



BLEEDING

Lecture for general surgery
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Poltava



Definitions

- ✿ **Bleeding (haemorrhage):** is abnormal internal or external loss of blood.
- ✿ **Homeostasis:** tendency of the body to maintain a steady and normal internal environment.
- ✿ **Shock:** is inadequate tissues perfusion and is considered a transition between homeostasis and death.

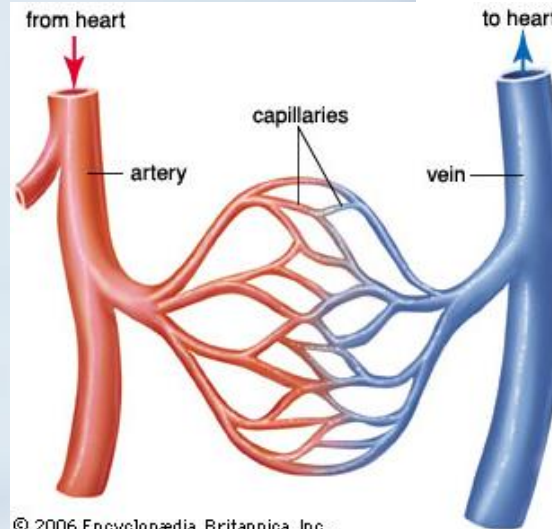
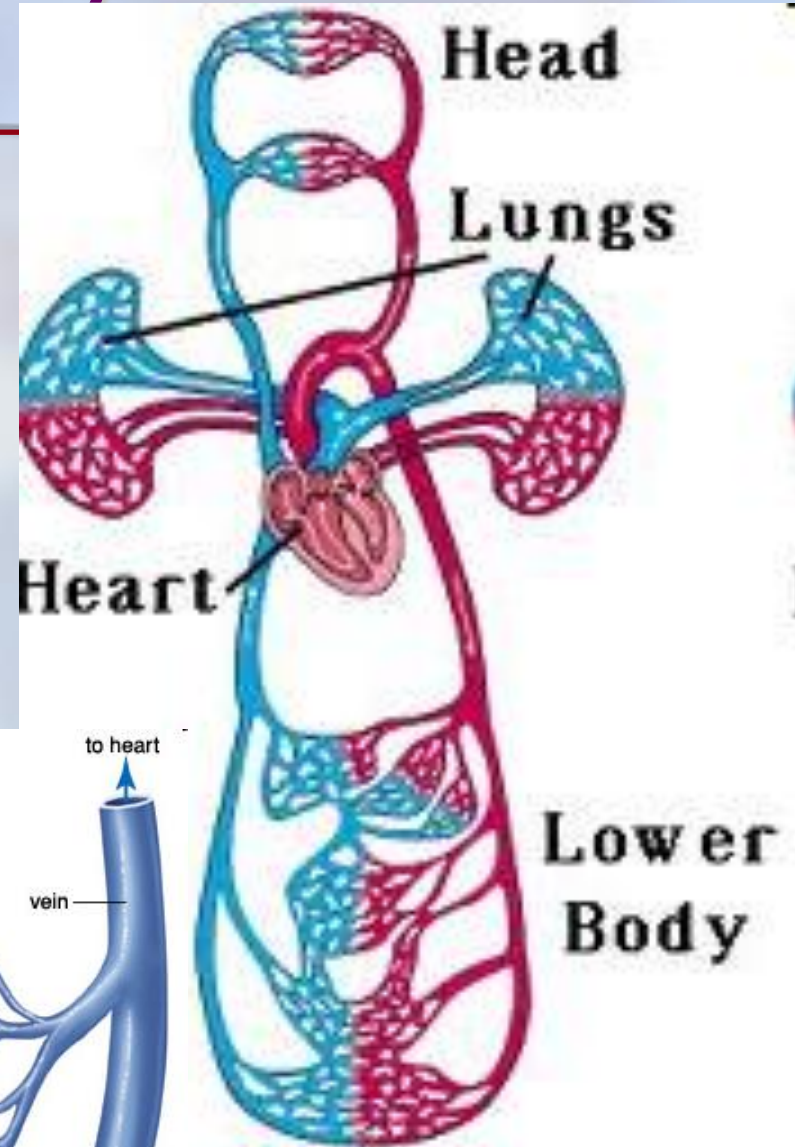


Circulatory System



Circulatory System

- * **Cardiovascular System**
- * **Responsible for distribution of blood**
- * **Components**
 - **Heart**
 - **Blood**
 - **Blood vessels**
 - * **Arteries**
 - * **Veins**
 - * **Capillaries**

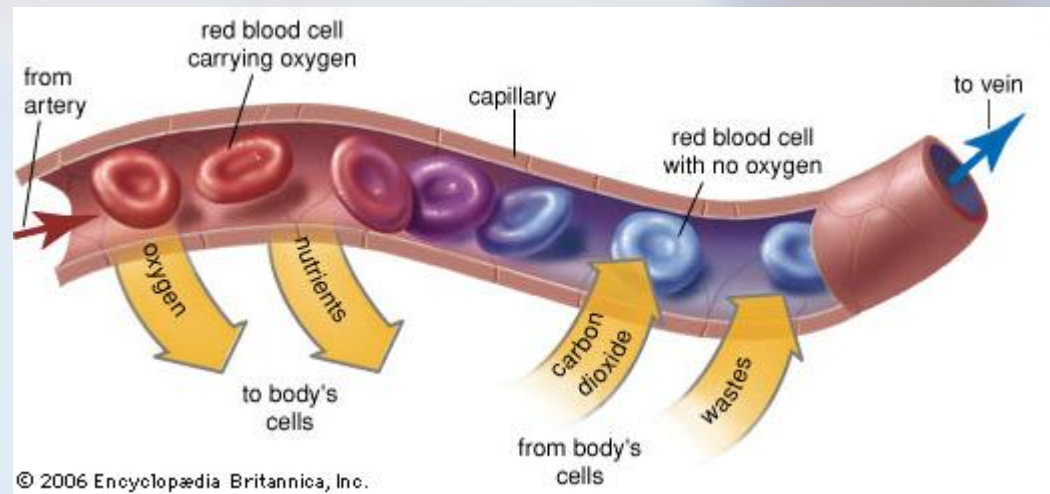




Types of Blood Vessels

* Arteries

- Carry oxygen-rich blood away from heart
- Thick muscular wall that constricts and dilates



* Capillaries

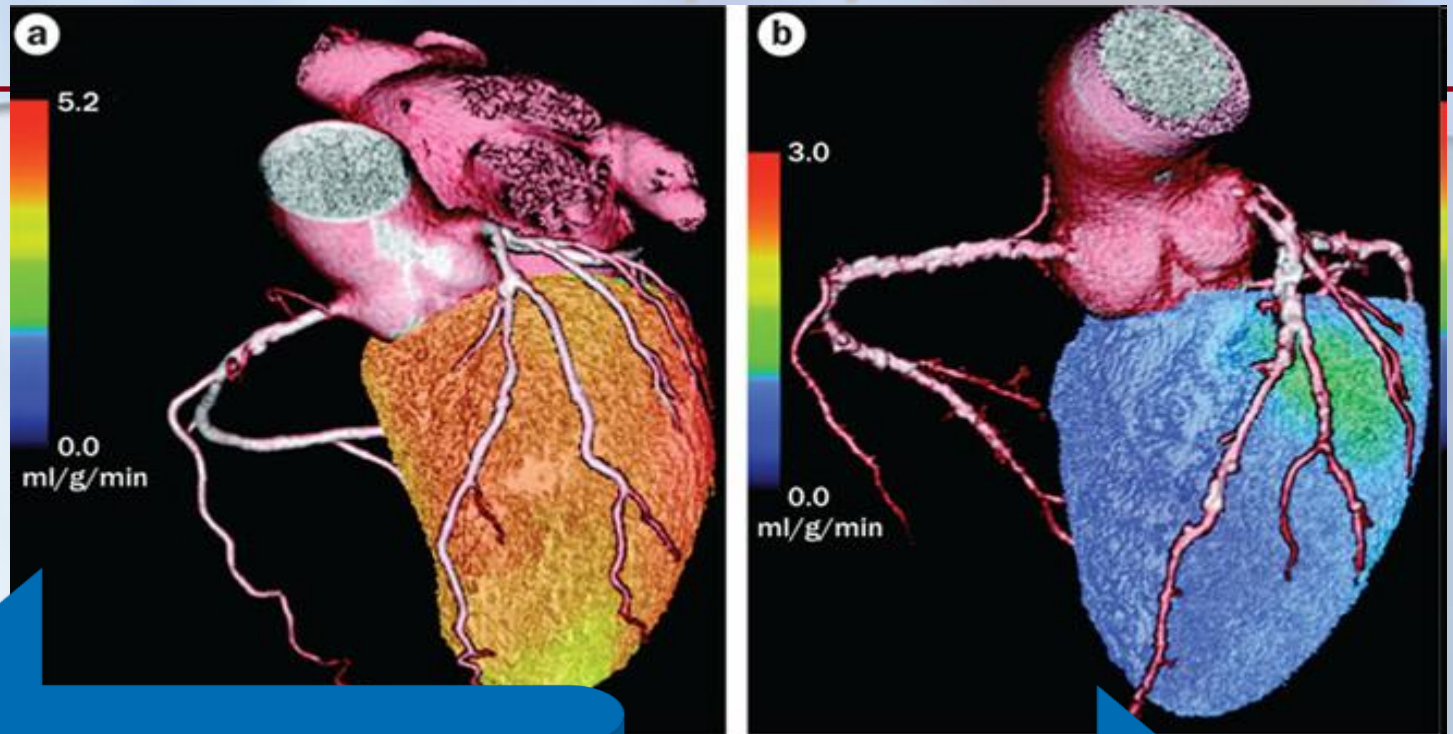
- Microscopically small and carry oxygen-rich blood to supply every cell

* Veins

- Carry deoxygenated blood back to the heart
- Less pressure than blood in an artery



Circulatory System



Perfusion

- Adequate circulation of blood throughout the body

Hypoperfusion

- Inadequate perfusion of the body's tissues and organs



Functions of the Blood

* Transportation

- Oxygenated blood
- Deoxygenated blood

* Nutrition

- Nutrients from intestines or storage tissues

* Excretion

- Waste products

* Protection

- Antibodies
- White blood cells

* Regulation

- Hormones
- Water, salt
- Enzymes
- Chemicals



Haemorrhage or bleeding is the outflow of blood from the blood vessels into tissues, cavities or surrounding environment, as a result of an injury or defected permeability of the vascular walls.



Classification of bleeding

Speaking about bleeding, it distinguishes three concepts:

- 1) itself bleeding** - the outflow of blood from the blood vessels into tissues, cavities or surrounding environment;
- 2) The hemorrhage** – when the blood oozes (просачивает) the surrounded tissues during the process of bleeding;
- 3) The hematoma** – when the poured out blood divides tissues into layers, separates organs. As a result the artificial dimension (объемная) cavity, which is filled with blood, is formed.

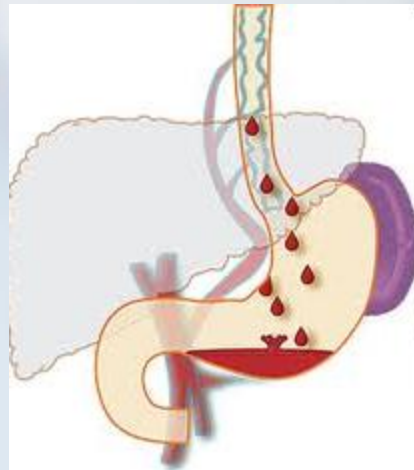


1. According to environment

Internal Bleeding

Damage to internal organs and large blood vessels, Blood loss cannot be seen.

External Bleeding



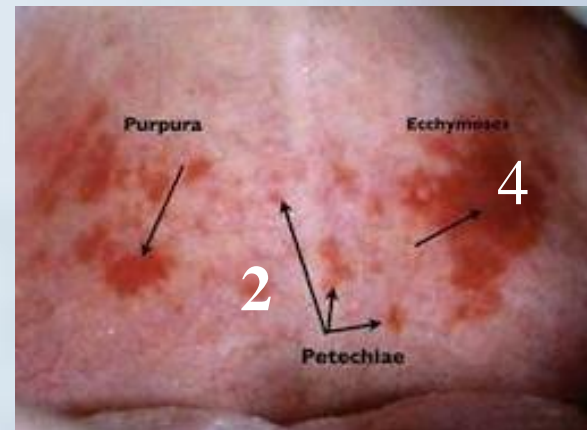
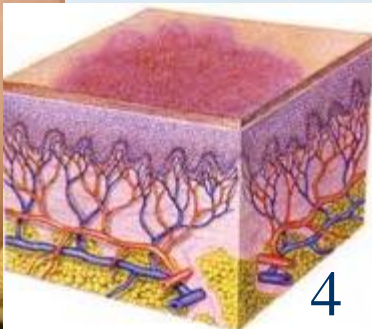


Interstitial bleeding

- During intratissue (interstitial) bleeding the blood collects in tissues (**haematoma**) or infiltrated them. Depending on the sizes and a form of such hemorrhage allocate:
- petechias (**petechiae**) — small hemorrhages;
- strips (**vibices**) — hemorrhages in the form of strips;
- ecchymomas (**ecchymoses**) — the larger size of a hemorrhage;
- ecchymoses (**suggilatio** s. **suffusio**) — larger deckle-edged hemorrhages.



- 1. Haematoma
- 2. Petechiae
- 3. Vibices
- 4. Ecchymoses
- 5. Suggillatio s. Suffusio



5

4

2

2

1

3

4

2

Petechiae

Purpura

Ecchymoses



2. Anatomical classification

❖ Arterial Bleeding:

- Bright red in color.
- Rapid and profuse, spurting with each heart beat.
- Difficult to control.
- Rich in oxygen

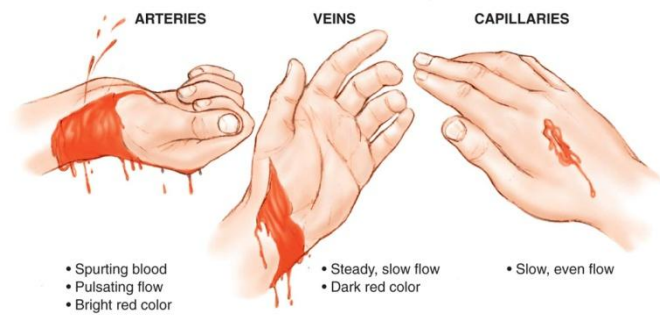
❖ Venous Bleeding:

- Dark red (**low in oxygen**)
- Steady flow.
- Easy to control.

❖ Capillary Bleeding:

- Color of blood between dark red and bright red.
- Slow and oozing, Low pressure.
- Very easy to control.

❖ Parenchymatous hemorrhage (bleeding is a capillary type of bleeding from an organ like the liver.).



Classification

* Arterial

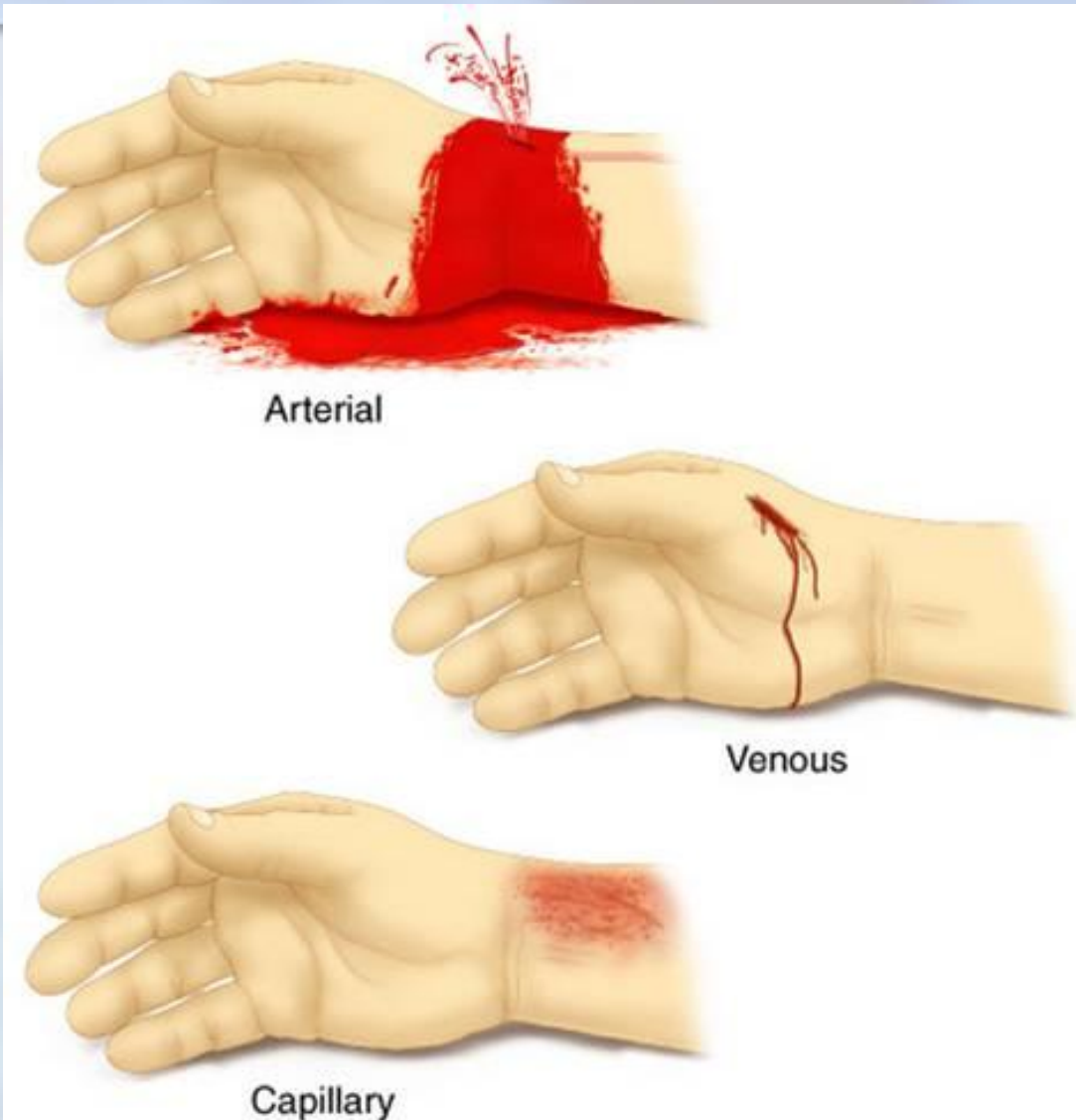
- Bright red, Rich in oxygen, High pressure

