كلية الطب البشري
Faculty of Medicine

Hematopoietic System-2023

Physiology Lab 2-2024

Presented by:
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Hemostasis

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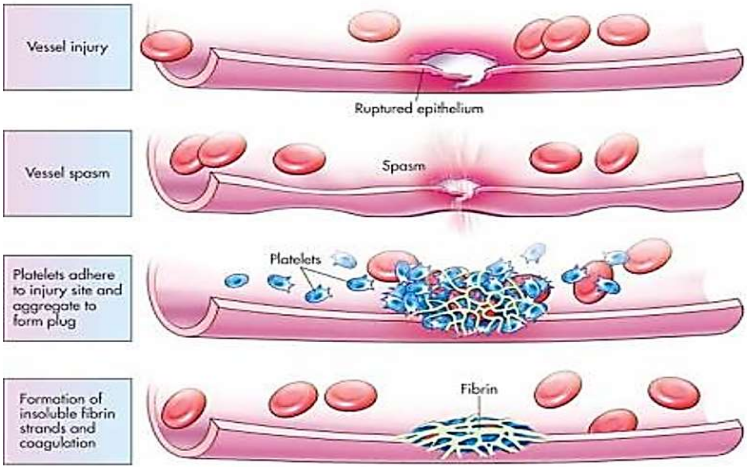
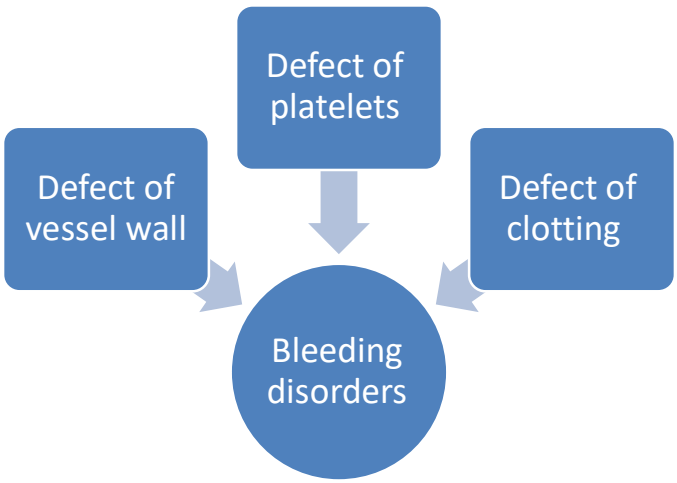
Steps of hemostasis





Hemostatic Function Tests

1. Blood count and blood film

2. Bleeding time: It is the time needed for bleeding to stop without blood clotting. The normal bleeding time is 1-3 minutes, depending on platelet count and function. It is prolonged in thrombocytopenic purpura.

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Hemostatic Function Tests

3. Tests for blood coagulation

a-Clotting time: It is the time needed for blood to clot. Normally, it is 3-10 minutes at 37^{O}C. *It is prolonged in* disorders such as vitamin K deficiency, hemophilia, and liver diseases.

b-Prothrombin time: A blood sample is collected in a tube containing citrate or EDTA to chelate any calcium and thus inhibit coagulation, and then the cells are removed by centrifugation. After the cells are removed, excess calcium is added with an excess of thromboplastin to anticoagulated plasma to initiate coagulation. A normal PT is 11.0–12.5 seconds. A PT greater than 20 seconds is indicative of a coagulation deficit.The result (in seconds) for a prothrombin time performed on a normal individual will vary according to the type of analytical system employed. This is due to the variations between different batches of the manufacturer's tissue factor used in the reagent to perform the test.

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Hemostatic Function Tests

3. Tests for blood coagulation

c-International normalized ratio (INR): The INR was devised to standardize the results.

Each manufacturer assigns an ISI value (International Sensitivity Index) for any tissue factor they manufacture. The ISI value indicates how a particular batch of tissue factor compares to an international reference tissue factor. The ISI is usually between 1.0 and 2.0.

$$INR = \left(\frac{PT_{test}}{PT_{normal}} \right)^{ISI}$$

The INR is the ratio of a patient's prothrombin time to a normal (control) sample, raised to the power of the ISI value for the analytical system used.

