- *Bleeding is major question of surgery*
- *Every doctor must be able to help patient with bleeding and stop of external bleeding*
- *Surgery and gynecologist meet bleding every day*

Theme of lecture

Bleeding

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Plan of lecture

- **Classification of haemorrhages**
- **Clinical picture of haemorrhages**
- **Determination of volume of losen blood**
- **Control of haemorrhage**

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Dangers of haemorrhages

- **A fast decrease in blood circulating volume can cause development of Hemorrhagic shock**

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Dangers of haemorrhages

- Hemorrhagic shock **and**
- **Acute anaemia because of loss of erythrocytes**

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Dangers of haemorrhages

- Hemorrhagic shock
- Acute anaemia
- **Accumulation of blood in skull or pericardium is dangerous for life because of**

Squeezing of life-important organs (brain, heart)

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Dangers of haemorrhages

- Hemorrhagic shock
- Acute anaemia
- Squeezing of life-important organs (brain, heart)
- **Development of purulent complications: peritonitis / empiema in case of accumulation of blood in abdominal / pleural cavity**

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Dangers of haemorrhages

- Hemorrhagic shock
- Acute anaemia
- Squeezing of life-important organs (brain, heart)
- Development of purulent complications

- Injury to the major cervical or thoracic vessels can lead to

Air-embolism (occurs as a result of air entering the neck veins through the laceration, which subsequently reaches the right cardiac chambers to finally obstruct the branches of the pulmonary artery)

Classification of haemorrhages

- On mechanism
  - mechanical (disruption or erosion of a vessel)
  - neurotrophic (increased permeability of vessels as a result of vascular wall pathology, which can be secondary to various diseases)

Classification of haemorrhages

- On mechanism
- **On cause**
  - haemorrhage per rexin (as a result of mechanical damage to the vessel);
  - haemorrhage per diabrosin results from erosion of blood vessels (by a tumour, in tissue necrosis and in infections);
  - haemorrhage per diapedesin due to a defect in the permeability of the vascular walls.

Classification of haemorrhages

- On mechanism
- On cause
- **On type of injured vessel**
  - Arterial (**bright red)**
  - Venous (**dark red)**
  - Capilary
  - Parenchymal (**capillary type of bleeding from an organ like the liver)**

Classification of haemorrhages

- On mechanism
- On cause
- On type of injured vessel
- **On time of beginning**
  - primary (results from an injury to a vessel);
  - secondary

    - ***early*** *(*occurs if a clot breaks away from the vessel because of a rise in blood pressure)

Classification of haemorrhages

- On mechanism
- On cause
- On type of injured vessel
- **On time of beginning**
  - primary (results from an injury to a vessel);
  - secondary

- *early* ***late*** (is due to clot dissolution to pyogenic infection or erosion of the vascular wall)

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Classification of haemorrhages

- On mechanism
- On cause
- On type of injured vessel
- On time of beginning
- **On place of haemorrhage**
  - external
  - internal

Signs

- **General**
  - **extreme pallor of the skin and visible mucous membranes**
  - **blurred vision;**
  - **dizziness;**
  - **thirst;**
  - **drowsiness;**
  - **fainting (in severe cases);**
  - **tachycardia (120-140 beats per minute);**
  - **hypotension.**

External bleeding

- General signs
- **Local signs**

  When a major vessel is damaged, the affected limb :

  - **becomes ischemic, pale and cold on touch**
  - **its sensation is impaired**
  - **distal pulses are not palpable**

Internal bleeding

- General signs
- **Local signs (vary with the location of**
- **the bleeding vessel)**

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Internal bleeding

- **Into a hollow organ ⟹ discharge via a natural opening outside**
- **is always difficult to determine**
- **color and type of blood is great importance**

Internal bleeding

- **Into a hollow organ**
  - foamy bright red blood (in bleeding from the lung);
  - ground coffee-like vomitus (in gastric or duodenal haemorrhage);
  - *melaena,* or black stools (in bleeding from the upper Gastrointestinal tract);
  - bright red blood coming from the rectum (in bleeding from the sigmoid or rectum);
  - haematuria (in bleeding from the kidney or urinary tract).

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Specific diagnostic procedures to locate the bleeding vessel

- **passing a probe into the stomach**
- **digital per rectum examination**
- **endoscopic methods (bronchoscopy in diseases of the lung, oesophagogastroduodeno-, rectosigmoido-, and colonoscopies for gastrointestinal haemorrhages, cystoscopy for diseases of the urinary tract**
- **ultrasound**
- **X-ray**
- **radioisotope method**

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Specific diagnostic procedures to locate the bleeding vessel

- **passing a probe into the stomach**
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- **ultrasound**
- **X-ray**
- **radioisotope method (radioactive isotope injected intravenously accumulates, together with the haemorrhaged blood, in a tissue, cavity or hollow organ. An increase in radioactivity at the area damaged is found during radiometry)**

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Internal bleeding

- Into a hollow organ
- **into body cavity**
  - **haemoperitoneum**
  - **haemotorax**
  - **haemopericardium**
  - **intracranial haemorrhage**
  - **haemartrosis**

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haemoperitoneum

- Is accumulation of blood in the abdominal cavity
- is associated with:
  - lacerations and blunt injuries to the parenchymal organs (the liver, spleen) or mesenteric vessels;
  - rupture of an ectopic pregnancy or an ovarian cyst,
  - loosening of the ligature placed on a bleeding vessel

The local signs of the haemoperitoneum

- restricted abdominal breathing;
- abdominal pain;
- slight rigidity of the abdominal wall;
- mild peritoneal symptom (Blumberg's sign);
- dull tympanitic sound over the areas of blood accumulation (when about 1,000 ml are accumulated)

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Laparoscopy for diagnostic of the haemoperitoneum

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haemotorax

- Is accumulation of blood in the pleural cavity
- results from:
  - injuries to the chest and lung
  - surgical manipulations
  - diseases of the lung and pleura (tuberculosis, tumours, etc.)

