Hematology

- Histology
- Biochemistry
- Pathology
- Pharmacology
- Physiology
- Microbiology

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lecture number : 2

Done BY : Mohannad momani

Handout | Sheet | Slide

By: Amer Abu Shanab

Lec2

What's written in BOLD is from the slides and is a part of the question, and the answer is written in bold and a line, or it could be an important note..

This is the first time I write a sheet in this way, please feedback me if you didn't find it efficient so I'll send you the other copy

1st case;

24 year old female complains of Dizziness, Fatigue, Shortness of breath especially on exertion and Headaches for the last 2 months. She has been losing scalp hair.

She does not eat red meat and has reported heavy menstrual bleeding.

Her physical exam showed ⇒
- **Spoon shaped nails**
- **Bluish sclera**
- **Stomatitis**
- **Narrowing the esophagus**

So what we have here **is iron deficiency or anemia** from chronic blood loss

Lab and Xray test showed

Narrowing in the esophageal mucosa

For dysphagia; she was found to have an esophageal web –diagnosed by endoscopy and in the Barium meal-

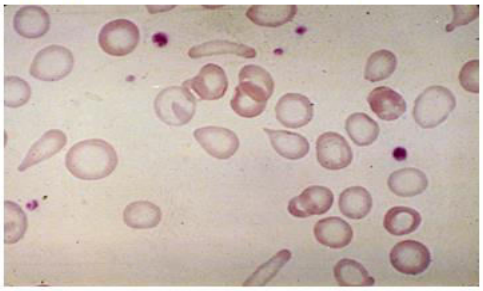
Hb 8 g/dl, MCV 65 fl, RDW 20%, MCH 19 pg(low), The highest normal level is 16%

Retcs 0.8% (slightly low)

Blood film

RDW is increased in the machine

Severe Hypochromia & Anisocytosis, Poikylocytosis: Iron Deficiency Anemia



☆**Serum Ferritin 2 ng/ml (low)** (drops before serum iron, so it's more accurate),

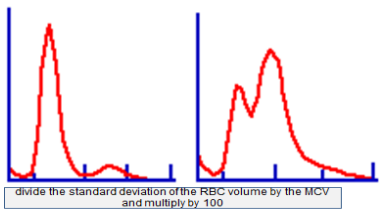
☆**Total iron binding capacity (TIBC) 450 µg/dL** (is increased),

Serum Fe 10 µg/dL (low)

B12, Folate: normal. We order these tests because the patient doesn't eat red meat so he may have deficiencies in them.

Thalassemia can have a similar blood film, but since it appears early in life and iron deficiency is the most common so you have to investigate it first

RDW: Normal + Abnormal



Due to poikylocytosis there is more than one peak, this figure may vary between individuals

Mohanned Al-Momani

2nd Case;

18 yr. old male complains of acute pain in his back, Dizziness, Fatigue, Shortness of breath and Headaches for the last 6 hours. He has had similar attacks.

So it's a chronic anemia with acute episodes

Physical exam showed

Jaundices

Skin ulcers

Abnormal bone growth

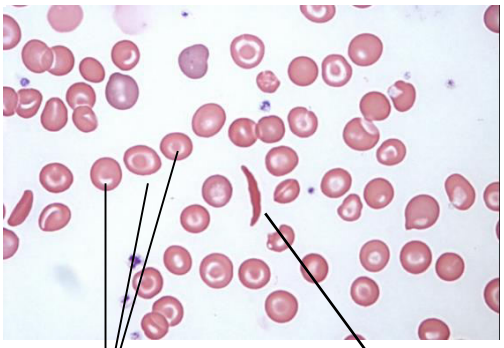
Back pain due to osteolysis

You have to think of g-6 PD and sickle cell anemia

Lab and Xray test

•**Hb 9g/dl**(low), **MCV 80 fl**(almost normal), **RDW 18%(**slightly elevated)

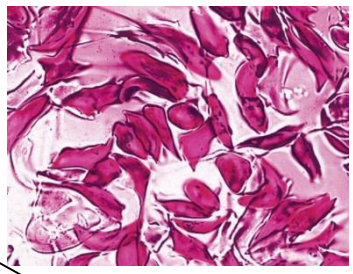
Blood film



Target calls

Sickle cells, indicates sickle cell anemia

Sickling test: reducing agent



Hg electrophoresis

DX: **Sickle cells anemia,**

Sometime we don't find sickle cells so for further investigation we use Sickling test

