AL-Furat Al-Awsat Technical University
College of Medical Rehabilitation for Prosthetics

Practical Physiology First class
(Lap 8)

Blood Groups and Rh factor

Prepared by
Ass. Lec. Doaa Ali Saeed

Principle

The surfaces of the red cell membrane contain a variety of genetically determined antigens, called **isoantigens** or **agglutinogens**, while the plasma contains antibodies (agglutinins), which occur as a result of antigen-antibody reaction.

The antigen-antibody reaction also activates the complement system that releases proteolytic enzymes (the lytic complex) which rupture the red cells and releases hemoglobin.

Apparatus And Materials

1. **The equipments:**

- Lancet, or test tube filled with blood
- Sterile cotton
- Alcohol Stick.

2. Anti-A serum: these antibodies are also called anti-A or alpha (α) agglutinins. Anti-A serum can also be obtained from a person with blood group B, the antiA serum is tinted blue.

3. Anti-B serum: these antibodies are also called anti-B or beta (β) agglutinins.

Anti-B serum can also be obtained from a person with blood group A, the anti-B serum yellow.

4. Anti-D (anti-Rh) serum: These antibodies are also called **anti-D agglutinins**.

Anti-D serum is colorless.

Procedure:

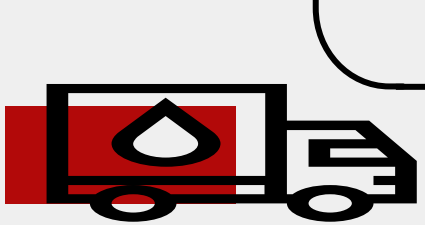
1. Using 3 slides, put on 1st slide the “anti-A”, 2nd slide the “anti-B”, and 3rd slide the “anti-D”.

2. Add a drop of blood on anti-A, one drop on anti-B, and one drop on anti-D sera.

3. Mix the anti-sera and blood, gently by stick (toothpick).

4. Wait for 8–10 minutes, then inspect the 3 antisera-red cell mixtures, with the naked eye to see whether agglutination (clumping and hemolysis of red cells) has taken place or not.

Observations



- Relevance blood transfusion is a life-saving procedure in all cases of severe blood loss and life-threatening anemia. However, blood can only be given after knowing blood grouping which is an essential requirement before blood is given to any individual.

- In addition to the antigens of the ABO system, the red cells of 80–85% of humans also contain an additional antigen, **called Rh antigen (or Rh factor)**.
- The Rh factor is so named because Landsteiner and Weiner discovered this antigen in the **Rhesus monkey** in 1940.
- They injected the red blood cells of Rhesus monkeys into rabbits.
- The rabbits' immune system reacted by forming antibodies against rhesus red cells, and when the rabbit’s plasma was tested against human red cells, agglutination occurred in 80–85% of individuals.

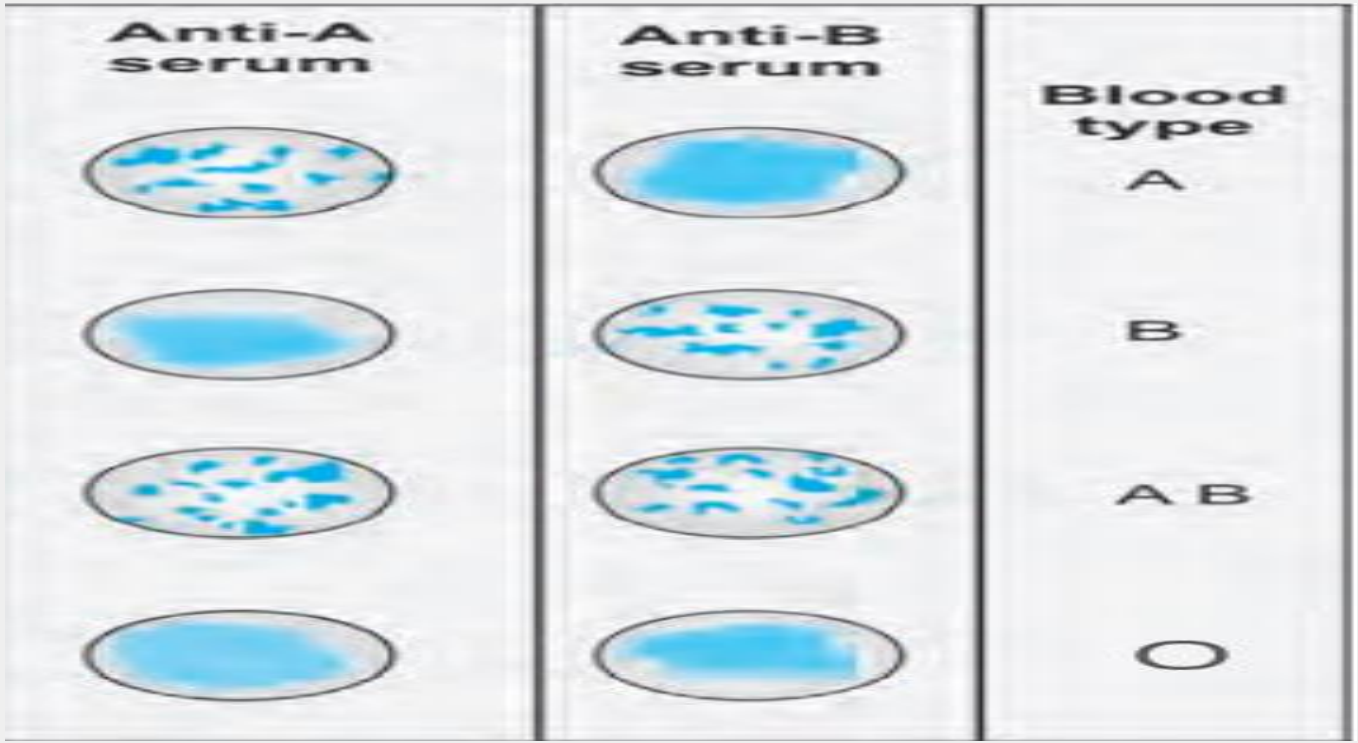
- Persons whose red cells contain this additional antigen are called “Rh positive” **(Rh+ ve)** while those who lack this antigen are called **(Rh– ve).**
- There are several varieties of Rh antigen: C, D, E, c, d, and e—but the D antigen is the most common, and antigenically, the most potent.

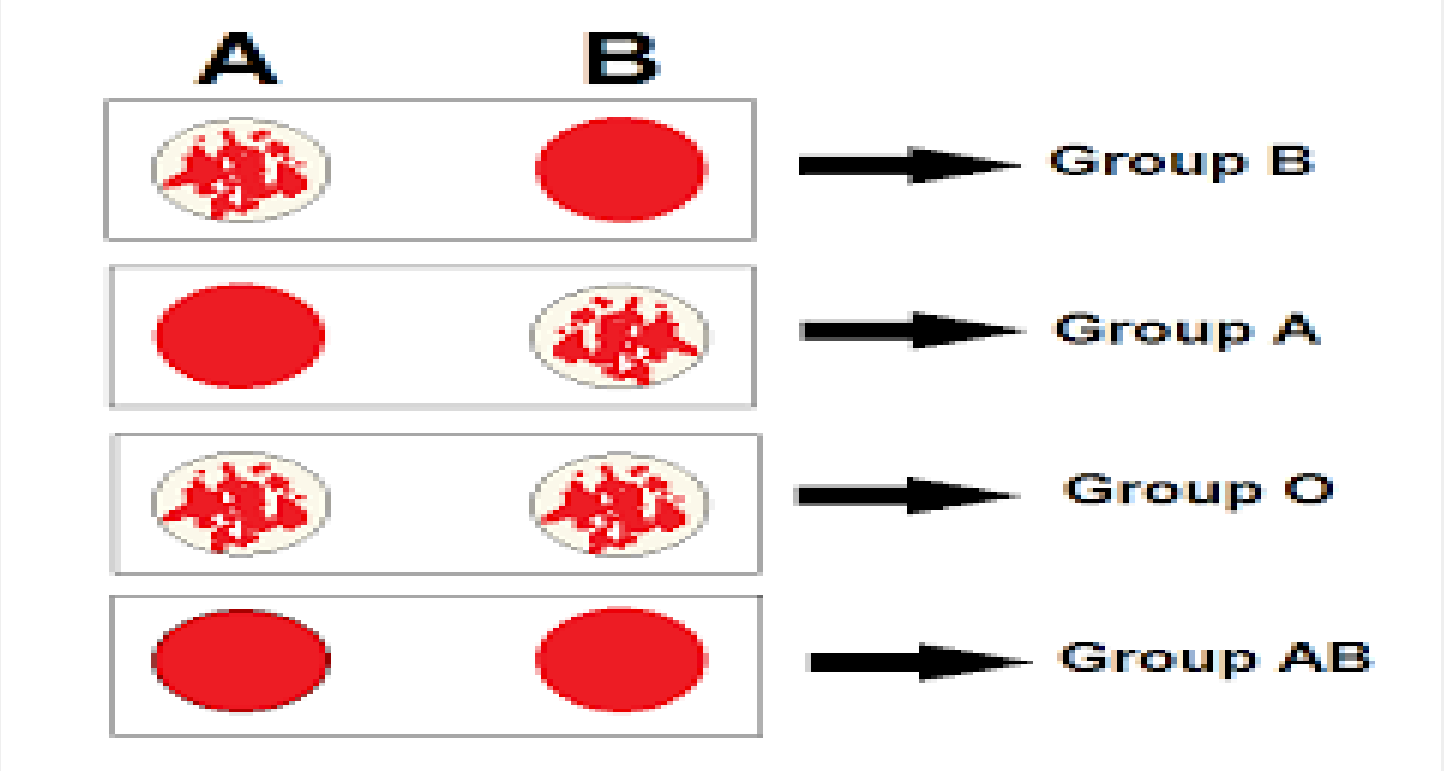
Clinical significance of Rh factor although there are no natural anti-Rh antibodies, and they never develop spontaneously, they can be produced only in Rh –ve persons. **This can happen in either of 2 ways:**

