

ESR, CBC, aPTT, PT, etc.

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Erythrocyte Sedimentation Rate

- Westergreen: 3.8% Na-citrate; 1:5 – solution: blood; 200 mm long tube; detection after 60'
- Male: <15 mm/h
- Female: <20 mm/h
- Mild increase among elderly
- Methodology: vertical position, movement, amount of citrate, temperature

ESR

- Aspecific physical examination
 - Calls attention
 - Follow up
 - Cheap, easy to repeat
- ESR depends on:
 - Red blood cell:
 - macrocytosis, anaemia: ↑
 - poikilocytosis, polyglobulia: ↓
 - Plasma components
 - α 2MG, IgG, immunocomplex, fibrinogen: ↑
- Physiologic changes: menstruation, AC, pregnancy (up to 50 mm/h, due to fibrinogen)

ESR↑

- Infectious diseases (bacterial, parazitic)
- Inflammatory, non-infectious diseases (IBD, sarcoidosis, thyreoiditis)
- Tumors (mainly metastatic – tumor mass!)
- Autoimmun diseases (RA, SPA, temp.arteritis, polymyalgia)
- Haematological disorders (leukaemia, lymphoma, AIHA, multiple myeloma, M-Waldenström)
- Nephrosis sy.

Diagnostic plan in case of ESR↑

- History, physical examination
- Lab: CBC, urine test, renal/hepatic function, electrophoresis, CRP, fibrinogen, Coombs-test, RA
- Focus? Infectious/inflammatory/tumorous (US, Xray, GI exam, gynecology, urology, ORL)
- In 5% of cases: no definitive diagnosis! (follow up)

C-Reactive Protein (mg/ml)

- Acute phase protein, production in liver, triggered by IL-6, other cytokines
- Aspecific as ESR
- Not influenced by RBC, pregnancy
- Quantitative measurement is possible
- T $\frac{1}{2}$: 24 hours
- More rapid, than ESR (2 weeks vs. 4 weeks)
- Not increased in viral infections

Complete Blood Count

- „lilac tube”, EDTA as anticoagulant
- **WBC** (white blood cell) 4.0-10.0 $10^9/L$
 - Neutrophil 53-75%
 - Lymphocyte 25-40%
 - Monocyte 2-10%
 - Eosinophil 0-5%
 - Basophil 0-1%
- **RBC** (red blood cell) 4.10-5.10 $10^{12}/L$
- **HGB** (hemoglobin) 120-150 g/L
- **HCT** (hematocrit) 0.35-0.45 L/L
- **MCV** (mean corpuscular volume) 85-95 fl
- MCH (mean corpuscular hemoglobin)
- MCHC (mean corpuscular hemoglobin concentration)
- **PLT** (platelet) 180-400 $10^9/L$
- **Reticulocyte** ratio ‰, absolute $10^9/L$
- **ANC** (absolute neutrophil count)

Qualitative Blood Count

- (pre)measured by the automatic equipment
- May-Grünwald staining, microscope
- Essential in hematologic disorder!
- Cytomorphology

Qualitative Blood Count

- Neutropenia, agranulocytosis (ANC < $0.5/10^9/L$)
- Lymphopenia
- Monocytopenia
- Eosinopenia
- Granulocytosis/neutrophilia
- Lymphocytosis
- Monocytosis
- Eosinophilia
- Basophilia

Anaemia - definition

- $\alpha\nu$ | $\alpha\iota\mu\alpha$ (*Aristoteles, Historia Animalium*)
- Decrease of haemoglobin concentration, haematocrit or red blood cell count below the normal level
- Hgb: < 135 g/l (m); < 120 g/l (f)
Htk: < 0.40 (m); < 0.37 (f)

WHO classification of anaemia based on haemoglobin level (g/l)

- 0. grade: ≥ 110 normal
- 1. grade: 95-109 mild
- 2. grade: 80-94 moderate
- 3. grade: 65-79 severe
- 4. grade: < 65 life-threatening

Classification of anaemias on ethiology

- Hyporegenerative – decreased production
- Hyperregenerative – increased destruction
- Blood loss
- Disturbed distribution

Classification of anaemias on MCV and MCH

- Hypochrom microcyter (MCH↓, MCV↓)
- Normochrom normocyter (MCH, MCV normal)
- Hyperchrom macrocyter (MCH↑, MCV↑)

Hypochrom microcyter anaemias

- Iron ↑/→
 - Thalassaemia
 - Myelodysplastic syndromes
- Iron ↓, ferritin↓
 - ***Iron deficient anaemia***

Normochrom normocytic anaemia

- Reticulocyte↑
 - Haemolytic anaemia
 - Anaemia due to bleeding
 - NB!: in case of high reticulocyte MCV↑*
- Reticulocyte↓
 - Aplastic anaemia
 - Bone marrow infiltration (lymphoma, leukaemia)
 - **Renal anaemia**
 - **ACD, anaemia of chronic disease**

Hyperchrom macrocyter anaemia

- Reticulocyta →/↓
 - ***Megaloblastic anaemias (B₁₂, folate deficiencies)***
 - Myelodysplastic syndromes

Platelet

- 180.000-400.000 $10^9/L$
- Lifetime 11 days
- > 50.000 : no spontaneous bleeding
- < 20.000 : spontaneous bleeding of skin and mucous membranes
- < 10.000 : severe bleeding

Coagulation Tests

- **Bleeding time:** Ivy's method (normal 6-8 min.)
- „blue tube”: Na-citrate as anticoagulant → centrifuged plasma
- **aPTT:** activated partial thromboplastin time (normal control 35”)
- **PT:** prothrombin time (Quick)
- **INR=** $PI_{(patient)} / PI_{(control)}^{ISI}$ (INR: International Normalized Ratio, ISI: International Sensitivity Index) (normal 0.9-1.1)
- **D-dimer:** intravascular thrombus (normal <0.5 mg/l)
- **Fibrinogen:** consumption (normal 2.0-4.0 g/l)

