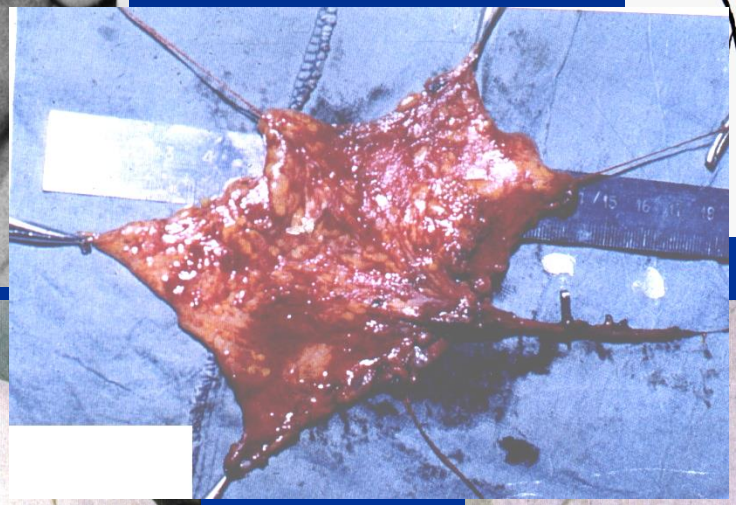
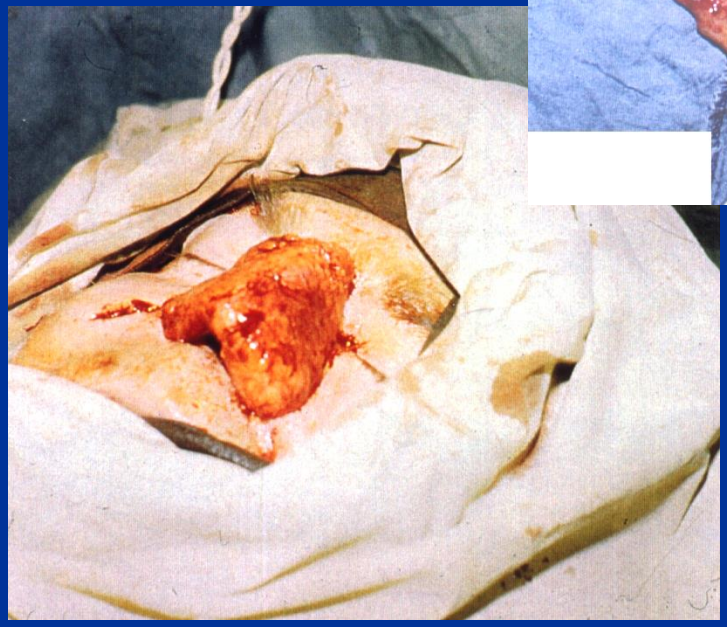
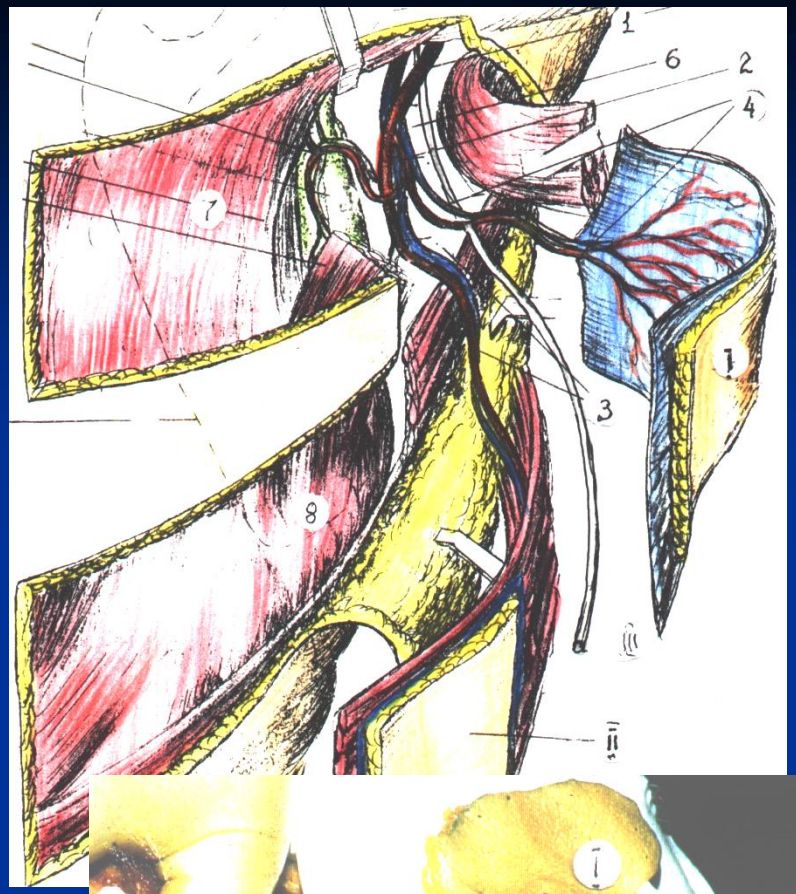