1. In transfusions: a Rh –ve person is given Rh +ve blood, the newly donated red cells will be agglutinated and hemolysed.
2. In pregnancy: a Rh –ve mother carries a Rh +ve fetus, cause agglutination and hemolysis. The clinical condition that develops in the fetus is called “hemolytic disease of the newborn, or “erythroblastosis fetalis”.

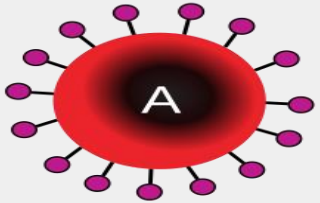
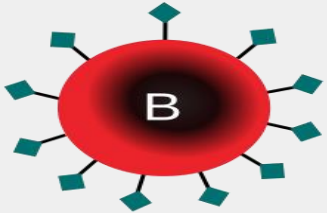
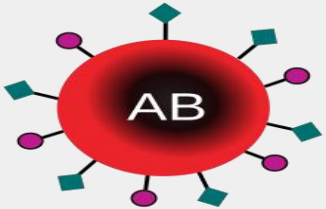
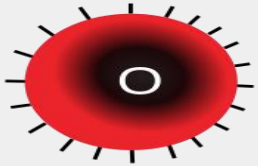
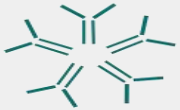
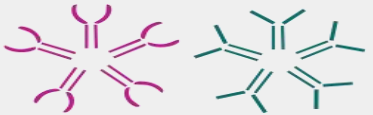
What is meant by the term’s universal donor and universal recipient?

- Since type O persons do not have either A or B antigens on their red cells, they are called “universal donors” because their blood can, theoretically, be given to all 4 blood types. Type AB persons are called “universal recipients” because they do not have circulating agglutinins in their plasma and can, therefore, receive blood of any type.

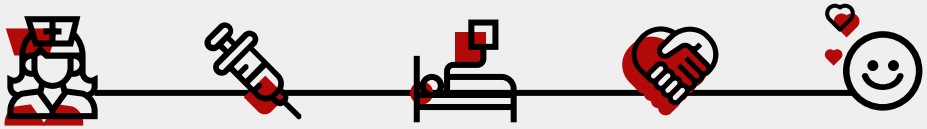

Anti-A serum
Anti-B serum
Blood type
A
B
A B
O


A
B
Group B
Group A
Group O
Group AB

Blood group	Antigen on Surface of RBC	Antibody in Serum	Can donate blood to	Can receive blood from
A	A	Antibody b	A, AB	A, O
B	B	Antibody a	B, AB	B, O
AB (universal acceptor)	A and B	Nil	AB	A, B, AB, O
O (universal donor)	Nil	Both Antibody a and Antibody b	A, B, AB, O	O

	Group A	Group B	Group AB	Group O
Red blood cell type				
Antibodies in plasma	 Anti-B	 Anti-A	None	 Anti-A and Anti-B
Antigens in red blood cell	A antigen	B antigen	 A and B antigens	None

Thanks



Bleeding Time

Doaa Ali Saeed

Definition

Bleeding time is a crude test of hemostasis (the arrest or stopping of bleeding) . It indicates how well platelets interact with blood vessel walls to form blood clots .

So the **Bleeding time** is defined as the time taken for a standard skin wound to stop bleeding .

Purpose

Bleeding time is used most often to **detect qualitative defects of platelets** . The test helps identify people who have **defects in their platelet function** . This is the ability of blood to clot following a wound or trauma . Normally, platelets interact with the walls of blood vessels to cause a blood clot . There are many factors in the clotting mechanism, and they are initiated by platelets .

Method description:

Duke's method for bleeding time:

principle : A standardized puncture of the ear lobe or a fingertip is made and the time needed for the bleeding to stop is recorded . Cessation of bleeding indicates the formation of a **haemostatic plug** which depends on **an adequate number of platelets and the ability of the platelets to** adhere to the sub endothelium and to form aggregates .

Materials & instruments:

- Lancet
- Stop watch
- circular filter paper
- Alcohol

Procedure:

1-The ear lobe is cleaned with alcohol and is allowed to dry. The alcohol should be left on the skin long enough for it to kill bacteria at the wound site. The alcohol must be removed before stabbing the arm because alcohol will adversely affect the tests results by inhibiting clotting .

2-Then a standardized puncture of the ear lobe is made using a lancet.

3- The recording of time is started at the time of puncture

4- Using a circular filter paper the blood is blotted every **15-30 sec.** without allowing the filter paper to touch the wound.

5- Stop the stop watch at the moment that the bleeding ceases and this will represent the bleeding time.

6- You can calculate the time by **dividing the number of spots by 2.**

The **disadvantage** to the Duke method is that the pressure on the blood veins in the stab area is **not constant and the results achieved are less reliable**.

Normal range is 2-6 minutes

Note

The stop of bleeding is not due to clotting but due to the spasm of the capillaries and the formation of the platelet plug.

Medical applications:

The prolongation of bleeding time is due to:

1- Decrease number of platelets (thrombocytopenia).

2- Defect in the function of the platelets (as in case of aspirin use) &Von -Willebrand's disease which is an inherited disease.

3- Defect in the vessels themselves.

Clotting time

Doaa Ali Saeed

Clotting time

Definition: It is the time required for blood to clot without the presence of any substance.

Introduction: When the blood vessel ruptures , in a few minutes blood loses its fluidity and sets into a semisolid mass called **clot**. This process is called **blood coagulation.**