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Internal bleeding

- Into a hollow organ
- into body cavity
- **accumulation of blood within tissues (haematoma)**

(most dangerous haematomas commonly result from the damage to the major blood vessels)

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Internal bleeding

- Into a hollow organ
- into body cavity
- **accumulation of blood within tissues (haematoma)**

If there are connection to an arterial lumen

Pulsating haematoma

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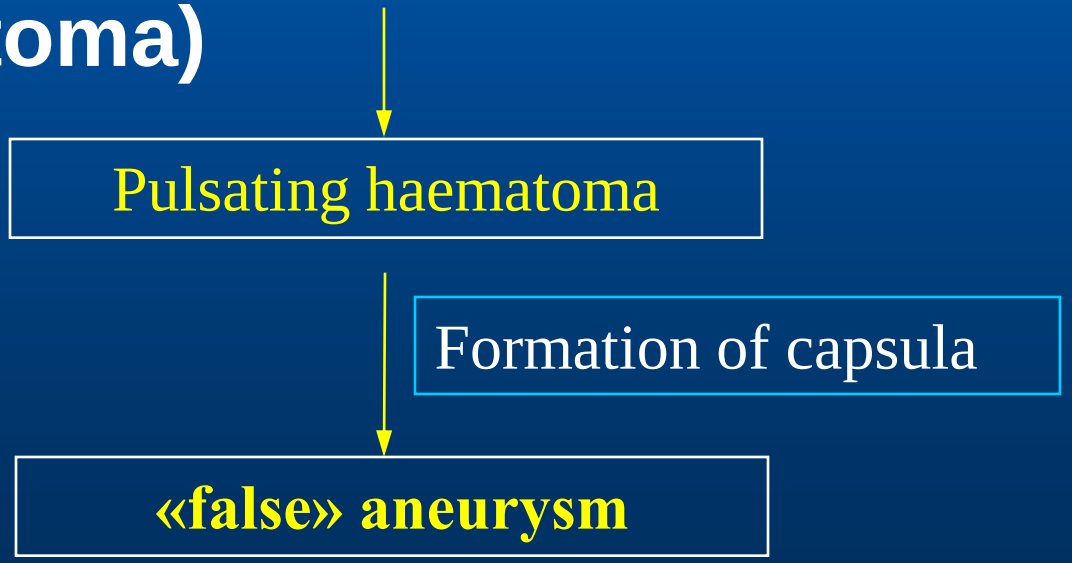
Internal bleeding

- Into a hollow organ
- into body cavity
- **accumulation of blood within tissues (haematoma)**



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Characteristics of pulsating haematoma

- the pulsation over the swelling is synchronous with the pulse rhythm
- the presence of a blowing systolic murmur on auscultation

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Acute haemorrhage. Shock

- development of shock depends on the intensity, duration of bleeding and the volume of blood loss.
- A fast decrease 30% blood circulating volume can cause acute anaemia, hypoxia of the brain that can be fatal.
- When bleeding persists for a long period but in smaller amounts, there are only few circulatory changes, and the patient can live with as low as 20 g/1 of hemoglobin

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Acute haemorrhage. Maintaining of haemodynamics

reduction in blood circulating volume

↓

decrease in venous pressure and the heart ejection force

↓

stimulating adrenal secretion of catecholamines

↓

vascular spasm and a reduction in vascular volume

↓

maintaining of haemodynamics in a safe state

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The four degrees of blood loss

- mild — a reduction in blood circulating volume of 10-12%, or 500-700 ml of blood;
- moderate — a reduction in blood circulating volume of 15—20%, or 1,000—1,400 ml of blood;
- severe - a reduction in blood circulating volume of 20—30%, or 1,500—2,000 ml of blood;
- massive — a reduction in blood circulating volume of more than 30%, or more than 2,000 ml of blood.

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Determination of blood loss volume

- = 57% of mass of balls and napkins, which were used at the operation
- on blood specific gravity:

  = 37x (1,065 - «blood specific gravity»)
- on blood viscosity (V) and hematocrit (Ht):

  for men = 1000 x V + 60 x Ht - 6700

  for women = 1000 x V + 60 x Ht - 6060

Laboratory investigations

- **Checking for levels of the red blood cells, haemoglobin and haematocrit should be done on admission and repeated afterwards**
- **In severe bleeding, the results of those investigations may not serve as objective indicators of the degree of haemorrhage in the first few hours, since autohaemodilution occurs with time, reaching its maximum within 1-2 days.**

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Methods of haemostasis

- **Temporary**
- **Definitive**

Methods of haemostasis

- **Temporary**
  - **– digital pressure on artery**

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press of femoral artery to pubis

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press of subclavian artery to first rib