A high INR level, such as INR=5, indicates a high chance of bleeding, whereas if the INR=0.5, there is a high chance of having a clot. The normal range for a healthy person is 0.9–1.3, and for people on warfarin therapy, 2.0–3.0. However, the target INR may be higher in particular situations, such as those with a mechanical heart valve.

d- Activated Partial Thromboplastin Time test (aPTT)): a test performed to investigate bleeding disorders and to monitor patients taking an anticlotting drug such as heparin which inhibits factors X and thrombin, while activating anti-thrombin. The partial thromboplastin time is the time it takes for a clot to form, measured in seconds. Normally, the sample will clot in 35 seconds.

e-Prothrombin concentration: normally > 70 %.

Determination of capillary fragility

Hess test (tourniquet test)

Principle:

This test is done to assess the mechanical fragility of the capillaries by raising the pressure within them. It may demonstrate latent purpura.

Apparatus: Sphygmomanometer (see before).

Procedure:

1. Take the patient's blood pressure and record it, for example, 100/70.

2. Inflate the cuff to a point midway between SBP and DBP and maintain for minutes. (100 + 70) ÷ 2 = 85 mm Hg

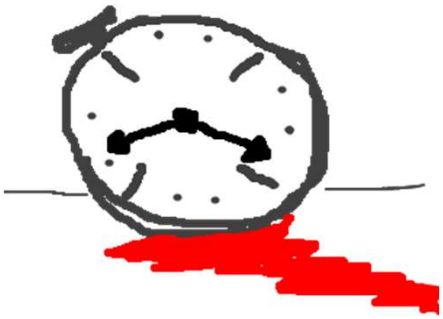
3. Reduce and wait 2 minutes.

4. Count petechiae below antecubital fossa.

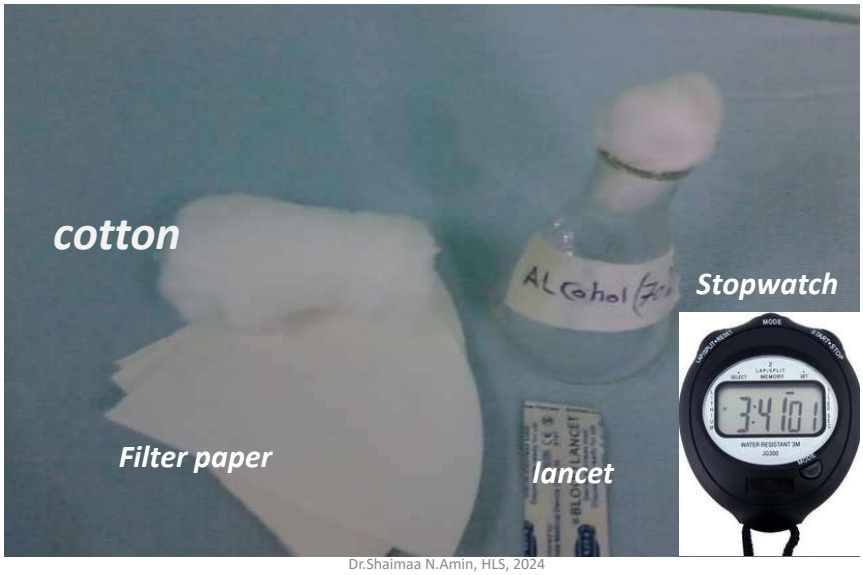
5. A positive test is 10 or more petechiae per 1 square inch.

Bleeding time

- *It is time needed to stop bleeding* ***without clot***
- *1-3 minutes*
- *Depend on*
  - *blood vessels (VC)*
  - *Platelets function*



Materials



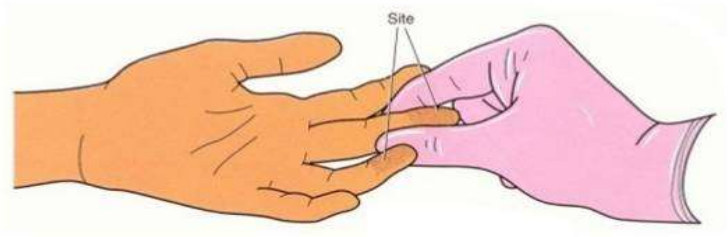
Steps

- Wear gloves Sterilize Puncture



Skin Puncture Procedure:

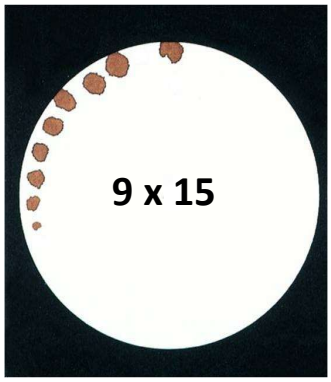
- Hold finger between your index finger and thumb
- Puncture the finger using a quick, smooth motion
- Start stopwatch immediately after puncture



Steps

- Use filter paper
- Interval: 15 sec.