* Venous

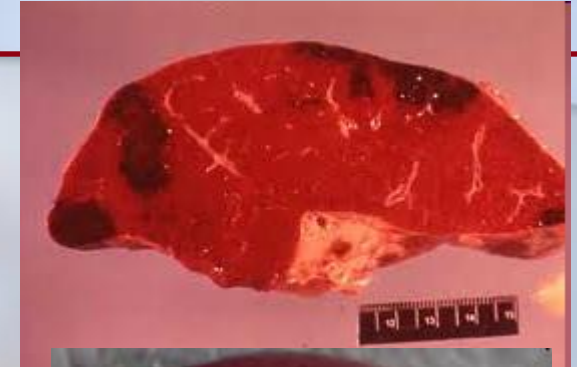
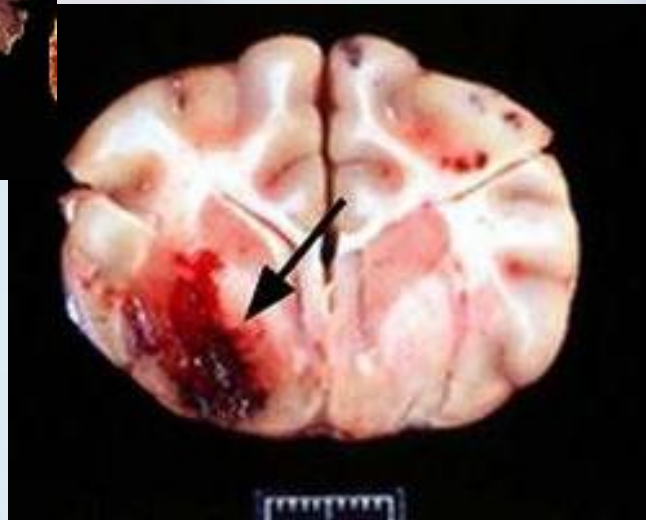
- Dark red (low in oxygen), Low pressure

* Capillary

- Slow and oozing, Low pressure



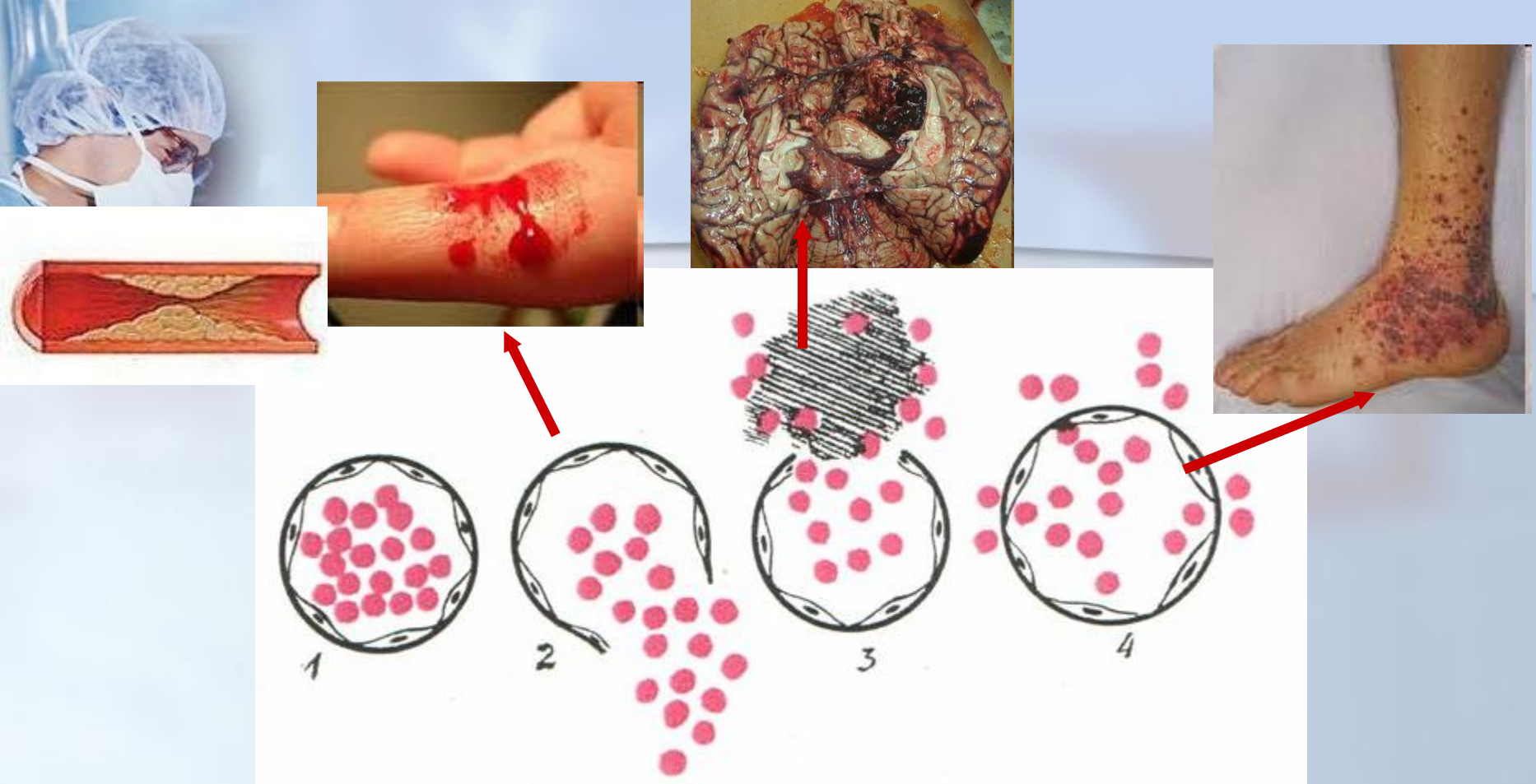
❖ **Parenchymatous hemorrhage** (bleeding is a capillary type of bleeding from an organ like the liver, brain, spleen.).





3. According to mechanism of bleeding

- • Mechanical trauma, and vessel rupture (**haemorrhagia per rhexin**) when the wall of vessels destroyed from inside different diseases (atherosclerosis);
- • Arrosive hemorrhage (**haemorrhagia per diabrosin**). These types of bleeding take place during suppurative melting of vessel wall from surrounding tissues;
- • Diapedetic hemorrhage (**haemorrhagia per diapedesin**) without damage of anatomical structure of vessels wall;



- **1. Norma**
- **2. haemorrhagia per rhexin**
- **3. haemorrhagia per diabrosin**
- **4. haemorrhagia per diapedesin**



4. According to time of beginning

primary - direct damaging of vessel during trauma. during first hours after injuring.

secondary

- ***early*** (usually from some hours to 4-5 days after damaging)

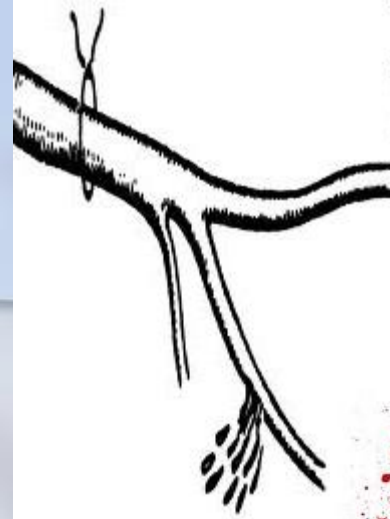
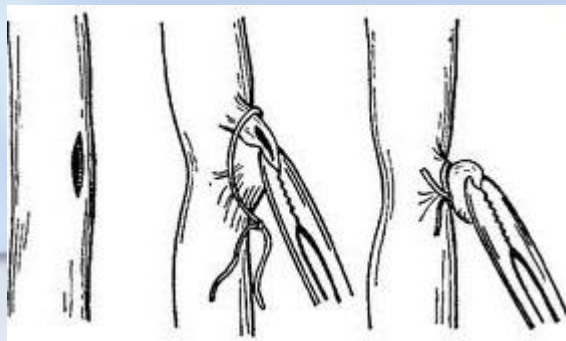
1. Slide of ligature off damaging vessel,
2. Washing-out the clot from the injured vessel.

- **Late** secondary or ***erosive hemorrhage*** concerned with vessel wall destruction (4-5 days after damaging)



primary - direct damaging of vessel during trauma. Straight off onset symptoms or during **first hours** after injuring be developed.

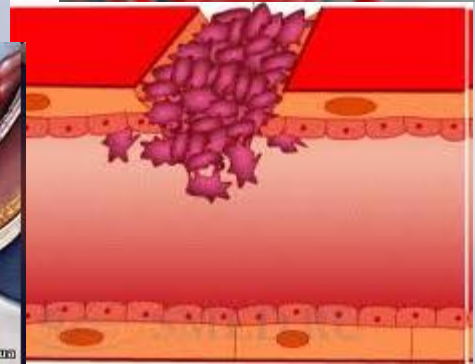
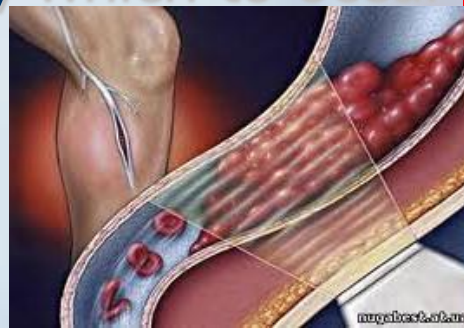




secondary

- ***early*** (usually from some hours to 4-5 days after damaging)

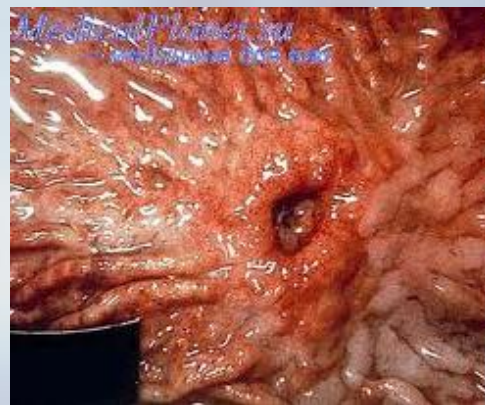
1. **Slide of ligature** off damaging vessel, which was imposition during operation;
2. **Washing-out the clot** from the injured vessel. This complication we have in connection with increased of blood pressure, blood flow acceleration or through reduction of spastic vessel contraction, which to occur during acute blood loss.





secondary

- **Late secondary** or ***erosive hemorrhage*** concerned with vessel wall destruction (4-5 days after damaging) . This is result of development of wound infected process. This case is one of very complicated, because all vessel wall change in this region and hemorrhage replace in every moment is possible.





5. According to clinical course

- **Acute** - During acute hemorrhage to bleed occurs at short time period.

- **Chronic** - During chronic hemorrhage to bleed is gradually, a little at a time.

Sometimes during some days narrow or periodic discharge of blood is observable. In cases of stomach ulcer, duodenum ulcer, malignant tumors, uterine fibromyoma, hemorrhoids the chronic hemorrhage is observe.



6. According to degree of severity

- **I level- easy degree** - blood loss is even to 10 -15% of blood circulating volume

(500- 1000 ml)

- **// level - middle degree** - blood loss is even to 15 - 20 % of blood circulated volume

(1000 - 1500 ml)

- **/// level - heavy degree** - blood loss is 20 - 30 % of blood circulating volume

(1500 - 2000 ml).

- **IV level- massive blood loss** - loss of blood is more then 30 % of blood circulating volume

(more than 2000 ml).



Some kinds of internal bleeding have specific name:

- **Hematemesis** - vomiting fresh blood
- **Melena** - feces or stools that are black as tar and contain blood that has been digested.
- **Hematochezia, Proctorrhagia** - rectal bleeding
- **Hemoptysis** - coughing up blood from the lungs
- **Haemoptoe** - bleeding from the lung
- **Haemothorax** - haemorrhage in pleural cavity;
- **Haemopericardium** - haemorrhage in pericardial cavity;
- **Hematuria** - blood in the urine from, urinary system bleeding
- **Haemobilia** - haemorrhage from biliary ducts;
- **Haemoperitoneum** - haemorrhage in abdominal cavity;
- **Haemartrosis** - haemorrhage in joint cavity;
- **Metrorrhagia** – bleeding from the uterine ;
- **Hemorrhagic insult** - cerebral hemorrhage;
- **Epistaxis** – bleeding from the nose

Hematemesis - vomiting fresh blood



Ectopic gastric mucosa

Hemorrhagic gastritis

Duodenal ulcer

Gastric ulcer

Hemorrhagic pancreatitis

Gastric carcinoma



A Mallory-Weiss tear is a tear in the mucosal layer at the junction of the esophagus and stomach

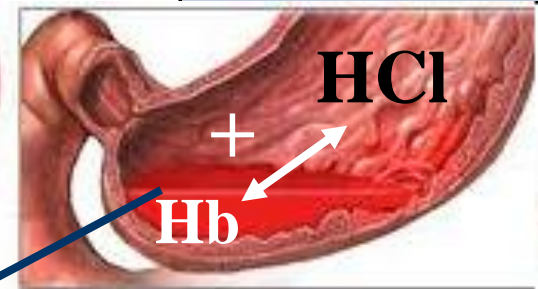
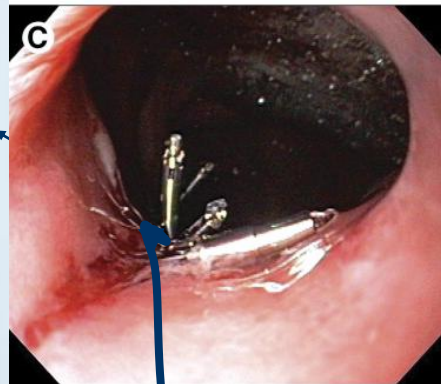
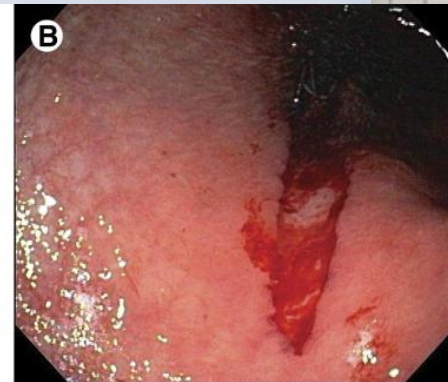
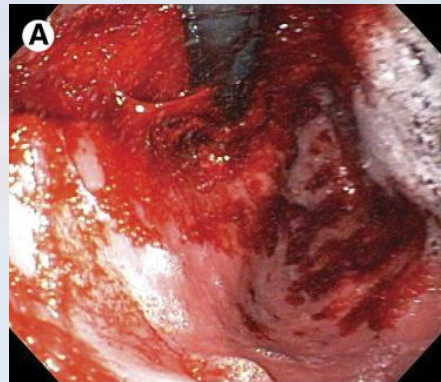


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5. Esophagus
after
bleeding



■ **Melena** - is spending feces or stools that are black as tar and contain blood that has been digested

