“UNDERSTANDING CBC HISTOGRAMS“
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INTRODUCTION:

CBC is the meat and potato of hematology.

CBC test include:
  - Cell counts.
  - HG.
  - HCT.
  - Red cell indices.
  - Plt indices.
  - White cell differentials.
  - WBCs histograms.
  - Plt histograms.
  - RBCs histogram.
WHAT IS A HISTOGRAM?

- Histogram derived by plotting the size of each cell on X axis and the relative number on the y axis.
- They are used to determine:
  - The average size.
  - Distribution of size.
  - Detect subpopulation.
**Red Cell Histogram:**

- It represents the relation between red cells size and the number.
- If RBCs are larger than normal, shift to right.
- If RBCs are smaller than normal, shift to left.
- If the curve is bimodal, 2 populations of RBCs.
2 parameters can be obtained:

- **MCV**
  - calculated using the entire RBCs histogram.
  - MCV decreased:
    - IDA.
    - Thalassemia.
    - Anemia of chronic diseases.
  - MCV increased:
    - Megaloblastic anemia.
    - Acquired aplastic anemia.
RDW:

- Coefficient of variation of RBCs volume distribution.

- RDW increased in:
  - IDA,
  - Megaloblastic anemia.
  - Hemoglobinopathies.
PLATELETS HISTOGRAM:

- It is the plt size plotted against the number.

- 2 parameters can be obtained:
  - MPV (7-10fl).
  - PDW (<20%).
If MPV >10 (immature PLt are released):

- Normal clothing activity.
- Sickle cell anemia.
- Following splenectomy.
- ITP.

If MPV <7:

- Aplastic anemia.
- Megaloblastic anemia.
- Chemotherapy.
- Heterozygous thalassemia.
increased PDW:
- Aplastic anemia.
- Megaloplastic anemia.
- CML.
- Chemotherapy.
- Fragmented erythrocytes.
**WBC histograms:**

- Plotting the WBC's size against their number.
- There are 3 analysis groups:
  - Lymphocytes
  - Granulocytes
  - Mononuclear cells.

![Image of WBC histograms](image-url)
‡ R1‡ RBC s precursors, non lyzed RBCs, cryoglobulins, giant or clumped PLts.
‡ R2‡ blasts, basophilia, oesinophilia, plasma cells and abnormal sized lymphocytes.
‡ R3‡ oesinophilia, and immature granulocytes.
‡ R4‡ absolute granulocytosis (shift to right).
The Histograms in conjunction with absolute cell counts gives a valuable information about the abnormality of the sample and the need for follow up blood film examination.

Histograms should be used as screen for blood pathology, but should not be considered diagnostic for any particular condition.

The manual blood film differentials remains the definitive tool for complete hematologic analysis.
INTERPRET THE FOLLOWING:

- 30 y F with CBC: RBC = 3.2 × 10^6/μL, Hg = 8.7 g/dl, HCT = 26%, MCV = 82 fL, MCH = 19 pG, MCHC = 27 gm/dL, RDW = normal.

- What is the next laboratory test you will recommend?
45 y/o female with the following results: RBC = 2.4 × 10^6/μL, HGB = 8.2
gm/dL, HCT - 26%, MCV = 113.0 fL, MCH = 34.1 pG, MCHC = 31.5
gm/dL, RDW = 25%. The RBC histogram is as follows:

What is the most likely diagnosis???
Young teenage male with a WBC count = 56.3 × 10⁹/L. The platelet count was 112 × 10⁹/L. The RBC = 2.8 × 10¹²/L, Hgb = 88.0 g/L, and Hct = 0.24 L/L. The histogram is shown as follows:

What is the most likely diagnosis??

What tests you will recommend??
46 y/o m with a total WBC count of $31 \times 10^4 / \mu L$. The three part differential results were lymphocytes = 13%, mononuclear cells = 50%, and granulocytes = 37%. The platelet count was $122 \times 10^3 / \mu L$. The RBC values were on the low end of the normal ranges. The WBC histogram is as follows:

What is the most likely diagnosis ??
Thank you ....