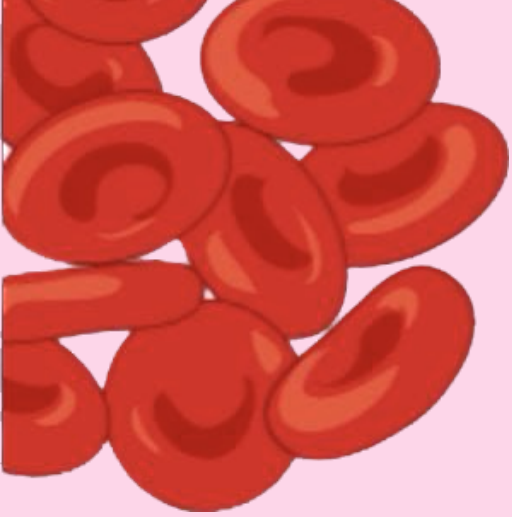


النادي الطبي

HEMATOPOIETIC & LYMPHATIC SYSTEM

-HAYAT BATCH-

SUBJECT : Physiology Lab

LEC NO. : 2

DONE BY : Dana khalaf 🤍

وَقُل رَّبِّ زِدْنِي عِلْمًا

Hematopoietic & Lymphatic System

كلية الطب البشري
Faculty of Medicine

Hematopoietic System-2023

Physiology Lab 2-2024

Presented by:
Dr.Shaimaa Nasr Amin
Professor of Medical Physiology

1

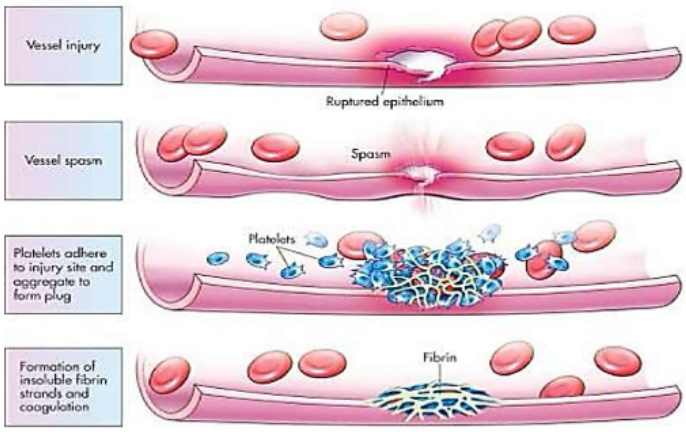
Hemostasis

2

وقل رب زدني علماً

Hematopoietic & Lymphatic System

Steps of hemostasis



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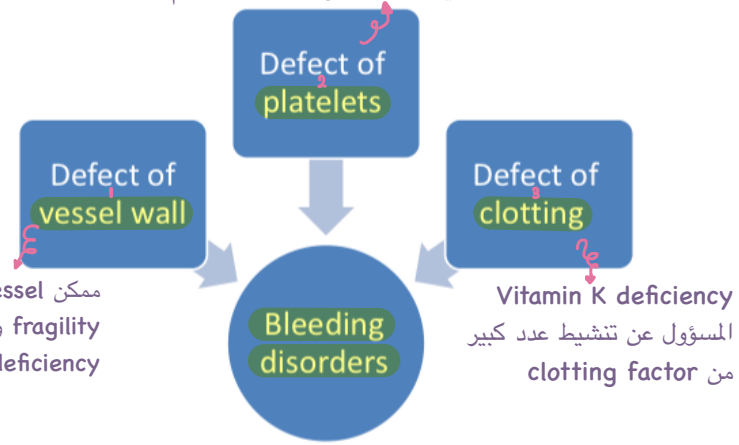
3

مشكلة بال number: Thrombocytopenia
او بال function: Thromboathenia يعني
reactions فيها مشكلة مع انو عددها تمام



ممكن blood vessel
وأشهر سبب اله fragility
vitamin C deficiency

Vitamin K deficiency
المسؤول عن تنشيط عدد كبير
من clotting factor

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4

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Hemostatic Function Tests

1. **Blood count and blood film** : بدنا نعرف وين المشكلة
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.