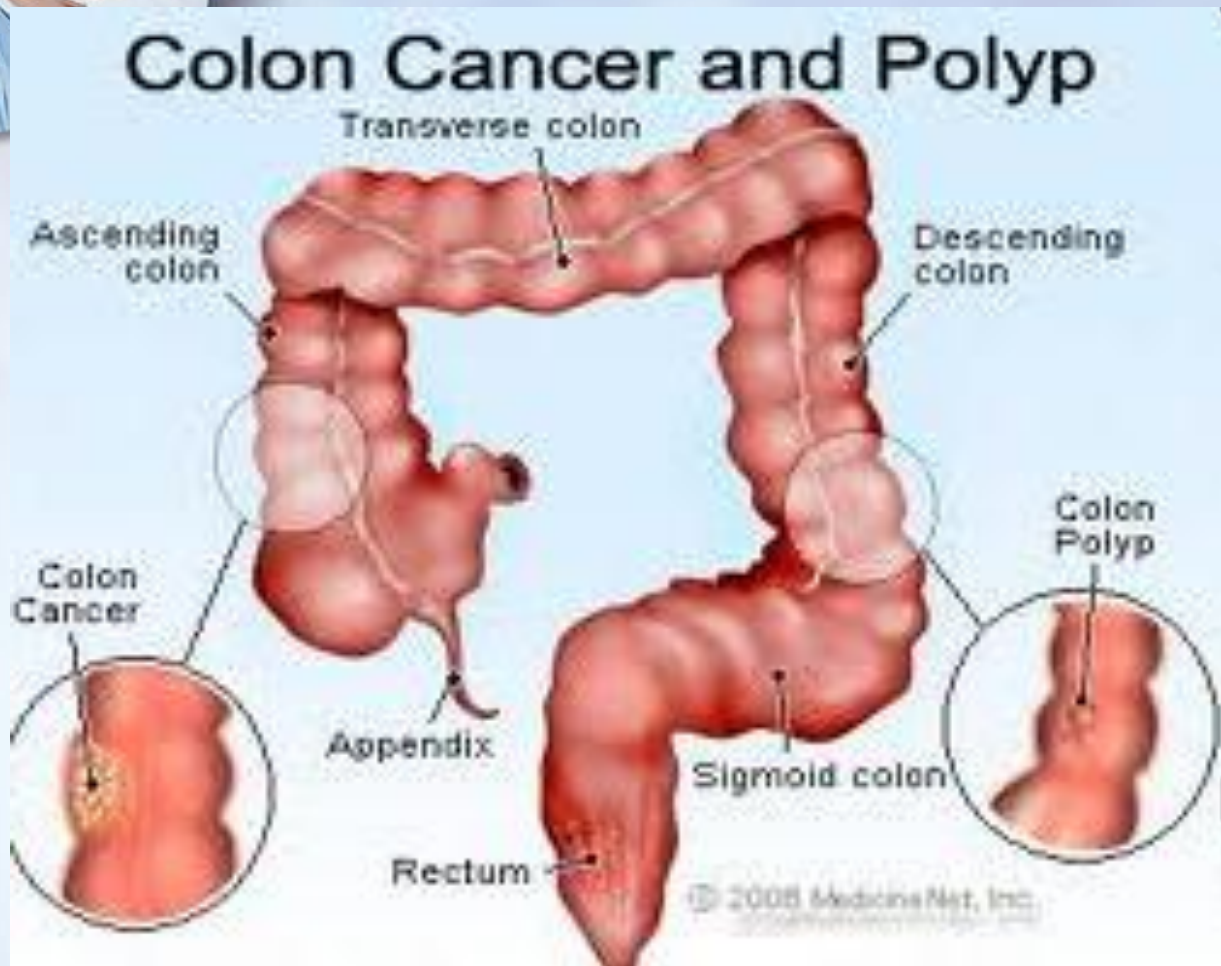


Peptic ulcers may lead to bleeding or perforation, emergency situations

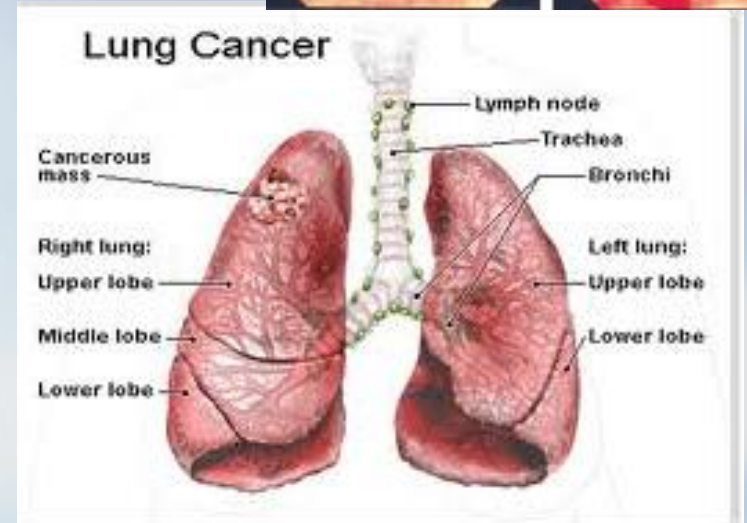
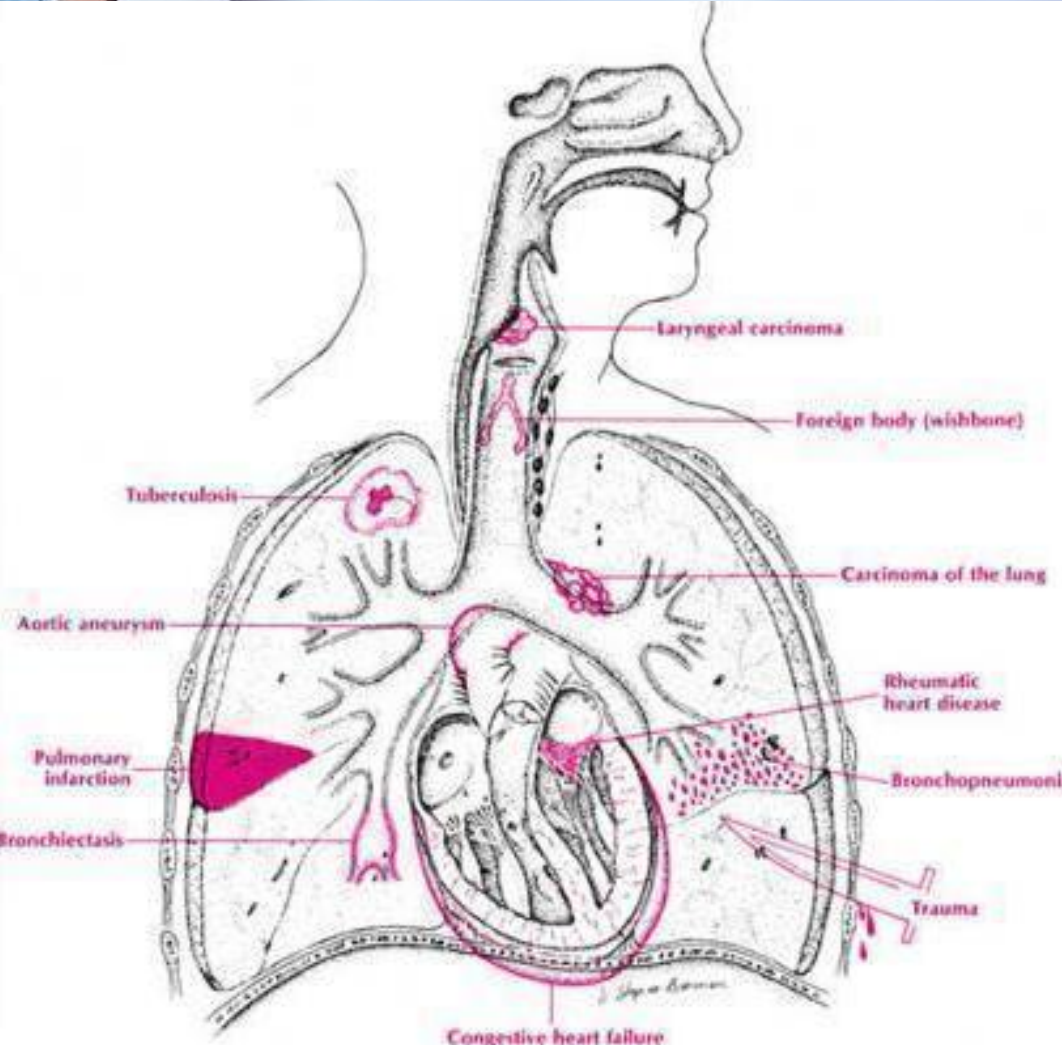
hydrochloride
hematin



■ Hematochezia, Proctorrhagia - rectal bleeding

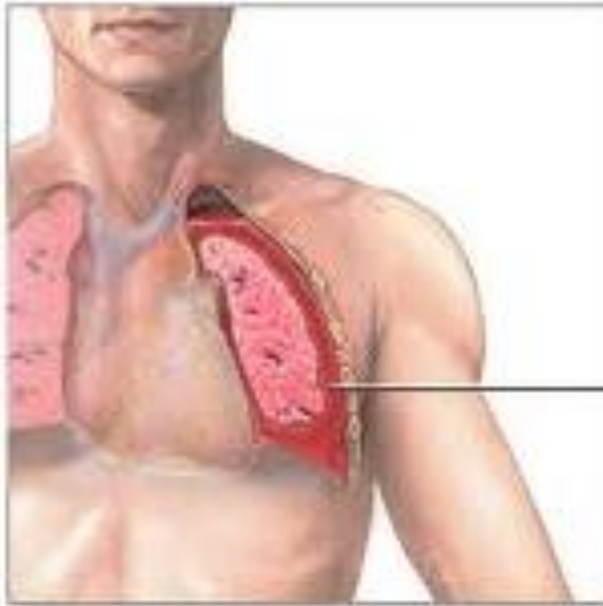


■ Hemoptysis - coughing up blood from the lungs





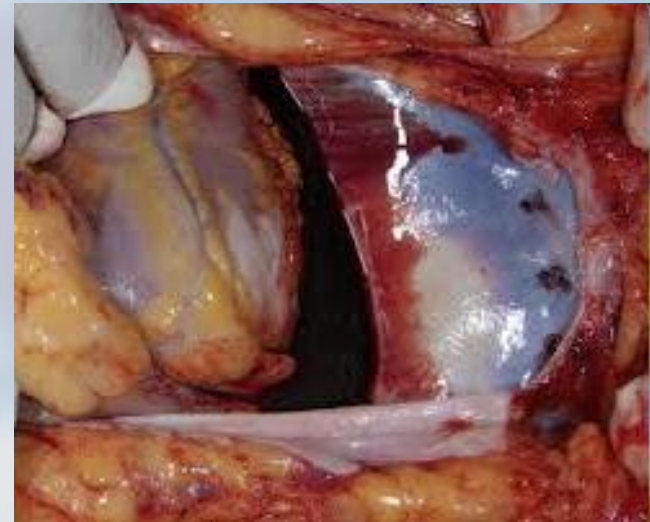
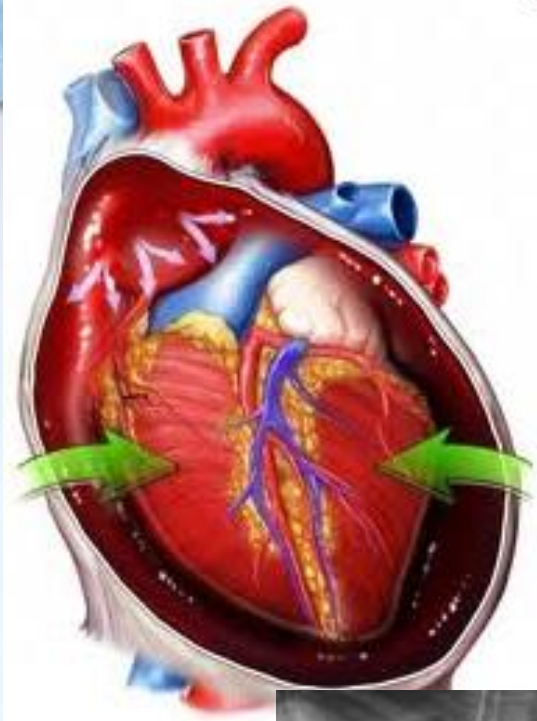
■ **Haemothorax** - haemorrhage in pleural cavity



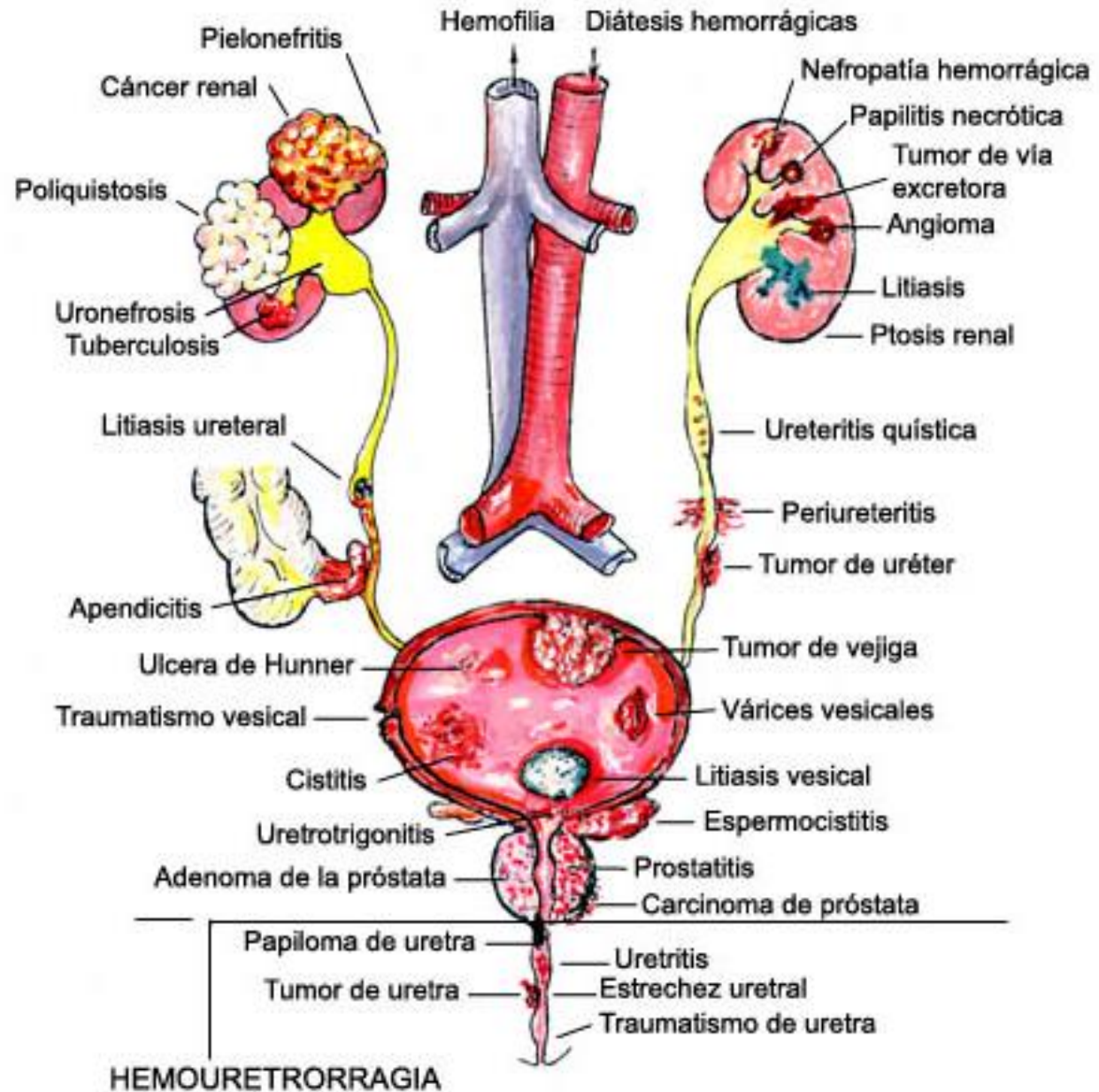
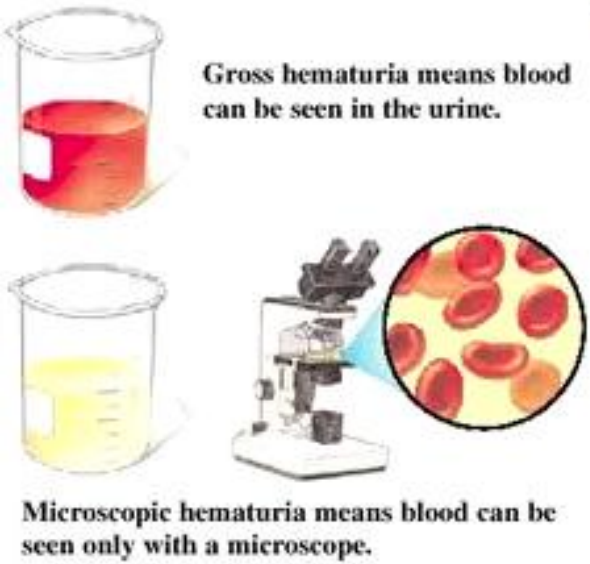
Blood in
pleural space



■ Hemopericardium – bleeding into pericardial area

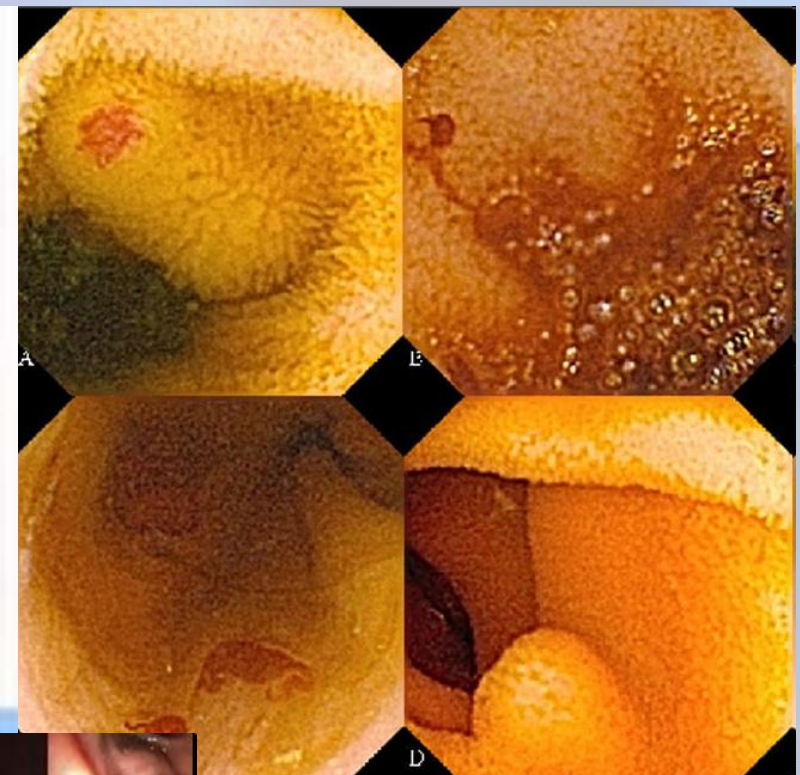


■ Hematuria - blood in the urine from, urinary





■ **Haemobilia** - haemorrhage from biliary ducts;



Endoscopy images. (A) Bleeding AVM in duodenum (B) bleeding lesion in ileum (C) Haemobilia (D) Polyp in ileum.

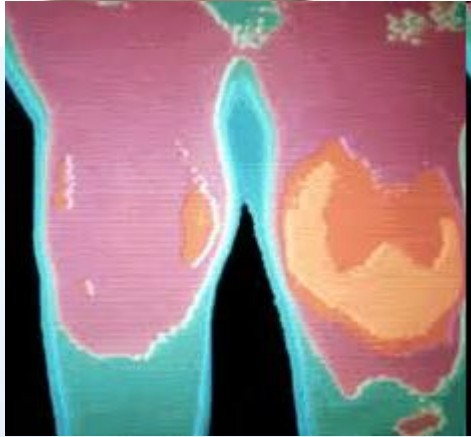


■ **Haemoperitoneum** - haemorrhage in abdominal cavity

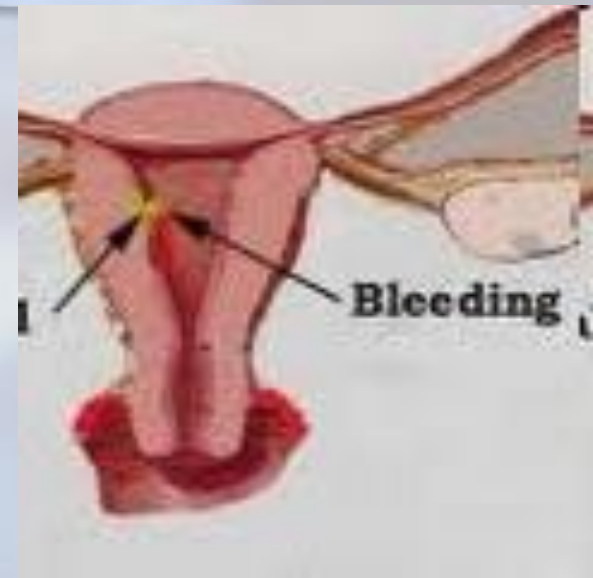
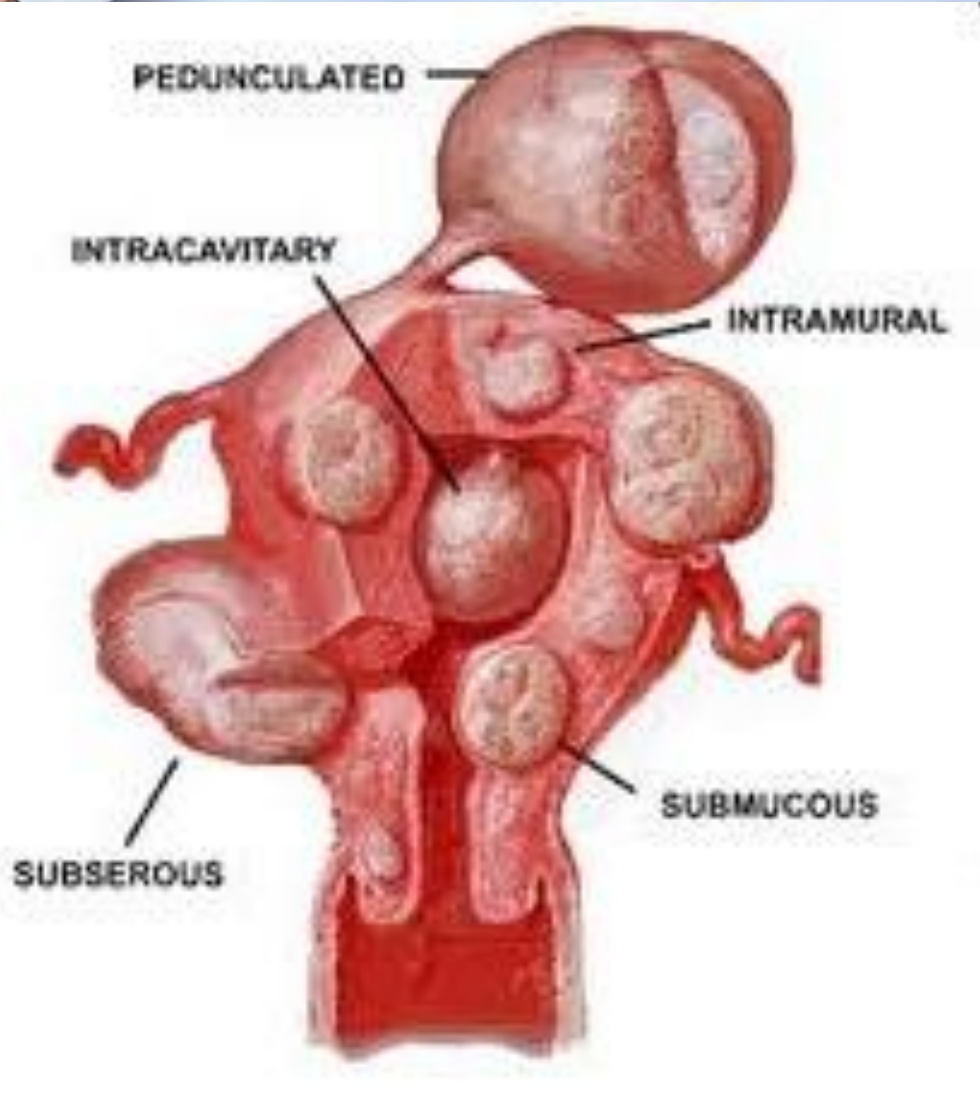




