

Clinicopathological Analysis of Bone Marrow Aspiration and Trepine Biopsy in Cases of Severe Anemia – A Study of 50 Cases

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ABSTRACT

Background: Anemia is the most prevalent nutritional deficiency disorder in the world. It affects all age groups. The two most important techniques used for the diagnosis of hematological disorders are bone marrow aspiration and trephine biopsy which are complementary to each other. **Aims and Objectives-** 1.To study the etiology of anemia in all age groups. 2.To analyze the bone marrow aspiration and trephine biopsy findings in cases of severe anemia due to various diseases. **Methods:** The present study comprised of 50 cases of bone marrow aspiration and trephine biopsy in patients of severe anemia received in the Department of Pathology, Government Medical College, Patiala from January 2018 to October 2019. Smears were made from bone marrow aspirate (BMA) and biopsy, stained by Leishman stain and examined. **Results:** In the present study the commonest cause of severe anemia was Megaloblastic anemia (36%) (Fig. 1), followed by Chronic Myeloid Leukemia (CML) (12%), Iron Deficiency Anemia (IDA) (8%) and Dimorphic Anemai (DA) (8%). The less common conditions were Chronic Lymphocytic Leukemia (CLL) (6%), Lymphoma (6%), Multiple Myeloma (MM) (6%), Chronic disorders (6%), Acute Leukemia (4%), Aplastic Anemia (AA) (4%), Hairy Cell Leukemia (HCL) (2%) and Hemolytic anemia (HA) (2%). **Conclusion:** Clinical history and bone marrow examination was critical in arriving at the diagnosis. Bone marrow aspiration and biopsy using standard fixation and embedding procedures complement each other in the work up of patients with severe anemia.

Keywords: Bone marrow aspiration, bone marrow biopsy, severe anemia, megaloblastic anemia.

INTRODUCTION

Anemia is most common nutritional deficiency disorder in the world. It is a condition when the red blood cells do not carry enough oxygen to the tissues of the body.^[1] Anemia is defined as a reduction in the concentration of hemoglobin in the peripheral blood below the normal for the age and sex of the patient. Anemia is graded according to degree as mild, moderate and severe. The individuals with Hb ≤ 6 g/dl are said to be severely anemic.^[2]

More than one of this process can contribute to the genesis of anemia. The cause of anemia in a particular patient is determined from consideration of:

- The type of anemia indicated by the peripheral blood smear
- The clinical features
- The results of further investigations where they are necessary.^[2]

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Examination of peripheral blood smears in severe anemia alone does not reflect the exact nature of the disease process. Thus bone marrow examination is the basis of investigations and diagnosis for a variety of hematological and non- hematological diseases involving the bone marrow. A microscopic examination of bone marrow is often useful and may be critical in the work up of unexplained anemia.^[3]

Bone marrow can be obtained by two ways:

- Needle aspiration
- Trepine needle biopsy

Bone marrow aspiration (BMA) alone is usually sufficient to diagnose nutritional anemias, most of the acute leukemias and Immune thrombocytopenias. Trepine biopsy does provide important diagnostic information in patients with granulomatous disease, myelofibrosis and bone marrow infiltration. Bone marrow aspiration is useful in making out better individual cell morphology. Whereas biopsy is useful in bone marrow architectural pattern and distribution.^[4]

Objectives

1. To study the etiology of anemia in all age groups.
2. To analyze the bone marrow aspiration and trephine biopsy findings in cases of severe anemia due to

various diseases causing it like nutritional deficiency, bone marrow depression or any neoplastic proliferation of blood cells.

MATERIALS AND METHODS

This study has been conducted in the Department of Pathology, Government Medical College, Patiala, fifty cases which included both indoor and outdoor patients, that presented with severe anemia were taken up for present study. Sex was no criterion for the selection of cases

Criteria - Patients with hemoglobin \leq 6gm/dl.

Clinical data with reference to the mode of onset, signs and symptoms, drug intake, bone pains, hepatosplenomegaly and lymphadenopathy were recorded.

The following investigations were performed and recorded in all the cases.

1. Complete hemogram which included Hb, TLC, DLC, Platelet counts, ESR, RBC count, PCV, MCV, MCH, MCHC and PBF.
2. Bone marrow aspiration.
3. Special investigations like serum proteins, serum ferritin, serum iron, FNAC lymph node and ultrasound abdomen were done in appropriate cases.

The peripheral smear was studied after staining with Leishman stain. Subsequently a bone marrow aspiration and biopsy were performed. The site of bone marrow aspiration was at the posterior superior iliac spine using Salah needle. After taking the marrow for smears, the biopsy specimen was obtained by using Jamshidi needle. Before the biopsy specimen was transferred to 10% neutral buffered formalin, touch imprints were made by gently rolling the bony core across a clean glass slide. This along with the aspiration smears were stained with Leishman stain. Special stains - Periodic acid Schiff stain, Myeloperoxidase, and Perls' stains were used wherever indicated.