من ال **blood film** حشوف لو في مشكلة بعدد **platelets** او لا (الطبيعي 350-400 الف ، ممكن يختلف من لاب ل لاب بس بفروق بسيطة)

ال **bleeding time** بعمل **assessments** ل **platelet function + blood vessels function**، زي كإنو بشتغل ع خطوتين من خطوات **hemostasis**

يعني لو حد عنده **fragile blood vessels** متوقع يكون عندك **bleeding time** اطول من الطبيعي (٣ دقائق)

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5

بتقلكم **blood count , bleeding time, clotting time** بدنا نعرف منهم **definition + normal biology**

اما **prothrombin time , INR, aPTT** بدنا نعرف **normal value** تبعتهم وبعملو **assessment** لشو، اما تفاصيل **technical** مو داخلة بالامتحان

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°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.

ال **clotting time** : هو **timing stop bleeding / to form clot** بيختبر ال **coagulation factors** ،، وقته ٣-١٠ دقائق .

ال **prothrombin time** بيختبر **extrinsic pathway** (بحتاج **tissue factor**)

بحط ع العينة **citrate** لانو انا بس بدي البلازما وما بدي تجلط (طبعا بشيل الكالسيوم عشان العينة تضل سائلة ولما ابلش اختبر **Ex pathway** بضيف الكالسيوم مرة تانية) هلأ بدي اضيف **tissue factor** مصنع من شركات معينة، وبشوف الوقت تبعه كم ... مشكلته لو المريض عمل الاختبار نفسه باكتر من مختبر رح يعطي ارقام بعاد عن بعض (**tissue factor** مختلف)

وهاد حياخدنا لاختبار **INR**

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6

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Hemostatic Function Tests

لو المريض عمل الاختبار مع اكتر من مختبر

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.

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

انت ك طبيب رح تكون حابب انو النتيجة تكون اعلى من واحد لما تكون معطي المريض دوا بزود سيولة الدم حتى يتجنب الجلطات وكل ما الرقم زاد يعني سيولة الدم عالية وبالتالي معرض للنزيف وكل ما قل عن واحد يعني هو معرض للجلطات اكتر

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.

هاد اللي بهمنا للـ امتحان ..

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.

اختبار aPTT بختبر intrinsic factor

e-Prothrombin concentration: normally > 70 %.

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7

بنقيس ال blood pressure تبع الشخص وبعدين بنربط ال cuff وبنخليها برقم متوسط بين التنين (مثلا هون ٨٥) والمقصود انو هاد الرقم رح يعمل comprision ع artery من غير ما يعمله complete obstruction يعني احنا ما بدنا نقفله احنا بس بدنا نرفع الضغط فيه .. بنخليها لمدة دقيقتين ، ولو الشخص طبيعي ما حنلاقي اي تغيير في الجزء اللي بعد cuff (الجلد زي ما هو) اما لو عنده زيادة ب capillary fragility ما رح تتحمل الضغط فبصيرلها rupture (petechial hemorrhage)

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.

rach زي

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

بعد 2 min

لوقت كم نقطة عادي بكون الشخص طبيعي

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8

وقل رب زدني علماً

Bleeding time

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

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9

Materials

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10

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Steps

- Wear gloves Sterilize Puncture

#مابصير نضغط هون.. بدنا كلشي زي ماهو



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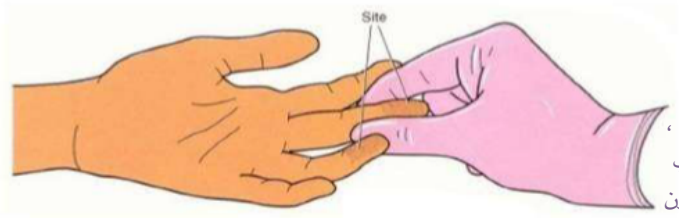
11

Skin Puncture Procedure:

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



#كل ١٥ ثانية بلمس المكان مرة ، لحد ما المس مكان خروج الدم ب filter paper وتكون بيضا وهون بشوف كم الوقت اللي أخدناه من لما بلشنا

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12

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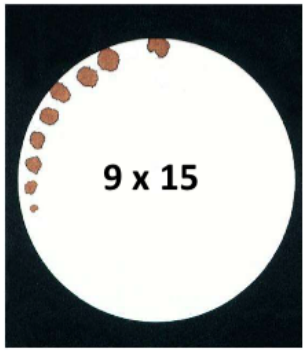
Steps

لما نضل نسحب كل ١٥ ثانية هيك احنا ما بنعطي فرصة ل pro coagulant activity انو يصير ،، إذا ال bleeding وقف من اول خطوتين

- Use filter paper
- Interval: 15 sec.