■ **Haemartrosis** - haemorrhage in joint cavity



■ Metrorrhagia – bleeding from the uterine

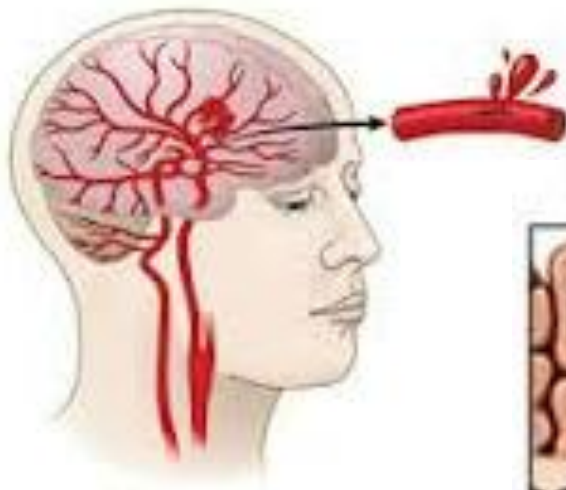




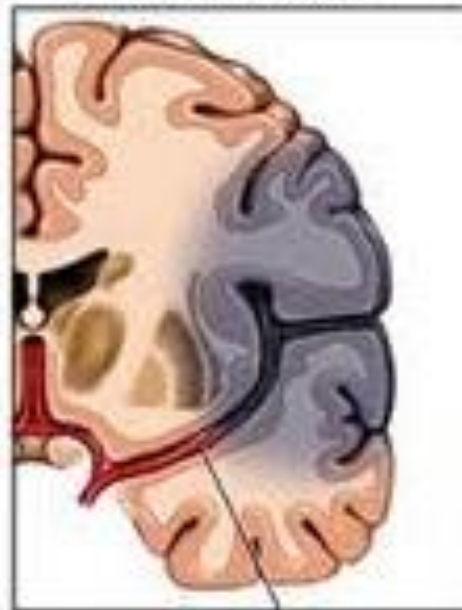
■ Hemorrhagic insult - cerebral hemorrhage



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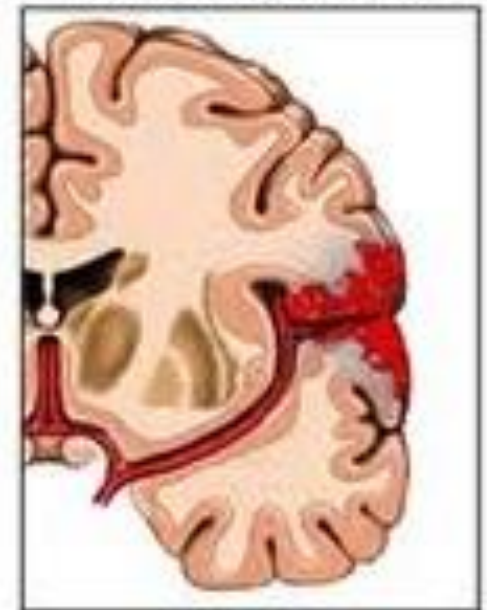


Ischemic stroke



A clot blocks blood flow
to an area of the brain

Hemorrhagic stroke



Bleeding occurs inside or
around brain tissue

■ **Epistaxis** – bleeding from the nose





The methods of a stopping of bleedings are divided on two bunches:

- **Temporal** - decision of the first problem
- **Final (terminating)** - decision of the second problem.



Temporary methods of haemostasis

- **1. Applying a arresting bleeding tourniquet;**
- **2. Digital compression of artery;**
- **3. The maximal flexion of extremity.**
- **4. Raised position of extremity;**
- **5. Pressure bandage;**
- **6. Tamponade of a wound;**
- **7. Applying clamp on bleeding vessel;**
- **8. Temporarily shunting (temporary bypass of vessel).**

1. Applying a arresting bleeding tourniquet



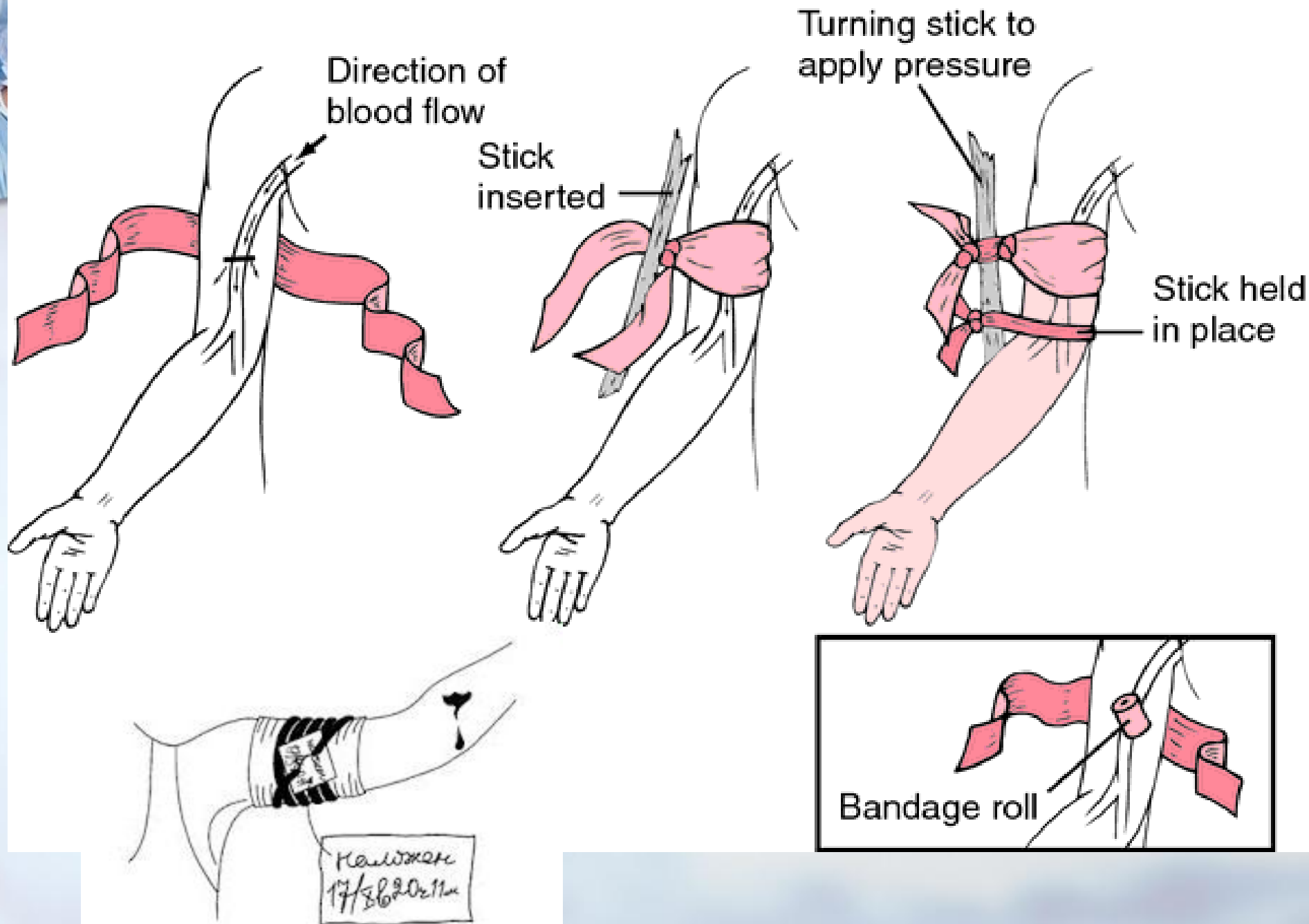
Aptek.ru

- * Device that closes off blood flow to and from an extremity
- * Controls life-threatening bleeding
- * Exist two type of tourniquet – arterial (applying on proximally in relation to a wound) and venous (applying distally in relation to a wound)





- 1, 3 – venous tourniquet
- 2,4,5,6, - arterial tourniquet





Tourniquet—Use




- * **Extremity injuries only**
- * **Once applied, do not remove or loosen.**
- * **Material**
 - 4 inches wide
 - 6–8 layers thick
 - Cravats frequently used
 - Never use narrow material
- * **Commercial tourniquets are available.**





- After procedure ***It is a must to write down the time when the tourniquet has been applied since*** keeping a tourniquet for more than 2 hours on the lower limb and for above 1½ hours on the upper one can result in ischaemic necrosis.
- The disappearance of pulse on peripheral arteries, arrest of bleeding and a slightly pale discolouration of the skin below the tourniquet level suggest that **it has been applied correctly.**



If the patient's transportation takes **more than 1 1/2 hours**, the tourniquet should periodically (for **10–15 minutes**) be released until the reappearance of the arterial blood flow, before it is reapplied. At this point press on the bleeding vessel with the fingers in the wound or apply some instrument with a plug to the bleeding point. Reapply the tourniquet either somewhat below or above the original place. Subsequently, if necessary, the removal and reapplication of the tourniquet can be repeated (in winter time every 30 minutes, in summer each 50—60 minutes).



Tourniquet—Application

Select site



Tighten tourniquet



Attach notation to patient



BP cuff may be used



Contact Medical Direction



Tourniquet—Effectiveness

- * Research has shown that tourniquets are highly effective and pose less risk than originally thought. Many current protocols recommend using tourniquets when direct pressure does not stop bleeding.**

2. Digital compression of artery - Direct Pressure

- * Apply pressure to wound
- * Hold pressure firmly
- * Bandage
- * Don't remove dressing



Apply direct pressure on external wounds with sterile cloth or your hand, maintaining pressure until bleeding stops



After bleeding stops, bind wound with tight bandage and apply ice pack with direct pressure for 10 minutes





Pressure Points

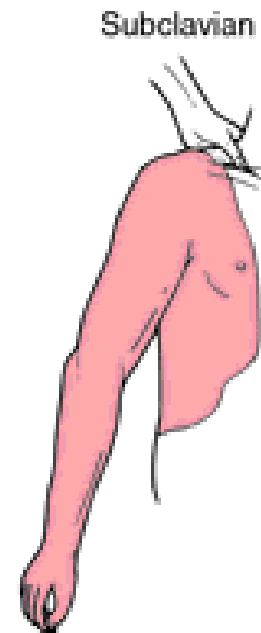
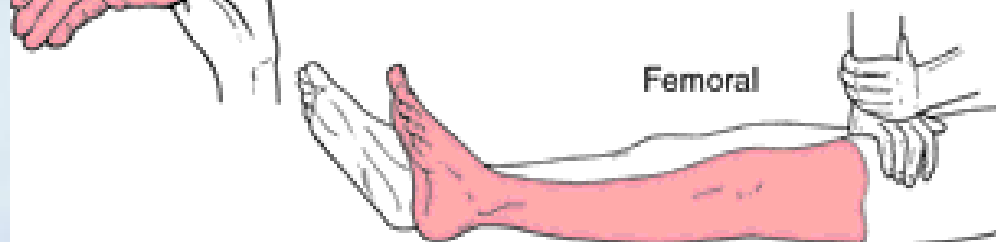
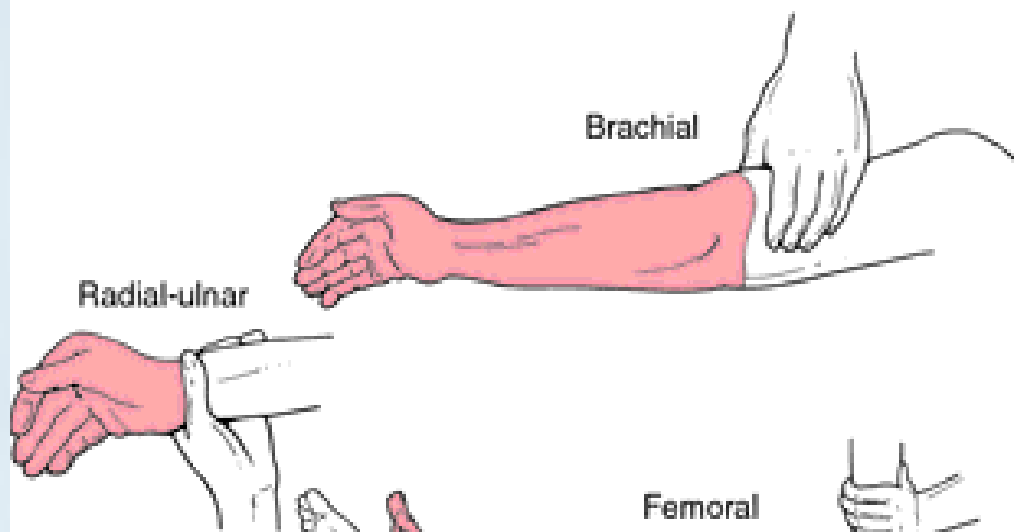
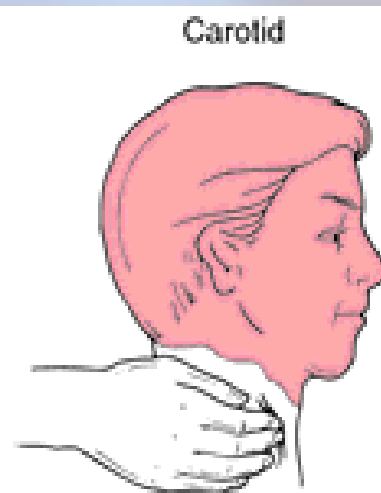
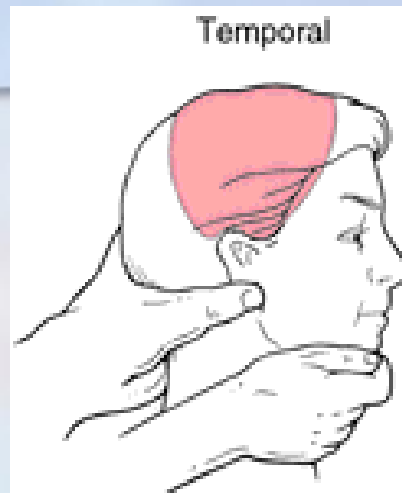
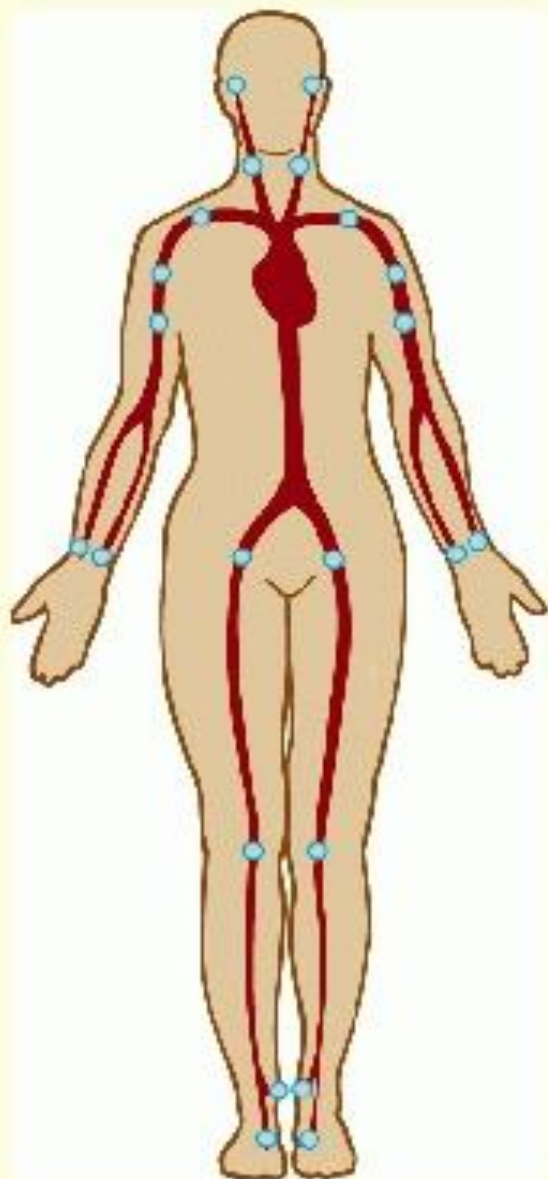


Pressure points—brachial



Pressure points—femoral

Other Pressure Points

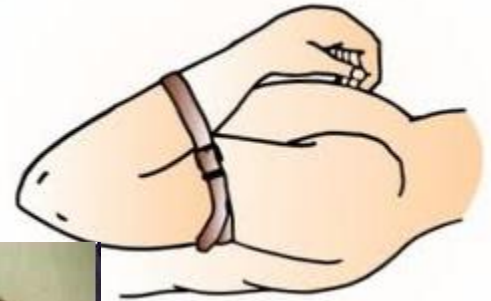




3. The maximal flexion of extremity.

Flexion of the limb in joint.

If the bleeding site of the femoral artery is too high for a tourniquet to be applied, the thigh can be fixed to the abdomen, with the knee and hip joints maximally bent.





4. Raised position of extremity Elevation

- * Used at the same time as direct pressure
- * Above the level of the heart
- * Gravity helps
- * Slows bleeding
- * Do not use with impaled objects or spinal injury





5. Pressure Bandage



- holds dressing in place
- Frees up 1st aider for other tasks
- Use roller bandage to wrap around dressings
 - Overlapping turns, wrap above and below site
 - Move distally to proximally
 - Tie off ends directly over dressings
 - Check pulse below bandage to maintain circulation

6. Tamponade of a wound

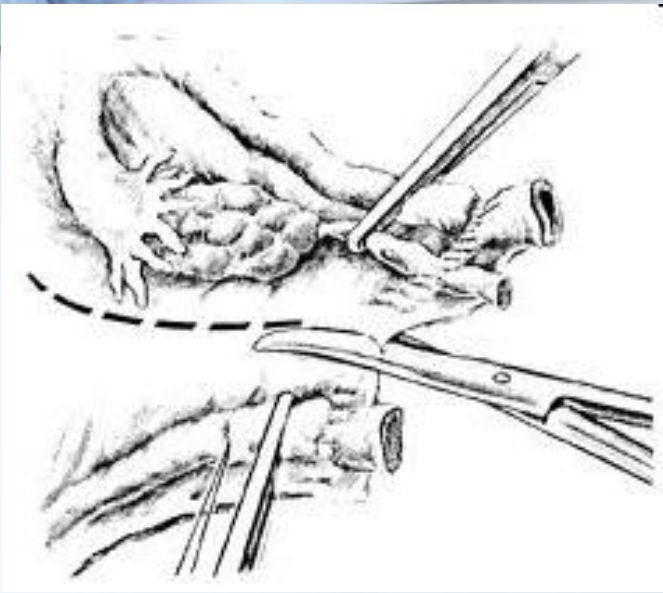
To achieve a tight package, the gauze should be tightly packed in the wound and pressure bandage applied over it.