Calculate bleeding time



Prolonged bleeding time

- **Defect in vascular wall**
  - Scurvy (Vit. C deficiency)
  - Old age
  - Vasculitis

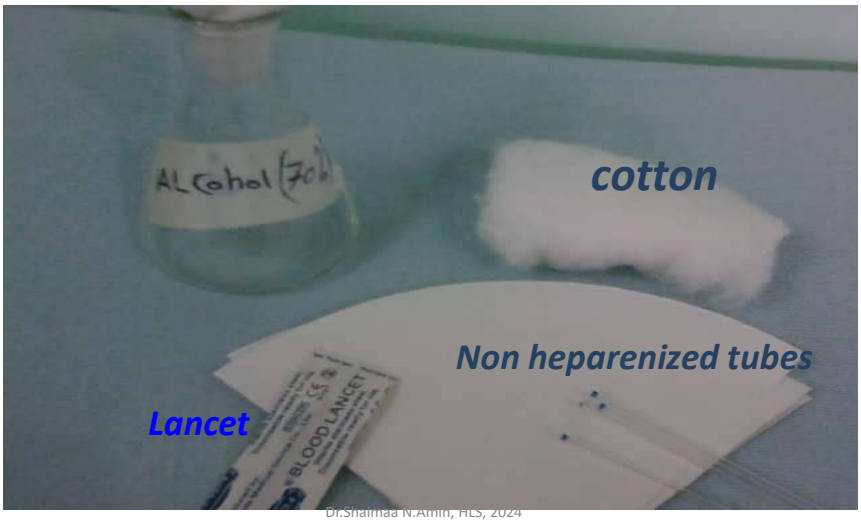
- **Defect in platelets**
  - Thrombocytopenia: ↓ Number < 50,000/cmm
  - Thromboathenia: Abnormal platelets receptors → Defect in platelet adhesion
  - Von Willebrand disease: ↓ VWF → Defect in platelet adhesion
  - Aspirin: inhibit platelet function

Clotting time

- It is time needed to form clot.
- 3-10 minutes
- Depends on

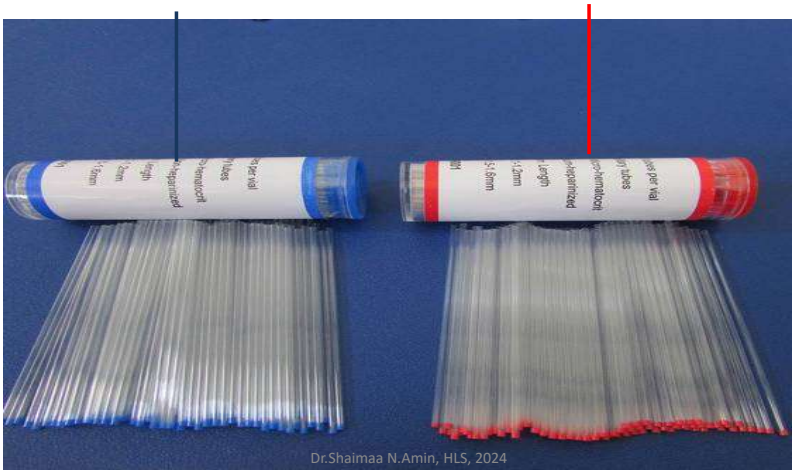
- Vit K (Why)
- Liver function
- Clotting factors

