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Original article:

Correlation of peripheral blood smear with Red cell histogram for morphological typing of anemia

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Abstract:

Introduction: peripheral smears are well known diagnostic test for anemia give as clue about morphological types of anemia . peripheral smears along RBC histogram together help as to do proper morphological typing of anemia.

Objectives: Aim of the study is to correlate peripheral smear and RBC indices and histogram .

Materials and Methods: The study was conducted in Hematology laboratory of our hospital for a period of 06 month during July 2018 to December 2018. Total 500 anemic patients of all age group were included in the study. Interpretation of RBC Histogram and peripheral smear examination was done in each case.

Results: All 500 cases categorized into normocytic, microcytic, dimorphic ,macrocytic population by peripheral smear examination. Left shifted and broad histogram mostly seen in microcytic RBC. Right shifted curve mostly in Macrocytic anemia. Bimodal peak mostly seen in dimorphic RBCs. Out of total 500 anemic cases, microcytic anemia is most common cause followed by normocytic, Dimorphic and macrocytic anemia. Female patients are more than male patients and most common involved age group is 31-40 years followed by 21-30 years.

Conclusion: peripheral smears along with RBC histogram help in morphological typing of anemia. With the proper examination of peripheral blood smear along with correlation with histogram help in early diagnosis of anemia.

Keywords: RBC indices, RBC histogram, Anemia, peripheral smear, microcytic anemia, macrocytic anemia, diamorphic anemia.

Introduction

Peripheral smear along with RBC histogram and indices are very useful in morphological diagnosis of anemia. The automated cell counter based on impedance principle and relies on the change in conductance as each cell passes through an aperture. This change in conductance results in development of an electrical pulse which's amplitude is proportional to the cell volume. The results are displayed as histogram and as figures. RBC histogram is a graphic representation of particle size distribution (cell frequencies verses size). Shift in one direction or another can be of diagnostic importance (1-3)

A lot of studies [4-8] have been done to assess the efficacy and significance of red blood cell parameters in different hematological conditions. We undertake this study to do correlation of peripheral blood smear with RBC's histograms in various anemia and to compare our findings with available literature.

Aims and Objective

To compare peripheral blood smear morphological features with RBC histogram

Material and Methods:

It was a prospective study and conducted at ***conducted in Hematology laboratory of our hospital for a period of 06 month during July 2018 to December 2018.*** Two ml of EDTA blood sample was collected from patient and histogram was obtained after through mixing. The automated analyzer.

Study group was selected by observing hemoglobin obtained from automated 3 part cell counter with respect to age and sex. A simultaneous peripheral smear was also prepared according to standard operating procedure and stained by Field stain. Blood sample of 500 anemic (Hemoglobin <10) patients were selected as per WHO reference range. Severity of Anemia was taken as mild if hemoglobin > 9 gm%, Moderate if hemoglobin between 7- 9 gm% and severe if Hb < 7 gm% (WHO) .

In all cases RBC histogram was obtained and Peripheral smear examination was also done on each slide. In the present study, we include all age groups.

Inclusion criteria: 1) all anemic samples as per WHO reference range hemoglobin < 10 gm%.

Exclusion Criteria: 1) Hemoglobin >10 gm%.

2) Patient having leukocytosis, leukemaiod reaction, leukaemia, and platelet Disorders were excluded from study.

Results and Analysis

Out of total 500 anemic samples 218 samples were from Males and 382 samples were from females and 1:1.75 is the male female ratio of the study. The majority of cases in the study group were belong to moderate degree of anemia with frequency of 235(47%) followed by severe degree of anemia with frequency of 150(30%).

TABLE 1: Distribution of case as per morphological types of anemia

Type of anemia	Number	Percentage
Normocytic	117	23.4 %
Microcytic	277	55.4 %
Macrocytic	34	6.8 %
Diamorphic	72	14.4 %

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Table 2: Comparison of cases between histogram and Peripheral blood smear

Type of Anemia	Frequency (%)	
	Histogram	peripheral blood smear
Normocytic	117 (23.4%)	24.8%
Microcytic	277 (55.4%)	60.6%
Macrocytic	34 (6.8%)	4.1%
Diamorphic	72 (14.4%)	6.0%
Total	500 (100%)	500 (100%)

Table 2 shows the overall difference in diagnosing anemia by histogram and Peripheral blood smears. Maximum difference was seen in dimorphic anemia followed by microcytic anemia.