Combined with application of a pressure bandage, immobilization and raising the extremity is a suitable method of temporary haemostasis, if the bleeding originates from veins or small arteries, soft tissues, the scalp.





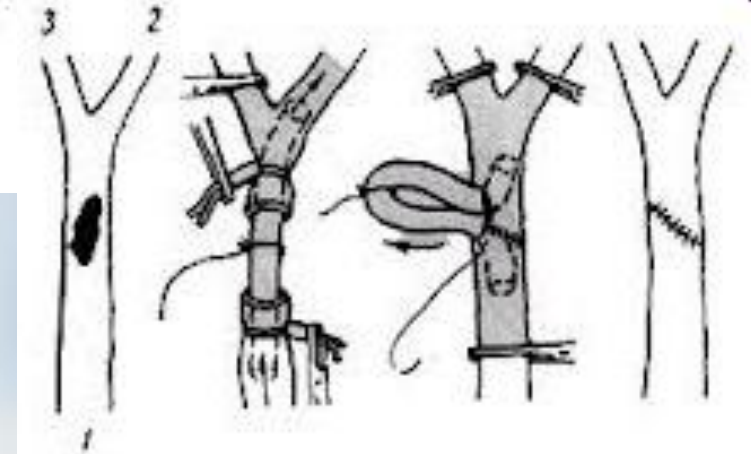
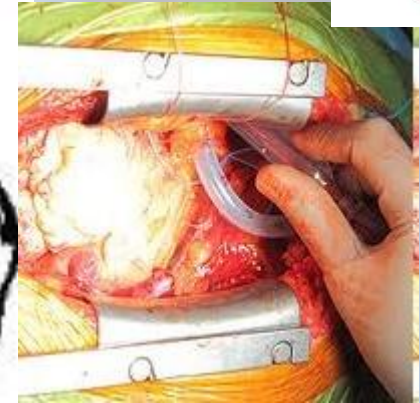
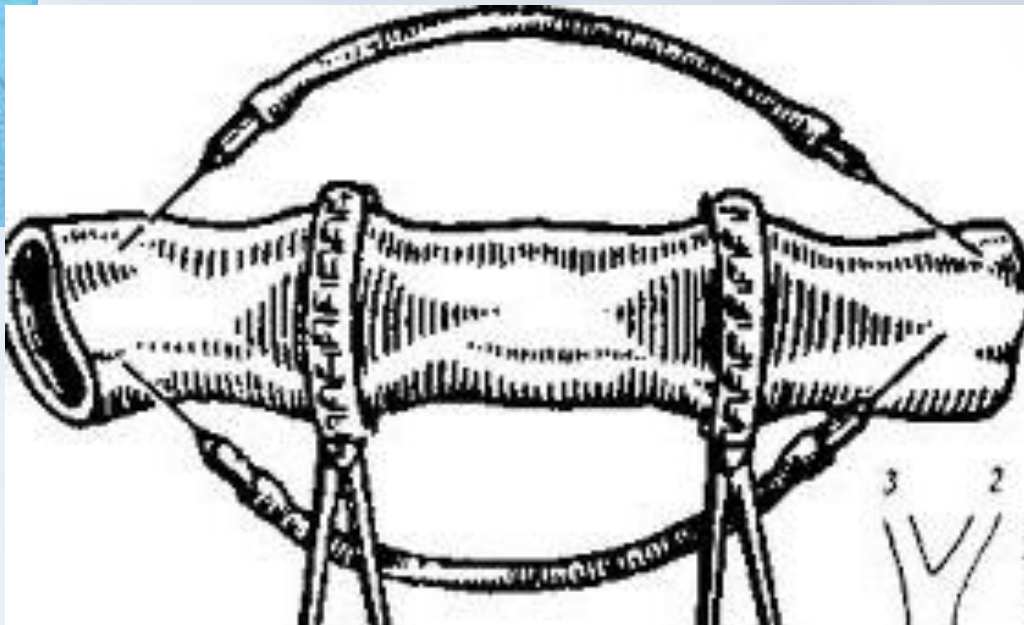
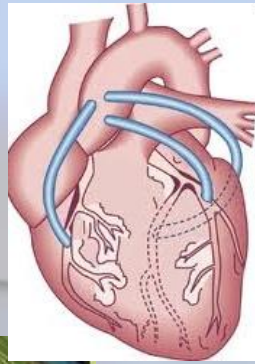
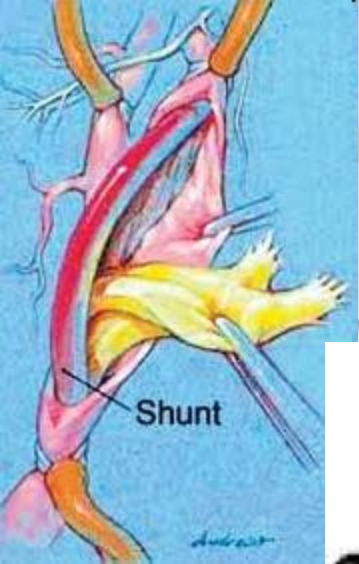
7. Applying clamp on bleeding vessel



Cat Spay. Asiahomes.com



8. Temporarily shunting (temporary bypass of vessel).





Alternative Bleeding-Control Methods: Splinting

- ✱ **Used to control bleeding**
- ✱ **Stabilization**
- ✱ **Various types**
- ✱ **Not effective for arterial bleeds**
- ✱ **Maintains pressure**





Alternative Bleeding-Control Methods: Pneumatic Anti-shock Garment

- * Bleeding in lower extremities
- * Never inflate just abdominal section
- * Follow local protocol





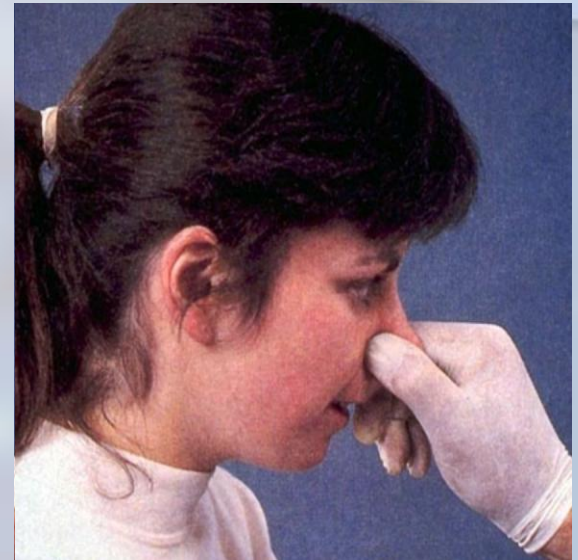
Special Situations

*** Head injuries**

- Fracture skull
- Bleeding or loss of CSF from ears or nose
- Do not attempt to stop bleeding

*** Nose bleed**

- Epistaxis
- Direct trauma
- Increased blood pressure
- Patients at risk





Controlling Nosebleeds

Have patient sit down and lean forward



Apply or instruct patient to apply direct pressure



Keep patient quiet and calm



Do not let patient lean back



Position patient on side if unconscious



FINAL METHOD of HAEMOSTASIS

**The methods of final haemostasis
divide into the four groups:**

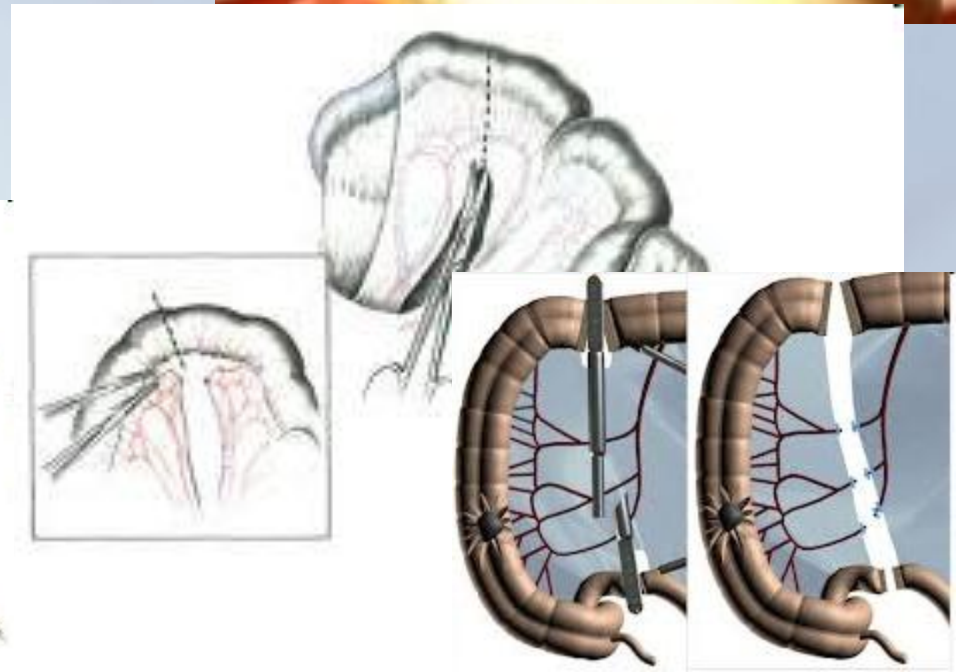
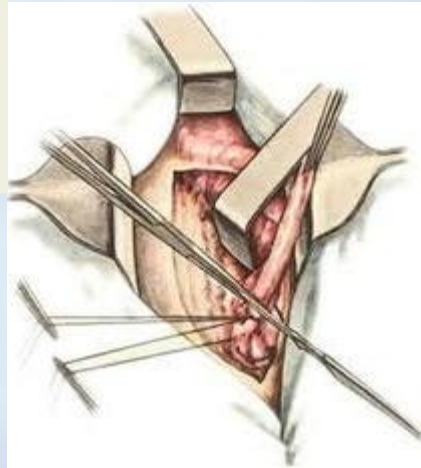
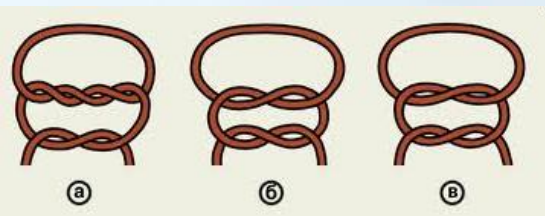
- **1) mechanical;**
- **2) physical;**
- **3) chemical**
- **4) biological;**
- **5) combined.**



1. Mechanical methods

1. Ligating a vessel

- 1) Ligation of bleeding vessel inside of wound.
- 2) ligation of bleeding vessel at a distance.



2. To under-run bleeding vessel.
The surgeon applied around bleeding vessel Z-like suture, if he can't clamp this vessel.



3. Twisting of a bleeding vessel.
To stop bleeding from small vessels, these can be picked up with a clamp and rotated.



4. Wound package (tamponade) and pressure bandage

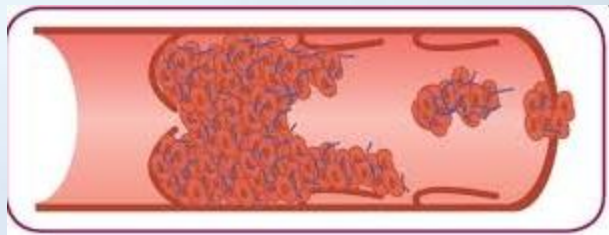
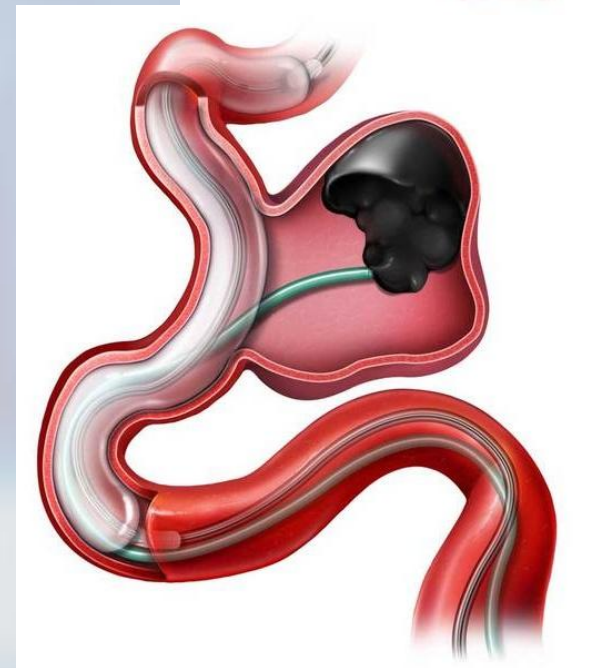
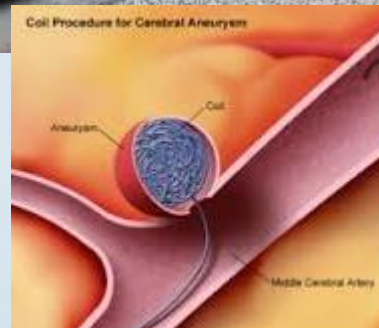
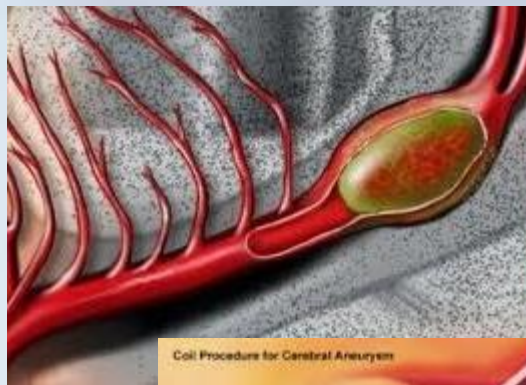
Wound package uses into abdominal surgery



Tamponade of nasal cavity



5. Embolisation of vessel. To stop bleeding from the lung, gastrointestinal tract and cerebral vessels a special method of artificial vascular embolism has been recently implemented; this involves the use of lysing (e.g. gelatin, muscle homogenate) or non-lysing (e.g. silicon, polysterol) substances.





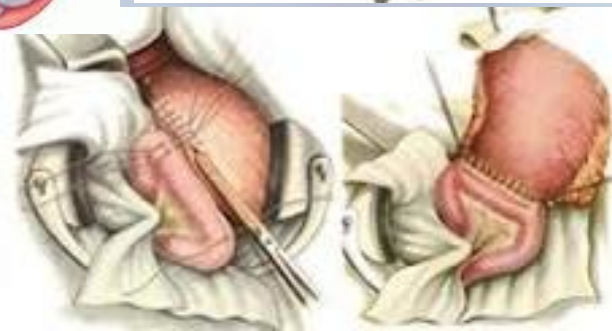
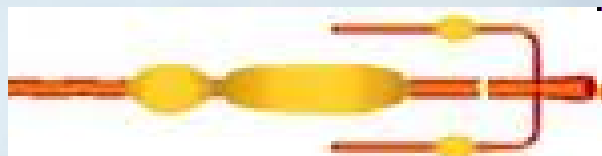
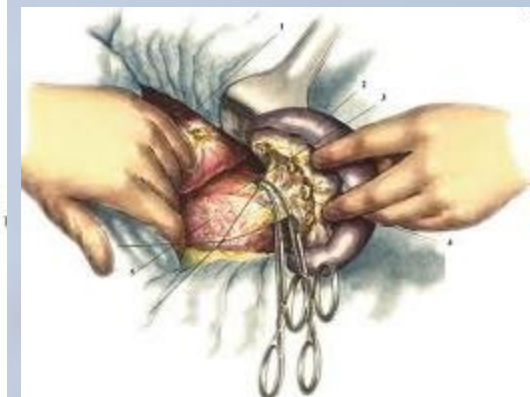
■ 6. Special methods (splenectomy at a parenchymatous bleeding from a lien, a resection of a stomach at a bleeding from a ulcer or a tumour, a lobectomy at a pulmonary bleeding, Blaekmor' probe, etc.)



73
Венозная фистула между селезеночной и желудочной венами. Перевязка сосудов/открытой полости левой верхней печени.



74
Венозная фистула между селезеночной и желудочной венами. Перевязка левой вены/челюстной вены.





Amputations

- Cutting or tearing off of a body part
- Usually bleed heavily
- Activate EMS immediately



7. Vascular suture, reconstructive of vessel

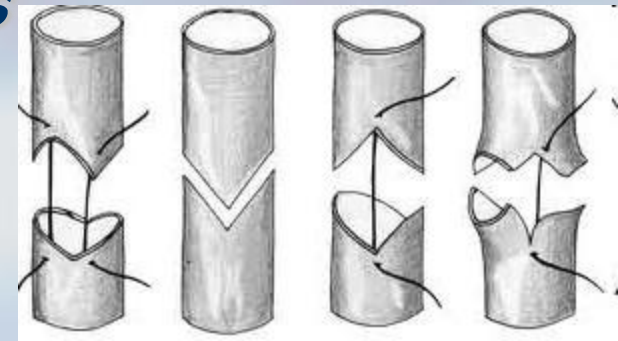
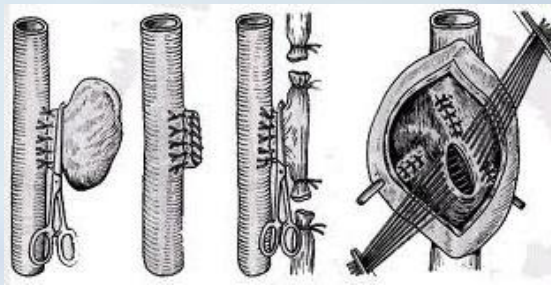
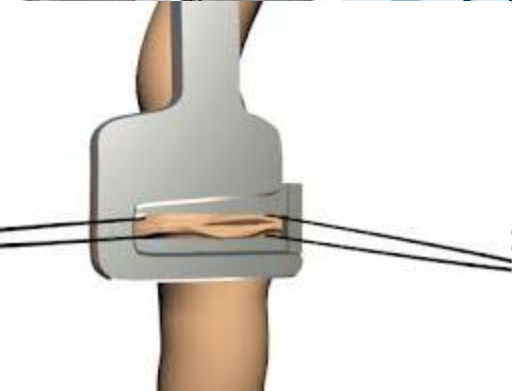
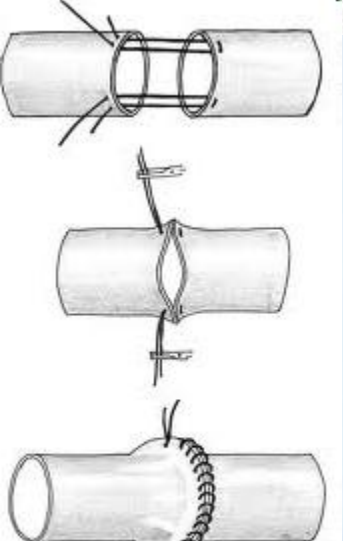
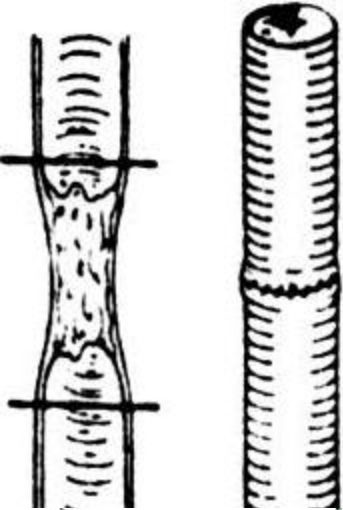
There exist both manual and mechanical vascular sutures.