Angiosomal multy-flaps autografts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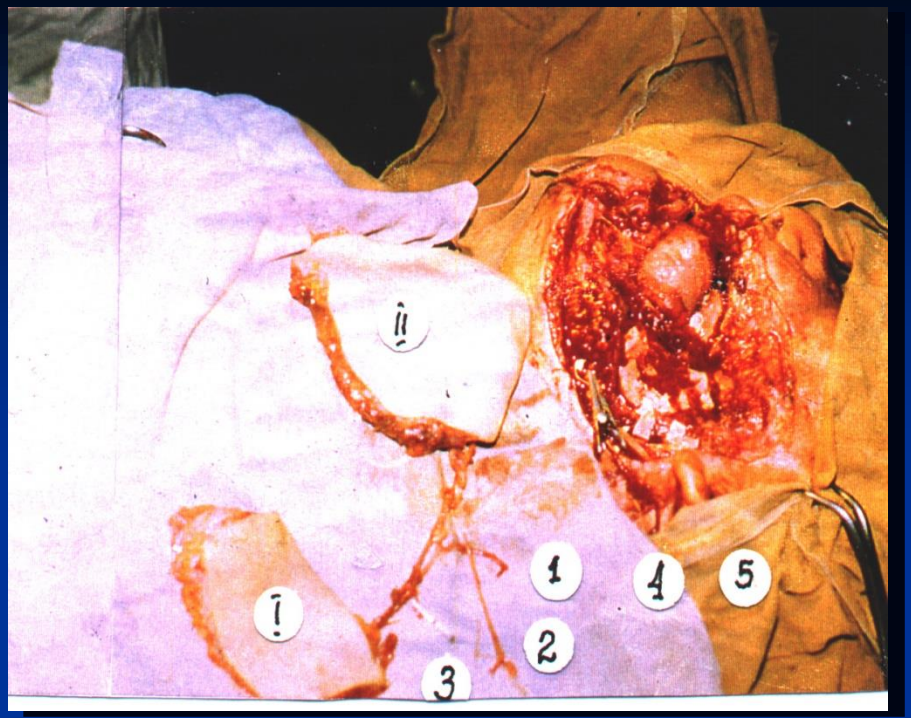
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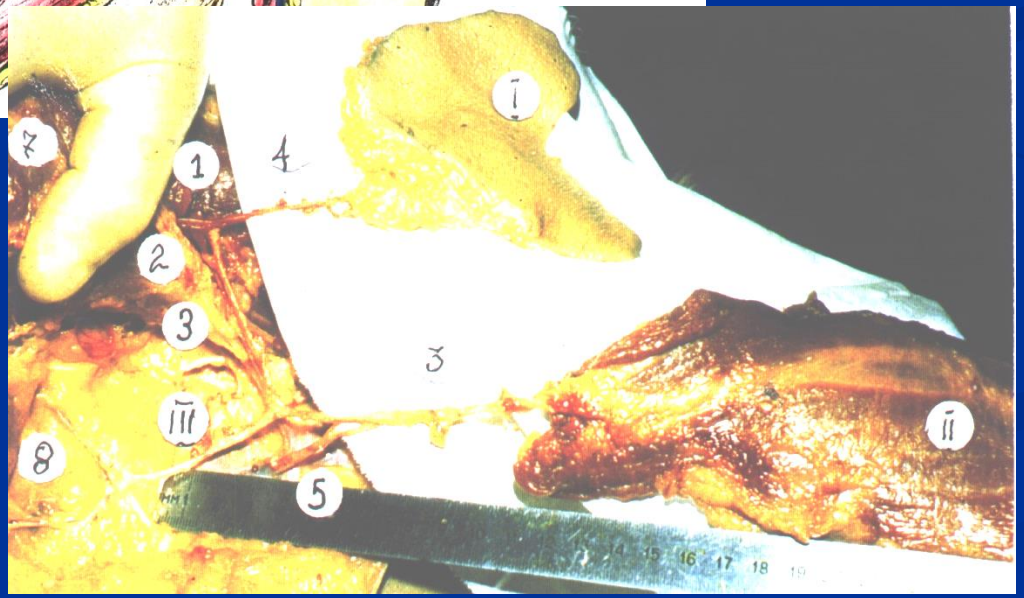
