

ERYTHROCYTE SEDIMENTATION RATE (ESR)



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Hematopathology

OBJECTIVES

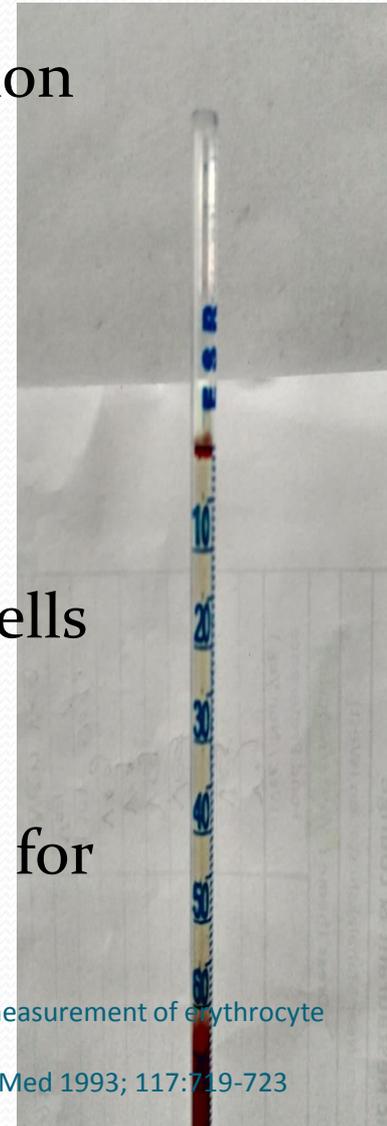
- After this PPT, you will be able to know
- the methods used for measuring ESR
- the factors influencing the sedimentation of red cells
- significance of measuring ESR

WHAT IS ESR?

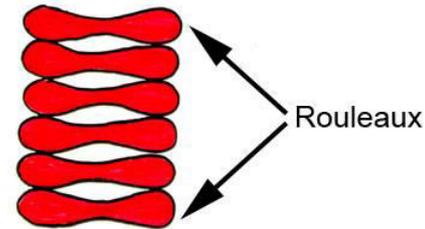
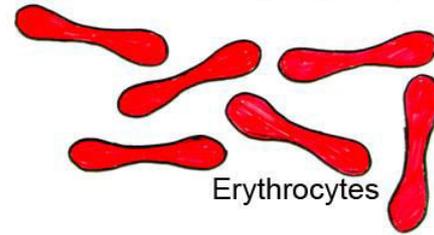
- Erythrocytes sedimentation Rate (ESR) is a common hematological test for nonspecific detection of inflammation
- It may be caused by infection, **some cancers** and certain autoimmune diseases.
- It can be defined as the rate at which Red Blood Cells (RBCs) sediment in a period of one hour.
- ESR is recommended by the international council for standardization in hematology (ICSH)

References

1. International Council for Standardization in Haematology (Expert Panel on Blood Rheology): ICSH recommendations for measurement of erythrocyte sedimentation rate. J Clin Pathol 1993; 46:198-208
2. Thomas RD, Westengard JC, Hay KL, et al: Calibration and validation for erythrocyte sedimentation tests. Arch Pathol Lab Med 1993; 117:719-723

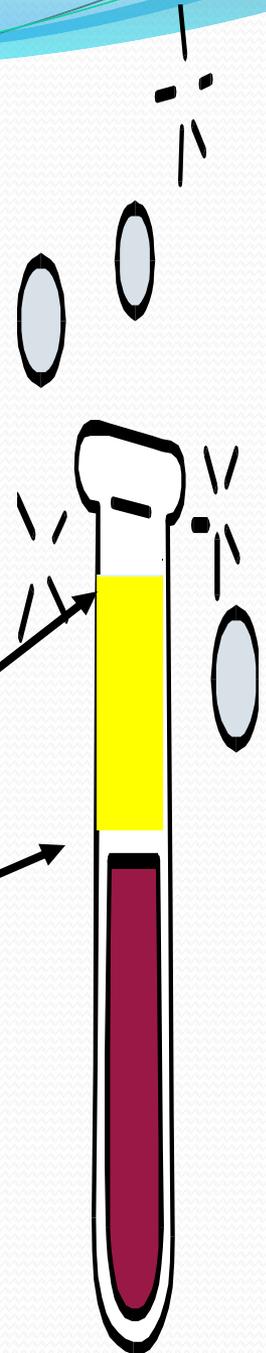


Erythrocyte Sedimentation Rate (ESR)

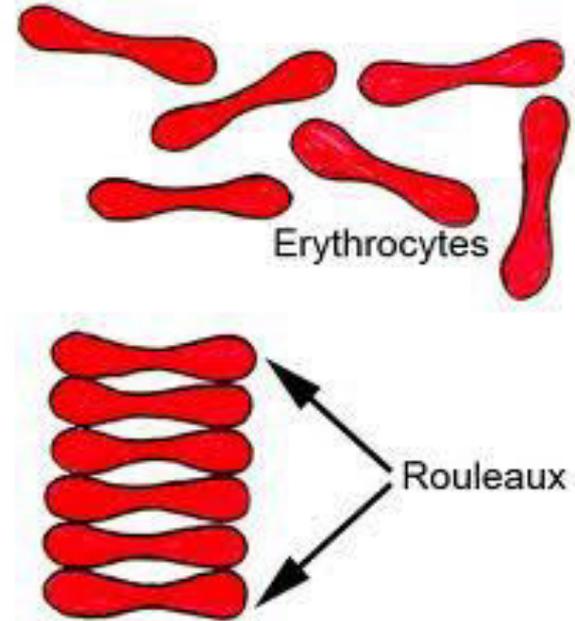


Sedimentation Phases

- The initial lag phase (10 mins)
- The phase of rapid RBC falling (40 mins)
- The packing phase (10 mins)



Rouleaux formation.