RESULTS

The following data was recorded and analyzed.

The sex distribution of severe anemia showed a male preponderance (62%). The male to female ratio was

1.63:1. Most of the patients were in the age group of 50-69 years (21%) and least occurrence was seen in patients $>$ 80 years (2%) (Fig-1). Generalized weakness (70%) was the commonest clinical feature in severe anemic patients. The other findings were pallor (64%) and fever (50%). Less common were hepatomegaly, bleeding and skin rashes. The hemoglobin concentration varied from 2.1g/dL to 6 g/dL. Majority (84%) of the patients had haemoglobin ranging from 4 to 6 g/dL. 16% of the patients had hemoglobin in range of 2 to 3.9 g/dL.

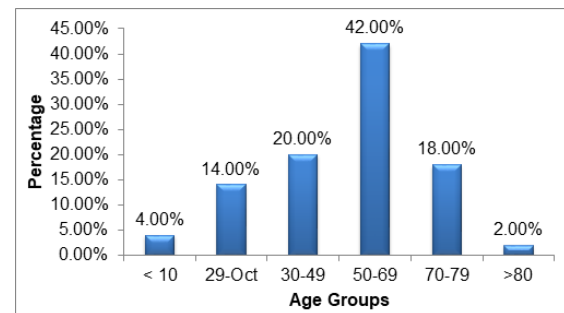


Figure 1: Percentage of Age.

The total leucocyte count (TLC) was in the range of 1 - 280 \times 10³/ μ L. Most (53%) of the patients had values in the range of 2.5 - 4.0 \times 10³/ μ L. Most (52%) patients had platelet counts in the range of $>$ 150 \times 10³/ μ L.

The commonest cause of severe anemia was Megaloblastic Anemia (36%) [Figure 3], followed by CML (12%) [Figure 4], IDA (8%) and DA (8%). The less common conditions were CLL (6%), Lymphoma (6%), MM (6%) [Figure 5], Chronic disorders (6%), Acute Leukemia (4%), Aplastic Anemia (4%), HCL (2%) (Fig-6) and Hemolytic Anemia (2%). Of the 50 cases of severe anemia, 31 (62%) were of non-neoplastic and 19 (38%) cases had neoplastic conditions. Of the 19 cases of neoplastic conditions, CML was the commonest cause (31.5%) followed by CLL (15.78%), lymphoma (15.78%) and Multiple Myeloma (15.78%). The other causes were AML, ALL, HCL, NHL and Metastasis of other malignancy.

Table 1: Distribution of Various Causes of Severe Anemia

Type of Anemia	Number of Cases	%age	Causes	Number of Cases	%age
Impaired Red Cell Production Nutritional anemia	26	52%	Megaloblastic anemia	18	36%
			IDA	4	8%
			DA	4	8%
Chronic disorders	3	6%	PUO	2	4%
			Malignancy	1	2%
Replacement of bone marrow	18	36%	Acute leukemia	2	4%
			CML	6	12%
			CLL	3	6%
			Lymphoma	3	6%
			MM	3	6%
			HCL	1	2%
Aplastic anemia	2	4%	AA	2	4%
Excessive Red Cell Destruction	1	2%	Hemolytic anemia	1	2%

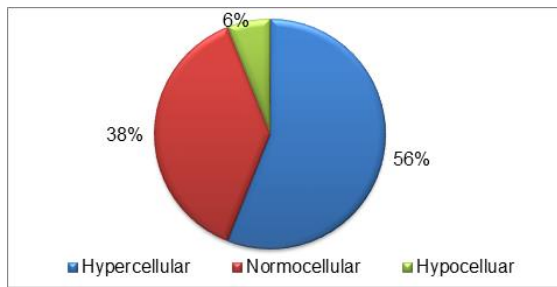


Figure 2: Cellularity.