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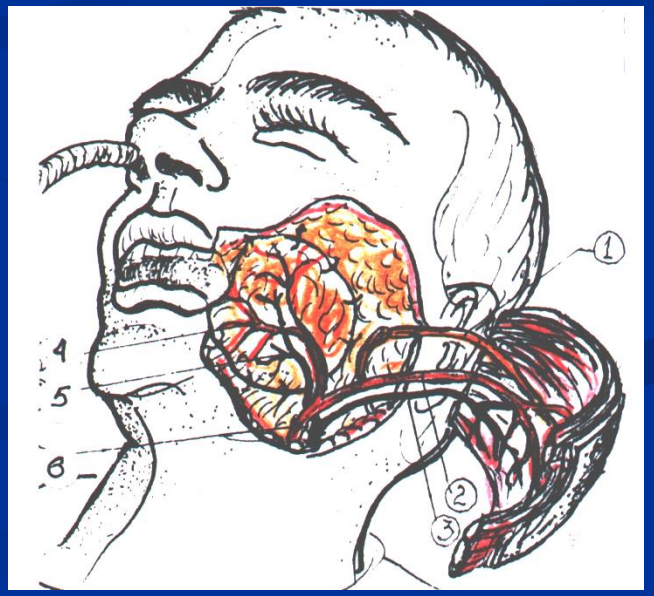
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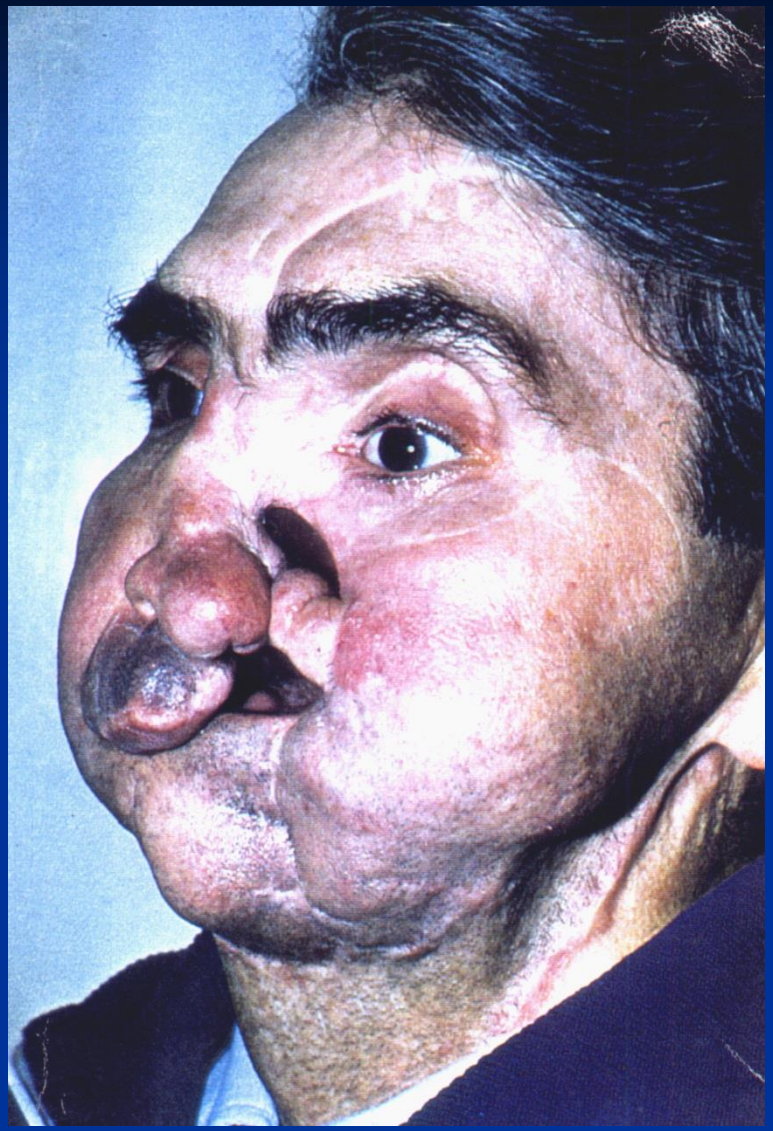