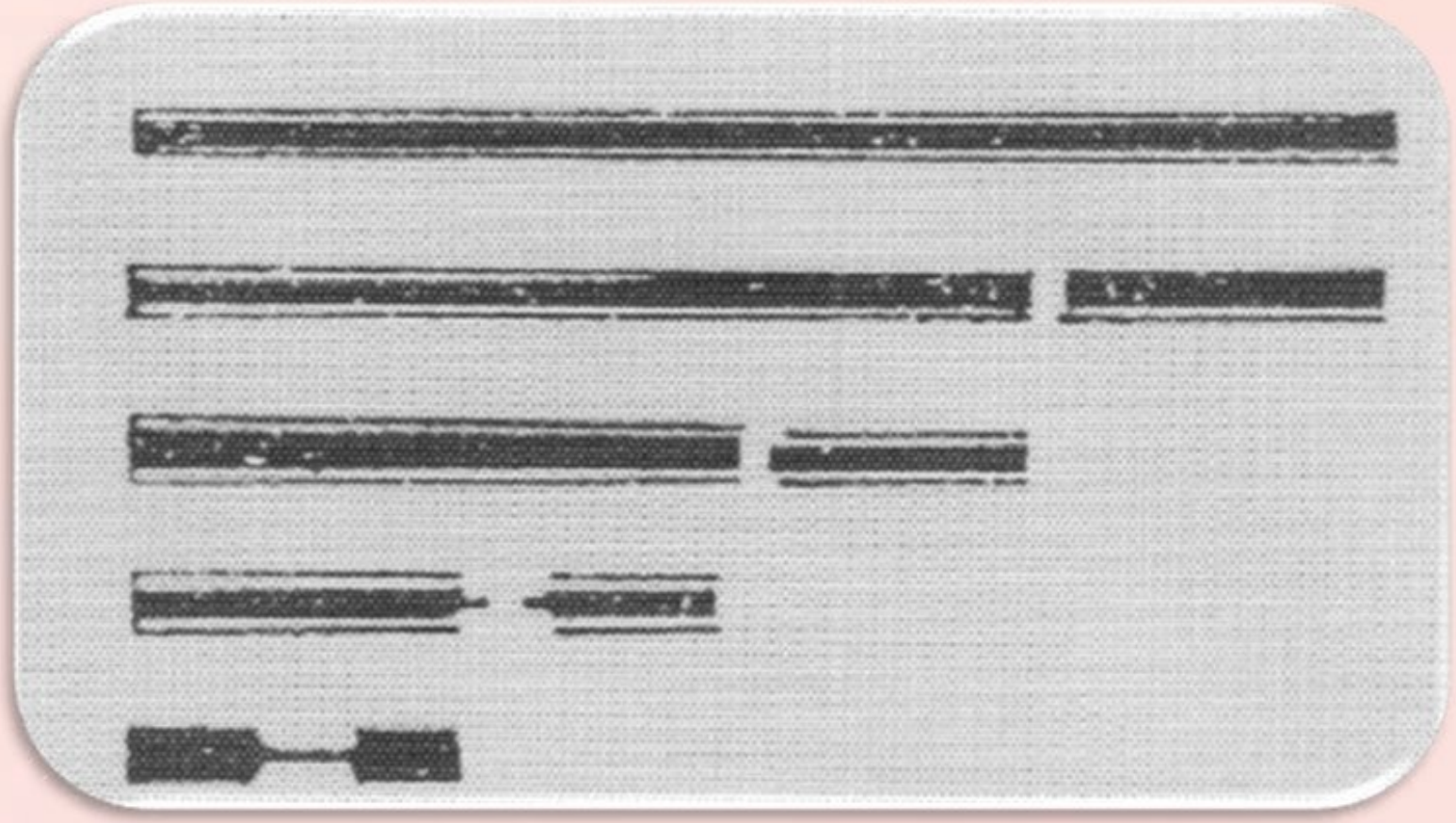
1. In vitro - blood clots outside the body on cuts and injuries.

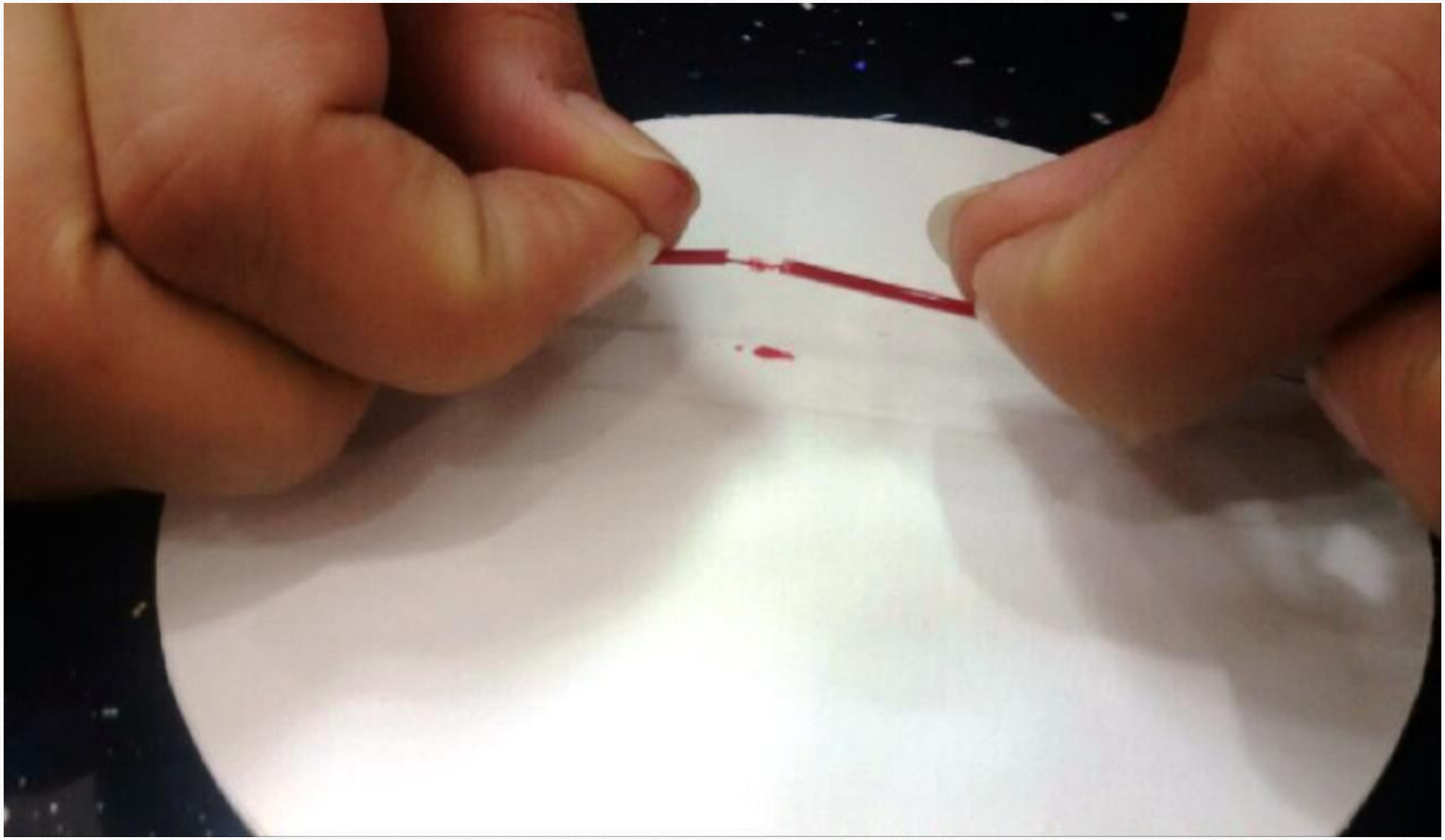
2. In vivo - Blood clots inside the blood vessels.

1- Capillary method

Purpose:

Capillary tube method (Wright's method) test for **Extrinsic coagulation pathway.**



