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Original Article

Study of Bonemarrow in Pancytopenia Patients at a Teritiary Care Centre Kurnool, Andhra Pradesh, India

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Abstract

Introduction: Pancytopenia is a combination of anemia, leucopenia and thrombocytopenia. It can be primary or secondary. Bonemarrow study plays an important role in pancytopenia to identify the cause.

Aim: The aim of the study is to identify the cause of pancytopenia, to know the frequency of various diseases in causing pancytopenia and the importance of bonemarrow study in such cases.

Materials and Methods: This study was conducted in and around Kurnool for a period of 4years in various health care centres. Patients presented with various complaints.Bone marrow aspiration and biopsy were performed from posterior superior iliac crest of the patients. Aspiration smears were stained with leishmann stain for microscopy. Touch imprints of bone marrow biopsy were made and examined before the tissue was put in the 10% neutral buffered formalin fixative.

Results: A total of 50 cases were studied during a period of four years. Age of patients range from 8months to 70years. 23 cases were female and 27 were male. The commonest cause of pancytopenia was megaloblastic anemia seen in 23 cases (46%) followed by nutritional anemia seen in 7 cases (14%), 5 cases (10%) were Aplastic anemia, 4 cases (8 %)were acute myeloid leukemia, 3 cases (6%) were acute lymphoblastic leukemia, 3 cases(6%) were lymphoma, 3 cases (6 %) were multiple myeloma, 1case (2%) was chediak higashi syndrome and 1 case (2%) was malaria.

Conclusion: Bone marrow study helps in the diagnosis of cause of pancytopenia and also helps in planning for further investigations and management.

Keywords: Bone marrow study; chediak higashi syndrome; megaloblastic anemia and pancytopenia.

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Introduction

The term pancytopenia refers to anemia, leucopenia and thrombocytopenia.[1] It can be primary or secondary.[2] Primary cause is due to bone marrow failure. Secondary causes are due to marrow replacement by toxins or malignant cells or abnormal cells or ineffective hematopoiesis or trapping of normal cells in a hypertrophied and over reactive reticuloendothelial system.[3] Aetiology varies from region to region. Bone marrow study helps in identifying the cause of pancytopenia and for further management.

Aim

- To identify the cause of pancytopenia.
- To know the frequency of various diseases causing pancytopenia.
- To explain the importance of bonemarrow study.

Materials and Methods

Our study was prospective study. This study was conducted in and around Kurnool for a period of 4 years in various health care centres. Patients of all age groups and both sexes were included in the study. During the study a total of 50 bone marrow aspirations and 50 biopsies were performed. Bone marrow aspiration and biopsy were done under aseptic conditions. The site was infiltrated with xylocaine. Most common sites done were posterior superior iliac crest and sternum. Sterilized salah's needle of sizes are used for aspiration depending on the age of the patient. 10cc syringe was used for aspiration. Aspirated material was spread on clean slides like a smear.

At the same time bone marrow biopsy, imprint smears, complete blood count and peripheral smear were done. Leishmann stain was used to stain the peripheral smear, bone marrow aspiration smear and touch imprint smears. Touch imprint smears are useful for identifying morphology better. Bone marrow smears were examined for cellularity, myeloid to erythroid ratio, erythropoiesis, myelopoiesis and megakaryopoiesis. Bone marrow biopsy was obtained by jamshidi needle. Before transfer to 10% neutral buffered formalin fixative touch imprints were made on clean glass slides.

Inclusion criteria: cases with hemoglobin less than 10gm/dl, Total leucocyte count of less than 4000 cells/cumm and platelet count less than 1,50,000 cells/cumm were included in the study.

Exclusion criteria: cases of chemotherapy induced pancytopenia were excluded.