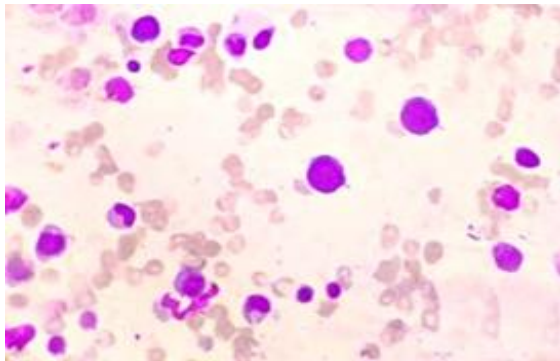


Figure 3: Bone marrow aspiration : Megaloblastic Anemia showing megaloblasts X1000 (Leishman's)

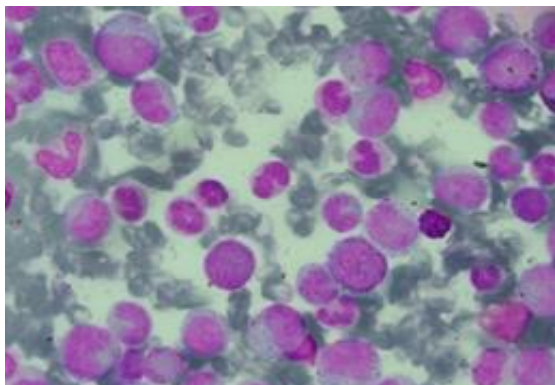


Figure 4: Bone marrow aspirate: Chronic Myeloid leukemia showing blasts. X1000 (Leishman's)

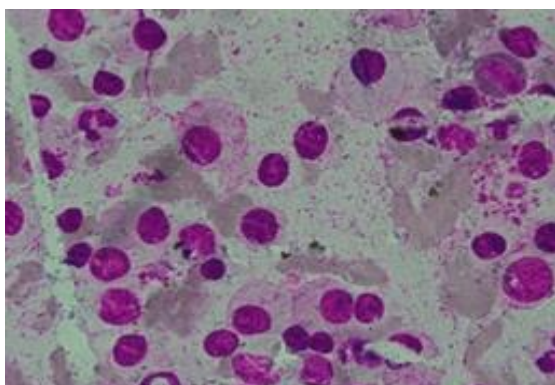


Figure 5: Bone marrow aspiration : Multiple myeloma –smears showing plasma cells X1000 (Leishman's)

Out of the 50 patients of severe anemia, 28 (56%) cases had a hypercellular marrow, 19 (38%) had normocellular marrow. The remaining 3 had hypocellular marrow [Figure 2].

In 3 cases repeat bone marrow aspiration had to be done because of inadequate material, to arrive at a definitive diagnosis.

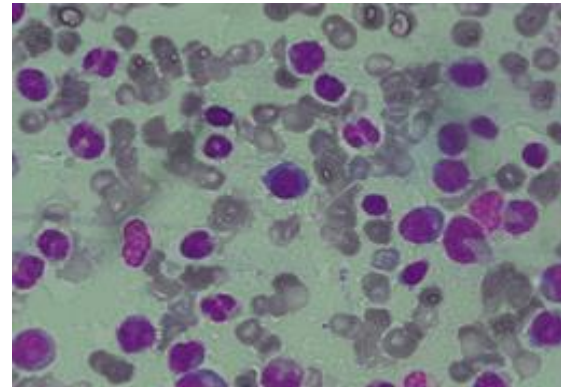


Figure 6: Bone marrow aspiration: Hairy Cell Leukemia showing hairy cells X1000 (Leishman's)

DISCUSSION

In the present study maximum number of patients were observed in the age group of 50 – 69 years i.e 21 patients (42 %) followed by 10 patients (20%) in the age group of 30-49 years. In the study conducted by Lalitha SM (2018),^[5] maximum number of patients were in the age group of 46- 60 years i.e 37/112 (33%) followed by 26/112 (23.2 %) patients in the age group of 31 – 45 years. The result of the present study were comparable to the studies conducted by Lalitha SM (2018).^[5] However the study conducted by Metikurke et al (2013),^[6] reported that maximum number of patients were in the age group of 21-30 years (25%).

The present study showed male preponderance which was in concordance with the studies conducted by Singh et al (2015),^[7] and Sharma N et al(2017).^[8]

In this study majority of the patients showed hypercellular bone marrow i.e 28 cases (56%). This result was similar to the study conducted by Metikurke et al (2013),^[6] in which the majority of patients were recorded with hypercellular bone in 30/58 cases (51.72%).

The most common cause of severe anemia was Megaloblastic Anemia followed by CML. This result was in concordance with the studies conducted by Atla BL et al (2015),^[9] Sharma N et al(2017),^[8] and Metikurke et al (2013).^[6] Their studies also showed Megloblastic Anemia the most common cause of severe anemia. However in the study conducted by Jha et al (2013),^[10] Acute Leukemia was the most common cause of anemia followed by CML.

CONCLUSION

Thus to conclude, bone marrow aspiration and biopsy using standard fixation and embedding

procedures complement each other in the work up of patients with severe anemia; while the aspiration smears are primarily useful for cytological diagnosis, biopsy sections are mainly helpful to identify histological features like architectural patterns, extent of involvement and fibrosis.

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