-The cells settle due to :

1-Density of RBCs is greater than that of plasma.

2-RBCs tend to aggregate to form Rouleaux.

(Rouleaux differs from agglutination that agglutinated cells are irreversibly bound together and can not be separated)

ESR methods

- Manual methods

1. Westergren Method.

2. Wintrobe's Method.

- Automated method

Westergren method



1. Westergren pipette

- Open at both ends.
- 23 cm in length
- 2.5 mm in diameter,
- Marking on the tube is from 0 to 180 mm.
- Anticoagulant : 3.8% trisodium- citrate solution (1:4)

2. Westergren rack.

3. Leveling plate for holding the Westergren rack

4. Timer



Procedure

- The blood should be mixed thoroughly.
- Fill the Westergren pipette by inserting in a vacutainer tube containing 1.6 ml blood and 0.4ml anticoagulant
- Keep the pipette upright in the ESR stand lying on the leveled surface
- Read the upper level of RBC column exactly after one hour
- Normal Range
Male: 0-10 mm/hour & Female: 0-20 mm/hour

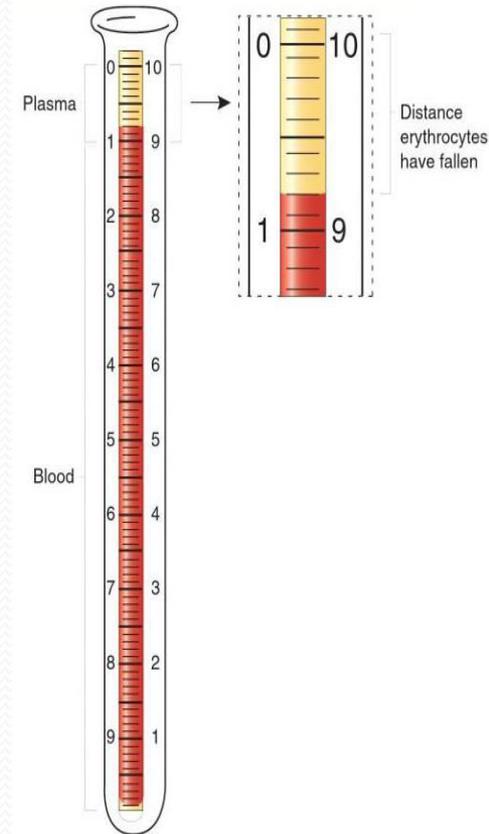


Westergren tube for ESR.

WINTROBE'S METHOD

- This method uses Wintrobe tube, a narrow glass tube closed at the lower end only.
- The Wintrobe's tube has a length of 11 cm and internal diameter of 2.5 mm.
- It contains 0.7-1 .0 ml of blood.
- The marking is 0 (Zero) at the top and Marking 10 at the bottom is use for ESR.
- The marking is 10 at the top and 0 at the bottom use for PCV. After centrifugation

Normal Value : For males : 0-9 mm/hr
For females : 0-20 mm/hr



Automated ESR analyzer

- Automated ESR analyzer is designed to accurately and precisely to measure the sedimentation rate of erythrocytes in ESR tubes



Advantage

- The tube in which blood is collected is pre-evacuated.
- No manual filling of blood is required as for Westergren method.
- It is quick and results are available in 20 minutes.
- Less sample volume.
- Barcode Scanner & Built-in Printer
- Multiple samples can be analysed simultaneously

Limitations of Automated ESR method

- Discrepancy was noted for HIGH ESR values. However it is not evident for normal ESR values.
- Hence it is recommended that a correction factor be applied while using automated equipment.

Clinical significance of ESR :

- The ESR is changed in a great variety of conditions
- Its not specific and not diagnostic.
- It is a prognostic test
- It detects the presence and severity of disease.
- It gives an idea about the activity of disease
- Repeated ESR estimation helps in prognosis and follow up of disease

Factors affecting ESR

- ESR values tend to rise with age and are generally higher in women.
- ESR is also elevated in the black population and those with anemia .
- It is absolutely essential that the ESR stand be on a level surface
- the table or area in which the tube is placed is free of vibration,

Some conditions with *very high* ESR >100 mm/hr

- Multiple myeloma
- Tuberculosis
- Connective tissue disorders - SLE, RA and other auto-immune diseases
- Malignancies
- Severe anemia

Some conditions with low ESR :

- Polycythemia
- Severe Leukocytosis
- Sickle cell disease (anemia)
- Hereditary spherocytosis
- Congestive cardiac failure
- Corticosteroid use
- Hypofibrinogenemia

is **ESR** important test