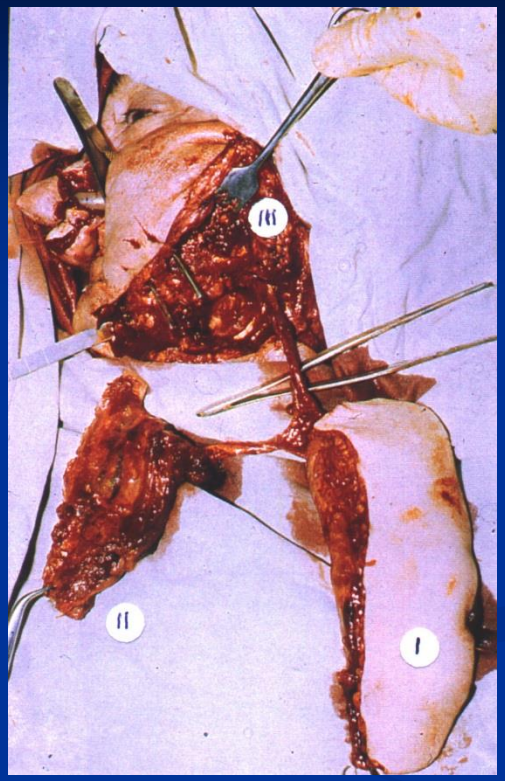
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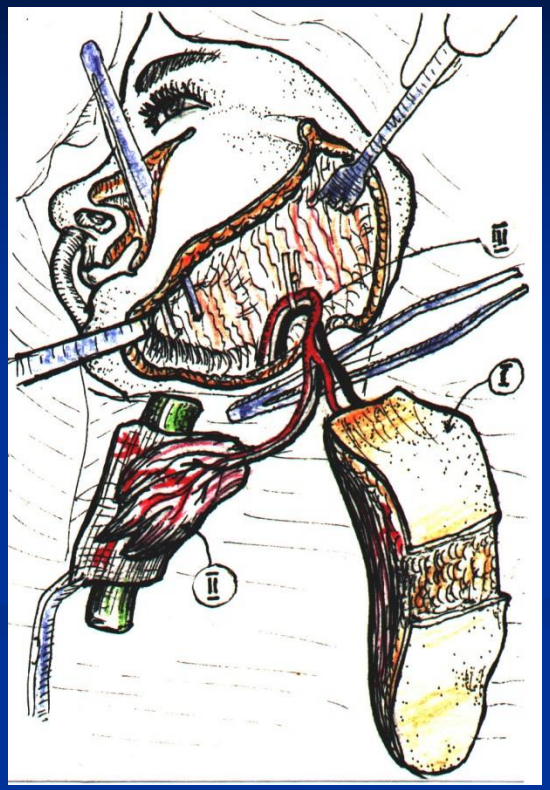
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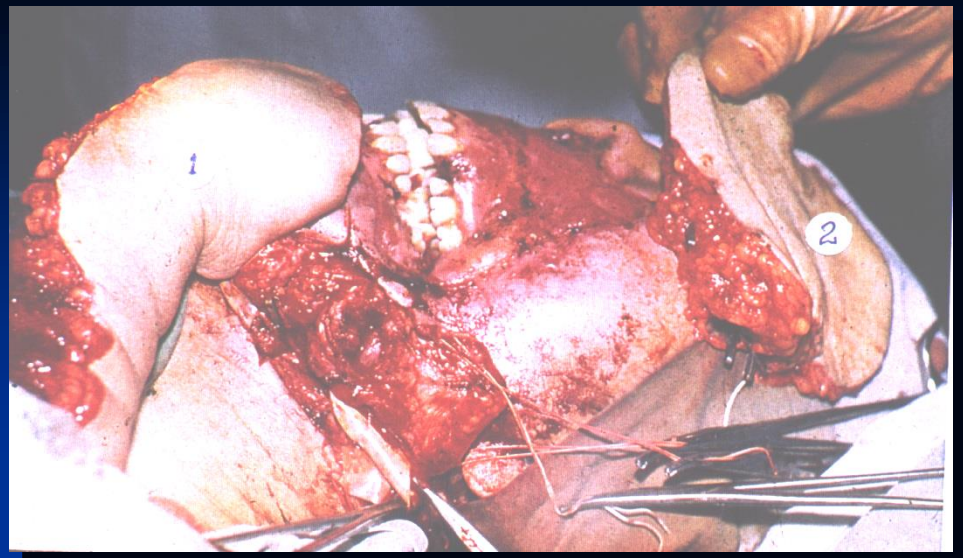