Calculate bleeding time



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13

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 bleeding time +clotting time بتأثر
  - Aspirin: inhibit platelet function

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14

Clotting time

- It is time needed to form clot.
- 3-10 minutes
- Depends on
  - Vit K (Why)
  - Liver function
  - Clotting factors

بأثروا ع clotting factors

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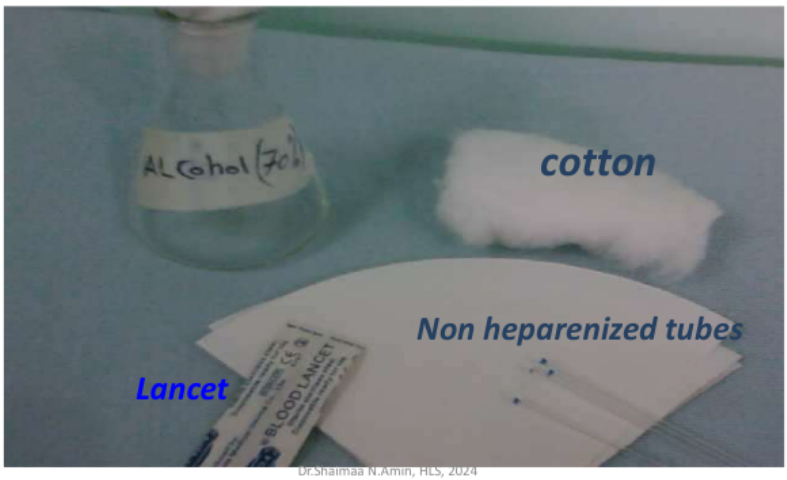
15

Material



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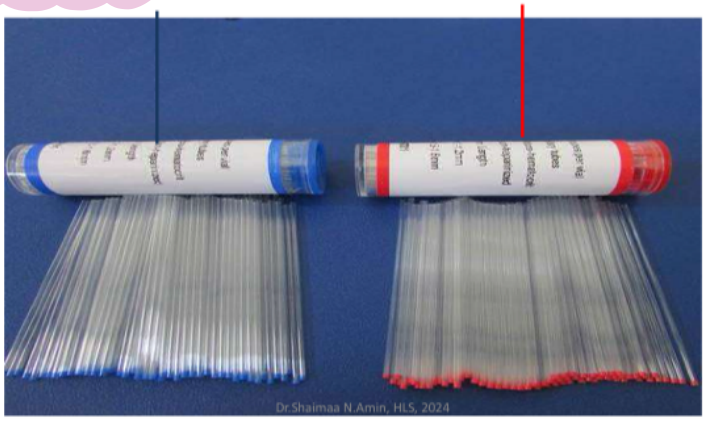
16

Capillary tubes

- Non heparinized *
- Heparinized ← in Lab 1

بدي العينة تتجلط



17

Steps

- Wear gloves Sterilize Puncture



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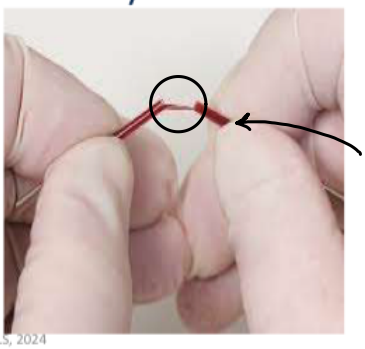
18

Steps of clotting time

Collect blood in non heparinized capillary tube بعبي نص لتلتين الأنبوبة

Break after 3 min
Interval 30 sec
till you see fibrin



بعد تلت دقائق بنكسر جزء من tube لحد ما اوصل لهالشكل

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19

💡إذا كسرت الأنبوبة وانفصلو الطرفين بلا ما أشوف مادة لزجة بينهم، طبعا لازم نكسر شوي شوي حتى ما نقطع احنا المادة اللزجة 🤥
لو ضلت **fluid** وما شفت المادة اللزجة بنستنى ٣٠ ثانية وبنكسر جزء تاني (لهيك لازم نعبي العينة منيح)

