

Original article

Study of bone marrow aspiration in cases of pancytopenia, one year study

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Abstract

Introduction: Pancytopenia is the feature of many life-threatening conditions. It is described as the deficiency of all three cellular elements of blood resulting in anemia ($<10\text{gm/dl}$); leucopenia ($<4 \times 10^3/\text{cumm}$); thrombocytopenia ($<150 \times 10^3/\text{cumm}$). In view of a wide array of etiological factors pancytopenia continues to be a challenge; however a comprehensive clinical, hematological & bone marrow study of patients having pancytopenia usually helps in identification of the underlying cause.

Material & method: Total 50 cases of pancytopenia diagnosed on peripheral smear were further evaluated by bone marrow aspiration. All smears are stained by leishmann stain & examined under conventional microscope. Pancytopenias due to drugs, Chemotherapy, radiotherapy were excluded from the study, on the basis of history.

Keywords: Pancytopenia; bone marrow aspiration; megaloblastic anemia.

Keynotes: Megaloblastic anemia due to nutritional deficiency seems to reflect the most common cause of pancytopenia in our set up.

Introduction:

Sir William Harvey described blood as “the fountain of life and the primary seat of the soul. The marrow of our bones is the seedbed of our blood”.¹ Examination of the marrow is critically important in the study and management of wide variety of hematological disorders. The spectrum of disorders primarily or secondarily affecting the bone marrow may manifest with peripheral pancytopenia.² It is described as the deficiency of all three cell lineage of blood, resulting in anemia ($\text{Hb} < 10\text{gm/dl}$), leucopenia ($\text{TLC} < 4 \times 10^3/\text{cumm}$), thrombocytopenia ($\text{Platelets} < 150 \times 10^3/\text{cumm}$).³ Underlying pathology determines the management and prognosis of the patients.⁴

Over last 30 years many conditions that cause pancytopenia were confused with aplastic anemia bas

ed on in -complete study of patient. The incidence of aplastic anemia is two to five cases per 10,00,000 populations per year. The incidence rate in industrialized countries is about five to ten per 10,00, -000 per year.⁵ The incidence in the far E-ast particu -larly China and Southeast Asia is higher than in West .⁴ Common questions that a healthcare professional ask are: What are the most common causes of pancytopenia? In the present study, it was tried to answer these questions.

Aims and objectives: To evaluate the underlying etiology of the pancytopenia.

Material & methods:

Bone marrow aspiration was done on total 50 patients with age group of 1-100 at G.G.G.Hospital, Jamnagar, in a period of one year, presenting with pancyt

-openia (Hb- <10gm/dl, TLC- <4×10³/cumm, Platelets- <150×10³/cumm). Before performing bone marrow aspiration we had taken written and informed consent.

The peripheral smear was studied after staining with leishmann stain; subsequently a bone marrow aspiration was performed. Pancytopenia due to drugs, chemotherapy & radiotherapy were excluded from the study on the basis of history. The bone marrow aspiration (approx.0.2-0.3ml) was done from the posterior superior iliac spine and smear was made at bedside without delay, because of risk of clot

formation. It had been found that bone marrow clots faster than peripheral blood and if we aspirated more than 0.5 ml there were high chances of peripheral blood dilution. The smear was stained with leishmann stain. Special stains- Periodic acid Schiff stain, Myeloperoxidase, Sudan black and Pearls' stain were used whenever indicated. The bone marrow aspirate is evaluated for 1) cellularity 2) erythropoiesis, 3) myelopoiesis, 4) megakaryopoiesis, 5) other cells. The data thus obtained was analyzed and tabulated.

Observations:

Total 50 patients with a hematological diagnosis of pancytopenia on peripheral smear were studied.

The following data is recorded and analyzed. (figure 1, 2 & 3)

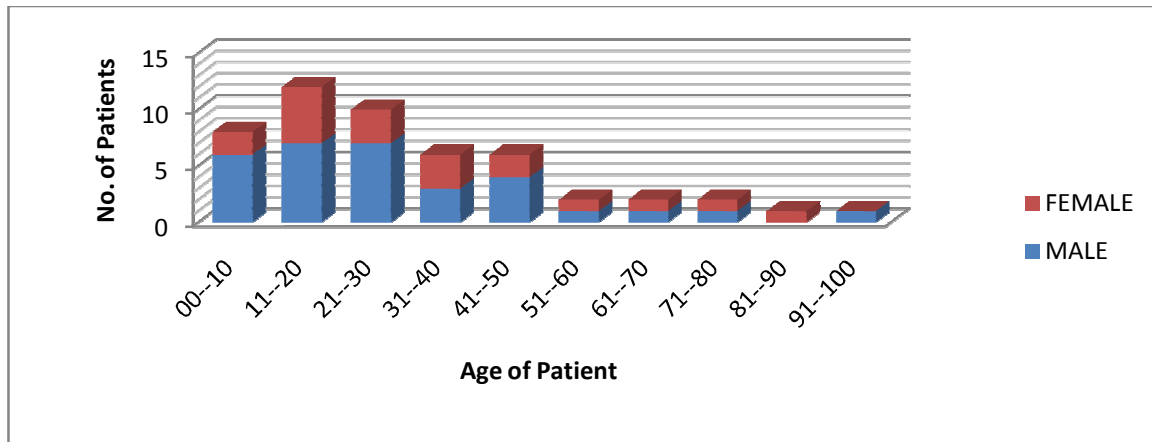


Figure 1 Age & Sex distributions in patients with Pancytopenia

Patient's age ranged from 1 to 100 years. Maximum number of cases were in the age group of 11 to 20 years (24%) followed by age group of 21 to 30 years (17%). So majority of patients were young. (Figure 1)