TABLE 3 : RBC histogram in our study

Type of histogram	**Percentage**
Normal curve	**24.4%**
Left shift	**44%**
Right shift	**7.8%**
Broad base	**15.8%**
Bimodal peak	**8%**

This abnormal histogram show variation in different type of anemia and it will suggest particular RBC disorder which aid in diagnosis of anemia.

TABLE 4: RBC histogram in different anemia

	Normal curve	Left shift	Right shift	Broad base	Bimodal
Normocytic	19 %	0	0	4.4%	0
Microcytic	1%	42%	0	10.4%	2%
Macrocytic	0	0	6.8%	0	0
Diamorphic	4.4%	02%	01%	1%	06%

Out of total 23.4 % cases of normocytic normochromic anemia,19% showed normal curve and 4.4% showed broad based curve.

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Out of 55.4% cases of microcytic hypochromic anemia,01% were normal,42% were left shifted curve,10.4% showed broad based curve and 02 % showed bimodal peaked histogram.

Out of total 6.8% cases of macrocytic anemia, all cases showed right shift curve histogram.

Out of total 14.4% cases of dimorphic anemia, 4.4% showed normal curve,02% showed left shift curve, 01%showed right shift curve and 06% showed bimodal curve.

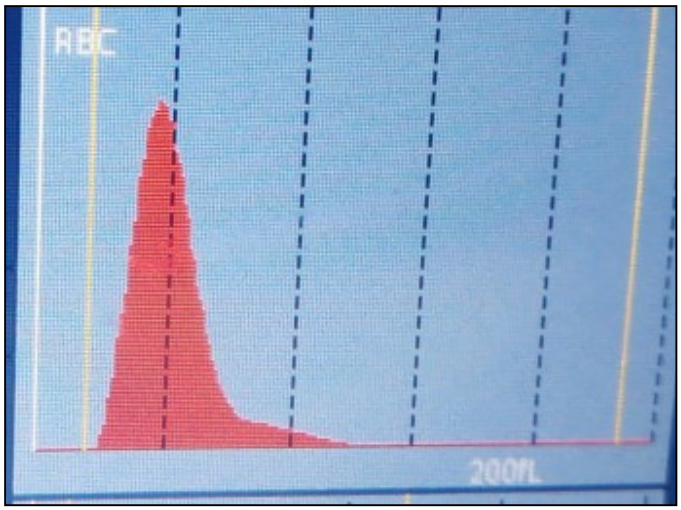

Fig 1 : Microcytic RBCs showing left shift.