Results

A total of 50 cases of pancytopenia were studied. Out of which 27 were males and 23 were females (Table 1). The age of patient ranged from 8months to 70years (Table 2). Patients were presented with different clinical features. Blood picture was predominantly macrocytic anemia (46%) followed by nutritional anemia. Leucopenia and thrombocytopenia were seen in all cases. Out of 50 cases 23 were megaloblastic anemia, 7 were nutritional anemia, 5 were aplastic anemia, 4 were acute myeloid leukemia, 3 were acute lymphoblastic leukemia, 3 were Lymphoma, 3 were multiple myeloma, 1 was chediak higashi syndrome and 1 was malaria (Table 3). In our study the commonest cause of pancytopenia is megaloblastic anemia (46%) followed by nutritional anemia (14%). On bone marrow aspiration, megaloblasts appears with sieved nuclear chromatin (Fig.1), asynchronous maturation of nucleus and basophilic cytoplasm. Granulopoiesis show few giant metamyelocytes.

5 cases were of aplastic anemia. Aspiration smears are hypocellular for age. The residual nucleated cells include mostly lymphocytes, plasma cells, mast cells and macrophages. Few normoblastic erythroid precursors are seen. Myelopoiesis is reduced and left shifted with only few segmented forms seen. Few scattered megakaryocytes are seen (Fig. 2), the bone marrow biopsies in all 5 cases showed hypocellular marrow with relative increased in fat but without any infiltrates or fibrosis (Fig. 3). 4 cases were of acute myeloid leukemia shows >20% of myeloblasts with hypercellular marrow with decreased trilineage hemopoietic elements. 3 cases were of acute lymphoblastic lymphoma, showing decreased erythropoiesis, myelopoiesis and megakaryopoiesis and whole marrow was replaced by lymphoblasts constituting >80%. 3 cases were of lymphoma, these patients bone marrow showed severe reduction of all three lineages with presence of medium sized lymphoid cells (Fig. 3). A possibility of lymphoproliferative disorder was considered in such cases and later proven 2 cases as low grade nonhodgkings lymphoma and one case as high grade nonhodgkins lymphoma by immunohistochemistry on bone marrow biopsy. 3 cases of plasma cells myeloma showed increased number of lymphoid cells and presence of atypical plasma cells with hypo to normocellular marrow

(Fig. 4). One case of malaria was detected with presence of malarial pigment in the aspiration smears. One case of chediak higashi syndrome was detected with presence of abnormal giant inclusion bodies in leukocyte precursor cells in aspiration smears (Fig. 5) and giant granule in lymphocytes in peripheral smear. Of the 50 cases of pancytopenia 48 cases show correlation between bone marrow aspiration and bone marrow biopsy. In 2 cases bone marrow biopsy was inadequate (Table 4).

Discussion

Though pancytopenia is a feature of many life threatening conditions, few of the conditions are treatable. So bone marrow study helps to treat such conditions. In the present study megaloblastic anemia (46%) was the commonest cause of pancytopenia (Table 3) followed by nutritional anemia (14%), aplastic anemia (10%), malignant diseases (26%) and other (4%).

The most common cause of pancytopenia according to literature was aplastic anemia. Our study found megaloblastic anemia as the commonest cause which is comparable to study done by metikurke et al[4], BN gayathri and kadam[5] and Pereira A et al[6] Incidence of megaloblastic anemia was 74%, 72% and 68% in the studies done by BN Gayathri and kadam[5], khungar et al[7] and Tilak et al[8] respectively. In few cases it is difficult to diagnose the megaloblastic anemia on peripheral smears due to treatments taken by them which are available over the counter, so in such cases bone marrow study helps to diagnose and treat the patients.

In our study second most common cause of pancytopenia was severe malnutrition seen in 7 cases. Multiple microprotien and protein energy malnutrition leads to depleted bone marrow. These results were correlation with metikurke et al[4], Chandra et al[9] and Borelli et al[10]

In our study third most common cause of pancytopenia was aplastic anemia. The incidence was correlating with the study done by metikurke et al (13%).[4] Aplastic anemia may be due to environmental factors or exposure to pesticides, drugs, chemical and infections.