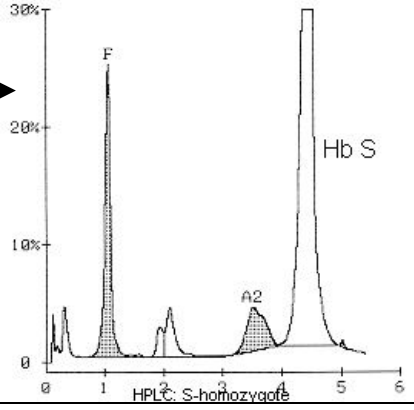
Because some patient show less evident sickle cells in their blood film, what we do here is that we stress the RBCs by adding a reducing agent before making a blood film, if it's positive then all his RBCs will sickle,

Unfortunately, sickling test can't differentiate between **sickle cell anemia** and **sickle cell trait**, both of these conditions will appear **positive** in Sickling test, that's why we use **Hg electrophoresis;**

Sickle cells anemia, patients will only have HbS, you'll also notice HbF and HbA2 but no HbA

Sickle cell trait, patients have 50% HbS and 50% HbA

All of their exact percentages will appear in the test, that's why electrophoresis is more accurate.



Written by

3rd Case;

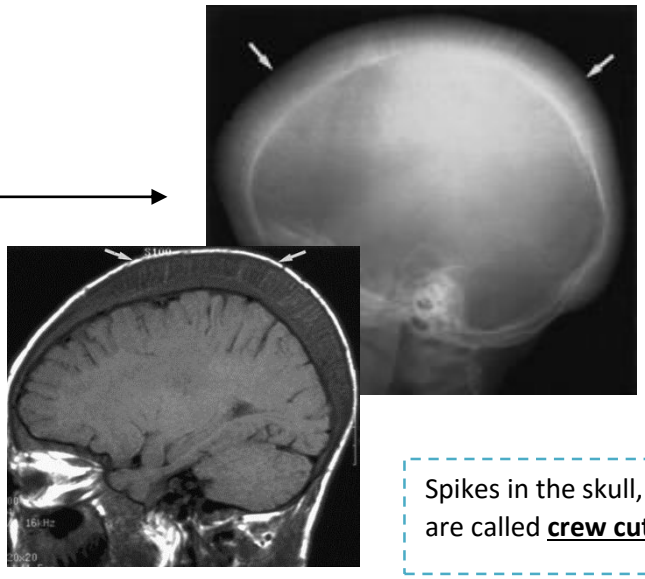
13 yr. old male complains of skin pigmentation, abdominal swelling and pallor. He has been receiving blood transfusions since the age of 9 months.

Physical exam showed

Prominent cheeks and chain (chipmunk face)

Hepatosplenomegaly

Lab and Xray test showed



Spikes in the skull, those are called **crew cuts**

Hg 5.6g/dl(very low) ,

MCV 55 fl (very low) indicates **thalassemia**,

RDW 18%,

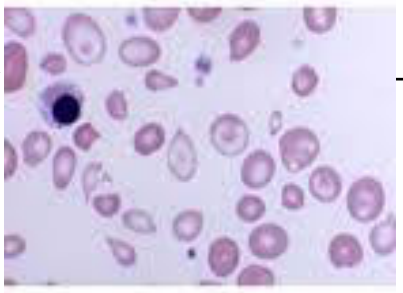
Reticulocytes; 12% indicates **hemolytic anemia (unlike Iron deficiency anemia)**

Think of **sickle cell anemia** or **thalassemia major**

Blood film

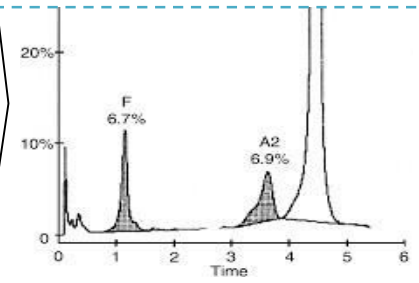
Serum Ferritin 6000ng/ml(very high) this test is to differentiate it from **iron deficiency anemia**

Hb electrophoresis



Microcytic and hypochromic RBCs, with a few nucleated RBCs

Target cells



Think of iron deficiency or thalassemia

HbA is normal

HbA2 & HbF are elevated, which confirms **B-Thalassemia**

4th Case;

50 yr. old man complains for several weeks of hotness in his face, itching and severe acute pain in his big toe.

Physical findings ⇨

Redness in his face

Inflammation and swelling of the big toe, severe pain and loss of movement.