- Suturing a vessel is recommended whenever restoration of the patency of major vessels is necessary.

Circular vascular sutures are placed manually using atraumatic needles. Ideally, an «end-to-end» connection is performed. Vascular sutures should be very compact and airtight and meet the following requirements

- 1) a lack of strictures or bumps (not to impede the blood flow);
- 2) minimum threads appearing in the lumen.

Lateral vascular sutures





8. Clamping the vessel.



2. Physical methods.

Action of low temperature

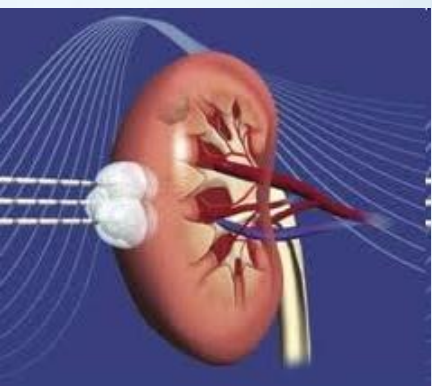
Local hypothermia – in postoperative period on the wound applied an ice-bag (for 10-20' with break 30-40'). The application of ice packs in cases of subcutaneous haematoma or swallowing of ice cubes in cases of gastric bleeding is widely used in surgery.

Cryosurgery - is the local application of cold, mostly in tumours of the organs with intense blood supply (e.g. the brain, liver, kidney). Local freezing of tissues is safe to the areas surrounding those exposed to cryonecrosis.

Cryosurgery is a very useful treatment modality using **liquid nitrogen** to freeze and kill skin tumors. Cryosurgery can be a less invasive way to remove lesions than open wound surgery, thereby reducing recovery time.



An ice pack should be applied to a simple crush injury, if the damage is extensive a health care provider should examine the wound



2. Action of high temperature

- **Action of hot solution.** In diffuse bleeding from a bone a piece of gauze soaked in hot normal saline is applied.
- **Surgical diathermy** involves the passage of high frequency electric current by knife or button electrode to generate heat in the tissues for the coagulation of bleeding vessels. It is mainly used to control bleeding from subcutaneous and muscles' vessels as well as from minor vessels of the brain.

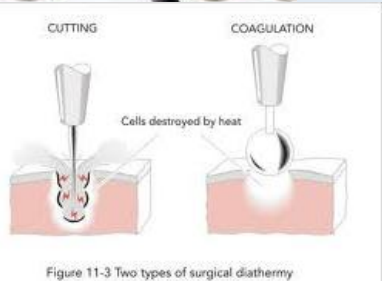
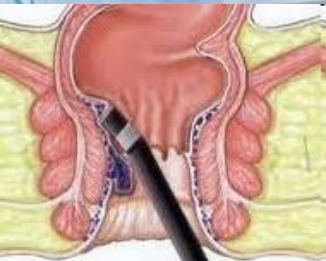


Figure 11-3 Two types of surgical diathermy



Laser photocoagulation (focused beam of electronic rays) is used in patients with peptic ulcer-associated upper GIT bleeding, haemophiliacs and in oncologic operations.

- **Plasma scalpel**






3. Chemical methods.

- According way of using, this methods divides on **local** and **general** (resorptive) action.

1. Local hemostatics

- 
- **hydrogen peroxide** - used for bleeding in wounds. It accelerates thrombogenesis
 - **vasoconstrictive agents** – Adrenaline hydrochloride 1% (injected intramucosum, f.e. –tooth-extracting).;
 - **inhibitors of fibrinolysis** – ϵ -Aminocaproic acid (from gastric bleeding, it normalizes the permeability of vascular walls)
 - **preparations of gelatin** –Gelapson, spongia gelatinosa (accelerate haemostasis and have tamponade action) GELFOAM Sterile Sponge
 - **Karboxochrom**– accelerate permeability vessels, normalize microcirculation



Bone wax

- is a mixture of beeswax (70%) and Vaseline (30%).
- It is a non-absorbable material, becoming soft and malleable in the hand when warmed.
- Its hemostatic effect is based on physical rather than biochemical properties
- It has been used *in bone surgeries* for a long time; not proper for combat/accident casualty care
- Complications: Allergic, granuloma, cord compression, infection, interferes with bone healing



Microfibrillar collagen (MFC)

- Adheres tightly to bloody surfaces, with an immediate and complete hemostasis.
- The hemostatic properties of MFC rely on the promotion of platelet aggregation.
- Advantages of collagen fleece are fast induction of hemostasis, low tissue reaction, and fast resorption
- A major disadvantage of using the collagen fleece is difficulty in manipulating the agent during attempts to place it in the area of bleeding
- This should be applied dry with clean and dry instruments, and pressure with gloved fingers should never be placed, as the MFC would adhere to the glove more than on the hemorrhage site.



Oxidized regenerated cellulose (ORC)

- **Cellulose is first dissolved and then made into a continuous fiber.**
- **Never use this soaked in thrombin. The latter, in fact, interferes with its natural action.**
- **The greatest use has been for the control of oozing and mild bleeding from broad surfaces,**
- **ORC presents multiple mechanisms of action, including physical and mechanical actions in tamponade, swelling and gel formation, conferring hemostasis by decreasing the pH and acting as a caustic and then surface interactions with proteins, platelets, intrinsic and extrinsic pathway activation.**
- **One major advantage of oxidized cellulose is its definite and potent action against a wide variety of pathogenic organisms, both in vivo and in vitro.**



2. Hemostatics of absorption action

- **agent which accelerate formation of a thromboplastin** – *Dicynone and Etamsylate* enhance the formation of thromboplastin, normalise vascular permeability and improve microcirculation,
- **substances of specific action** (Pituitrinum for uterin bleeding)
- **Agent with antifibrinolytic action-inhibitors of a fibrinolysis** (trasilol, contrical)
 - ϵ -acidi aminocapronyci 5%
 - Tranexamic acid, tugina 500mg/5ml solution for injection ampoules
 - Aminomethylbenzoic acid (inhibit plasminogen activation, inhibit the activity of plasmin (large dose))



- **Synthetic analogues of vitamin K – Vicasolum** is synthetic water-soluble analogue of vitamin K, is applicable for haemorrhage associated with a deficit of prothrombin (e.g. acute hepatitis and mechanical jaundice, parenchymal and capillary bleeding following injuries and surgical manipulations, gastrointestinal and nasal bleeding, haemorrhoids).
- **Conversion of prothrombin** to thrombin requires a slight amount of calcium ions that are available in the blood. Therefore, the use of **calcium** as a haemostatic substance is justified only in massive transfusion of citrated blood, since on reaction with calcium citrate ions tend to lose their anticoagulative properties. **Calcium chloride** 1%, 10% intravenously.




- **substances which normalize a vessel wall permeability** – Acidum ascorbinicy, Rutinum, refortan, carbosochrom.
- **Vasoconstrictors** Epinephrine , levonordefrin (neo-cobefrin), Brilocaine-Adrenaline

4. Biological methods

- According way of using, this methods divides on **local** and **general** action.



Local action

- 
- **Using the patient own tissues** (omentum, muscular tissue, subcutaneous fat, fascia)
 - **Using the biological substances**
 - **thrombin** – only local (a substance obtained from the plasma of donor blood) is effective in capillary and parenchymal bleedings as it influences the conversion of fibrinogen into fibrin. Prior to its use it will be dissolved in normal saline to soak sterile gauzes or the haemostatic sponge and then applied to the bleeding surface. The use of thrombin ***is contraindicated in bleeding from major vessels***, since it can induce the fatal generalised thrombosis.
 - **Fibrinogen** Fibrin glue to be applied locally for surgery (Tisseel®). A patient may donate autologous plasma for processing into cryoprecipitate prior to a planned surgical procedure.



Haemostas sponge gelatin foam **(absorbable gelatin sponge)**

- is made **from animal-skin gelatin** (denatured collagen) whipped and baked into its sponge form through which nitrogen has been bubbled in during polymerization in order to produce a porous device. The porous structure of the sponge enables it to absorb 45 times its weight in blood. As the sponge fills with blood, platelets come into contact with one another, initiating the clotting cascade.
- If soaked in thrombin, it directly acts on the coagulation cascade and has an increased hemostatic action.
- Its effect is probably mostly mechanical on low-pressure bleeders



Folkloric Medicinal Plant Extract

Blood Stopper

- comprises a standardized mixture of the plants *Thymus vulgaris*, *Glycyrrhiza glabra*, *Vitis vinifera*, *Alpinia officinarum* and *Urtica dioica*
- Each of these plants has some effect on the endothelium, blood cells, angiogenesis, cellular proliferation, vascular dynamics and cell mediators,
- the basic mechanism of action is unknown: Independent of the classic coagulation cascade system, it shows homostatic effect in a protein network environment in a matter of split seconds in vitro and seconds in vivo environments.



continue

- Therefore it is not only effective on patients with normal haemostatic values, but also on those who are primary and secondary hemostasis defective
- It is in liquid form
- Has not especial storage condition
- Has shown in-vitro anti-bacterial activities

A



B



C



FIGURE 1: The appearance of fresh normal serum before (A) and after (B) the addition of Ankaferd Blood Stopper[®] (ABS). ABS resulted in very rapid (< 1 s) formation of a protein network (B), the microscopic structure of which is shown in C; original magnification $\times 10$.



General action

Biological substance of general action is **blood substance**. Its accelerate trombogenesis.

- **Inhibitors of fibrinolysis** (have been widely used to decrease the blood fibrinolytic activity. Bleeding associated with an increase in the blood fibrinolytic activity is encountered during operations on the lung, heart, prostate, in liver cirrhosis, sepsis and following transfusion of large amounts of blood. Biologic anti-fibrinolytic substances include ***contrycal, trasylol (aprotinin)***, while ***aminocapronic acid*** and ***ambenum*** are synthesised.



- **Fibrinogen** 2-4 g/L total: 10g no reserve pool, quickly depleted, only few in FFP. diluted with volume substitution, but colloids make a pseudoelevation substitution: 1g Fib: 3E FFP v. 100ml fibrinogen conc.
- **Hemotransfusion of the blood** (250 ml is haemostatic dose) Direct blood transfusion is the most effective. In addition, transfusion of small amounts (100—150 ml) of freshly frozen blood.
- **Transfusion plasma**
- **Transfusion trombocitaris masse, platelet mass,**



- **Antyhemoliticum plasma, antihaemophilic globulin, cryoprecipitate**
- **injection of protrombin complex** - concentrated coagulation factors II-VII – IX
- **Injection of vitamins** - These agents are indicated for congenital or acquired deficiency of blood coagulating factors as is the case in pernicious anaemia, leukaemia, haemorrhagic disorders etc



Patient Care for Bleeding



External Bleeding

❑ Signs & symptoms:

- a. Spurting/steady flowing or oozing blood.
- b. Bright red or dark blood.
- c. Separated or displacement of body part or tissue.
- d. Signs of shock (hypo perfusion)



Emergency Care of External Bleeding

- 1. Assure patent airway.**
- 2. Assess the ABCs.**
- 3. Control bleeding:**
- 4. Do not remove impaled objects unless impaled in cheek and airway is compromised by the object. Secure impaled objects in place.**
- 5. Treat for shock if necessary.**
- 6. Transport the victim to the nearest hospital.**



Patient Assessment— External Bleeding

- * Estimate amount of external blood loss**
- * Triage (prioritize) (сортировка)**
- * Predict potential shock**
- * Control external bleeding**



Internal Bleeding

☐ *Signs & symptoms:*

- Injuries to the surface of the body, which indicate underlying injuries.
- Bruising, swelling, or pain over vital organs.
- Painful, swollen, or deformed extremities.
- Bleeding from mouth, rectum, vagina, ear, or other part.
- A tender, rigid, or distended abdomen.
- * Vomiting
- * Dark, tarry stools or bright red blood
- * Signs and symptoms of shock



Patient Care —Internal Bleeding

Maintain ABCs



A Administer high-concentration oxygen via NRB



Control external bleeding



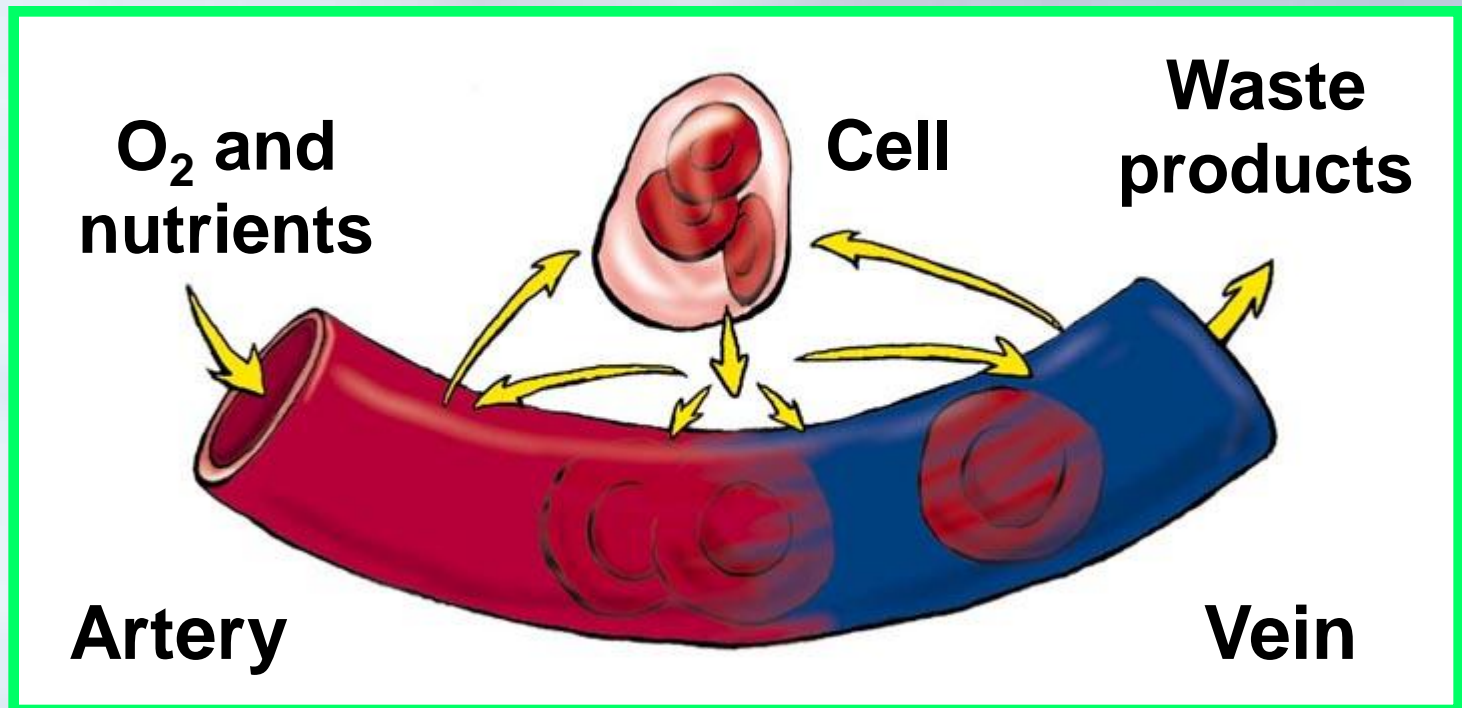
Prompt transport

Perfusion:

The skin condition is a good indicator of perfusion.

The process of delivering blood with oxygen and nutrients to the cells, and removing wastes.

The Perfusion Process



Hypoperfusion:

- The state that results when cells are not perfused adequately; oxygen and nutrients are not delivered and there is an inadequate removal of metabolic waste products.

*Widespread hypoperfusion results in **shock**.*



Shock (Hypoperfusion)

