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BONE MARROW STUDY IN CASES OF HAEMATOLOGICAL DISORDERS

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Abstract

Introduction: There are various disorders in formation of blood in body. Bone marrow is one of them which involved variety of hematological and nonhematological disorders. Hematological disorders include myeloproliferative neoplasm (MPN), acute leukemia, hemato-lymphoid neoplasm and nutritional deficiency diseases whereas nonhematological disorders include infectious diseases infiltrating the bone marrow such as parasitic infections, tuberculosis and metastatic deposits. Bone marrows present various diseases with various clinical symptoms with the involvement of blood but peripheral blood picture alone does not reflect the nature of disease process. Depending upon the suspected diagnosis from clinical features and peripheral blood examination, that indication for bone marrow examination can be done. Examination of Bone marrow is useful in the diagnosis of both hematological and non-hematological disorders. The most important techniques used for the diagnosis of hematological disorders are trephine biopsy and bone marrow aspiration. For the interpretation of the disorder of bone marrow history, clinical finding, peripheral blood picture and other laboratory findings are required. Usually Bone marrow aspiration (BMA) alone is sufficient for the diagnosis of nutritional anaemias, most of the acute leukaemias and Immune thrombocytopenias. Diagnosis such as Trephine biopsy provides important diagnostic information myelofibrosis, granulomatous disease 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. Bone marrow is nor mocellular or hypercellula resulting from ineffective hematopoiesis, increased peripheral destruction and bone marrow invasion. Therefore, bone marrow examination is extremely helpful to identify the cause of pancytopenia.

Aim: The main aim of this study is to evaluate the cytological and histological pattern of various hematological disorders in bone marrow aspiration and trephine biopsy respectively.

Material and Methods: During the period of 1 year 100 patient with the cases of haematological disorders were included in this study. Routinely stain like Leishman stain is used for bone marrow aspiration. Haematoxylin and eosin stain is also used for trephine biopsy. For all the cases reticulocyte count, peripheral smears, sickling test and complete hemogram were done. Special stains PAS Stain (Periodic acid schiff) was done for all ALL, AML and gauchers disease. In ALL cases Block positivity is shown. In gauchers disease, a gaucher cell shows wrinkled tissue paper appearance with PAS positivity. Reticulin stain was done in myelofibrosis and metastatic deposits. In myelofibrosis, trephine biopsy shows increase in reticulin network with coarse fibrils.

Result: In all the cases bone marrow aspiration was done and among them 40 cases trephine biopsy were done. Out of total patients 57 were male and 43 were female. And the mean age was found as 32.6 years. The findings of the bone marrow were examination. At the time of study period 50% of the study have anemias and they are predominantly megaloblastic followed by aplastic/ hypoplastic anemias. Other three cases include two metastatic deposits and one storage disorder (Gaucher's Disease).

Conclusion: Bone marrow examination is important to diagnosis, prognosis or evaluate therapeutic response for a variety of hematologic and non-hematologic problems. Nowadays, Bone marrow aspiration & bone marrow biopsy are used routinely as diagnostic procedures because it is easier and does not require advance equipments. Therefore both the procedures are complementary to each other which are helpful in further investigation and management.

Keywords: Bone marrow aspiration, Trephine biopsy, Pancytopenia, Megaloblastic Anemia

Introduction

There are various disorders in formation of blood in body. Bone marrow is one of them which involved variety of hematological and nonhematological disorders. Hematological disorders include myeloproliferative neoplasm (MPN), acute leukemia, hemato-lymphoid neoplasm and nutritional deficiency diseases whereas nonhematological disorders include infectious diseases infiltrating the