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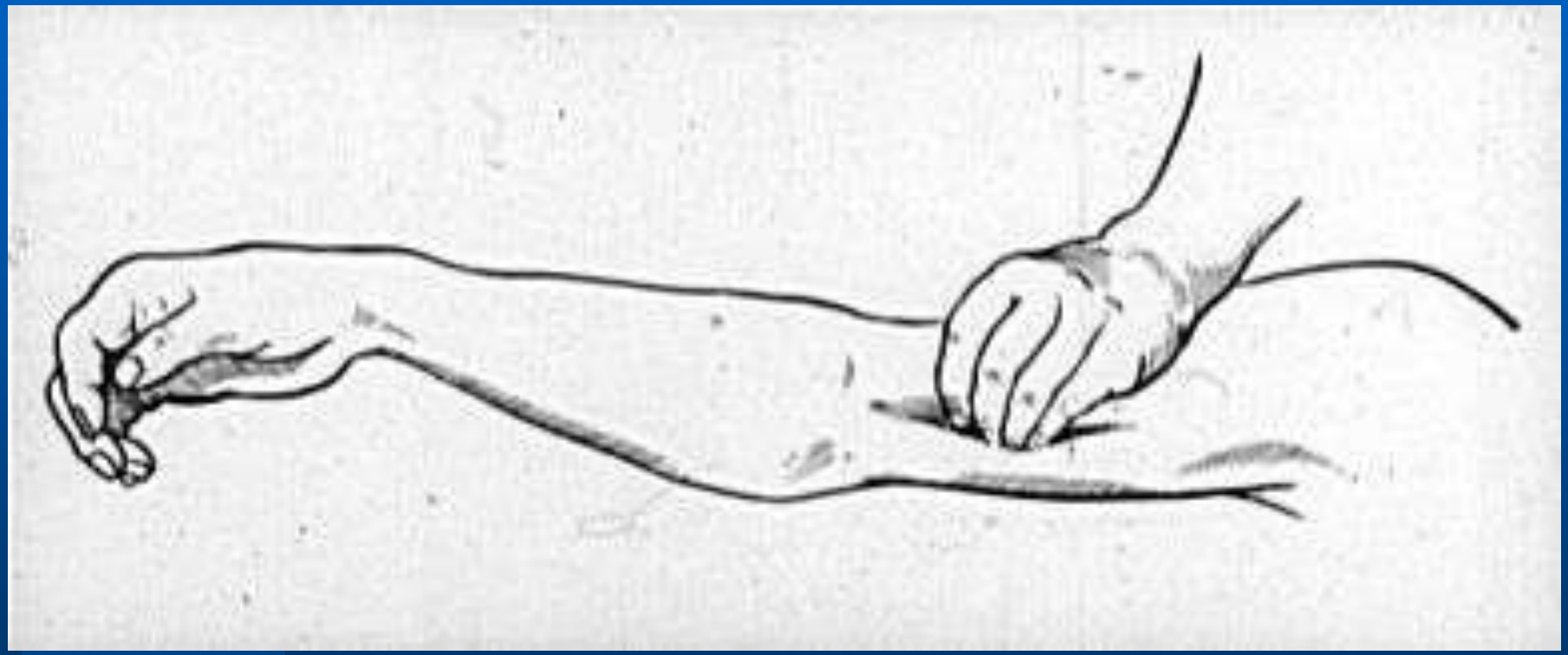
press of brachial artery to humerus



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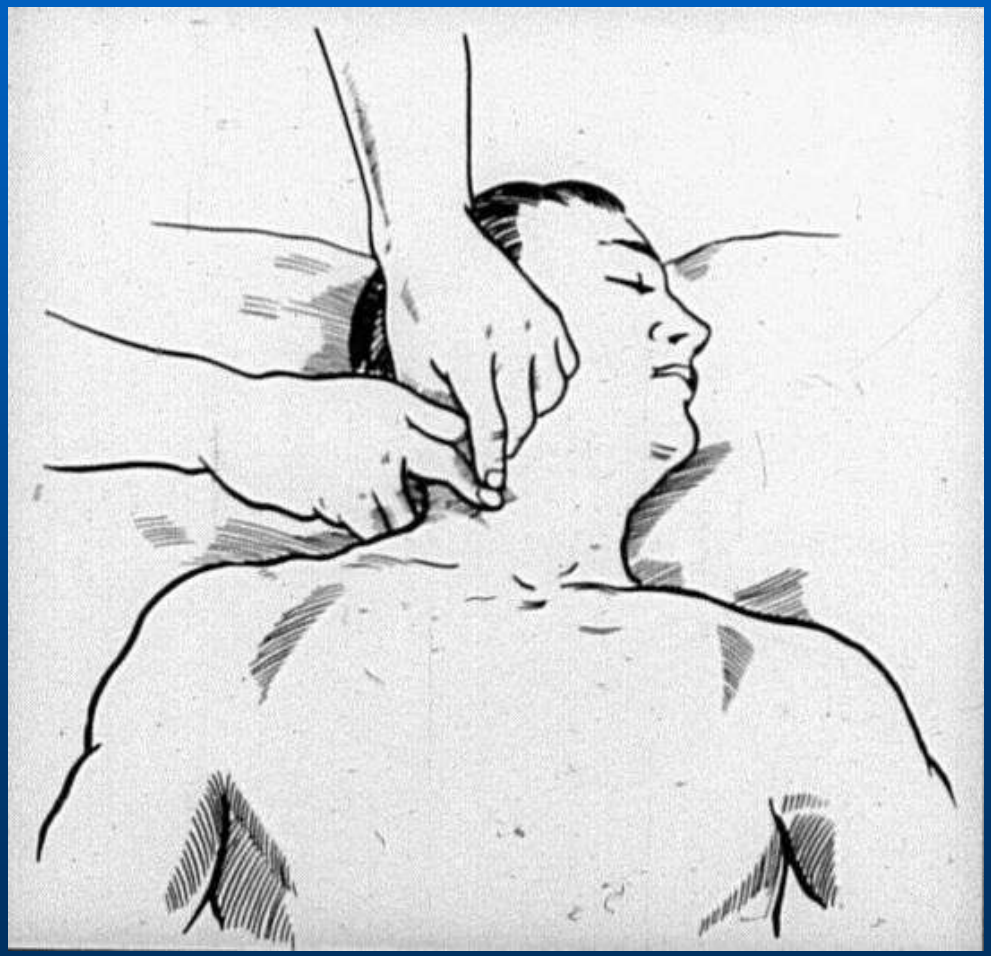
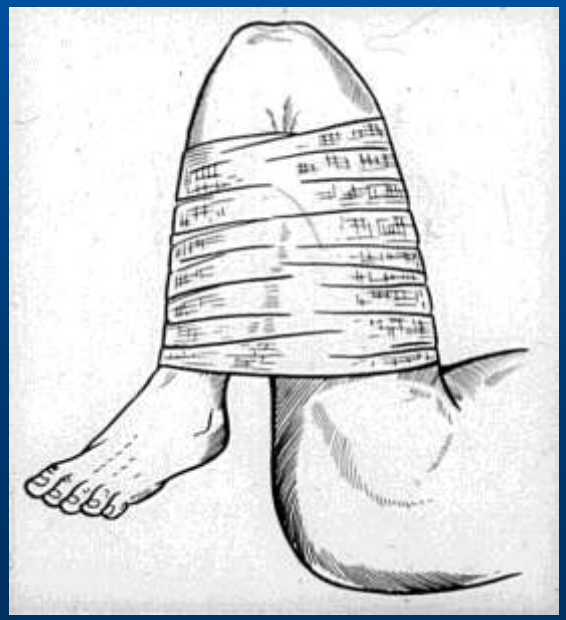
press of carotid artery to the transverse process of the C6 vertebra