**Inadequate
perfusion of cells
with oxygen and
nutrients**

**Inadequate
removal of
metabolic waste
products**



Severity of Hypoperfusion

Compensated

Compensated

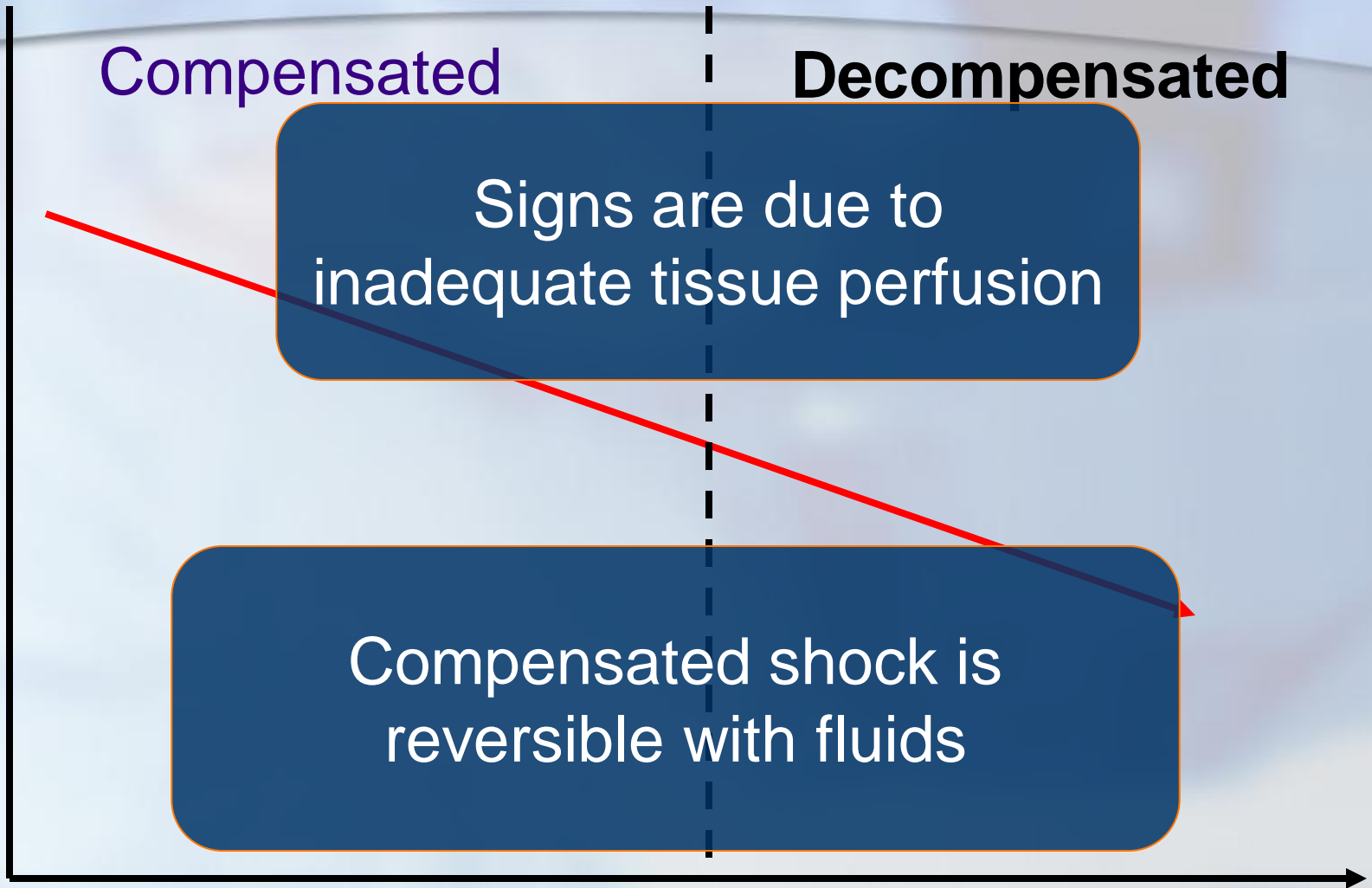
Decompensated

Volume

Signs are due to
inadequate tissue perfusion

Compensated shock is
reversible with fluids

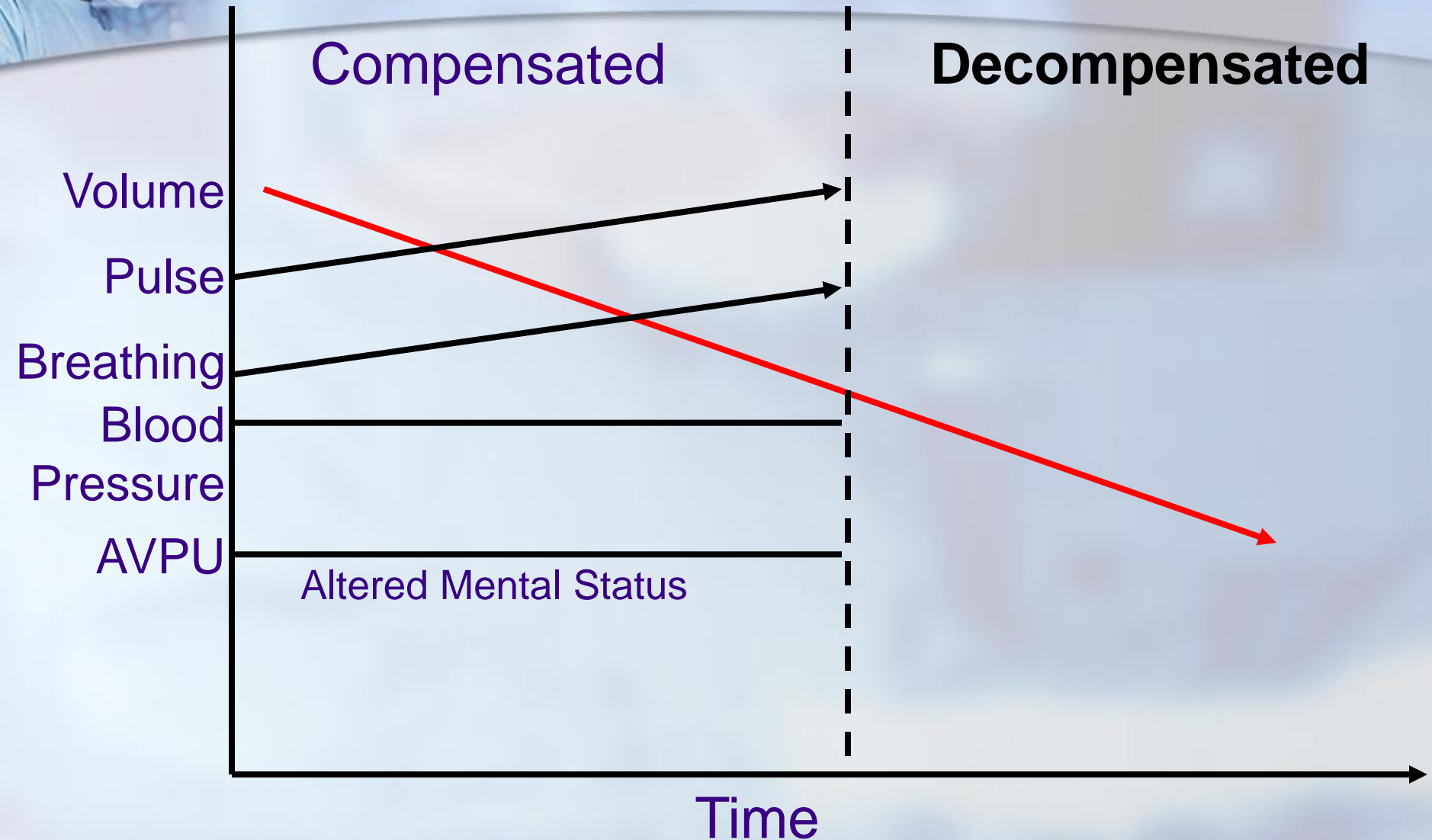
Time





Severity of Hypoperfusion

Compensated Shock Signs





Severity of Hypoperfusion

Compensated Shock Signs

Volume

Compensated

**Weak
peripheral
pulses, strong
central pulses**

Decompensated

**Weak or
absent
peripheral
pulses, weak
central pulses**

Time



Severity of Hypoperfusion

Dehydration Testing

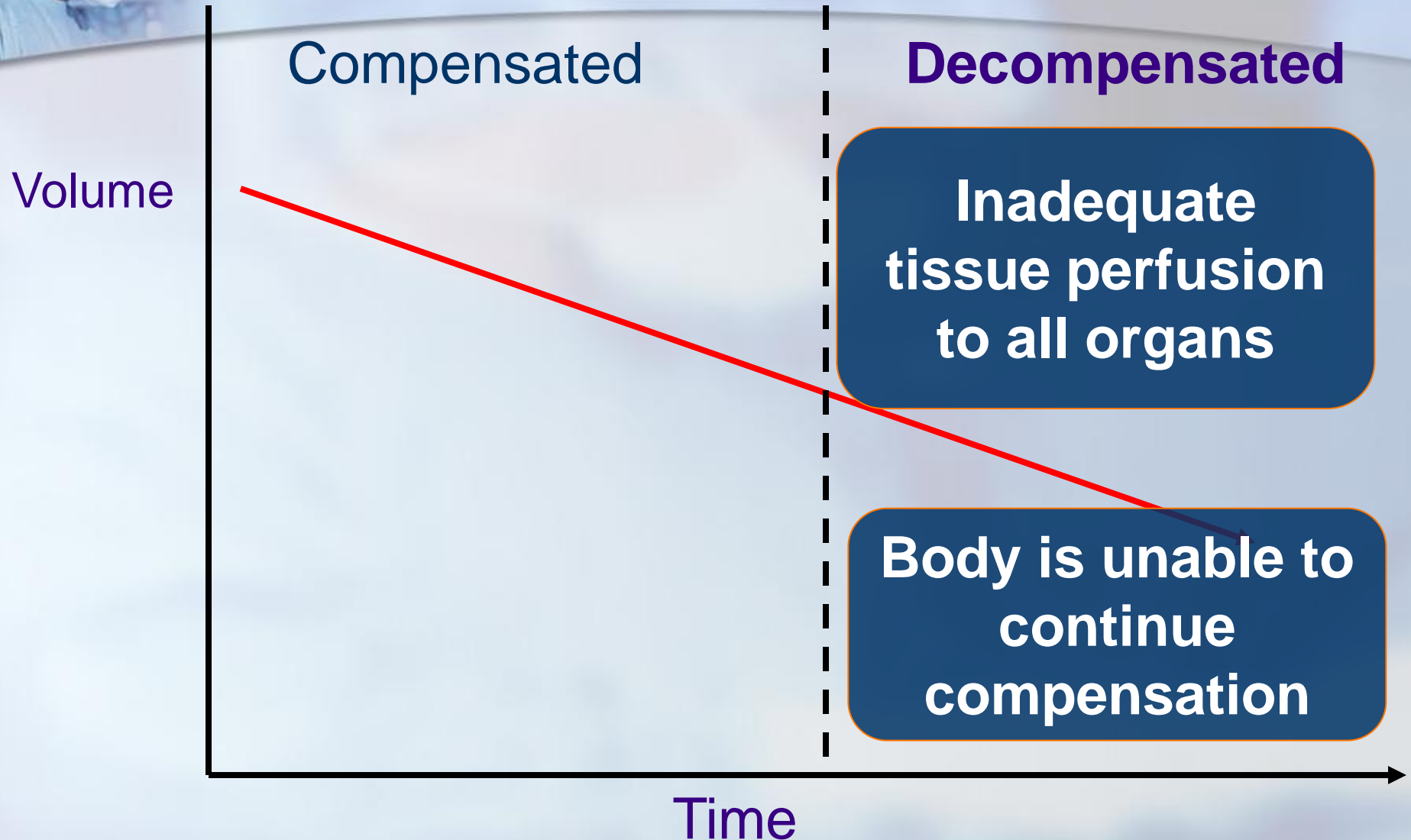


**Hypovolemic patient's skin
will "tent"**



Severity of Hypoperfusion

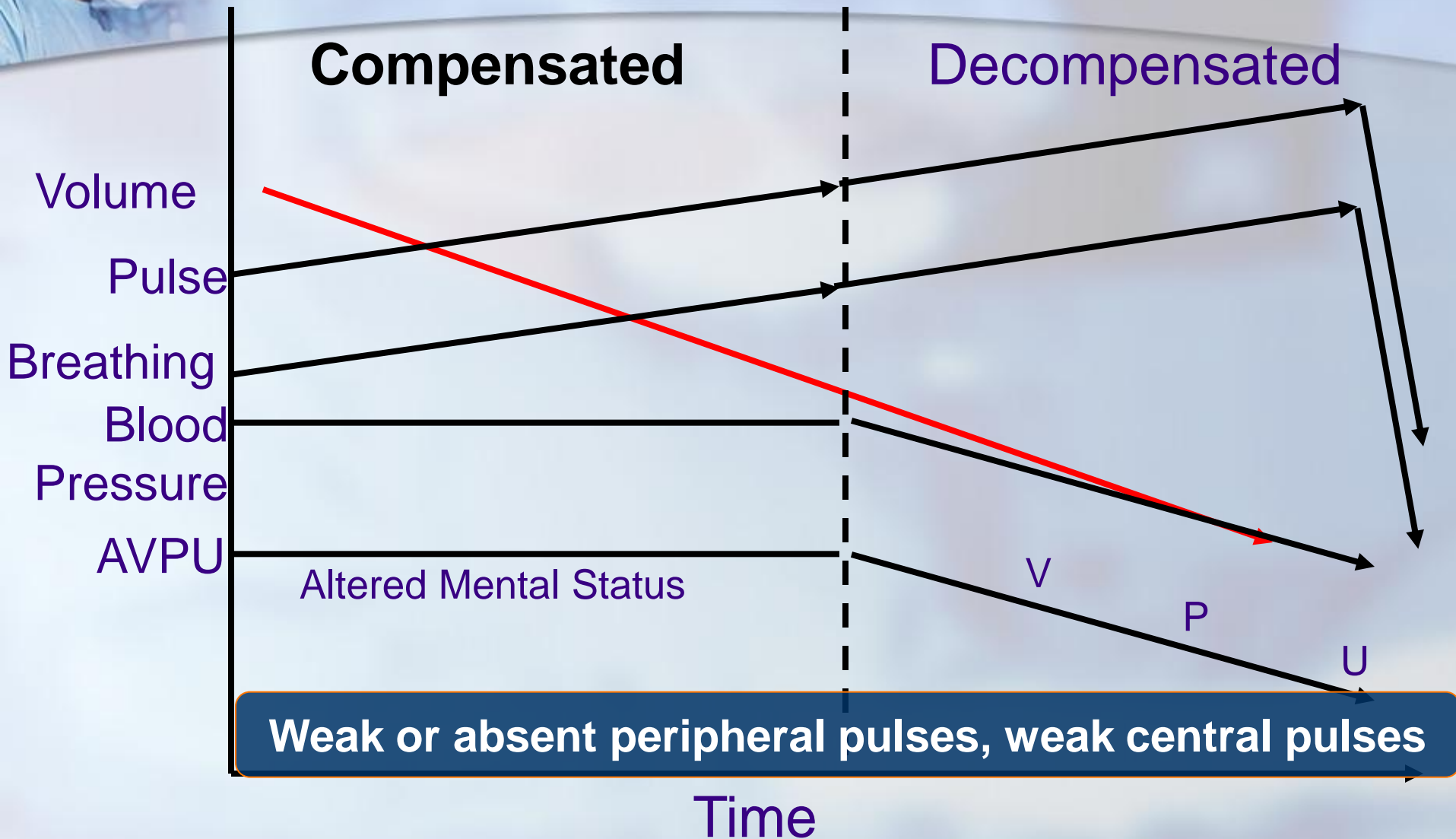
Decompensated Shock

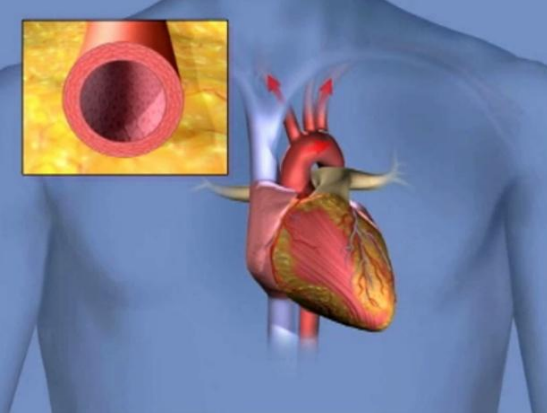




Severity of Hypoperfusion

Decompensated Shock Signs





The Effects of Shock

Causes of Shock

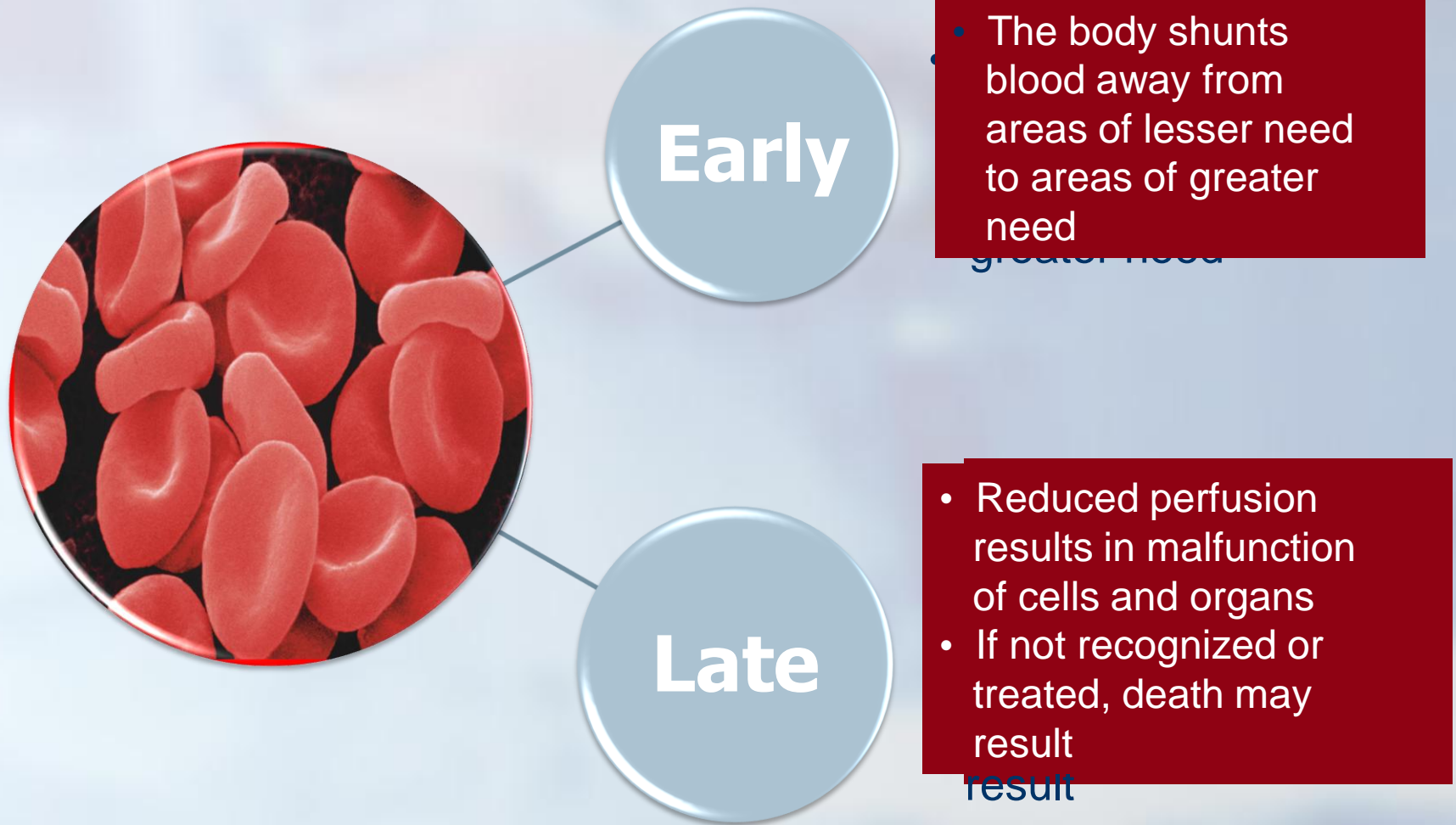
- Inability of heart to pump
- Decreased supply of blood
- Lack of integrity in blood vessels
- Failure of vessels to dilate and constrict

Development of Shock

- * Heart fails as a pump.
- * Blood volume is lost.
- * Blood vessels dilate.