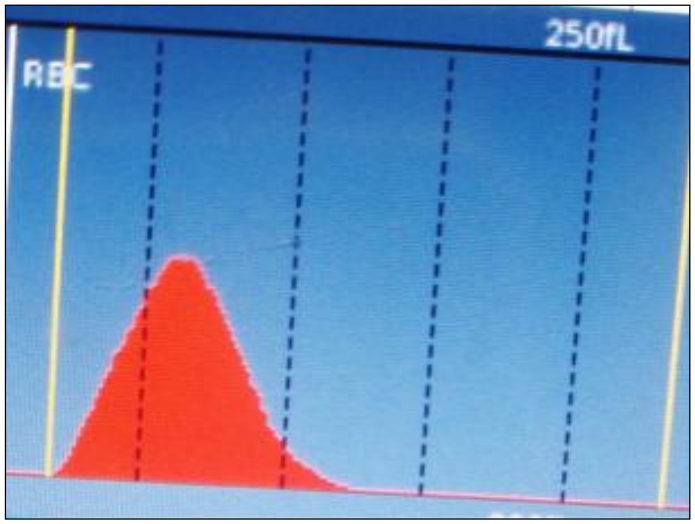

Figure 2 : microcytic anemia with broad base

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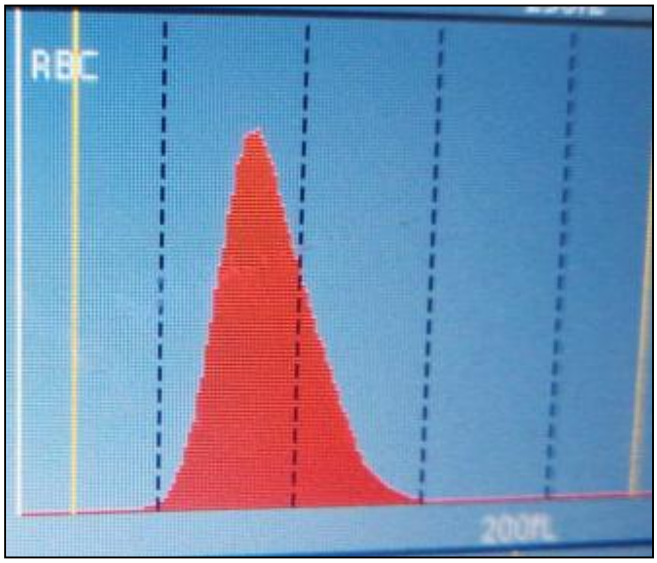

Fig 3: Macrocytic RBCs showing right shift

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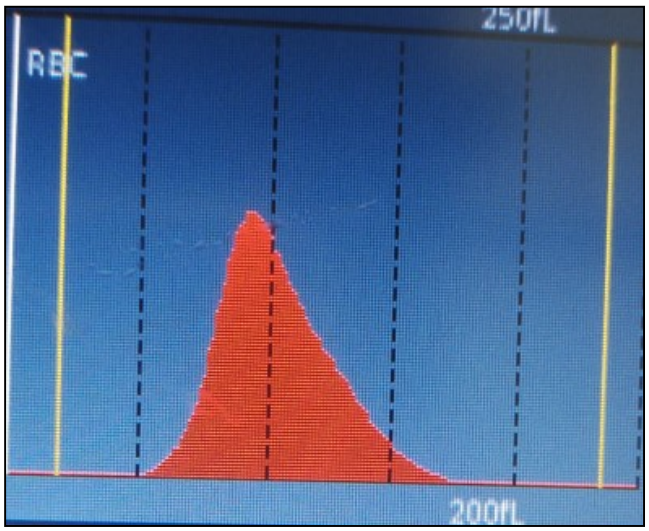

Figure 4 : Macrocytic RBC with broad base

Discussion

In present study of 500 cases, maximum numbers of cases are having Microcytic anemia (55.4%) followed by normocytic (23.4%), Dimorphic (14.4%) and Macrocytic (6.8%). Other studies like sandhya et al. [5] Chavda J et al. [6] & Byna Syam Sundara Rao et al. [7] were also found similar findings regarding distribution of anemia cases. Our study of RBC histogram showed normal curve (24.4%), left shift (44%), right shift (7.8%) Broad base (15.8%) and bimodal (8%) and these findings regarding to RBC histogram were also correlated with other studies like sandhya et al. [8] Chavda J et al. [9] & Rao BSS et al. [7]

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In present study, microcytic RBC show left sided shifted curve because of small size along with cases showing broad base curve that is because of high RDW which suggest presence of anisocytosis. In cases of macrocytic anemia right shift with broad based curve means low hemoglobin and macrocytic blood picture. In our study majority of cases of macrocytic anemia showed right shift curve. The dimorphic blood picture is showing bimodal curve along with some case showing left and right shifting of curve.

Conclusion

Proper microscopic examination of peripheral blood smears along with correlation with RBC Histograms help in morphological typing of anemia . Histogram could be used as screening method and when combined with Peripheral blood smear findings, they act as useful supplement and by correlating findings of both methods we could diagnose majority of anemia.

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