Methods of haemostasis

- **Temporary**
  - – digital pressure on artery
  - – **flexion of the limb in a joint**



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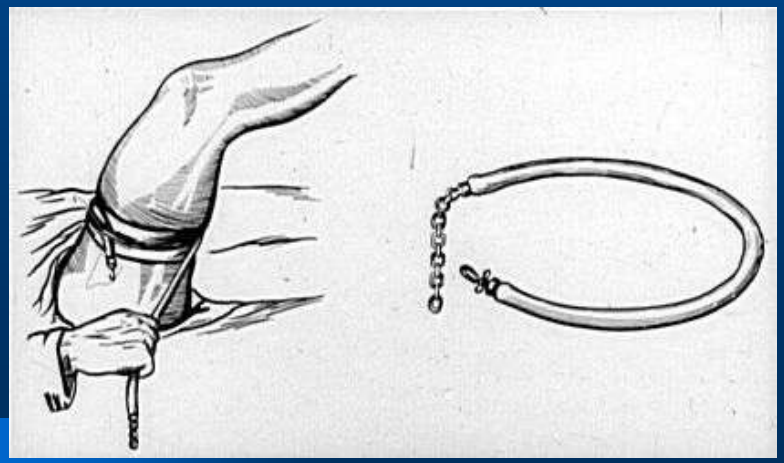
Methods of haemostasis

- **Temporary**
  - digital pressure on artery
  - flexion of the limb in a joint
  - **Wound package**

Methods of haemostasis

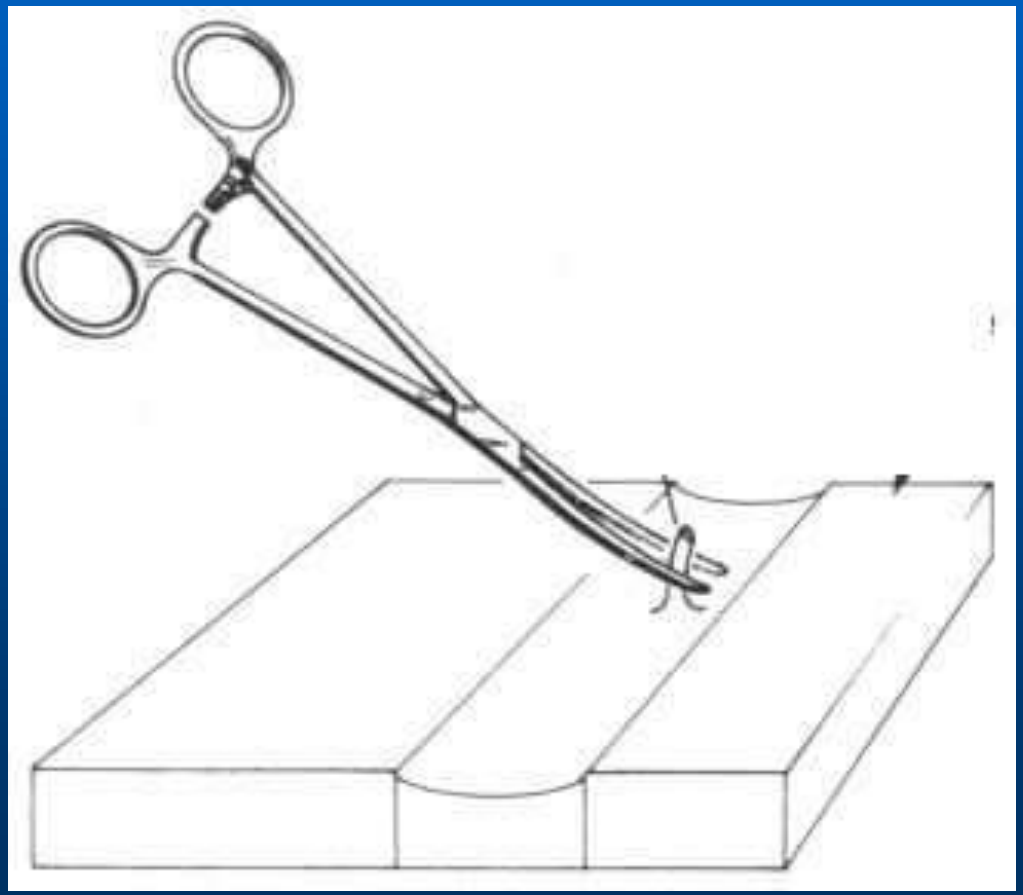
- **Temporary**
  - digital pressure on artery
  - flexion of the limb in a joint
  - Wound package
  - **application of a tourniquet**



Methods of haemostasis

- **Temporary**
  - digital pressure on artery
  - flexion of the limb in a joint
  - Wound package
  - application of a tourniquet
  - **apply the clamp on the bleeding vessel**

apply the clamp on the bleeding vessel



Methods of haemostasis

- Temporary
- **Definitive**
  - Mechanical
    - **ligating the bleeding vessel inside the wound**