Lab and ct-scan test showed

⇩

Hb 19(high)

WBC 17,000(high)

Platelets 500K (slightly high)

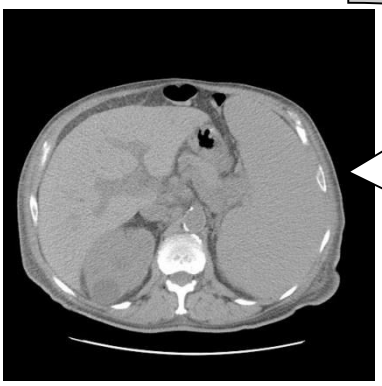
Serum Uric acid 12mg/dl (<6) (high) explains the **gout**

Serum erythropoietin 10 mU/ml; (normal range is 2-19) so it's not increased. Meaning that the bone marrow is working irrespective to the erythropoietin, so most probably it's **primary polycythemia**

Jak2Mutation is positive; this test is positive in all cases of polycythemias

Bone marrow biopsy; since it's a myelo proliferative neoplasm it shows hyper cellularity above the age, also we see hyper production of all stem cells types (pancytosis). Normoblast, megakaryocyte myelocytes,,,

Splenomegaly



As you can see the size of the **spleen** nearly equals the liver

Think of **polycythemia vera**, but of course you need further investigation

Written by Mohanned Al-Momani

5th Case,

3 year old kid presented with unexplained large bruises over skin. Physical examination showed no signs of anemia. Abdominal palpation of the left upper quadrant showed palpable small movable mass.

Physical findings → **Hemorrhage on the skin**

Lab test showed

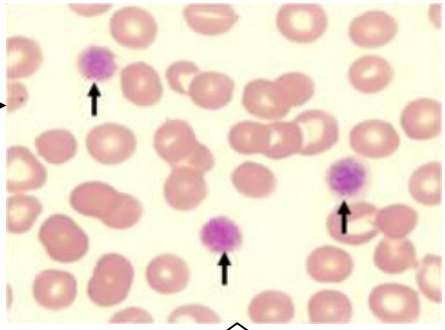
Hg 15 (normal), **WBC 8** (normal)

Plt 50 (low), normal range is 150-450

Blood film

Prothrombin & partial thromboplastin time: (normal, not a clotting-factor disease)

Bleeding time: 19 min (high) normal range (3-10) this test plus the blood film proves **idiopathic thrombocytopenic purpura**



The size of those platelets is increased they are immature. Nearly the same as the RBCs, indicating that the bone marrow is producing a lot of platelets to compensate thrombocytopenia

You think of **platelets problem** not clotting factors problem because it's a **superficial hemorrhage**

Idiopathic thrombocytopenic purpura (ITP): is an autoimmune disease that targets the platelets, not to be confused with PNH or MDS those are presented with a decrease in all blood components. However, ITP is presented with only a decrease in platelets number.

6th Case,

22 year old man, presented with widespread skin rash –it's pinpoint and palpable-, fatigue, fever, confusion, decreased urination

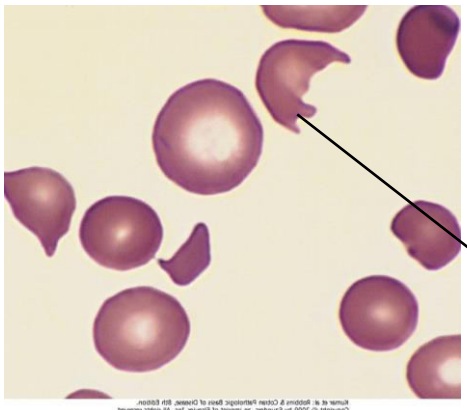
Indicates purpura

lab results

So the patient has anemia and thrombocytopenia

Hg: 9 (low), **WBC 10**(normal**), Plt 30**(very low)

Blood film



PT, PTT: normal (not DIC)

Bleeding time: 40 min (increase)

Fibrin degradation products: negative. (negative in TTP and positive in DIC, not DIC)

Serum LDH: 1,000 normal range is <400 (increased secondary to hemolytic anemia and Schistocytes)

Blood urea nitrogen: high indicating renal failure

Enzyme ADAMTS13 test: negative

Schistocytes

Indicates microangiopathic hemolytic anemia

There are three diseases under this category

thrombotic thrombocytopenic purpura (TTP)

hemolytic uremic syndrome (HUS)

disseminated intravascular coagulation (DIC)