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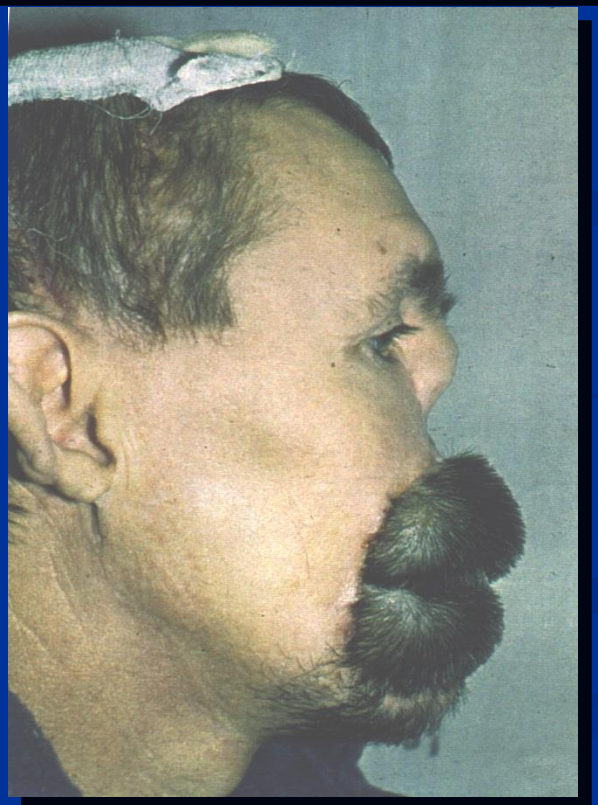
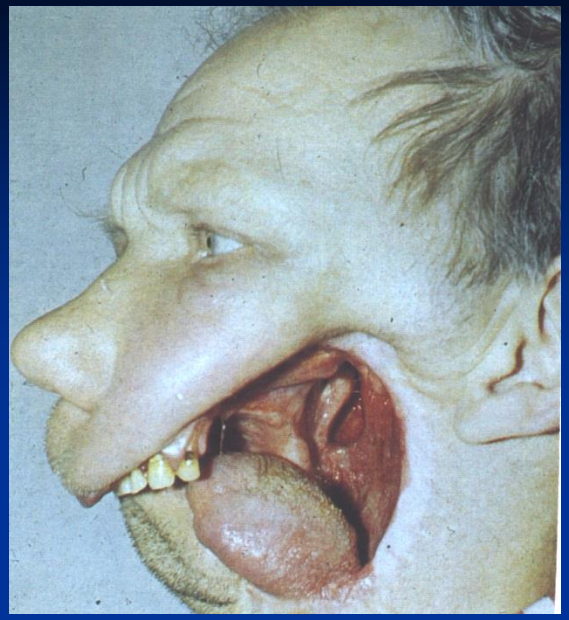
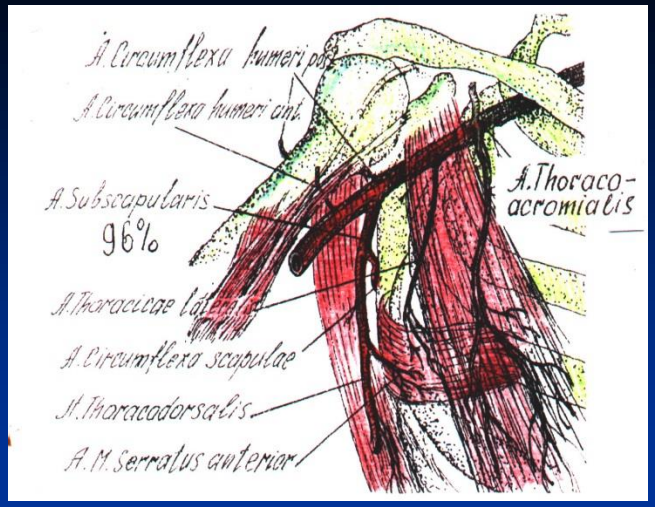
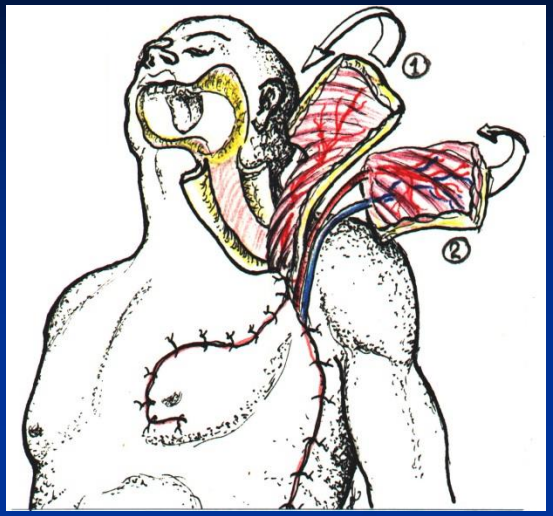