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

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20

Hemostatic function tests

اعتمدوا الأرقام هاي

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

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21

بسبب vitamin K deficiency عنده bleeding

Io.	DOB	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/concentration	:	55.0	%	
INR	:	1.62		Less Than 1.
Partial Thromboplastin Time (PTT)	:	45	sec	31 - 54

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22

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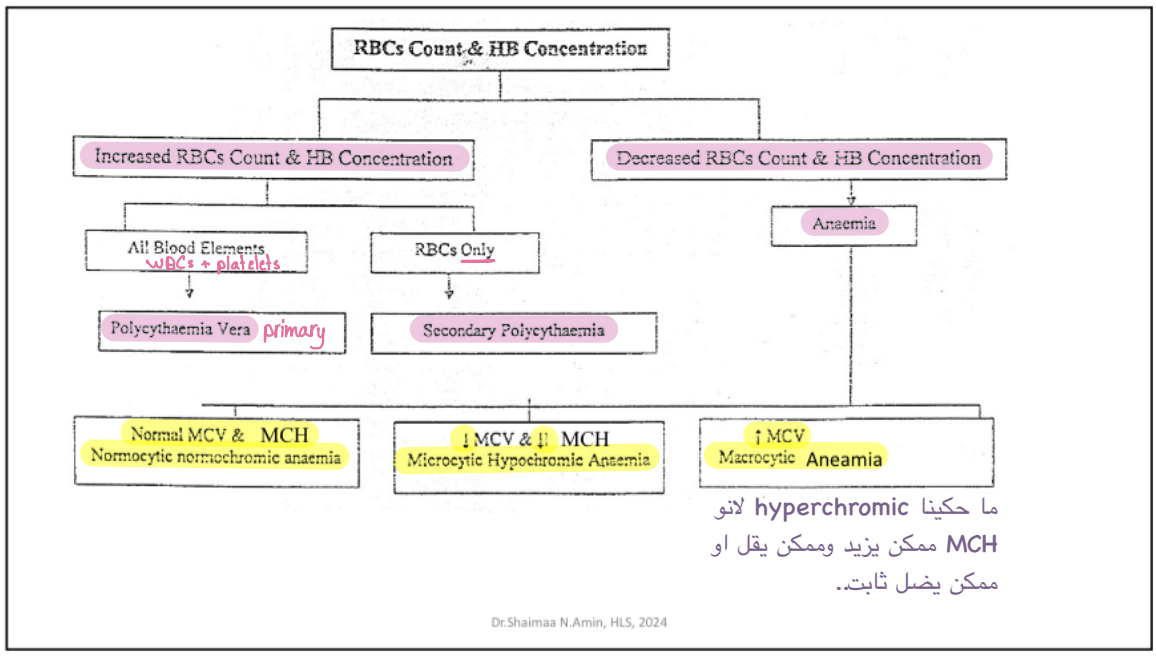
CBC Report

اول شيييي لازم أشوفه هون هو Sex + Age

23



ما حكينا hyperchromic لانو MCH ممكن يزيد وممكن يقل او ممكن يضل ثابت.