bone marrow such as parasitic infections, tuberculosis and metastatic deposits[i]. Bone marrows present various diseases with various clinical symptoms with the involvement of blood but peripheral blood picture alone does not reflect the nature of disease process. Depending upon the suspected diagnosis from clinical features and peripheral blood examination, that indication for bone marrow examination can be done. Therefore complete hematological examination of cases in which bone marrow examination includes BMA smear and bone marrow trephine biopsy as they are complementary to each other[ii]. Pancytopenia is multitude of disorders primarily or secondarily affecting bone marrow manifesting, with various hematological derangements that refl ected in the peripheral blood as pancytopenia. Pancytopenia is a disorder in which all the three major formed elements of the blood as red blood cells, white blood cells, and platelets are decreased in number[iii]. Pancytopenia is simultaneous presence of anemia, leukopenia and thrombocytopenia[iv]. Examination of Bone marrow is useful in the diagnosis of both hematological and non-hematological disorders. The most important techniques used for the diagnosis of hematological disorders are trephine biopsy and bone marrow aspiration. For the interpretation of the disorder of bone marrow history, clinical finding, peripheral blood picture and other laboratory findings are required[v]. Usually Bone marrow aspiration (BMA) alone is sufficient for the diagnosis of nutritional anaemias, most of the acute leukaemias and Immune thrombocytopenias. Diagnosis such as Trephine biopsy provides important diagnostic information myelofibrosis, granulomatous disease 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[vi]. In cases of pancytopenia Bone marrow cellularity and composition usually differ in relation to underlying etiological condition. In cases of pancytopenia Bone marrow cellularity is reduced by primary production defect. Bone marrow is nor mocellular or hypercellula resulting from ineffective hematopoiesis, increased peripheral destruction and bone marrow invasion. Therefore, bone marrow examination is extremely helpful to identify the cause of pancytopenia[vii]. The main aim of this study is to evaluate the cytological and histological pattern of various hematological disorders in bone marrow aspiration and trephine biopsy respectively.

Material and Methods:

This study was conducted in the Department of pathology at Zydus Medical College and Hospital, Dahod, Gujarat. During the period of 1 year 100 patient with the cases of haematological disorders were included in this study. In this study patients were convinced for the enrollement of sampling method through screening patients admitted from the clinical departments. Detail history of patients was taken as a form of recorded data from patient's parents or care taker. Routinely stain like Leishman stain is used for bone marrow aspiration. Haematoxylin and eosin stain is also used for trephine biopsy. For all the cases reticulocyte count, peripheral smears, sickling test and complete hemogram were done. Special stains PAS Stain (Periodic acid schiff) was done for all ALL, AML and gauchers disease. In ALL cases Block positivity is shown. In gauchers disease, a gaucher cell shows wrinkled tissue paper appearance with PAS positivity. Reticulin stain was done in myelofibrosis and metastatic deposits. In myelofibrosis, trephine biopsy shows increase in reticulin network with coarse fibrils. Perl's stain was done in all cases for iron stores. In this study total 100 cases of suspected hematological disorders were carried with Complete blood count, peripheral smear examination, reticulocyte count, sickling test, bone marrow aspiration and among them 40 cases were carried out for trephine biopsy.

Result:

In this study total 100 patients were included during the period of 1 year. In all the cases bone marrow aspiration was done and among them 40 cases trephine biopsy were done. Out of total patients 57 were male and 43 were female. In this study total patients with age range from 1 year to 60 years were included. And the mean age was found as 32.6 years. The findings of the bone marrow examination were shown in the table no 1 below. At the time of study period 50% of the study have anemias and they are predominantly megaloblastic followed by aplastic/ hypoplastic anemias. Other three cases include two metastatic deposits and one storage disorder (Gaucher's Disease). In bone marrow aspiration sickle cells with megaloblastic maturation of eythroid series were found.

Table 1: Showing hematological disorders

Hematological disorders	No. of Cases	Percentage
Anemias	48	48
Acute leukemias	17	17
Myeloproliferative disorders	10	10
Myelodysplastic syndrome	1	1
Plasma cell dyscrasias	5	5
Lymphoproliferative disorders	3	3
Platelet disorders	7	7
Others	3	3
Normal Study	4	4
Inconclusive	2	2
Total	100	100

Table 2: Showing distribution of cases in Trephine Biopsy.