Material



Capillary tubes

- **Non heparinized** **Heparinized**



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Steps

- Wear gloves Sterilize Puncture

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Steps of clotting time

Collect blood in non heparinized capillary tube

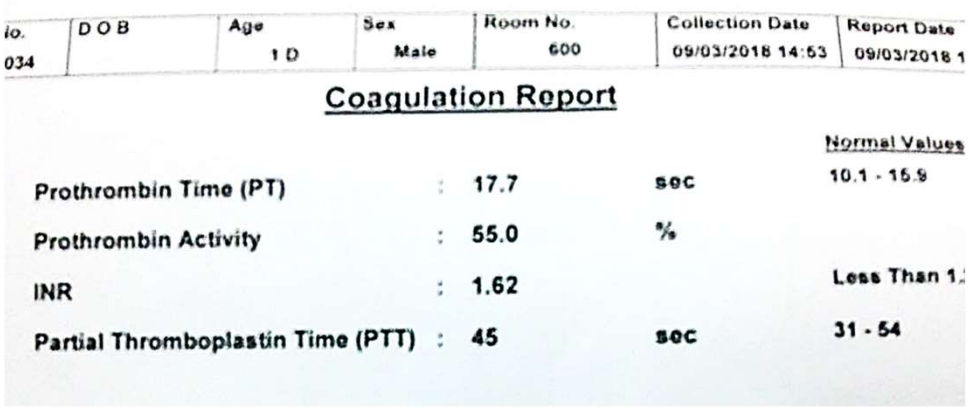
Break after 3 min
Interval 30 sec
till you see fibrin

Prolonged clotting time

↓ Vit K	↓ Clotting factors	Liver diseases
♠ Newborn: 1st week ♠ Long use of antibiotics ♠ Biliary tract obstruction ♠ Dietary dificiency & malabsorption ♠ Antagonist: warfarin	♠ I:Afibrinogenemia ♠ VIII: Hemophilia A ♠ IX: Hemophilia B ♠ XI: Hemophilia C	♠ Cirrhosis ♠ Hepatitis

Hemostatic function tests

TEST	NORMAL VALUE
CBC	Platelets 150-400 x $10^3/mm^3$
Bleeding time	1-4 min
Clotting time	3-10 min
PC	> 70%
PT	15 sec (test extrinsic pathway)
APTT	30-40 sec (test intrinsic pathway)
INR	0.8- 1.2



io.	D O B	Age	Sex	Room No.	Collection Date	Report Date
034		1 D	Male	600	09/03/2018 14:53	09/03/2018 1

Coagulation Report

				Normal Values
Prothrombin Time (PT)	:	17.7	sec	10.1 - 15.9
Prothrombin Activity	:	55.0	%	
INR	:	1.62		Less Than 1.
Partial Thromboplastin Time (PTT)	:	45	sec	31 - 54

CBC Report

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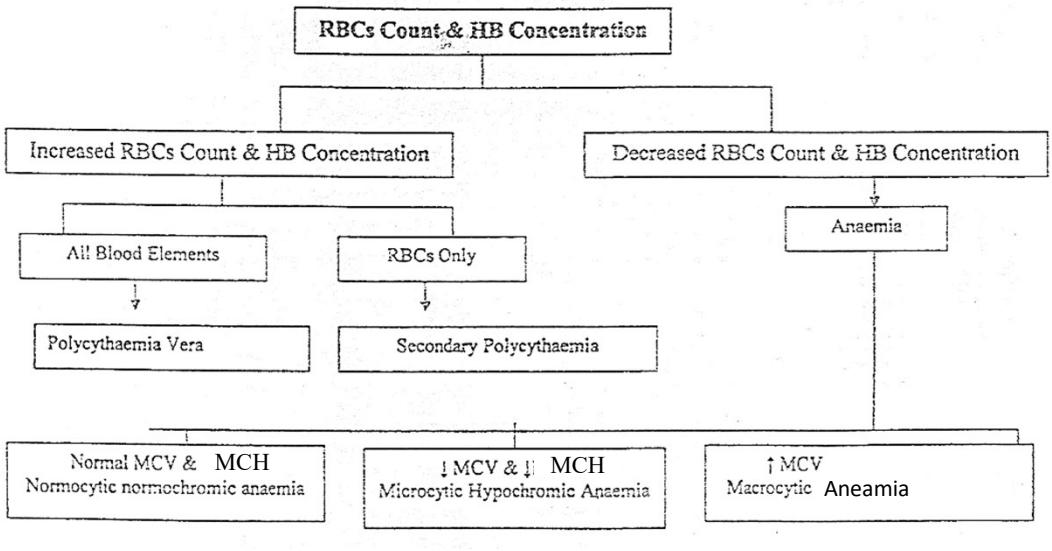