A. Circumflexa humeri post.
A. Circumflexa humeri ant.
A. Thoraco-acromialis
A. Subscapularis
96%
A. Thoracicae lat.
A. Circumflexa scapulae
M. Thoracodorsalis
A. M. Serratus anterior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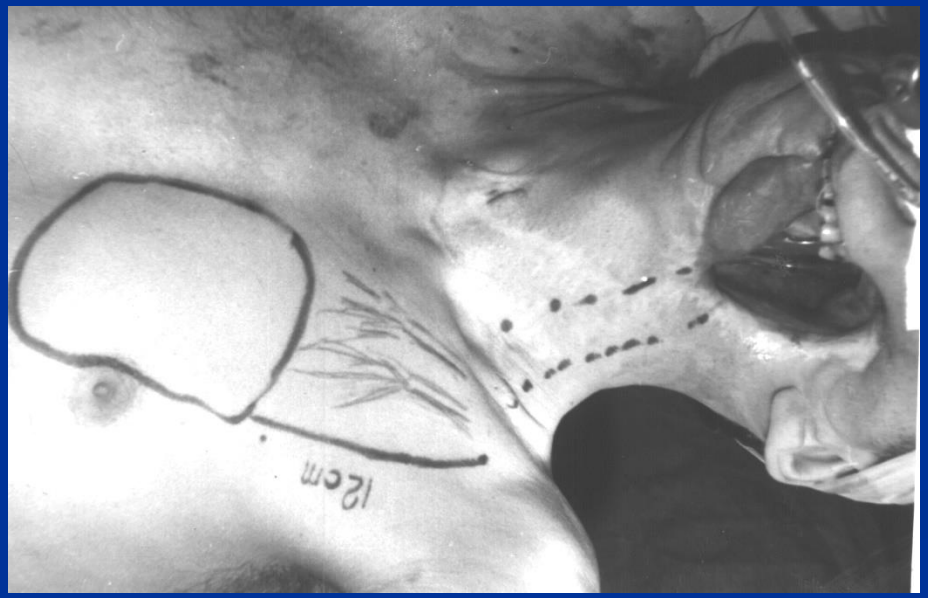