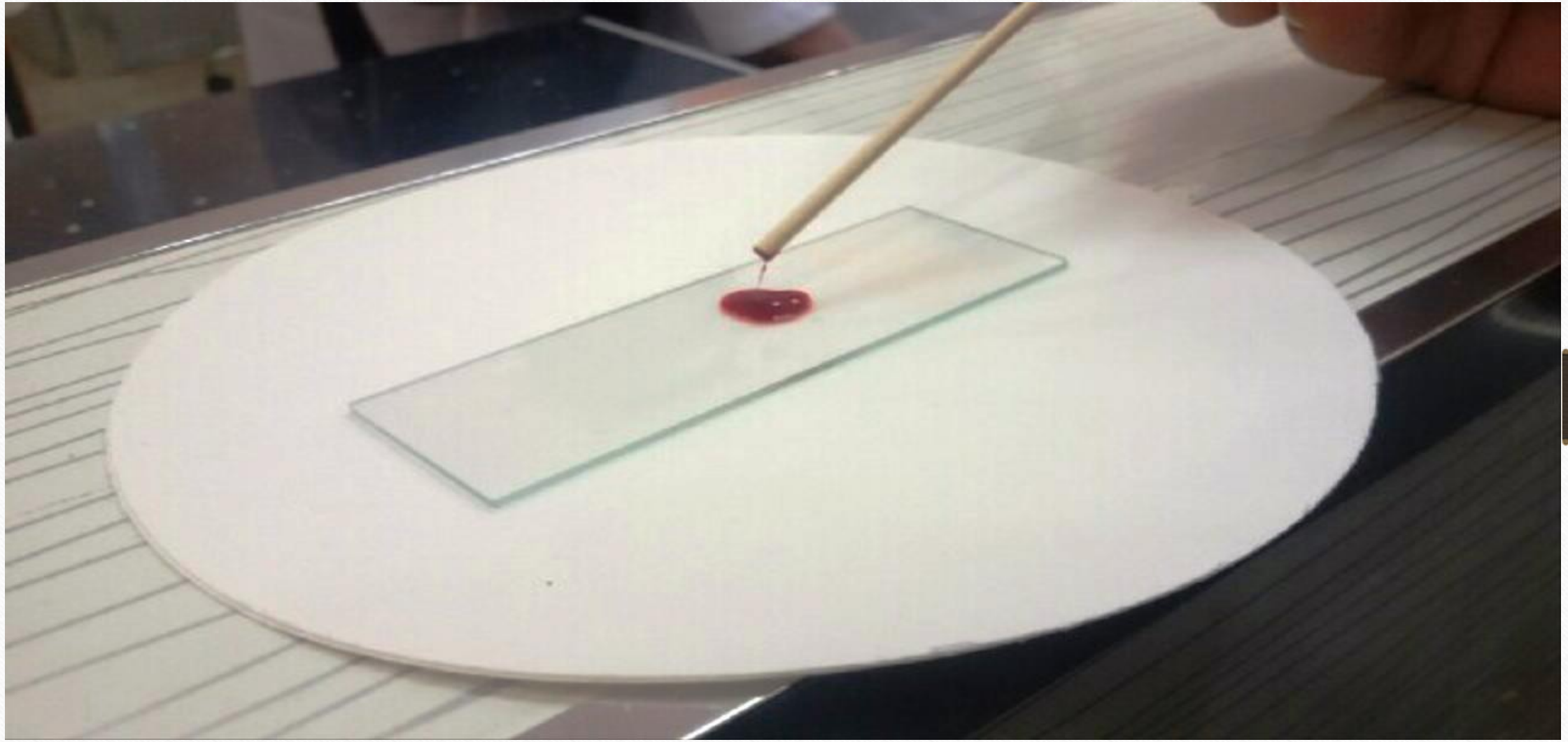


2- Slide Method

Materials and Method:

Few drops of blood were obtained and placed on the glass slide. A needle, lancet or wooden stick was continuously drawn on to the drops for every 30 second interval until shreds of fibrin cling to the needle.

The time elapsed from placing the blood onto the slide and the formation of fibrin shreds was recorded. **Normal range 3 _ 10 min**



Medical applications:

The prolongation of clotting time is due to :

- In coagulation disorders likehaemophilia
- vitamin K deficiency
- liver diseases
- Over dosage of anticoagulants etc.

AL-Furat Al-Awsat Technical University
College of Medical Rehabilitation for Prosthetics

Thermometer and its uses

Practical Physiology First class (Lap 4)

Prepared by

Doaa Ali Saeed

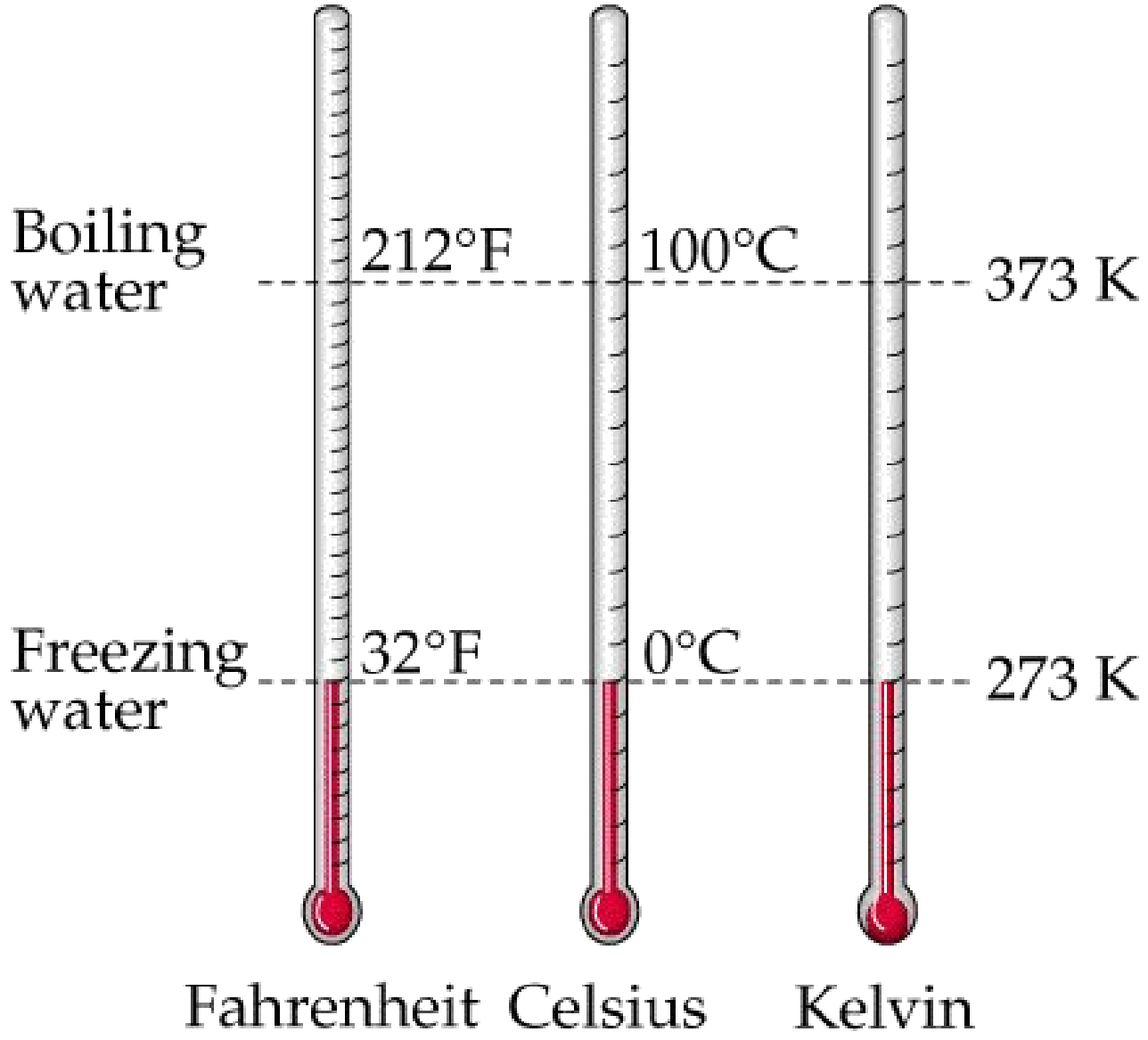
Body Temperature **:- It's** the main vital signs and it's the degree of sensible heat or cold, expressed in terms of a specific scale (Celsius, Fahrenheit, and Kelvin).

Body temperature is the balance between the heat production due to chemical activities by the body **and** heat lost by the body through radiation, conduction, convection, and vaporization (evaporation).

While heat production in the body is called thermogenesis, heat loss to the environment is called thermolysis

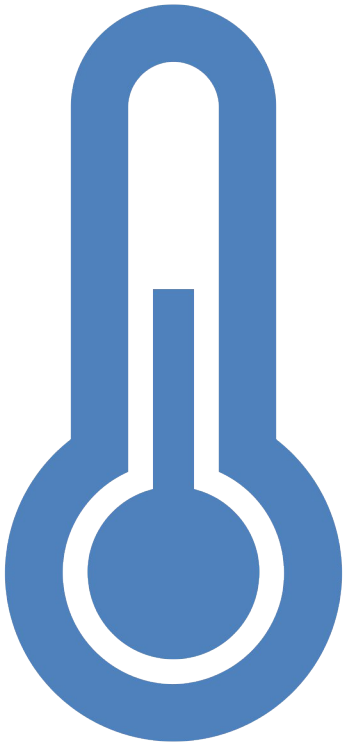
- A condition with body temperature more than 37.2℃ (100℉) is called ***fever*** ***or pyrexia***, and that with a temperature of less than 35℃ is called ***hypothermia***.
- ***Hyperpyrexia*** is an ***extreme*** elevation of body temperature

Hypothermia	**< 35 ˚C**
Subnormal	**35-36.6˚C**
Normal	**36.6-37.2˚C (mouth)**
Febrile	**37.2-41.6˚ C**
Hyperpyrexia	**> 41.6˚ C**


Boiling water
212°F
100°C
373 K
Freezing water
32°F
0°C
273 K
Fahrenheit
Celsius
Kelvin

Thermometer

- It is an instrument that measures temperature.
- The three most common temperature measurement units are Celsius, Fahrenheit, and Kelvin.