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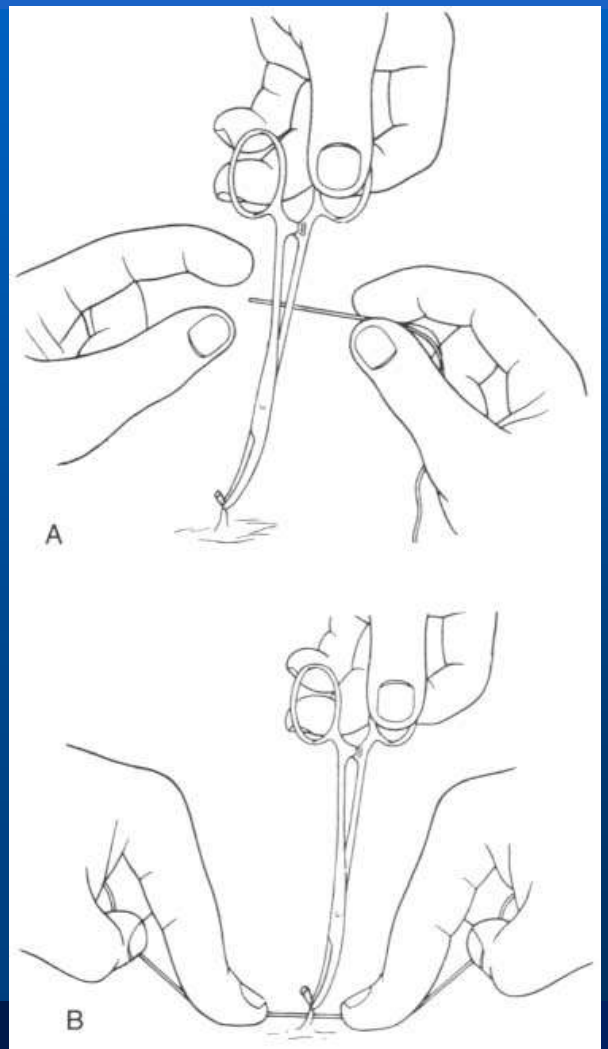
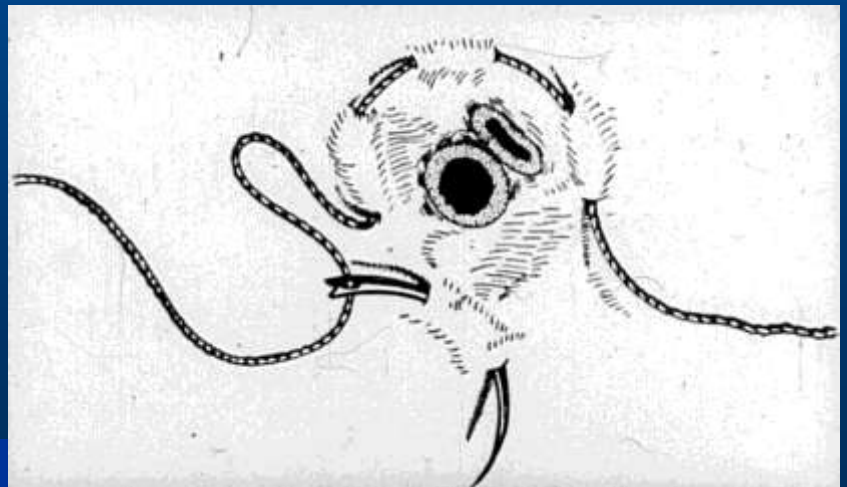
ligating the bleeding vessel inside the wound



Methods of haemostasis

- Temporary
- **Definitive**
  - Mechanical
    - ligating the bleeding vessel inside the wound
    - **suture of wound with bleeding vessel**



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Methods of haemostasis

- Temporary
- **Definitive**
  - Mechanical
    - ligating the bleeding vessel inside the wound
    - suture of wound with bleeding vessel
    - **Ligation of the vessel along its length (is indicated when its ends cannot be identified in the wound. This is also the case in secondary bleeding when the erosed vessel is located in the inflammatory mass)**

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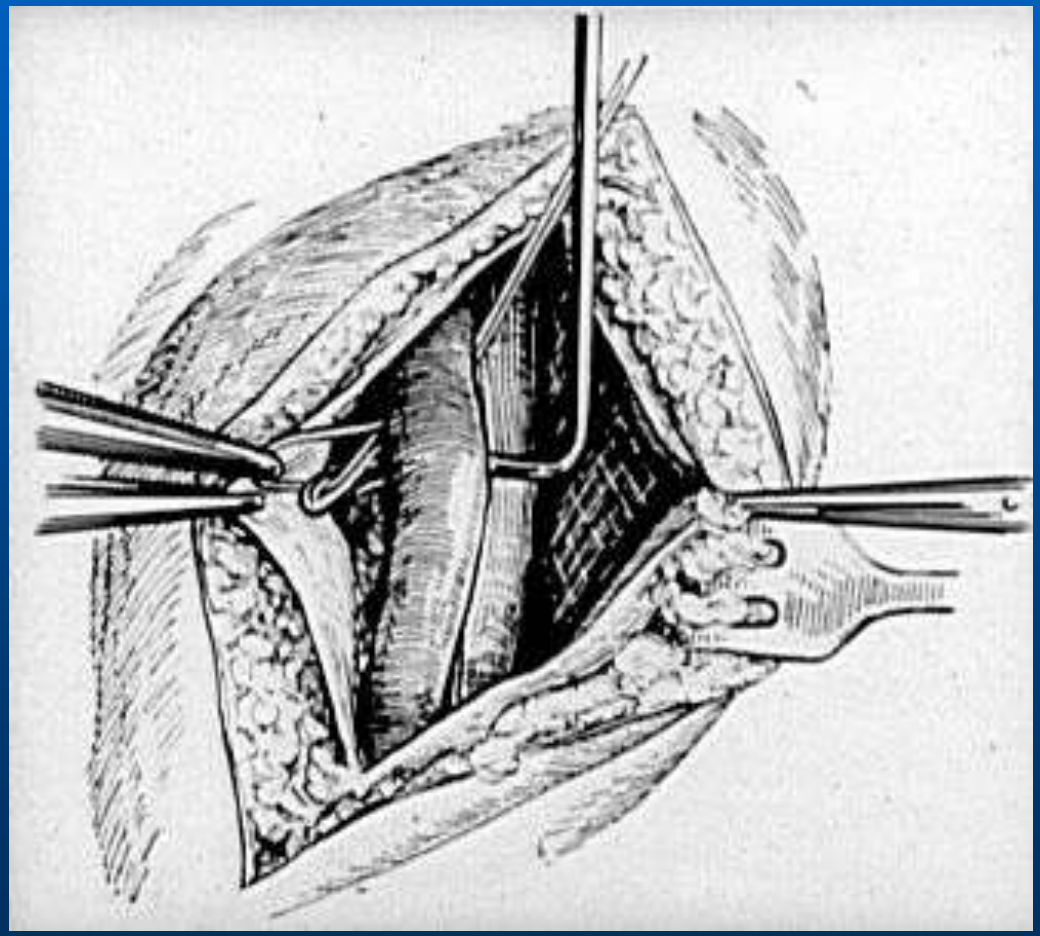
Ligation of the vessel along its length