12cm

Tissue engineering involves three main areas:

1. Cultivation of cells and tissues.

2. The three-dimensional matrix in tissue engineering.

3. Biological materials used in tissue engineering.

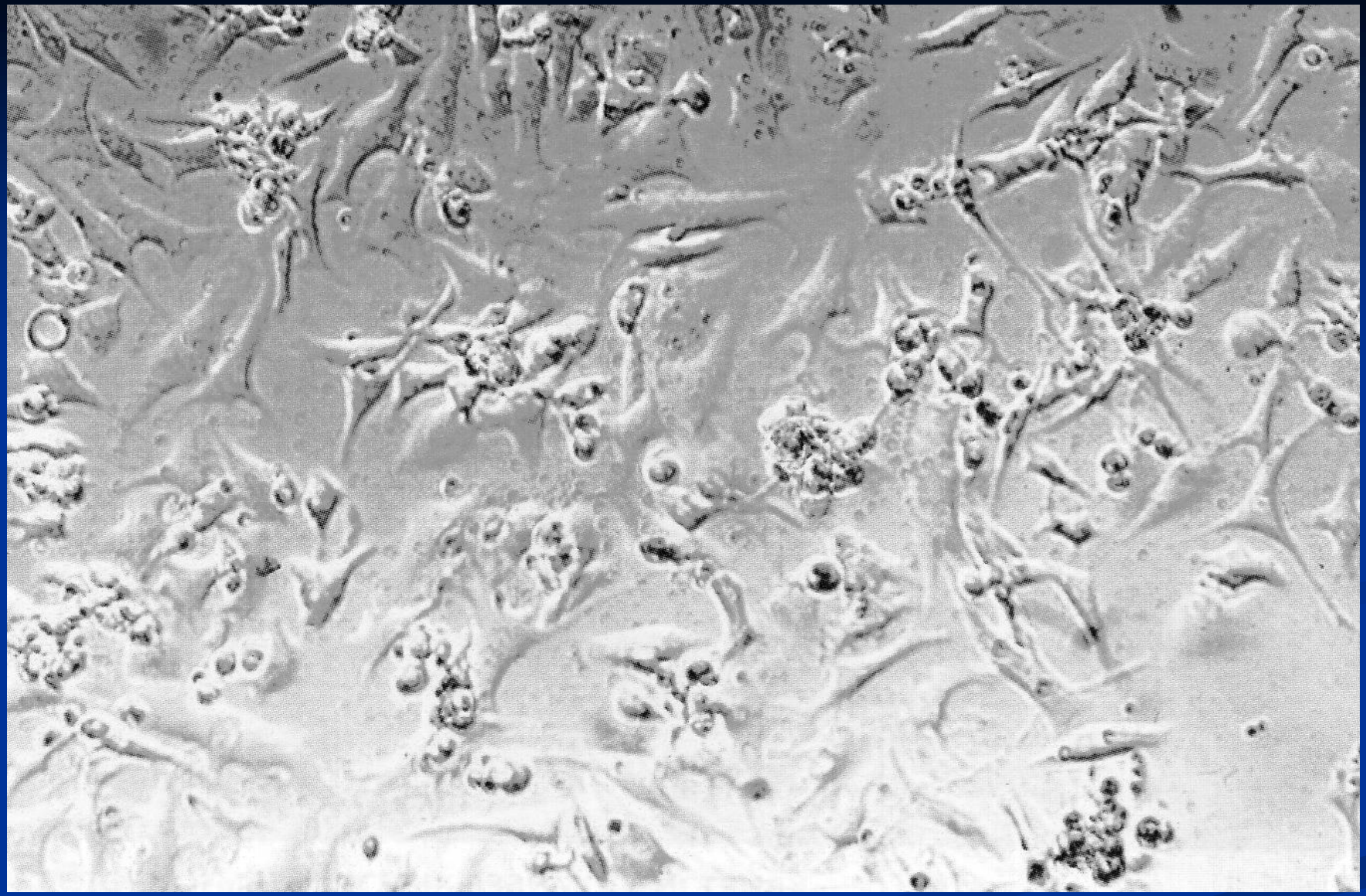
collagen Abundant protein in the human body. They provides tissue strength at strain. Plays an important role in cell adhesion and differentiation.	Collagen I - XII types of collagen family includes 12 subgroups differing supramolecular structure.
proteoglycans provide elasticity of the extracellular matrix. Involved in cell adhesion, migration and proliferation.	Hyaluronic acid, chondroitin sulfate, dermatan sulfate, keratan sulfate, heparan sulfate, heparin, etc.
Glycoproteins give the stability to tissues. Have binding sites for collagen and proteoglycans, as well as cell surface receptors. Important for cell adhesion, migration, proliferation and differentiation.	Fibronectin, laminin, vitronectin, thrombospondin, tenascin, chondronectin, von Willebrand factor, etc.
elastic filaments Provide flexibility tissues.	elastin

Biological properties.	Biological compatibility, ability to adhesion of cells, the host immune response directed against the biomaterial, the risk of disease transmission; possible bioactivity, including binding of growth factors.
Mechanical properties.	Resilience to deformation, the pore size, the ratio of surface - pores, pore permeability.
Chemical properties.	Surface properties, the ability to change under the influence of adhesion molecules, the decay rate, hydrophobicity - hydrophilicity.
Production factors.	Cost, technical complexity, reproducibility, sterilization.

Tissue engineering - one of the most perspective sectors in modern plastic surgery, so-called regenerative or stimulating surgery.

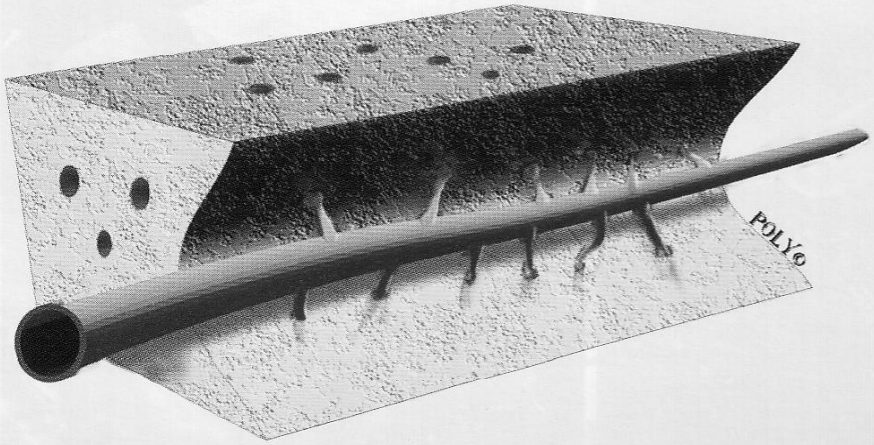
- In tissue engineering there are two basic methods:

- 1. In vivo: stimulation of multiplication of cells under the influence of their own respective biomaterials or growth factors (restore) the lost function by gene therapy.
- 2. In vitro: use of cells able to grow and multiply in culture. These cells are placed in the foundation (supporting three-dimensional matrix consisting of hyaluronic acid, collagen, chitosan or synthetic components in the case of culturing fibroblasts or keratinocytes).