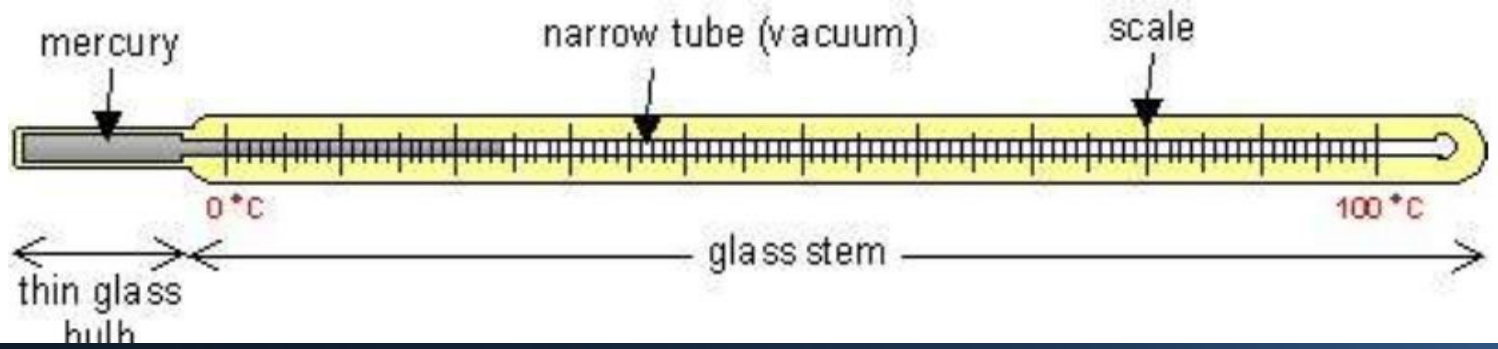


- ***There are three main types of thermometers:***

1. Mercury thermometer
2. Digital (Electronic) thermometer
3. Infrared (Tympanic) thermometer

Mercury thermometer

- Mercury glass thermometer is used for measuring oral, rectal, and axillary temperature.
- It takes about ***2-8 minutes*** for an accurate result.
- Placed below the tongue or in the axilla (armpit) at least for 2 minutes.
- Mercury is ***TOXIC*** if it comes in contact with the skin or is mistakenly ingested.



➢ *Digital thermometer*

✓Safer than mercury thermometer.

✓Used to measure **oral**, **axillary**, and **rectal temp**.

✓Takes about 30 sec. to 2 min for accurate reading.

➢ *Infrared (Tympanic) thermometer*

✓It is used to measure ear temperature/ tympanic temperature.

✓It takes about 2-3 seconds for accurate reading.

Routes for Measuring Body Temperature

1. Oral Route

- It is the most suitable route for measuring body temperature,used for conscious adult patients.
- Normally, it is 0.5˚C lower than rectal temperature. It is affected by some factors as ingestion of hot/cold fluids and mouth breathing.

2. Axillary Route

•It is also suitable and used in practice, usually for unconscious patients and children.

•Normally, it is 0.5˚C lower than oral body temperature and can be affected by environmental temperature changes.

Rectal Route

- It is an uncomfortable route for measuring body temperature, but the most trusted route.
- The rectal temperature represents the temperature of the body core and is the **least** affected by environmental temperature.
- It is used in unconscious patients and infants.
- Rectal temperature is normally 0.5˚C higher than that of the oral route.

- **Groin Route**
- It is suited and usually used for children.
- It can be affected by environmental temperature and is usually done by placing the bulb of the thermometer in the fold of the groin with the thigh held flexed on the abdomen.
- Groin temperature is 0.5˚C **lower** than that of the oral route

Forehead Route

By skin. A special thermometer can quickly measure the temperature of the skin on the forehead.

Range: 36.4-36.7°C.

Ear (Tympanic) Route

- Temperatures can be taken in the ear.
- A special thermometer can quickly measure the temperature of the ear drum, which reflects the body's core temperature (the temperature of the internal organs).
- Normal ranges: 36.8-37.3 °C) .

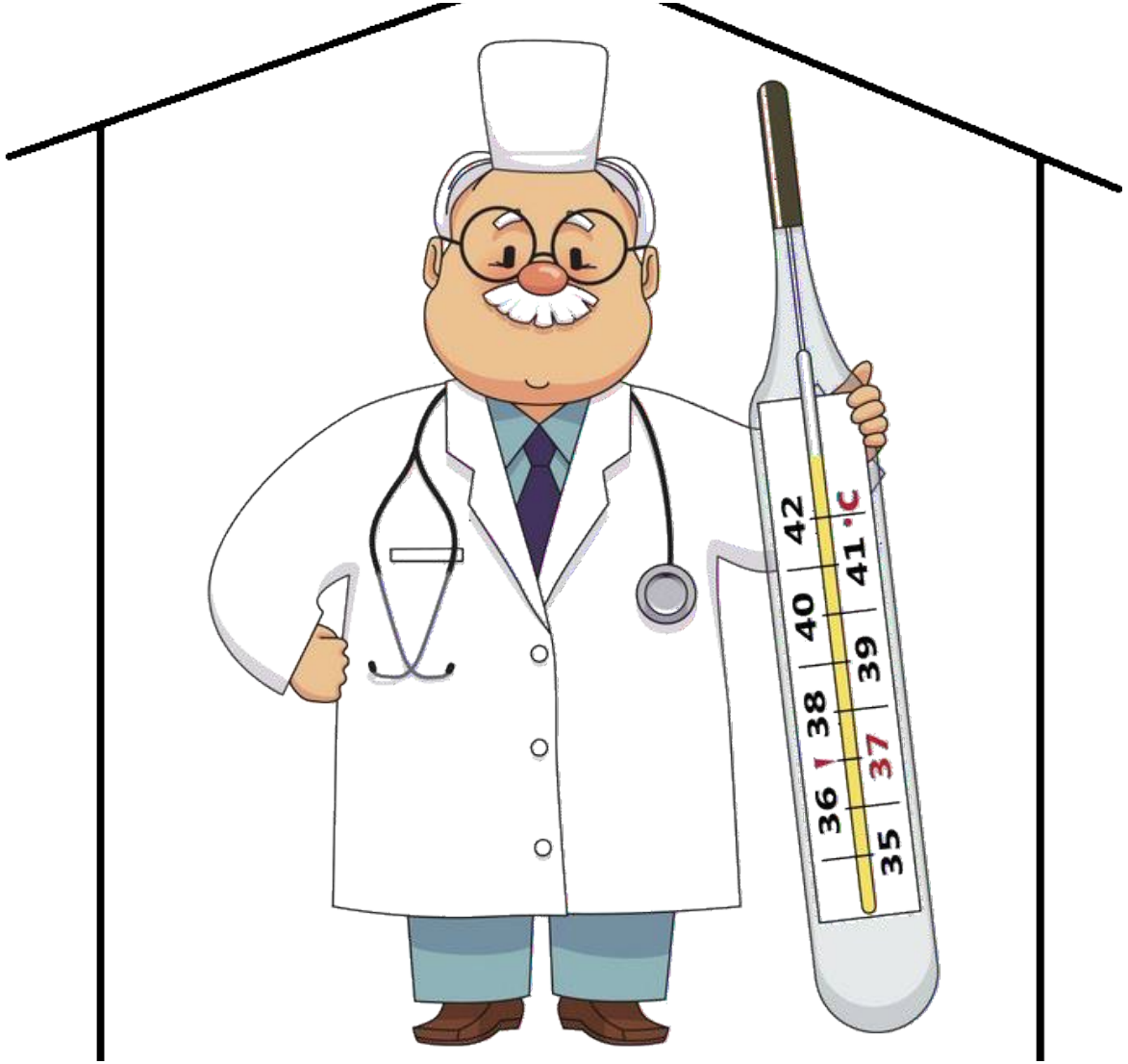
Procedure of Temperature Measurement

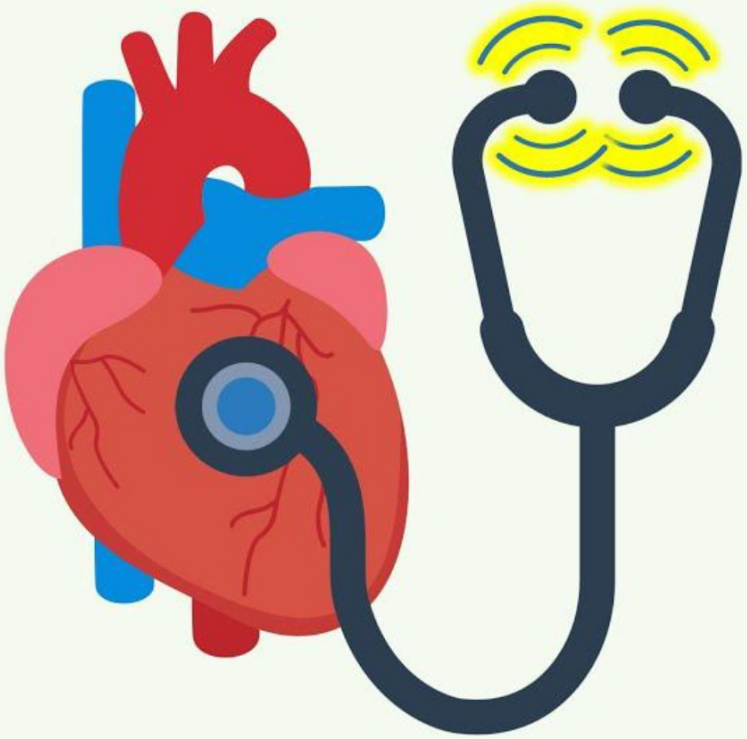
1. Hold the thermometer from the end away from the bulb with your thumb and index finger.
2. Lower the mercury level by shaking the thermometer to below 35˚C.
3. Wash the thermometer with an **antiseptic** solution with cotton wool.