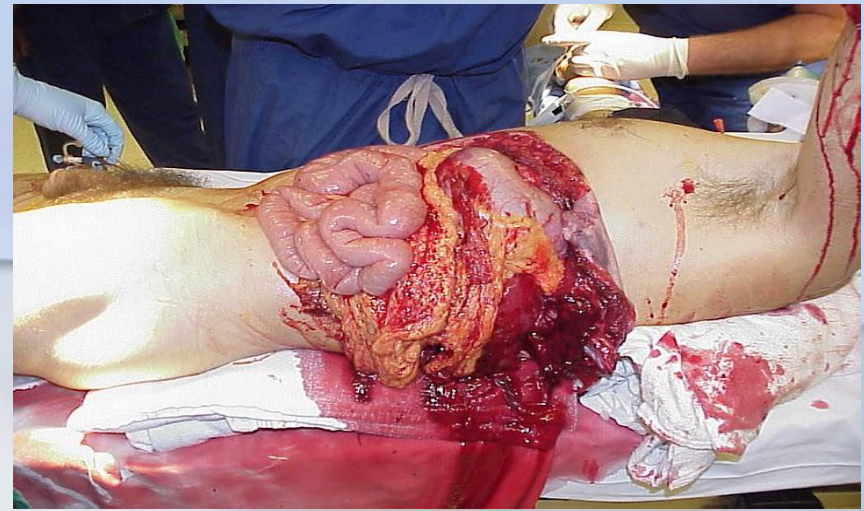


Severity of Shock





Classification of Shock



* Compensated

- Increased heart rate and respirations
- Constriction of periphery

* Decompensated

- Blood pressure falls

* Irreversible

- Unable to maintain perfusion of vital organs
- Cell damage occurs



Types of Shock

- ✱ **Hypovolemic shock (hypoperfusion)**
 - Uncontrolled bleeding or hemorrhage
 - Internal, external, or a combination
- ✱ **Hypovolemic Cardiogenic shock**
 - Myocardial infarction or heart attack
 - Inadequate pumping of blood
 - Electrical system malfunctioning
- ✱ **Neurogenic shock.**
 - Uncontrolled dilation of blood vessels
- ✱ **Anaphylactic shock**
- ✱ **Septic shock.**



Signs and Symptoms

- * Restlessness, changes in mental status /anxiety.**
- * Pale, cool, and clammy skin**
- * Nausea and vomiting**
- * Vital sign changes**
 - a. Shallow/rapid breathing.
 - b. Weak rapid pulse , Inaccurate pulse oximetry
 - c. Decreasing blood pressure.
 - d. Blood pressure drops - Dilated pupils.



Types of Hemorrhagic Shock

CLASSIFICATION OF HEMORRHAGIC SHOCK

	Compensated	Mild	Moderate	Severe
Blood Loss (mL)	≤ 1000	1000–1500	1500–2000	> 2000
Heart rate (bpm)	< 100	> 100	> 120	> 140
Blood pressure	Normal	Orthostatic change	Marked fall	Profound fall
Capillary refill	Normal	May be delayed	Usually delayed	Always delayed
Respiration	Normal	Mild increase	Moderate tachypnea	Marked tachypnea: respiratory collapse
Urinary output (mL/h)	> 30	20–30	5–20	Anuria
Mental status	Normal or agitated	Agitated	Confused	Lethargic, obtunded



General Emergency Care of Shock

1. Assure patent airway.
2. Maintain the ABCs Administer high- concentration oxygen.
3. Control bleeding.
4. Give nothing by mouth.
5. Administer IV fluids.
6. Elevate lower extremities, if no contraindications.
7. Splint fractures.
8. Prevent heat loss.
9. Transport the victim immediately.



Treatment of Shock





Sample Documentation

PATIENT NAME: <i>Arnold Johnson</i>				PATIENT AGE: <i>46</i>				
CHIEF COMPLAINT		TIME	RESP	PULSE	B.P.	MENTAL STATUS	R PUPILS L	SKIN
<i>Left flank pain</i>		VITAL SIGNS	Rate: <i>24</i> <input type="checkbox"/> Regular <input type="checkbox"/> Shallow <input checked="" type="checkbox"/> Labored	Rate: <i>110</i> <input checked="" type="checkbox"/> Regular <input type="checkbox"/> Irregular	<i>130</i> <i>85</i>	<input checked="" type="checkbox"/> Alert <input type="checkbox"/> Voice <input type="checkbox"/> Pain <input type="checkbox"/> Unresp.	<input checked="" type="checkbox"/> Normal <input type="checkbox"/> Dilated <input type="checkbox"/> Constricted <input type="checkbox"/> Sluggish <input type="checkbox"/> No-Reaction	<input type="checkbox"/> Unremarkable <input checked="" type="checkbox"/> Pale <input type="checkbox"/> Cyanotic <input type="checkbox"/> Flushed <input type="checkbox"/> Jaundiced
PAST MEDICAL HISTORY			Rate: <i>28</i> <input type="checkbox"/> Regular <input type="checkbox"/> Shallow <input checked="" type="checkbox"/> Labored	Rate: <i>120</i> <input checked="" type="checkbox"/> Regular <input type="checkbox"/> Irregular	<i>124</i> <i>80</i>	<input type="checkbox"/> Alert <input checked="" type="checkbox"/> Voice <input type="checkbox"/> Pain <input type="checkbox"/> Unresp.	<input checked="" type="checkbox"/> Normal <input type="checkbox"/> Dilated <input type="checkbox"/> Constricted <input type="checkbox"/> Sluggish <input type="checkbox"/> No-Reaction	<input type="checkbox"/> Unremarkable <input checked="" type="checkbox"/> Cool <input type="checkbox"/> Warm <input checked="" type="checkbox"/> Moist <input type="checkbox"/> Dry
<input checked="" type="checkbox"/> None <input type="checkbox"/> Allergy to _____ <input type="checkbox"/> Hypertension <input type="checkbox"/> Stroke <input type="checkbox"/> Seizures <input type="checkbox"/> Diabetes <input type="checkbox"/> COPD <input type="checkbox"/> Cardiac <input type="checkbox"/> Other (List) <input type="checkbox"/> Asthma			Rate: <i>28</i> <input type="checkbox"/> Regular <input type="checkbox"/> Shallow <input checked="" type="checkbox"/> Labored	Rate: <i>120</i> <input checked="" type="checkbox"/> Regular <input type="checkbox"/> Irregular	<i>118</i> <i>78</i>	<input type="checkbox"/> Alert <input checked="" type="checkbox"/> Voice <input type="checkbox"/> Pain <input type="checkbox"/> Unresp.	<input checked="" type="checkbox"/> Normal <input type="checkbox"/> Dilated <input type="checkbox"/> Constricted <input type="checkbox"/> Sluggish <input type="checkbox"/> No-Reaction	<input type="checkbox"/> Unremarkable <input checked="" type="checkbox"/> Cool <input type="checkbox"/> Warm <input checked="" type="checkbox"/> Moist <input type="checkbox"/> Dry
Current Medications (List) <i>None</i>								
NARRATIVE <i>Our patient states that he fell several feet while standing on a ladder. While falling, he struck his left side on the edge of a protruding kitchen table. Patient denies striking his head, neck, or back. He denies any loss of consciousness. Patient is ashen, tachypneic, tachycardiac, has a decreasing level of responsiveness, and is becoming nauseated. Our physical exam reveals a very tender LUQ.</i>								



Hypovolemic Shock

Definition:

- ❖ Reduction in intravascular volume leading to insufficient oxygen delivery to cells (mitochondria)





Hypovolemic Shock

Reduced intravascular volume?
No oxygen delivery!

No aerobic metabolism!

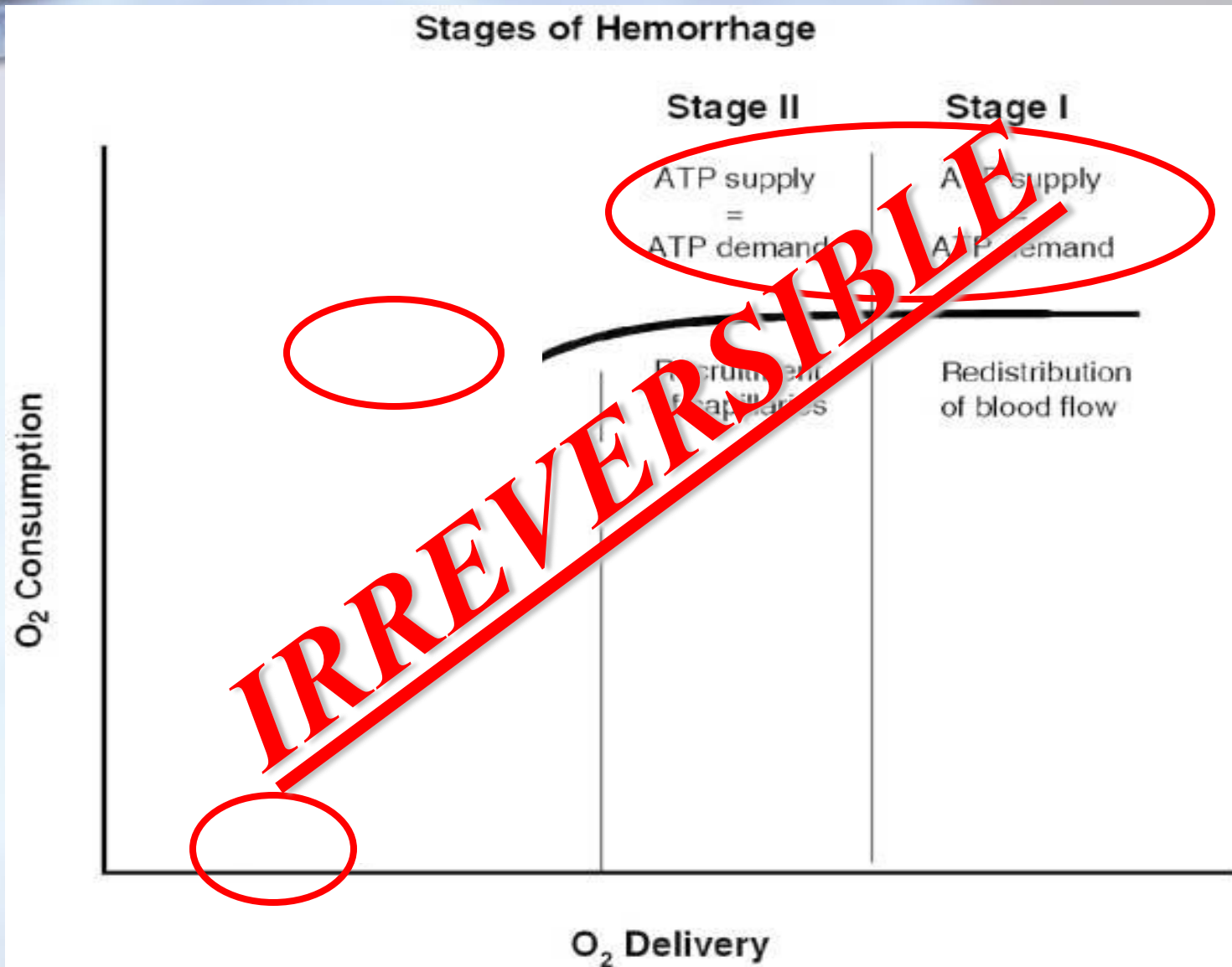
Then...

- ❖ Metabolic acidosis (lactic acid production)
- ❖ Endoplasmic reticulum sv
- ❖ Mitochondrial damage
- ❖ Cell Death!





EFFECTIVE RESUSCITATION





Hypovolemic Shock

Tension
Pneumothorax
~ impairment
of ventricular
filling.



Right lung pneumothorax - Radiograph



Right lung pneumothorax - CT



Hypovolemic Shock

- ❖ Hemorrhagic shock (3 categories)

- **1. Compensated:**

- **0-20% of blood loss**

Blood pressure is maintained via increased vascular tone and increased blood flow to vital organs





Hypovolemic Shock

The body's response:

Compensated shock → Baroreceptor mediated

vasoconstriction!

- ❖ Increased epinephrine, vasopressin, angiotensin
- ❖ Results in:
 - Tachycardia
 - Tachypnea
 - Lowered pulse pressure
 - Slightly lowered urine output

Hypovolemic Shock

The Organs who win:

- ❖ Brain
- ❖ Heart
- ❖ Kidneys
- ❖ Liver

The Organs who lose:

- ❖ Skin
- ❖ GI tract
- ❖ Skeletal Muscle





Hypovolemic Shock



But why

- ❖ The body will make whatever adjustments it can to maintain....

Adequate

Cardiac

Output

- ❖ Brain and heart perfusions remain **near normal** while other less critical organ systems are, in proportion to the blood volume deficit, stressed by ischemia.

Hypovolemic Shock

2. Uncompensated:

- ❖ **20-40% loss** of blood volume
- ❖ Decrease in BP
- ❖ Tachycardia





Hypovolemic Shock

The body's response:

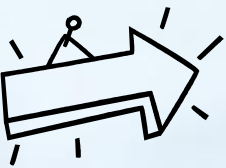
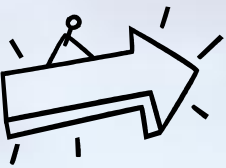
Uncompensated shock

- ❖ The intravascular volume deficit exceeds the capacity of vasoconstrictive mechanisms to maintain systemic perfusion pressure.
- ❖ Increased cardiac output
- ❖ Increased respiration
- ❖ Sodium retention

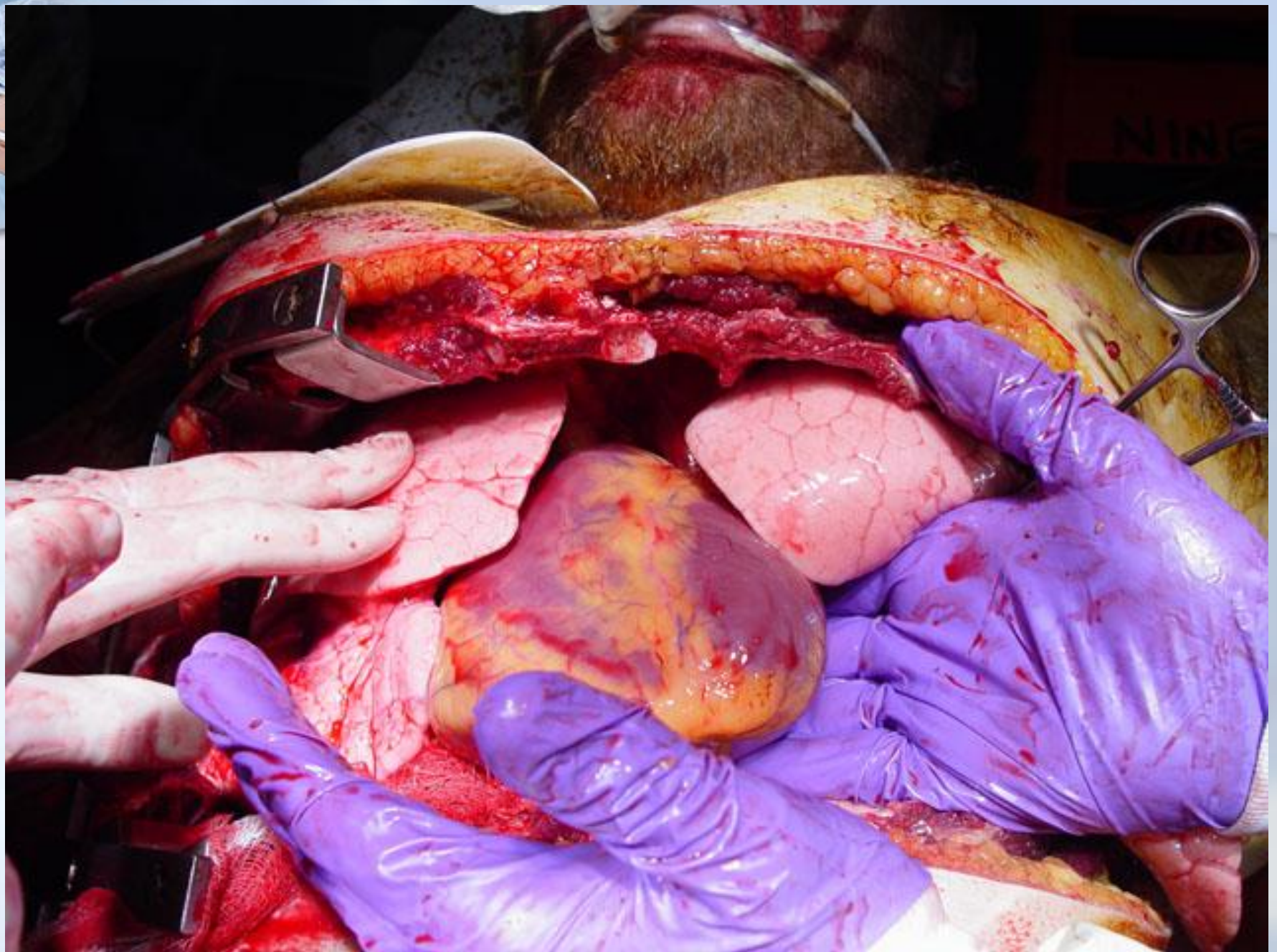


Hypovolemic Shock

3. Lethal exsanguination: **40% loss of blood volume**



Profound hypotension and inability to
perfuse vital organs





Hypovolemic Shock

Caveats...

- ❖ Athletes
- ❖ Pregnancy
- ❖ Extremes of age
- ❖ Medications
- ❖ Hematocrit/Hemoglobin





Hypovolemic Shock

Management:

- ❖ ABCs of trauma (AIRWAY is always first!)
- ❖ Control hemorrhage (splint the limb!!)
- ❖ Obtain IV access and resuscitate with fluids and blood
 - 2 liters crystalloid for adults
 - 20 cc/kg crystalloid x 2 for kids
- ❖ Blood vs. Crystalloid??
- ❖ Long term critical care management





Hypovolemic Shock

Your management goals AFTER
securing the ABCs:

STOP THE BLEEDING!

RESTORE VOLUME!

**CORRECT ANY
ELECTROLYTE/ACID-BASE
DISTURBANCES!**

Hypovolemic Shock



Hypovolemic Shock



Lung

Lung

Heart

Pericardial
sac



Hypovolemic Shock

Volume Resuscitation ~ What are my goals?

1. Rapid Responder

- Give 500cc-1 Liter crystalloid → rapid improvement of BP/HR/Urine output
- < 20% blood loss
- Surgery consult





Hypovolemic Shock

Volume Resuscitation ~ What are my goals?

2. Transient Responder

- Give 500cc-1 Liter crystalloid → improves briefly then deteriorates
- 20-40% blood loss
- Continue crystalloid infusion +/- B
- Surgery consult



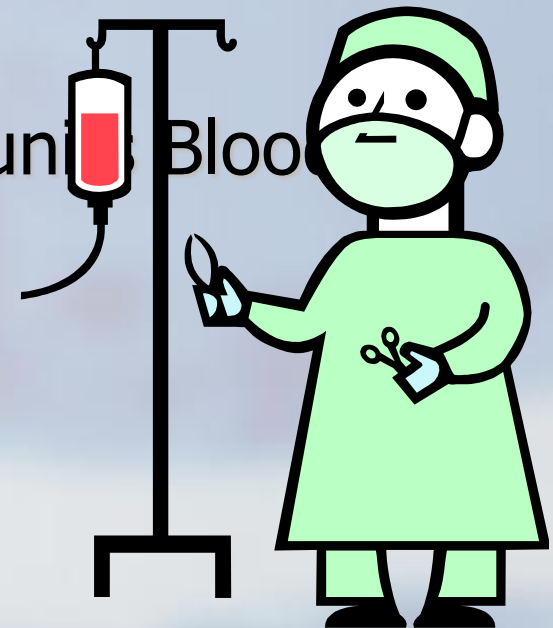


Hypovolemic Shock

Volume Resuscitation ~ What are my goals?

3. Non Responder

- Give 2 Liters crystalloid/ 2 units Blood no response
- > 40% blood loss
- STAT Surgery consult!





Hypovolemic Shock

Is my volume resuscitation
adequate/inadequate?

- ❖ Urine output ★
- ❖ Vital signs
- ❖ Skin perfusion
- ❖ Pulse Oximetry
- ❖ Acidemia??





**Thanks for your
attention!!**