Bone marrow smears of 7 cases of acute leukemia were hypercellular with reduction of trilineage hemopoietic cells with presence of >20% blasts. The findgings were detected by Pathak R et al[11] and Das R et al.[12] Acute myeloid leukemia was more common in adults while acute lymphoblastic leukemia in childhood. In contrary to the above one of our young female child patient showed features of acute myeloid leukemia.

In this study 3 cases were lymphoid neoplasia. Bone marrow study of these cases show sheets of atypical lymphoid cells. These finding are comparable to other studies done by Panigrahi R el al[13], Horvath F et al[14] and Desalphina M et al[15].

In our study 3 cases were plasma cells myeloma. Marrow was hypocellular to normocellular with increased lymphocytes and atypical plasma cells. These findings were comparable to other studies.[11,12,13,16]

Difference in the frequency of disorders has been due to variation in geographic area, duration and exposure to chemical agents.

Conclusion

Pancytopenia should be evaluated thoroughly because it is a common hematological problem seen in clinical practice. Bone marrow study is an important tool to evaluate the cause of pancytopenia. The present study concluded that bone marrow study in pancytopenia cases helps to identify the cause and also help us to know the frequency of various diseases in causing pancytopenia, thus it helps in the management of patients in a better way. Bone marrow aspirate and biopsy are easy, safe and minimal invasive outpatient procedures for evaluation of causes of pancytopenia.

Table 1: Sex wise distribution of cases.

Gender	No. of Cases
Male	27
Female	23

Table 2: Age wise distribution of cases.

Age	No. of Cases
0-10 yrs	01
11-20yrs	02
21-30yrs	08
31-40yrs	12
41-50yrs	12
51-60yrs	10
>60yrs	05

Table 3: Causes of Pancytopenia.

Diagnosis	No. of Cases	Percentage
Megaloblastic anemia	23	46%
Nutritional anemia	07	14%
Aplastic anemia	05	10%
Acute myeloid leukemia	04	08%
Acute lymphoblastic leukemia	03	06%
Lymphoma	03	06%
Multiple myeloma	03	06%
Chediak higashi syndrome	01	02%
Malaria	01	02%

Table 4: Comparison of findings between BMA and BMB.

Diagnosis	No. of Cases BMB	Features Same as BMA
Megaloblastic anemia	23	23
Nutritional anemia	07	07
Aplastic anemia	05	05
Acute myeloid leukemia	04	04
Acute lymphoblastic leukemia	03	02
Lymphoma	03	03
Multiple myeloma	03	03
Chediak higashi syndrome	01	00
Malaria	01	01

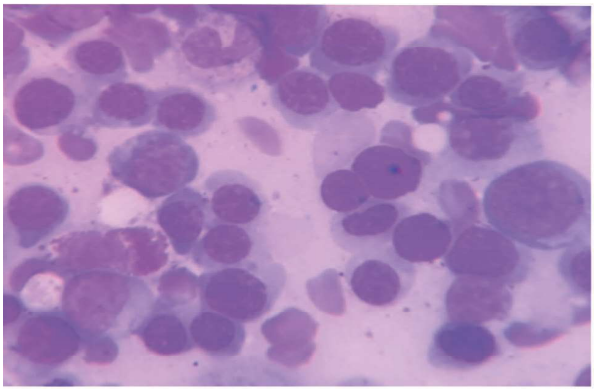

Fig. 1: Bone marrow showing megaloblasts, with basophilic cytoplasm and sieve-like chromatin (Leishmann stain).