4. Place the bulb of the thermometer underneath the tongue and ask the patient to close his lips and breathe from his nose for 2 min. then read the temperature at the level of the mercury column.

5. Repeat the procedure above for the axillary,groin, and Rectum route for measuring temperature.

Thank you





Heart Sounds

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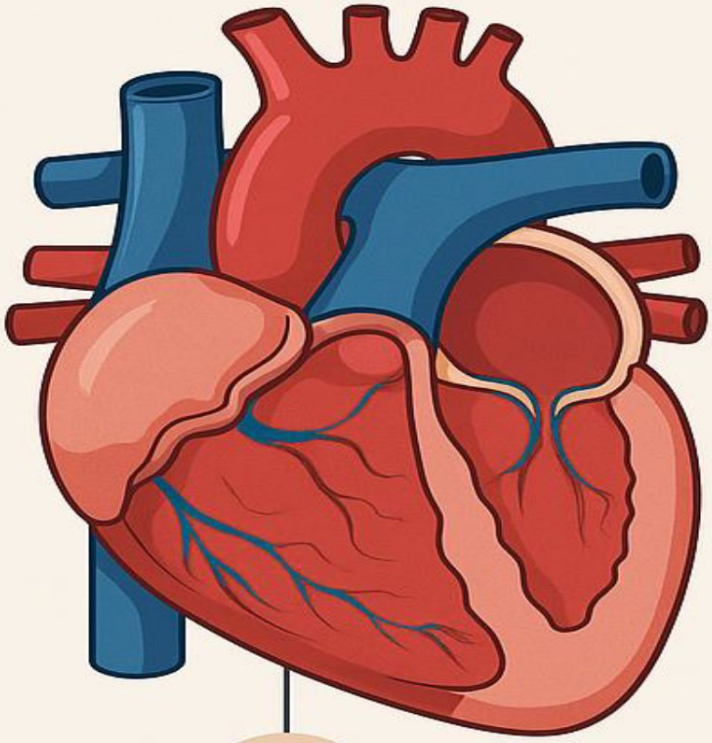
HEART SOUNDS



S2

S2

S4

S2

S3

HEART SOUNDS

are the sounds produced by mechanical activities .of the heart during each cardiac cycle

:Heart sounds are produced by

Flow of blood through cardiac chambers .1

Contraction of cardiac muscle .2

.Closure of valves of the heart .3

Heart sounds are heard by placing the ear over the .chest or using a stethoscope or microphone

The Study of heart sounds has important diagnostic value in clinical practice because alterations in the heart sounds indicate cardiac .diseases involving heart valves

Four heart sounds are produced during each cardiac .cycle

.Clinically, two heart sounds are easily distinguishable

: First and second heart sounds.1

.Called classical heart sounds •

.Heard by using the stethoscope •

Prominent and resembling the spoken words ‘LUB’, (or • .LUBB), and ‘DUBB’ (or DUP), respectively

Third heart sound.2

- Itis a mild sound, and it is not heard by using a stethoscope in normal conditions.
- But it can be heard by using a microphone.

Fourth heart sound.3

- is an inaudible sound it becomes audible in pathological conditions only.
- This sound is studied only by the phonocardiogram

CAUSES OF HEART SOUNDS

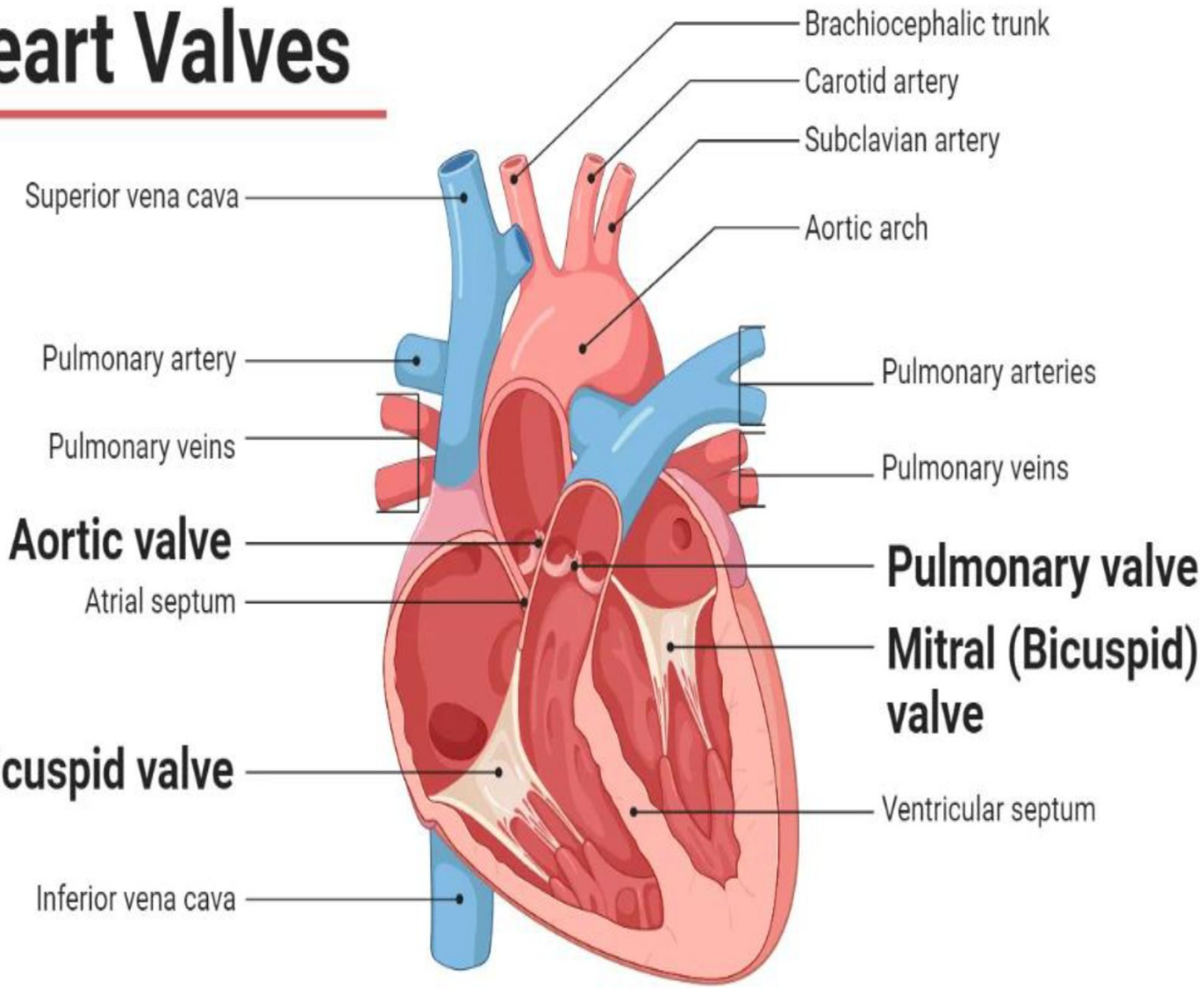
S1 (First Heart Sound) is due to the closure of the AV .(valves (mitral and tricuspid valves

S2 (Second Heart Sound) – to the closure of the (semilunar valves (aortic and pulmonary

S3 (Third Heart Sound) – Caused by rapid ventricular filling

S4 (Fourth Heart Sound) – Caused by atrial contraction .(against a stiff ventricle (usually pathological