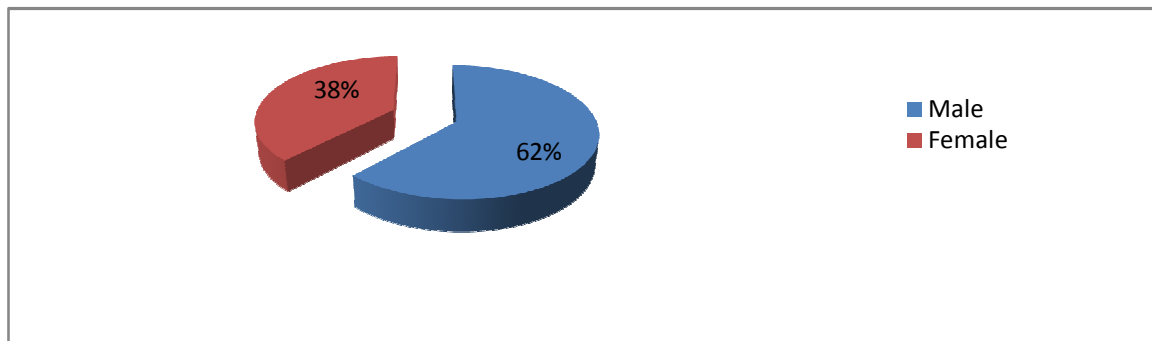


Figure 2 Sex distribution in patients with Pancytopenia

Out of 50 patients 31 patients (62%) were males and 19 patients (38%) were females. Male to female ratio was approximately 3:2. So male preponderance was noticed. (Figure 2)

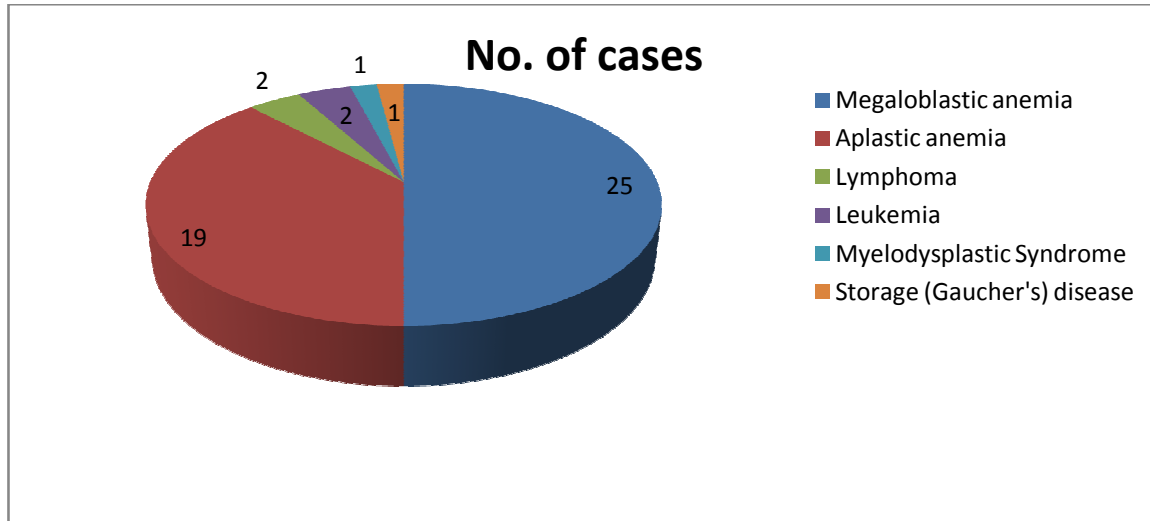


Figure 3 Bone marrow findings in patients with Pancytopenia

Bone marrow examination was done in 50 patients out of which 25 patients (50%) had megaloblastic anemia followed by 19 patients (38%) had aplastic anemia, 2 patients (4%) had lymphoma, 2 patients (4%) had leukemia, 1 patient (2%) had myelodysplastic syndrome and 1 patient (2%) had bone marrow storage disease. Majority of patients with pancytopenia had megaloblastic anemia (50%) followed by aplastic anemia (38%) on bone marrow examination. (Figure 3)

Discussion:

Majority of patients (24%) in the present study were in the age group of 11 to 20 years (range 1-100 years) with male preponderance (62%). The male to female ratio was 3:2. Majority of patients (50%) had megaloblastic anemia followed by (38%) had aplastic anemia. Krishnappa Rashmi (2013) found most common age of presentation was 21-30 years (25%) with male preponderance (60%). Male to female ratio was 3:2, megaloblastic anemia (39.5%) was the most common cause of pancytopenia followed by nutritional anemia (24.1%).⁶ Tilak V. Jain R(1998) found megaloblastic anemia (68%) to be commonest cause of pancytopenia followed by aplastic anemia (7.7%).⁷ Khodke et al (2000) observed megaloblastic anemia (44%), followed by hypoplastic anemia (14%) as the commonest cause of pancytopenia.²

Bone marrow examination in patients of megaloblastic anemia had markedly hypercellular marrow with erythroid hyperplasia and thus reversal of M:E ratio to even 1:8. Erythroid precursors showed megaloblastosis and predominance of early and intermediated megaloblasts. Megaloblasts have open sieve like nuclear chromatin. Morphological changes were also seen in myeloid cells which showed giant metamyelocytes and band forms. Megakaryocytes of variable maturity display nuclei with open chromatin pattern and complex nuclear hyper segmentation. Megakaryocytes showed fragmentation. (Figure 4 & 5)

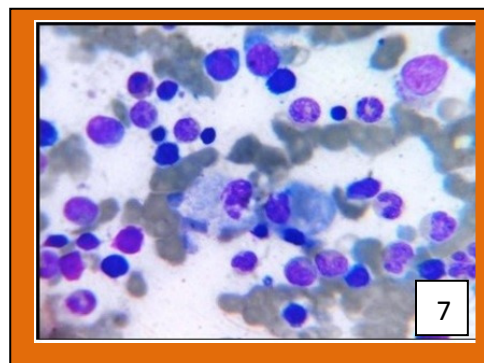
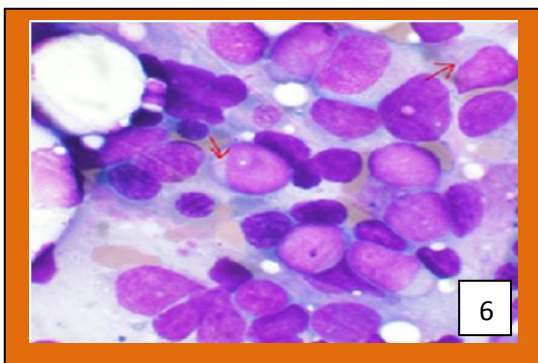
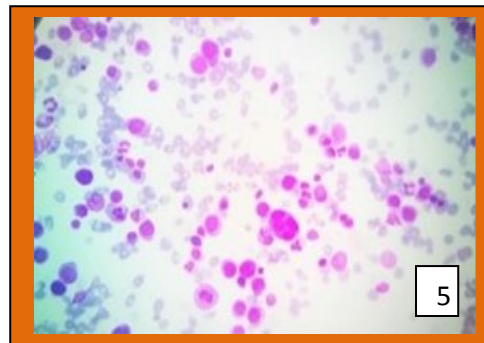
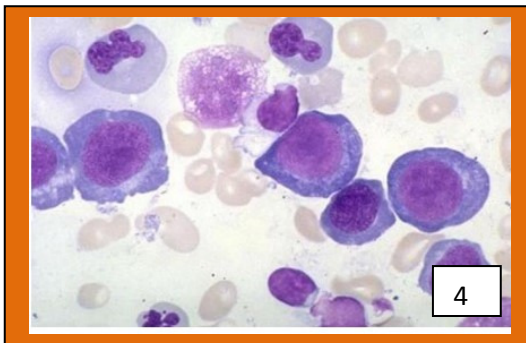
Bone marrow examination in patients of aplastic anemia had progressively diminished hemopoietic precursors with concomitant increase in fat. There were focal cellular areas in the marrow which show

lymphocytes, few plasma cells. Few islands of erythroid precursors which may show a normoblastic/megaloblastic picture. Myeloid and megakaryocytic precursors were markedly diminished. Bone marrow examination in patient of acute myeloid leukemia stage M3 had hypercellular marrow with increase myeloid precursor cells particularly promyelocytes. (figure 6) In case of acute prolymphocytic leukemia had hypercellular marrow with increased lymphoid precursor cells. Bone marrow examination in patient of myelodysplastic

syndrome had erythroid hyperplasia with normoblastic to megaloblastic reaction with features of dyserythropoiesis. Hypogranular and hyposegmented myeloid precursors, irregularity of myeloid precursor nuclei and multinucleated giantoblasts. Abnormality in megakaryopoiesis was also present. Bone marrow examination in patient of Gaucher's disease had large number of Gaucher's cell and corresponding decrease in hemopoietic precursors. (Figure 7)

Conclusion:

Pancytopenia is a common hematological entity that we come across in routine practice. Pancytopenia was observed in younger age group with male preponderance. Majority of patients with pancytopenia had megaloblastic anemia followed by aplastic anemia. In majority of megaloblastic anemia cases, cause was nutritional deficiency of vitamin B12 and folic acid, which was corrected in majority of patients with proper treatment and follow up. This seems to reflect higher prevalence of nutritional anemia as a cause of pancytopenia in our set up.



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