Subject: HLS- pathology

Topic: Anemia-lecture1

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*Definition :

*Anemia : is decrease in RBCs mass >>> that will lead later on to reduction of oxygen carrying capacity >>> so hypoxia .

*How anemia is diagnosed ? by measuring the hemoglobin concentration and Hematocrit .

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*Anemia and erythropoietin :

Anemia >>>> trigger the kidney to >>> produce the erythropoietin hormone >>> erythropoietin hormone increase the production of RBCs from bone marrow>> and this is called (**compensatory erythroid hyperplasia**) زيادة عدد الخلايا الحمراء كتعويض لنقصها بسبب الانيميا

In acute anemia :

The production of RBCs increase 5 times or more .

In chronic/ severe cases :

An extramedullary hematopoiesis will happen

It mean : production of RBCs from **secondary hematopoietic organs** like (spleen/ liver and lymph nodes) .

**EXCEPTION : in anemia of chronic inflammation + anemia of renal failure >>> there is no increase in erythropoietin .

*Classification of anemia according to the cause :

1) Blood loss

2) Diminished RBC production

- Iron deficiency anemia
- Anemia of chronic inflammation
- Megaloblastic anemia
- Aplastic anemia
- Pure red cell aplasia
- Myelophthisic anemia
- Myelodysplastic syndrome
- Anemia of renal failure
- Anemia of hypothyroidism

3) Increased destruction (hemolytic anemia)

- Extrinsic factors (infection, antibody, mechanical)
- Intrinsic RBC abnormalities:
1) Hereditary (membrane, enzyme, Hg abnormalities)   More common than the acquired .
2) Acquired (Paroxysmal nocturnal hematuria)

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*Diminished RBCs production is the **most common** specifically the iron deficiency anemia .

*In Diminished RBCs production the **problem is in the bone marrow** >>so BM produce less RBCs .

* In hemolytic anemia the bone marrow is normal , the **problem is in the RBCs.**

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*Classification according to Morphology of blood film :

- Size: normo, micro, macrocytic (MCV) ——→ Mean cell volume
- Color: normo, hypochromic (MCH) ——→ Mean cell hemoglobin
- Shape: anisopoikelocytosis (spherocytes, sickle, schistiocytes) (RBC distribution width) RDW : if it is high it mean we have anisopoikelocytosis.
- Hypochromic microcytic anemia usually reflects impaired Hg synthesis
- Macrocytic anemia reflects stem cell disease and maturation

*RBC indices :

–we have slight variation from one lab to another + from one area to another .

–the RBCs test ranges affected by (sex /age /mobility status /race) .

*what is the reticulocytes ? they are **immature RBCs** , produced from the BM , it is larger than the RBC and more bluish in color) ...

*what is the importance of the reticulocytes ? it help to **diffrentiate** the hemolytic anemia from anemia of decreased RBCs production .

* How to diffrenciate ?? in <u>hemolytic anemia</u> the BM is normal so the BM try to compensate the anemia by **producing more** immature RBCs (**reticulocytes**)

However in the <u>anemia of decreased RBCs</u> the problem is in the BM so we are **not able to produce the reticulocytes** .

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*clinical **features** of anemia :

Generally : Dizziness/ headache/ pallor /fatigue / hypotension .

*the **adaptive changes** : –if the patient have heart or lung disease the symptomes will be worse, because the compensatory methodes depend on this organs .

1/ tachycardia : because we have hypoxia in the tissues so the heart begin to pump more blood ..

2/tachypnea : in order to try to get more oxygen .

3/increase the 2.3-diphosphoglycerte : this molecule is bind to Hg to make the oxygen dissociate form Hg and released to the tissues that is suffer from hypoxia .

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*clinical symptoms in types of anemia :

Anemia type	Symptoms
Chronic hemolytic anemia	<u>Jundice</u> / <u>pigmented gall bladder stones</u> / <u>red urine</u>
Extramedullary hematopoiesis	<u>Splenomegaly</u> / <u>hepatomegaly</u>
Thalassemia major +sickle cell anemia	<u>Growth retardation</u> / <u>bone deformity</u> / <u>secondary hemocromatosis</u> that damading the heart + endicrine glands .

*Anemia of blood loss :

1/ acute

2/ chronic

Anemia of blood loss	Notes	Results
Acute	–we will have **decrease in IV blood volume** . –the symptoms in this type is related to the _shock_ . –if the **loss >20%** of the blood volume this will lead to **shock and death** maybe . –if the **loss <20%** the body try to deal with this condition by **shifting fluids** from the interstitial space into the vessels >>> and this will lead to Dilutional anemia . 👀 In case if internal hemorrhage the Fe is restored and used again 👀 In external hemorrhage the Fe is lost outside the body.	– because we have loss of the blood the secretion of the erythropoietin is stimulated but the activation of BM erythropoiesis needs 5 to 7 days . –the morphlogy is : Normocytic normochromic . + we have increase in the reticulocytes (due to increase in erythropoietin production) .
Chronic	– the causes: gastrointestinal diseases +excessive menstruation . ⬇ So the rate of RBCs loss exceeds the regeneration .	–lead to develop iron deficiency anemia – the morphology : hypochromic microcytic + we have low reticulocytes .