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Methods of haemostasis

- Temporary
- **Definitive**
  - Mechanical
    - ligating the bleeding vessel inside the wound
    - suture of wound with bleeding vessel
    - Ligation of the vessel along its length
    - **Vascular sutures**

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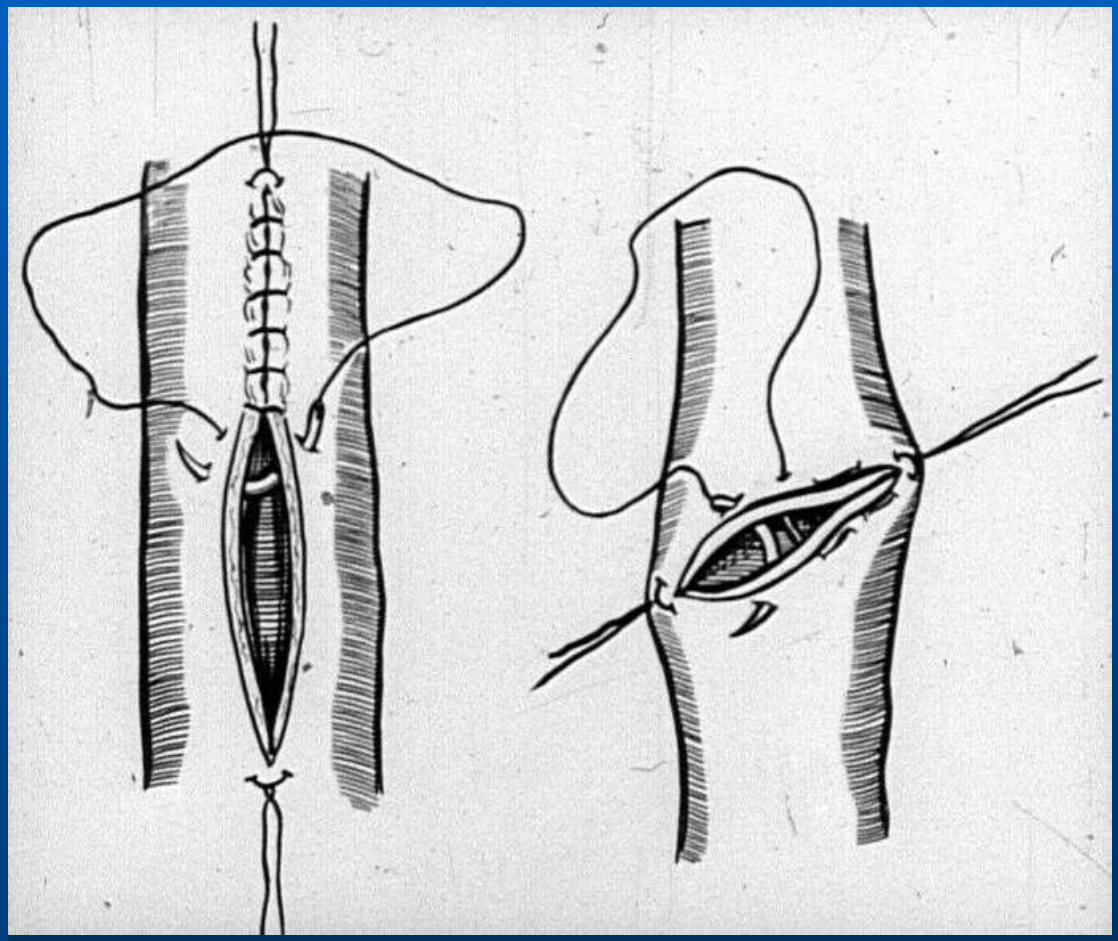
Lateral vascular suture



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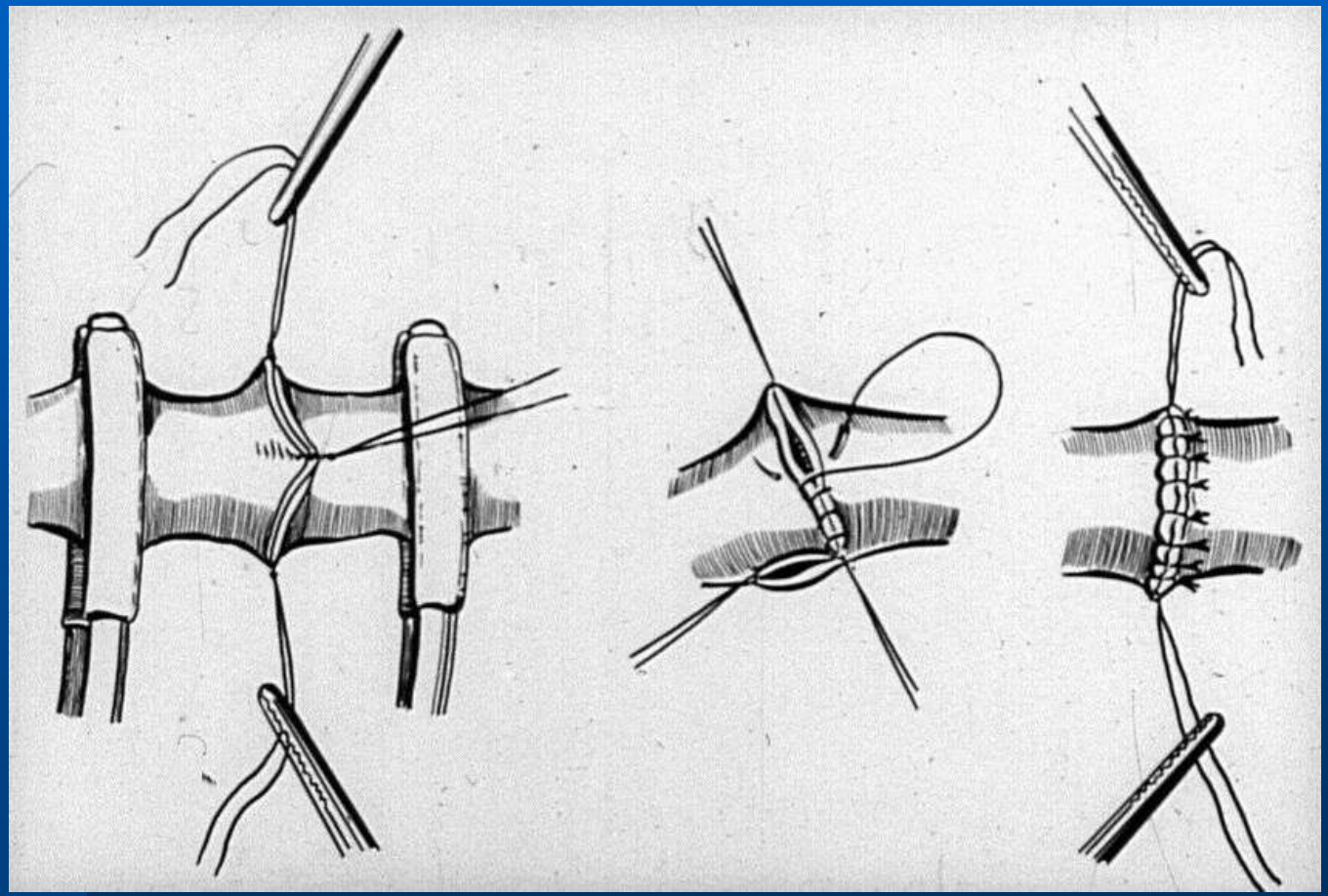
Circular vascular sutures