Heart Valves



IN DISEASE, THE FOLLOWING DEVIATIONS FROM THE NORMAL :OCCUR

,The sounds may have different intensities.1

either increased or decreased

The sounds may be abnormally split.2

Low-frequency sounds in diastole.3

The third and fourth heart sounds may be heard

Additional sounds, often related to.4

.Abnormal valves, may be heard

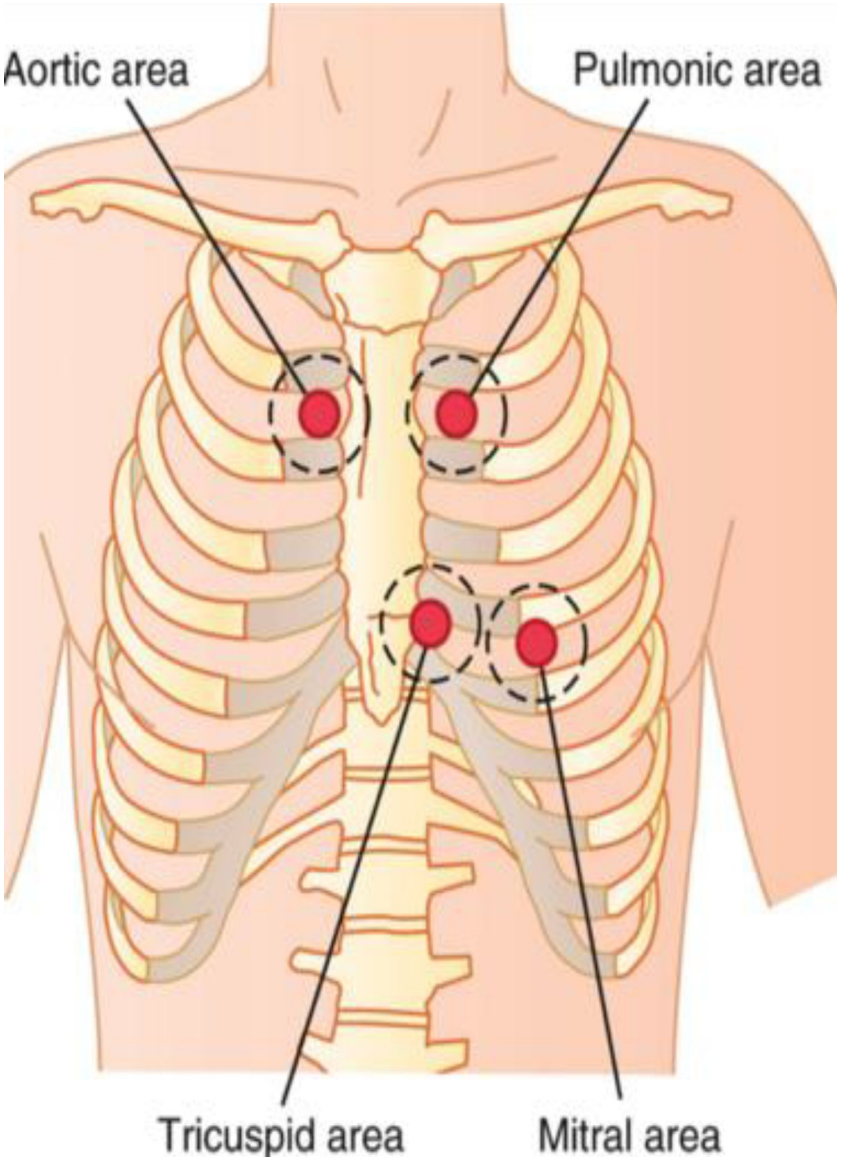
MURMUR

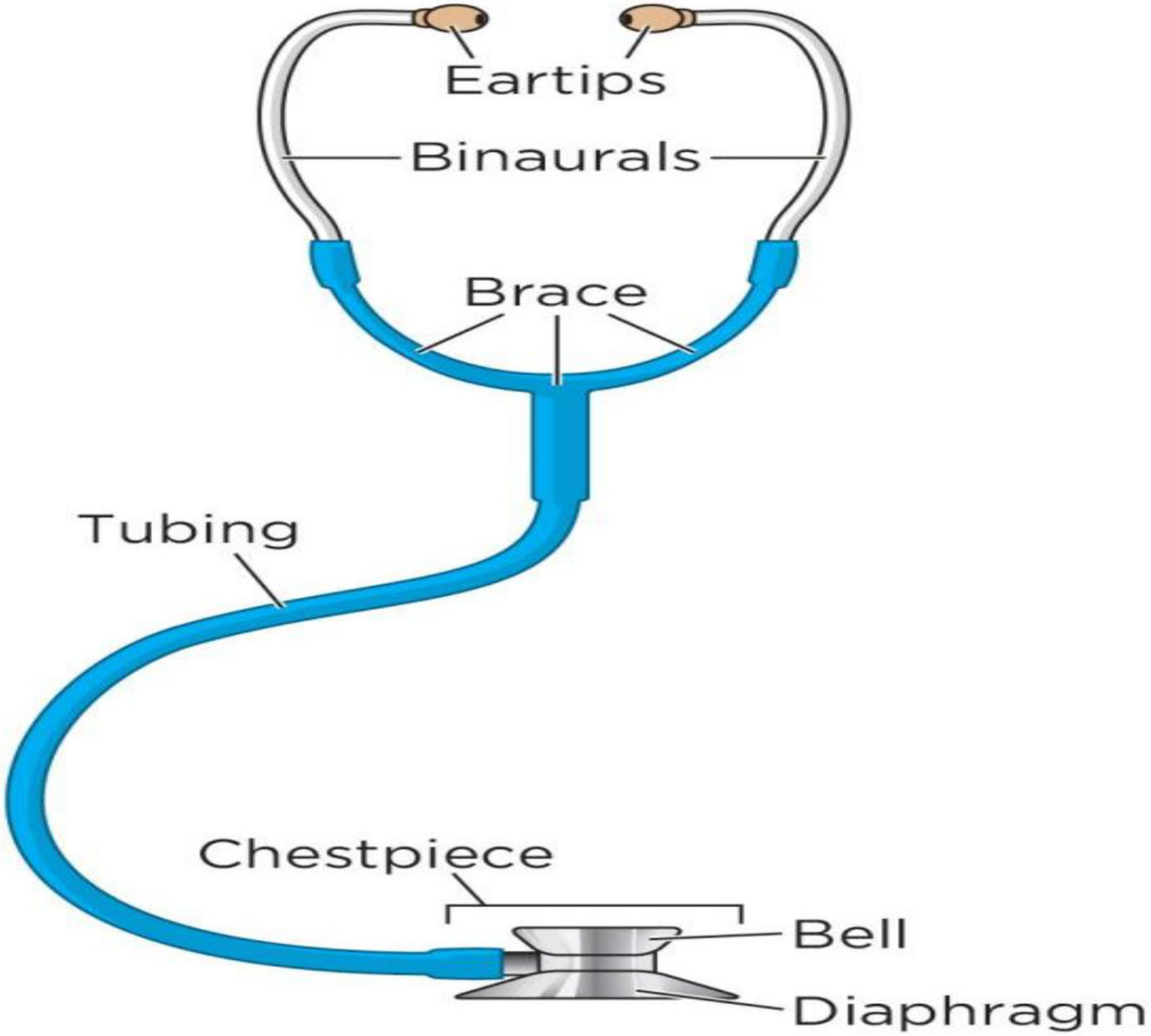
A murmur is an abnormal heart sound caused by turbulent .blood flow within the heart or great vessels

It is heard during auscultation and can indicate physiological .or pathological conditions

PROCEDURE

Positioning of the stethoscope




Eartips
Binaurals
Brace
Tubing
Chestpiece
Bell
Diaphragm

EXAMINE THE HEART SOUNDS OF THE SUBJECT

Make the subject comfortable and instruct him/her. properly

Expose the chest completely Locate all four. auscultatory areas (mitral, tricuspid, aortic, and (pulmonary

Place the diaphragm of the stethoscope over the areas. .sequentially and auscultate for the heart sounds

Confirm the first heart sound by palpating the carotid. artery simultaneously. Report the observation .correctly


thank you

ASSESSMENT OF VITAL SIGNS

ARTERIAL BLOOD PRESSURE MEASURING

LAB:6

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VITAL SIGNS

- One of the most important milestones of general examination. they give a rapid and good general impression about the patient's health status .
- When these values are not zero, they indicate that a person is alive .
- Temperature, Pulse, Respiration, and Blood Pressure are the Vital Signs

BLOOD PRESSURE

- Blood pressure refers to the force exerted by circulating blood on the walls of blood vessels, and it is one of the vital signs.
- The term blood pressure generally refers to arterial pressure (AP), that they are the vessels where the pressure is measured.
- **Blood pressure** is usually recorded as :Systolic Pressure/Diastolic pressure.
- **Systolic Pressure** : is the peak pressure, which occurs near the beginning of the cardiac cycle when the ventricles are contracting. Normal range is 100-140 mmHg.
- **Diastolic Pressure** :is the minimum pressure in arteries, which occurs near the end of the cardiac cycle when the ventricles are filled with blood (heart's relaxation). Normal range is 60-90 mmHg.