24

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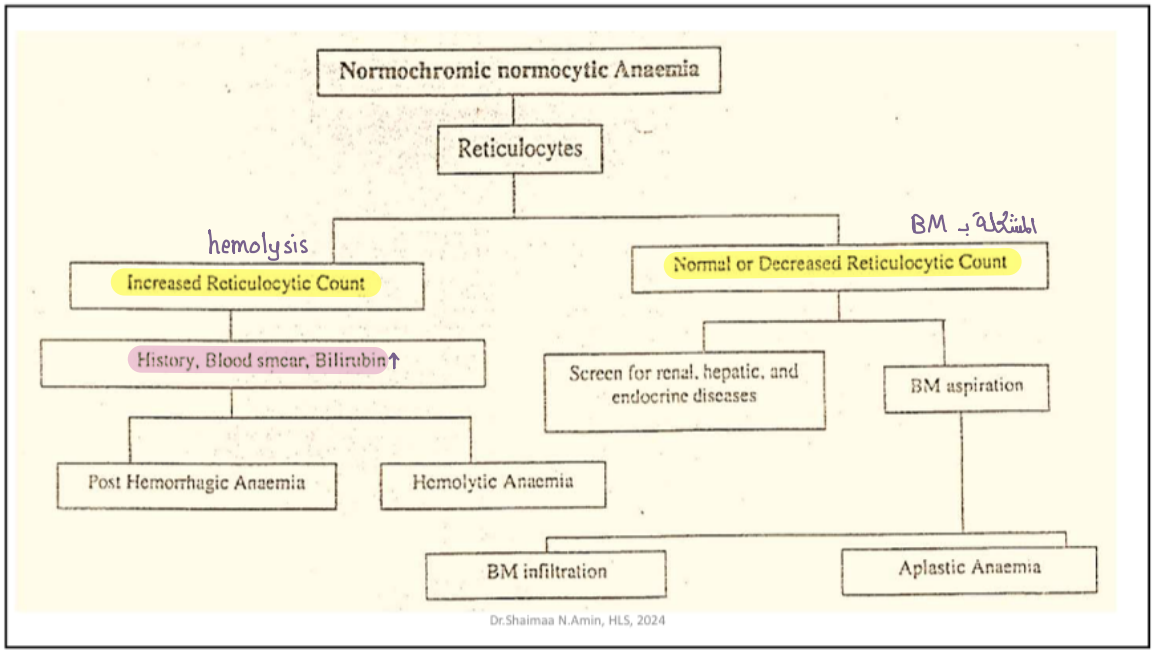
بشخص ب history وتحليل و examination



25

CBC Reports
Report I

Male
30 Years old

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

Viral infection

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26

وقل رب زدني علماً

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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 normal	fl
MCH	30 normal	pg
MCHC	33 normal	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↓	

في مشكلة بـ BM

27

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 normal	g/dL	14.0 - 22.0
Red Cell Count	: 6.37 normal	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 normal	/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 normal	x10^3/cmm	150 - 450	

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28

وقل رب زدني علما

Hematopoietic & Lymphatic System

Physiology Lab 2-Tutorial cases

A young male adult; is admitted to the hospital. He complains that he feels weak and tires easily. On questioning, it becomes clear that he has been bleeding into his gastrointestinal tract, probably from a gastric ulcer. The patient is also found to have a mild fever (38.6°C).

The medical house officer sends a sample of the patient's blood: to the haematology laboratory in a bottle containing a Ca2+-chelating agent. The requested investigations include the measurement of the hemoglobin concentration and a blood cell count. The results are given in the Table below.

Variable	Measured value	Normal value
Haemoglobin	9.6 g dl^{1}	14-16gdr^{1}
Red cell count	3.3 x $10^{12}L^{-1}$	4-6 x $10^{12}L^{-1}$
Reticulocytes	9 %	0-2%
White cell count	15.6 x $10^{9}L^{-1}$	4-11x $10^{9}L^{-1}$
Platelet count	190 x $10^{9}L^{-1}$	150-400 x $10^{9}L^{-1}$

1-What is the purpose of the Ca2+-chelating agent in the sample bottle?

2-How might the patient's symptoms of weakness and tiredness be explained on the basis of the haematology results?

3-Comment on the reticulocyte count in the light of the other blood results.

4-Which of the blood results is most consistent with the patient's fever and what may be the cause of both changes?

Hematopoietic & Lymphatic System

Case 2:

A 34-year-old man with schizophrenia has had: chronic fatigue for 6 months. He has a good appetite but has refused to eat vegetables for I year because he hears voices that tell him the vegetables are poi¬soned. His physical and neurological examinations are normal.

- His hemoglobin level is 9.1 g/dl (Reference: 14-16 g/dl)
- Leukocyte count is 10,000/mm3 (Reference: 6000-11000/mm3)
- Mean corpuscular volume is 122 Fl (Reference: 85-92 FL).

What is the most likely diagnosis? Explain your answer

Case 3:

A 65-year-old man complains of dizziness and visual disturbances. His laboratory values are as follows:

- Red blood cell count = 8.5 x lOVmm3
- Hemoglobin = 21 g/dl
- Hematocrit = 60 per cent
- Plasma osmolality = 295 mOsm/L

What is the most likely explanation for this -presentation?

Cases

[Students Presentation]

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29

30

#بالتوفيق..🤍🎀🫶

وَقُل رَّبِّ زِدْنِي عِلْمًا