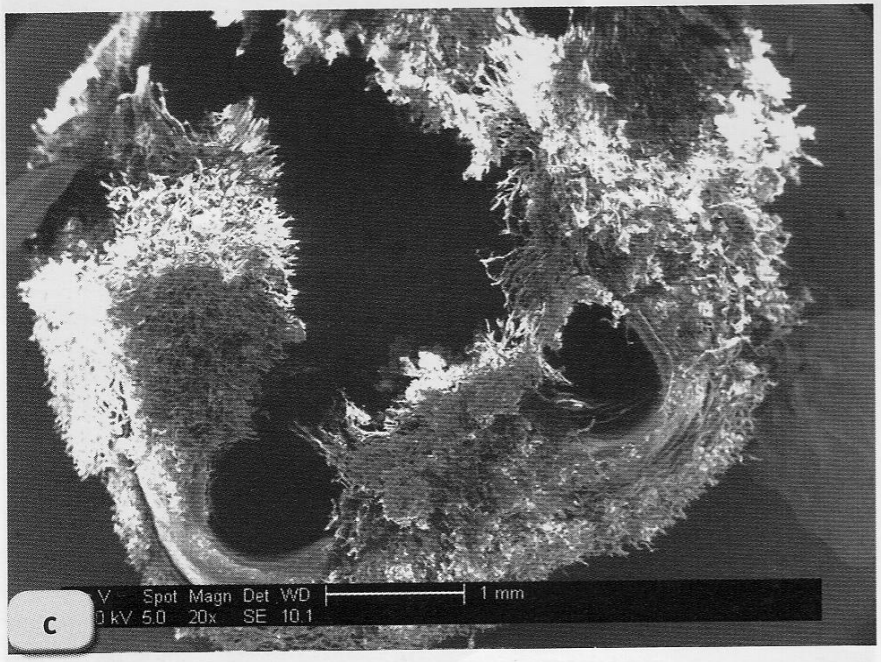
Human chondrocytes in monolayer culture, the fifth day, in vitro

Autologous flap of organotipical surrogate based on HYAFF.



a

b



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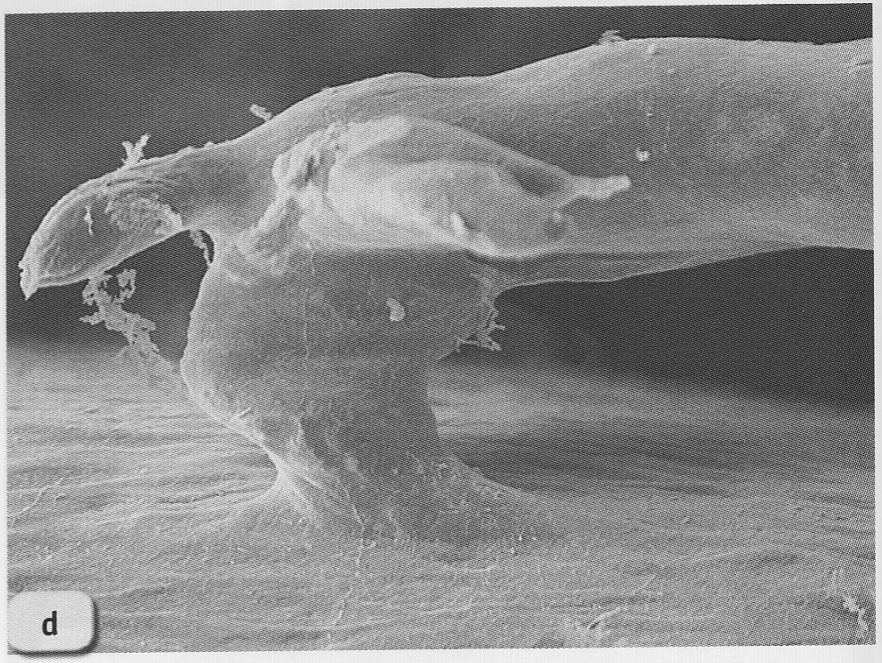

d

Questions for discussion of the lecture

1. What classifications of deformations do you know?
2. Deformations. What etiological factors do you know?
3. What diagnosis is required for maxillofacial localization deformities?
4. Modern principles of transplantation of tissues. What do you know about this?
5. Principles of reconstructive microsurgery. What are the main principles?

Thank you for attention!