FACTORS AFFECTING BLOOD PRESSURE

- Age
- Stress
- Gender
- Diurnal Variations
- Exercise
- Obesity
- Medications
- Disease process

- **High Blood Pressure (Hypertension)** : Above normal
- Systolic pressure is consistently > 140 mmHg
- Diastolic pressure is consistently > 90 mmHg
- Symptoms of Hypertension
- Severe headache
- Fatigue
- Vision problem
- Chest pain
- Difficulty in breathing
- Irregular heartbeat
- Blood in urine

CAUSES OF HYPERTENSION

- Smoking
- Overweight or obesity
- Lack of physical activity
- Too much salt consumption
- Too much alcohol consumption
- Stress
- Older age
- Genetics
- Family history of high blood pressure
- Chronic kidney disease
- Sleep apnea

- **Low Blood Pressure (Hypotension)** : Below normal
- Systolic pressure is Consistently less than 90 mmHg
- Diastolic pressure is consistently less than 60 mmHg
- **Symptoms of Hypotension :**
- Dizziness
- Fainting
- Blurred vision
- Nausea
- Fatigue
- Lack of concentration
- Cold, clammy skin
- Pale skin

Causes of Hypotension

- Dehydration
- Blood loss
- Heart problems
- Pregnancy
- Poor nutrition
- Severe burns
- Certain medications

METHODS OF MEASURING BLOOD PRESSURE

- PalpatoryMethod

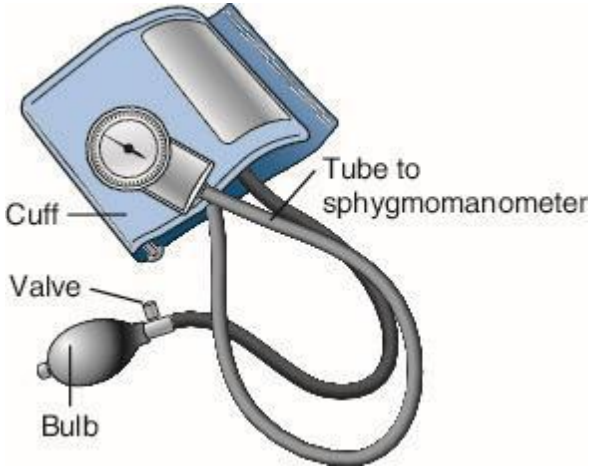
- AuscultatoryMethod

- OscillometricMethod

PROCEDURE OF AUSCULTATOR METHOD

•Arterial blood pressure is most commonly measured via a sphygmomanometer, which historically used the height of a column of mercury to reflect the circulating pressure. Blood pressure values are generally reported in millimeters of mercury (mmHg)

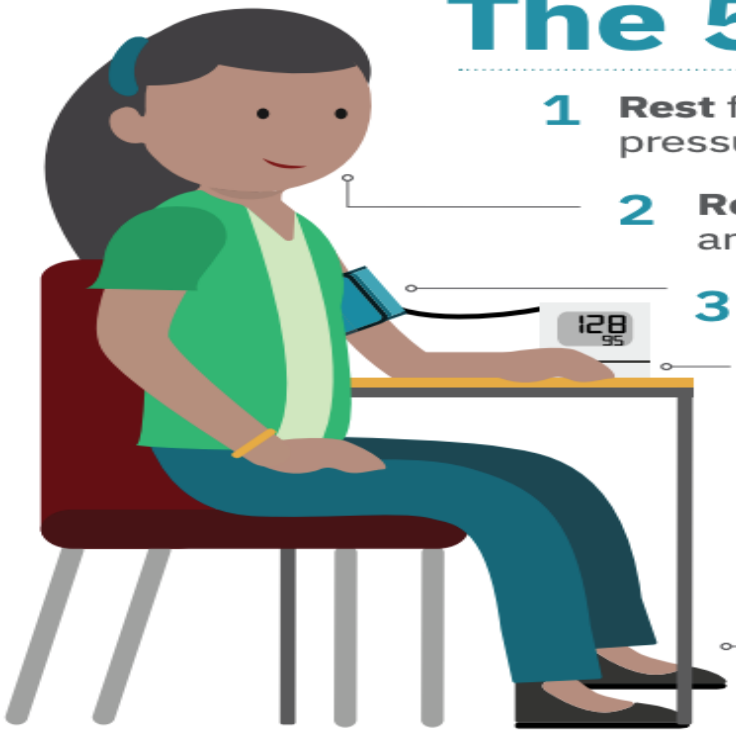
•The standard location for blood pressure measurement is the brachial artery.



FEBRUARY 2022

CARDI·OH
Ohio Cardiovascular and Diabetes Health Collaborative

Accurate Blood Pressure Measurement for Patients



The 5 R's

1. **Rest** for 5 minutes before blood pressure reading
2. **Refrain** (avoid) talking while resting and during blood pressure reading
3. **Remove** upper arm clothing
4. **Rest** arm on supported surface with cuff at heart level
5. **Rest** feet flat on floor in seated position

- ***TAKE 2 BLOOD PRESSURE READINGS 1 MINUTE APART***
- ***GOAL BLOOD PRESSURE IS LESS THAN 130/80***

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ASSESSMENT OF VITAL SIGNS

ARTERIAL BLOOD PRESSURE MEASURING

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Vital Signs

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Blood Pressure

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.walls of blood vessels, and it is one of the vital signs

The term blood pressure generally refers to arterial pressure (AP), that •
.they are the vessels where the pressure is measured

Blood pressure is usually recorded as :Systolic Pressure/Diastolic •
.pressure

Systolic Pressure : is the peak pressure, which occurs near the beginning •
of the cardiac cycle when the ventricles are contracting. Normal range is
.100-140 mmHg

Diastolic Pressure :is the minimum pressure in arteries, which occurs • near the end of the cardiac cycle when the ventricles are filled with .blood (heart's relaxation). Normal range is 60-90 mmHg

Factors Affecting Blood Pressure

Age

Stress•

Gender•

Diurnal Variations•

Exercise•

Obesity•

Medications•

Disease process•

High Blood Pressure (Hypertension) : Above normal

Systolic pressure is consistently > 140 mmHg•

Diastolic pressure is consistently > 90 mmHg•

Symptoms of Hypertension•

Severe headache•

Fatigue•

Vision problem•

Chest pain•

Difficulty in breathing•

Irregular heartbeat•

Blood in urine•

Causes of Hypertension

Smoking

Overweight or obesity•

Lack of physical activity•

Too much salt consumption•

Too much alcohol consumption•

Stress •

Older age •

Genetics •

Family history of high blood pressure •

Chronic kidney disease •

Sleep apnea •

Low Blood Pressure (Hypotension) : Below normal

Systolic pressure is Consistently less than 90 mmHg•

Diastolic pressure is consistently less than 60 mmHg•

: Symptoms of Hypotension•

Dizziness•

Fainting•

Blurred vision•

Nausea•

Fatigue•

Lack of concentration•

Cold, clammy skin•

Pale skin•

Causes of Hypotension

Dehydration

Blood loss•

Heart problems•

Pregnancy•

Poor nutrition•

Severe burns•

Certain medications•

Methods of Measuring Blood Pressure

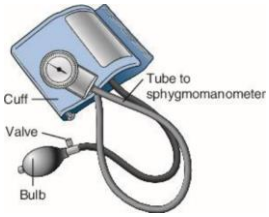
PalpatoryMethod

AuscultatoryMethod•

OscillometricMethod•

Procedure of Auscultator Method

Arterial blood pressure is most commonly measured via a sphygmomanometer, which historically used the height of a column of mercury to reflect the circulating pressure. Blood pressure values are (generally reported in millimeters of mercury (mmHg



.The standard location for blood pressure measurement is the brachial artery•