Cause TPP to decrease*. Deficiency in ADAMTS13 enzyme

Cause TPP to decrease* Causes renal failure

developes sepsis by e coli

Can present with anything. Clotting factors are lost so it gives high PT and PTT

DX

Although they all have nearly the same clinical manifestation but **the normal PT & PTT rules out DIC**

HUS usually manifest sepsis from E. coli which wasn't found in the patient (no history of hemorrhage)

TTP fits all the symptoms, we do Enzyme ADAMTS13 test to confirm the diagnosis (it should be deficient)

*Correction note: I'm not sure what the writer meant with TPP and that it is low in TTP and HUS. Knowing that PT & PTT are normal in these diseases

Written by Mohanned Al-Momani

19 yr. old boy complains of repeated attacks of large joint painful swelling especially in his knees for several years. His maternal uncle has similar condition.

- several years → Means it's a chronic condition, with recurrence
- maternal uncle → Means it's an x-linked inherited condition

Physical findings

Lab results,

Hemorrhage in the gum

Increase in the size of the knee, "filled with blood"

Hg: 6 (low, due to acute bleading), **WBC 8** (normal), **Plt 180** (normal)

PT 12/12 s (normal),

PTT 100/30s(high), BT 7/20 min normal

Mixing study: PTT: 30/30 indicates a deficiency in one of the clotting factors

Factor VIII: <1% (very low), Factor IX 100% so the DX is **hemophilia A**

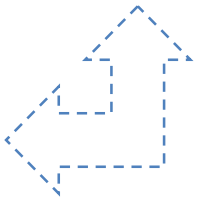
Means the patient has a deficiency in one of the intrinsic pathways of the coagulation factor

We make this test by adding plasma to the patient's blood till PTT becomes normal, to rule out autoimmune diseases, because if there were antibodies it'll kill the newly added ones

Think of hemophilia A or B

if he has a deficiency in factor VIII then it's hemophilia A

if he has a deficiency in factor IX then it's hemophilia B



8th case,

49 yr. old lady complains of painful selling and hotness of her L leg following coming back from visiting her relatives in USA. She had repeated attacks of cough with hemoptysis and shortness of breath.

Physical findings

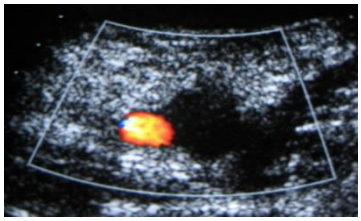
LAB tests

Inflamed leg

Severe cuffing and hemoptysis (blood in sputum)

1- Duplex ultrasound: can visualize the vein and the clot

2- Found to have Protein C deficiency autosomal dominant



DX

<u>Deep vein thrombosis</u>, happens in 50% patients with history of thrombophilia, explains the swelling. Also, an embolus can be formed from it causing pulmonary embolism, which explains hemoptysis and the cuffing. In some cases this embolus can reach vital organs and cause sudden death if went untreated.

9th case

29 yr. old lady complains of fever and painful gums for 1 week. She developed easy <u>bruising and hemorrhagic</u> spots on her trunk.

You should be thinking of leucopenia and thrombocytopenia

Physical findings

Likely diagnosis

Swollen gums "like tumors"

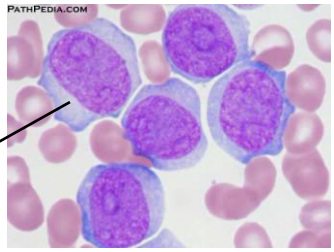
Hb 8.5 g/dl, Wbc 37,000(increased), 70% blasts, 12% monocytes. Platelets 24(increased, I think the dr. meant decreased)

Serum uric acid 10 mg/dl (increased) because of the high number of cells

Bone marrow: 80% blasts

CD34 +: which is a marker of immature cells

DX **<u>acute monocytic leukemia M5</u>**



Immature monocytes (monoblast)

Case11: 57 yr. old man complains of back pain for several months and fracture of his L leg 2 days ago.