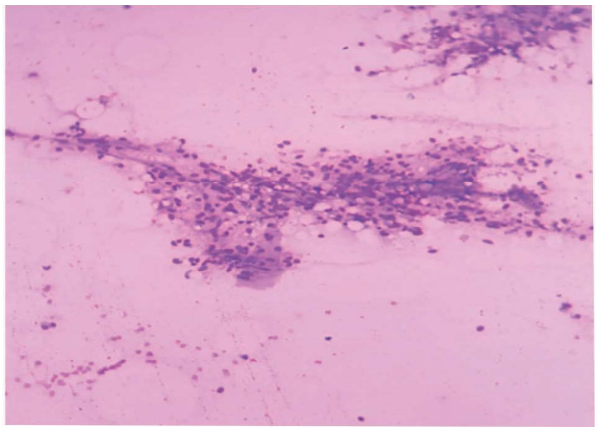

Fig. 2: Bone marrow aspiration showing hypocellular fragments – Aplastic anemia (Leishmann stain).

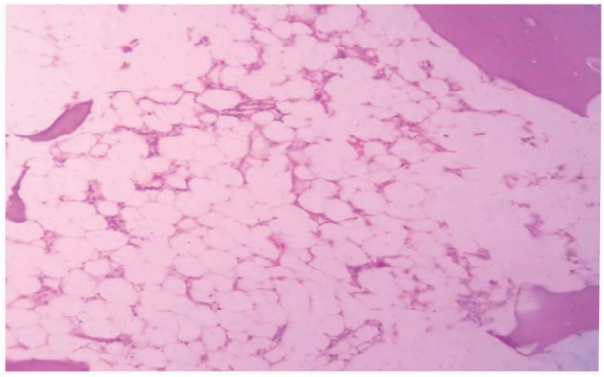

Fig. 3: Bone marrow biopsy of aplastic Anemia (Leishmann stain).

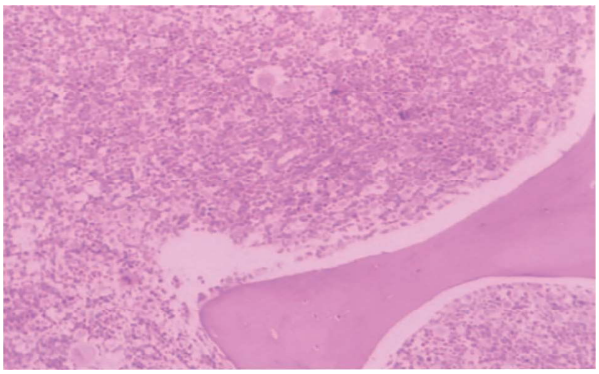

Fig. 4: Bone marrow Biopsy of Nonhodgkings Lymphoma (Leishmann stain).

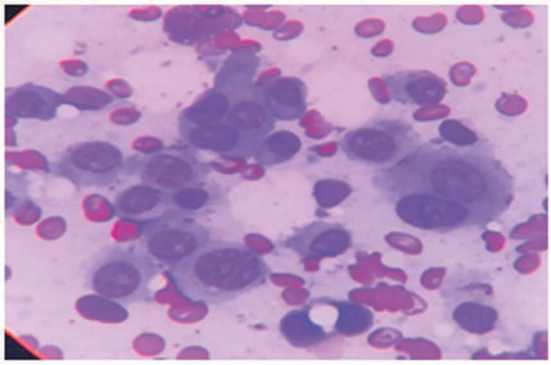

Fig. 5: Bone marrow aspiration of plasma cell myeloma (Leishmann stain).

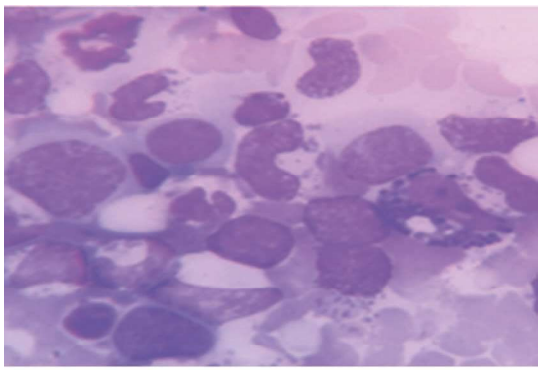

Fig. 6: Bone marrow aspiration of Chediak higashi syndrome (Leishmann stain).

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