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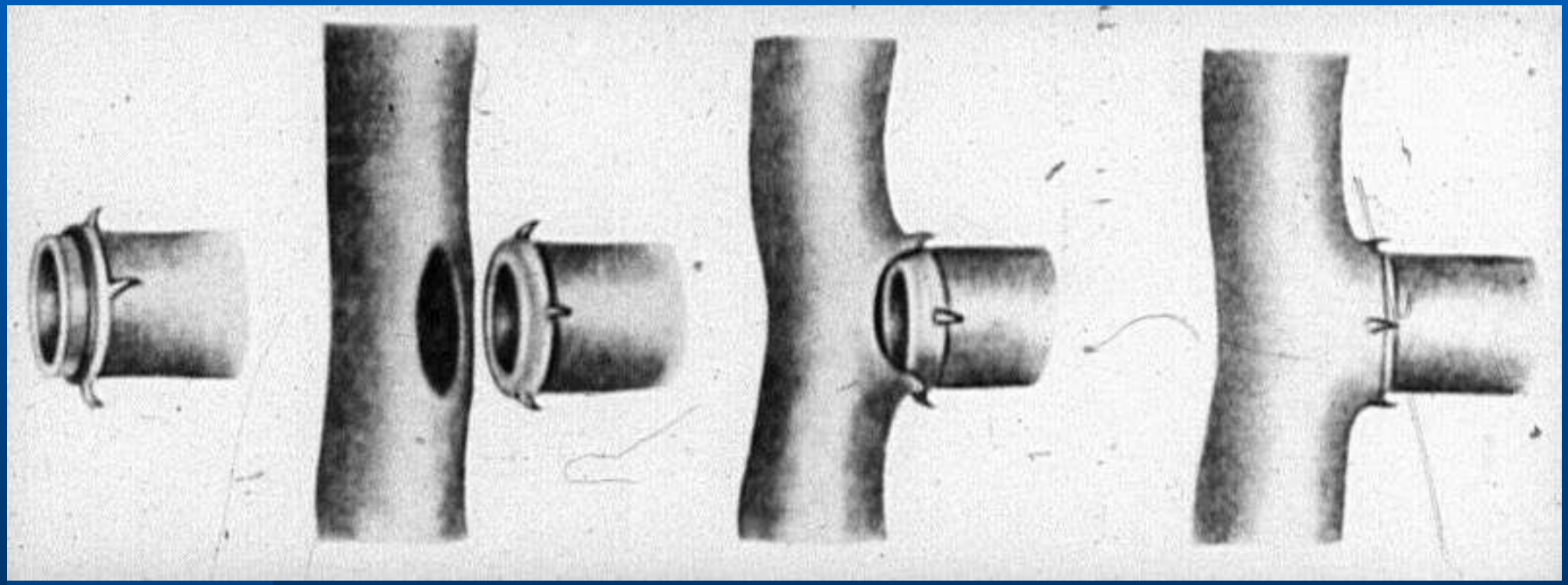
Mechanical vascular suture



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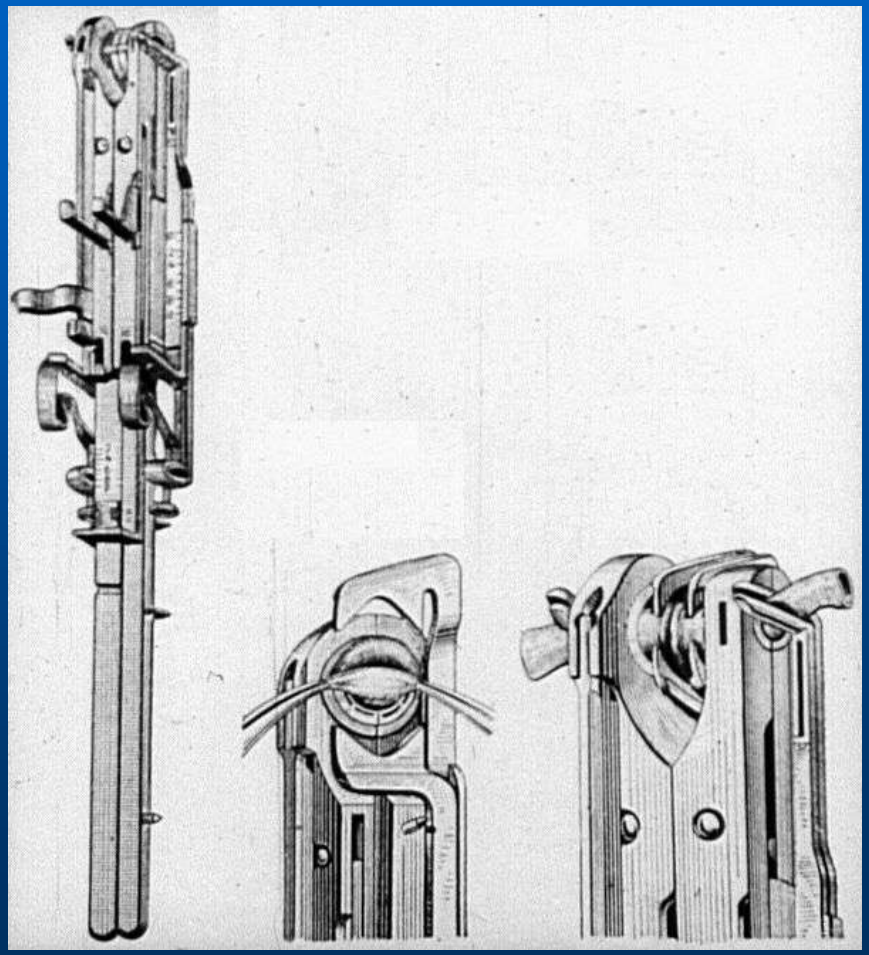
Apparatus for vascular sutures