Lab and Xrays

Physical findings

First thing you should be thinking of is, **plasma cell myeloma** because of **old age** and **anemia**

Hg: 7(low**), WBC: 8**(normal, **Plt 200**(normal)

Blood film

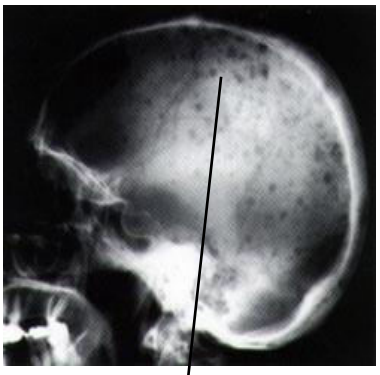
ESR: 120 (increased)

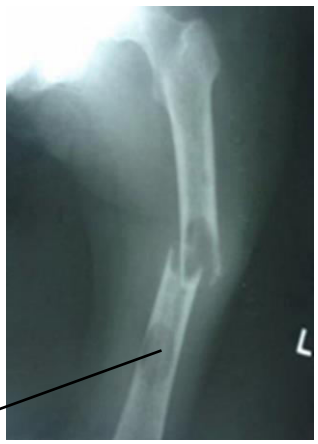
BUN: high (renal failure) because plasma cells produce large amount of proteins "immunoglobulin" the light chains to be exact, which are called **bence jones proteins**, which stick in the tubules of the kidney

Serum albumin: low; no reabsorption after renal failure

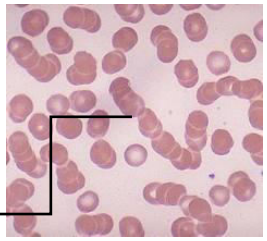
B2 microglobulin: high. It presents on cell surface, indicates tumor and its presence **means that this disease is bad**, it increases in plasma cell myeloma, lymphoma leukemia

Serum calcium: 13 mg/dL (5-10)(high, osteolysis)



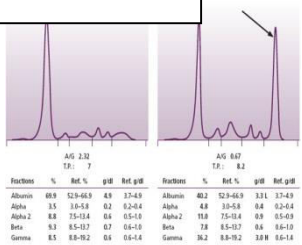


Those black areas indicates osteolysis "weak bones"

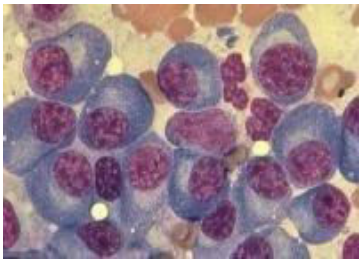


Rouleaux formation

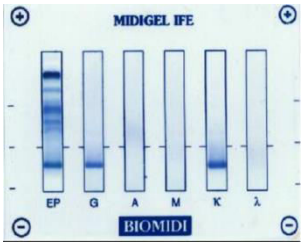
On the left (serum protein test) is the abnormal case, showing an increase in the immunoglobulins



A lot of plasma cells in bone marrow >10% (normal is 3%)



Electrophoresis to show which type of immunoglobulin is increased, mostly IgG-Kappa



10th case,

69 yr. old man complains of fever and cervical and axillary swelling for several months with occasional fever and productive purulent cough.

Physical findings

Investigations,

Large axillary mass

Enlargement of the two tonsils and the cervical lymph nodes

Chronic condition of repetitive infection, so you should think of neutropenia

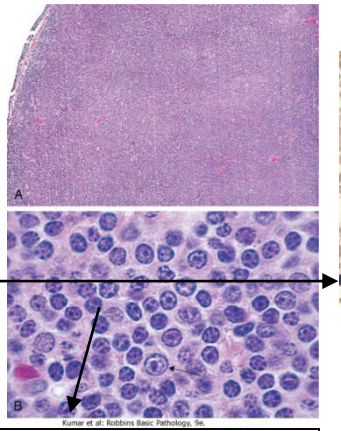
Hb 10(low**), WBC 123**(high), **Plt 95**(low)

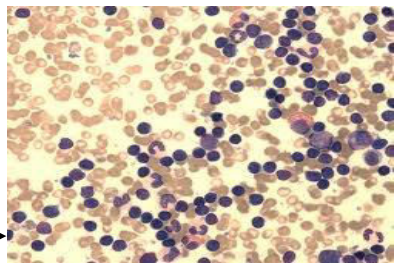
Blood film

Serum LDH: 1200 (high) because large amount of lymphocytes are dead so LDH is released from them

CD3: negative, CD20: positive (expressed by b cells)

Dx: **Chronic lymphocytic leukemia (CLL) or small lymphocytic lymphoma (SLL)** (it's the same disease)





High amount of lymphocytes and low count of neutrophils

In the lymph nodes, we see effacement of the architecture. Most of the cells are small, dark lymphocytes, with scattered, larger prolymphocytes with a prominent nucleolus.

End of the sheet, el7amdollah

Done by; mohanned momani