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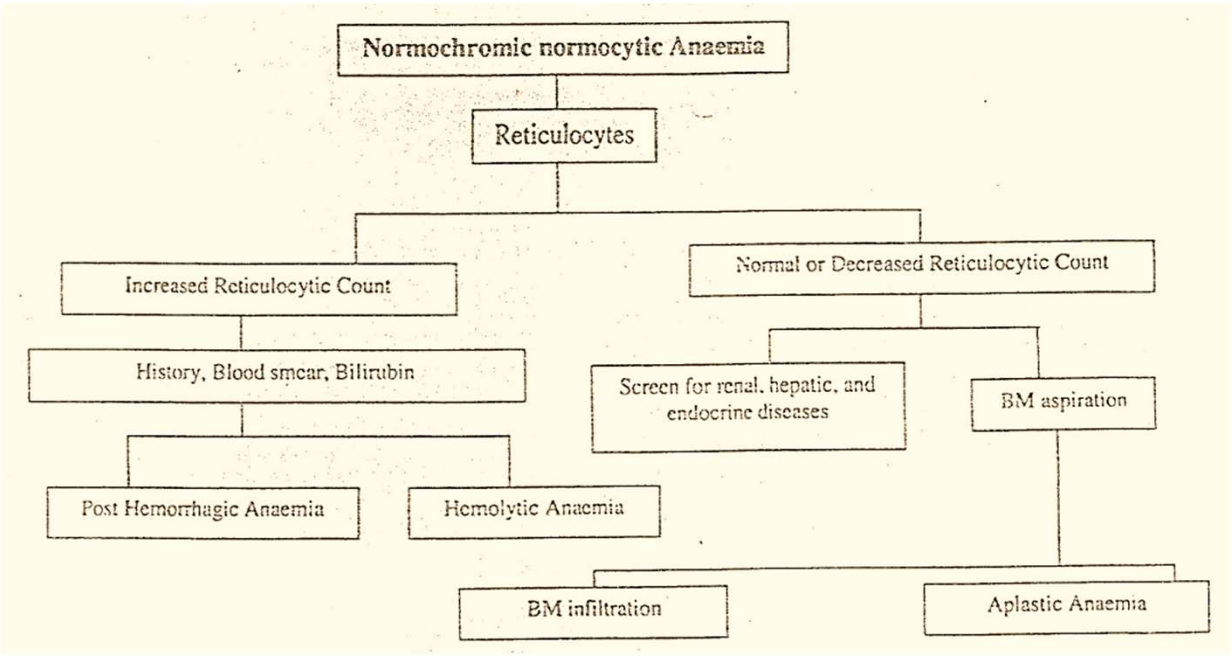

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Male
30 Years old

CBC Reports
Report 1

Haemoglobin	11.5	g/dl
PCV (haematocrit)	35	%
Red cell count	3,800,000	/cmm
Reticulocytic count	2	%
MCV	92	fl
MCH	30	pg
MCHC	33	g/dl
TLC	35,000	/cmm
Basophils	0	%
Eosinophils	1	%
Staff	2	%
Segmented	15	%
Lymphocytes	80	%
Monocytes	2	%
Platelet count	250,000	/cmm

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Female
26 years old

Report 2

Haemoglobin	8.5	g/dl
PCV (haematocrit)	26	%
Red cell count	2,830,000	/cmm
Reticulocytic count	0.2	%
MCV	92	fl
MCH	30	pg
MCHC	33	g/dl
TLC	4000	/cmm
Basophils	0	%
Eosinophils	0	%
Staff	2	%
Segmented	7	%
Lymphocytes	2	%
Monocytes	14	%
Myeloblasts	50	%
Promyelocytes	25	%
Platelet count	30,000 /cmm	

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No.	DOB	Age	Sex	Room No.	Collection Date	
80034		1 D	Male	600	09/03/2018 14:53	09/03/2018 16:19

Blood Picture Report

			Ref. Values	
Haemoglobin	: 21.4	g/dL	14.0 - 22.0	
Red Cell Count	: 6.37	million/cmm	3.90 - 6.30	
Haematocrit	: 62.9	%	45.0 - 75.0	
MCV	: 98.7	fl	100.0 - 120.0	
MCH	: 33.6	pg	31.0 - 37.0	
MCHC	: 34.0	g/dL	32.0 - 37.0	
RDW	: 19.3	%	11.5 - 14.5	
Total Leucocyte Count	: 15470	/cmm	10000 - 26000	
Differential Leucocyte Count			Relative (%)	Absolute (Thousands/c
Neutrophils	: 70	%	40-70	4.0-14.0
Lymphocytes	: 21	%	20-40	3.0-8.0
Monocytes	: 8	%	02-08	0.5-2.0
Eosinophils	: 1	%	01-06	0.1-1.0
Basophils	: 0	%	.	up to 0.1
Platelet Count	: 165	x10^3/cmm	150 - 450	

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Cases
[Students Presentation]

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