Methods of haemostasis

- Temporary
- **Definitive**
  - Mechanical
    - ligating the bleeding vessel inside the wound
    - suture of wound with bleeding vessel
    - Ligation of the vessel along its length
    - Vascular sutures
    - **A large tissue defect resulting from the injury can be covered with a patch from biological materials (e.g. fasciae, aponeuroses, muscles and venous walls). An “auto-vein” is most commonly used.**

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Methods of haemostasis

- Temporary
- **Definitive**
  - Mechanical
    - ligating the bleeding vessel inside the wound
    - suture of wound with bleeding vessel
    - Ligation of the vessel along its length
    - Vascular sutures
    - patch from biological materials
    - **auto- ,allotransplants of arteries and veins**
    - **xenotransplants (of synthetic compounds)**

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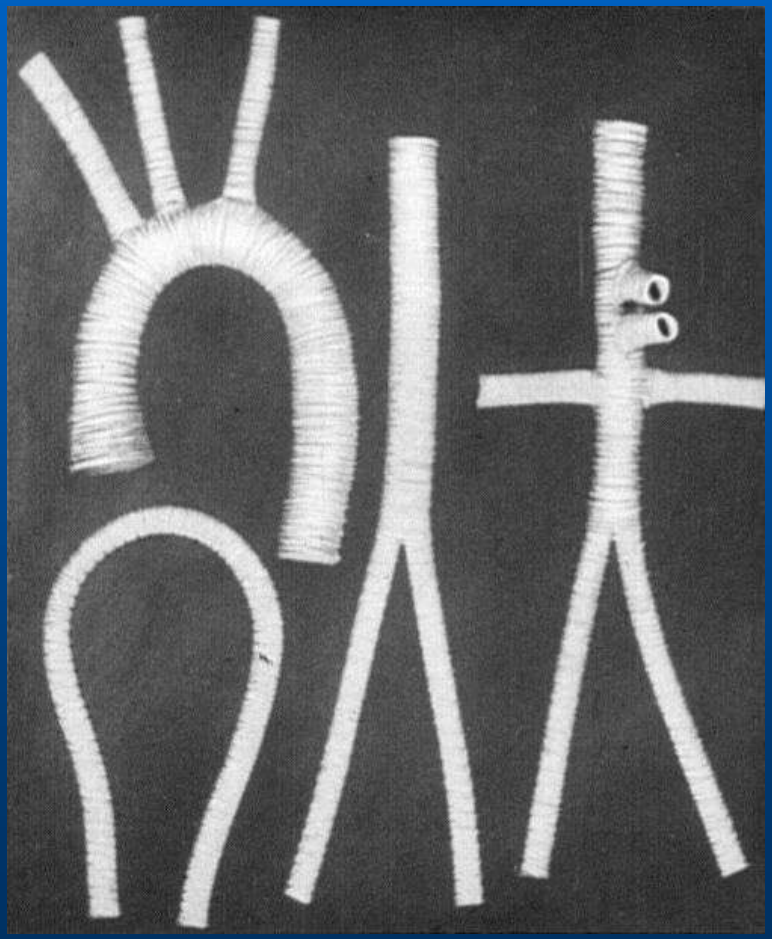
xenotransplants



Methods of haemostasis

- Temporary
- **Definitive**
  - Mechanical
    - ligating the bleeding vessel inside the wound
    - suture of wound with bleeding vessel
    - Ligation of the vessel along its length
    - Vascular sutures
    - patch from biological materials
    - auto- ,allotransplants of arteries and veins
    - xenotransplants (of synthetic compounds)
    - **artificial embolism of vessels**

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Methods of haemostasis

- Temporary
- **Definitive**
  - – Mechanical
  - – **Physical**
    - **Surgical diathermy**
    - **laser coagulation**
    - **ultrasound coagulation**
    - **argon coagulation**
    - **cryosurgery**

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Methods of haemostasis

- **Definitive**
  - Mechanical
  - Physical
  - **Chemical and biological**
    - **fibrinogen, prothrombin complex, anti-haemophilic globulin, cryoprecipitate**
    - **inhibitors of fibrinolysis (trasylol)**
    - **Dicynone (etamsylate)**
    - **Vicasol**
    - **Topical haemostatics (thrombin) is effective in capillary and parenchymal bleedings**


TachoComb
- UNCOMPLICATED HANDLING
- NO THAWING
NO MIXING
NO DISSOLUTION PROCESS
- IMMEDIATE USE
- SUITABLE FOR EMERGENCY CASES
- APPLICABLE BY PRESSURE
- GLUE COMPONENTS CANNOT BE WASHED AWAY BY BLOOD
- SUITABLE ALSO FOR EXTENSIVE INJURIES
- FAST AND SECURE HEMOSTASIS