Trephine Biopsy Diagnosis	No. of Cases	Percentage
Erythroid Hyperplasia	17	42.5
Aplastic/ Hypoplastic anemia	8	20
Normal	6	15
NHL deposits	2	5
Myelofibrosis	1	5
ALL	1	2.5
Metastatic deposit	2	2.5
Plasma cell dyscrasias	1	2.5
Reactive thrombocytosis	1	2.5
Inconclusive	1	2.5
Total	40	100

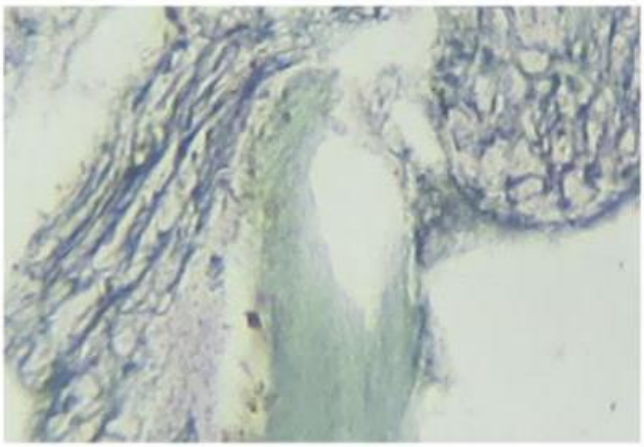

Fig. 1: Photomicrograph of Myelofibrosis: Trephine biopsy showing increase in reticulin network with coarse fibrils (Reticulin stain 400x).

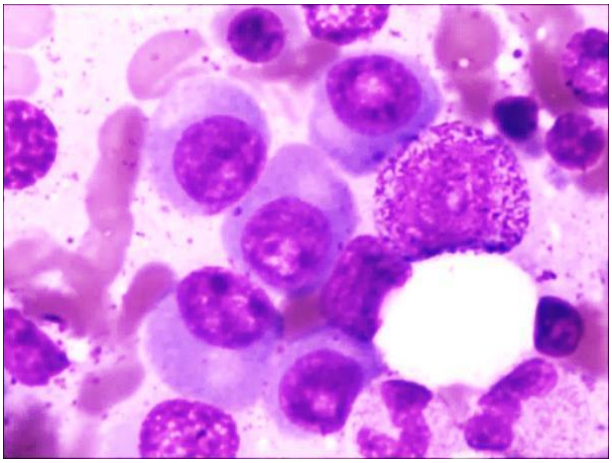

Fig. 2: Photomicrograph of multiple myeloma: Marrow aspirate showing plasma cells with eccentric nuclei and basophilic cytoplasm with perinuclear hof (Leishman stain 1000x).

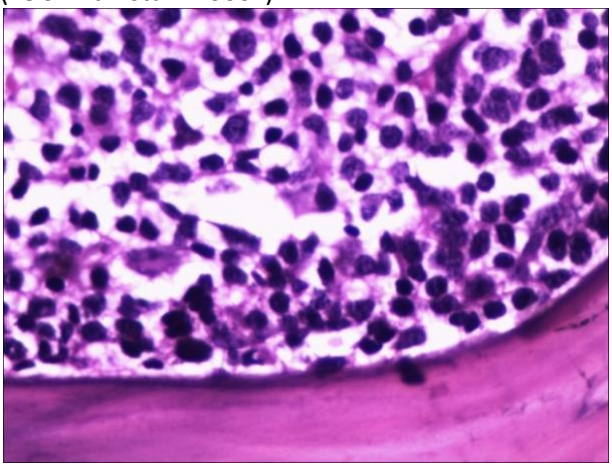

Fig. 3: Photomicrograph of NHL deposits: trephine biopsy of metastatic deposits of lymphoma. (H&E 400X).

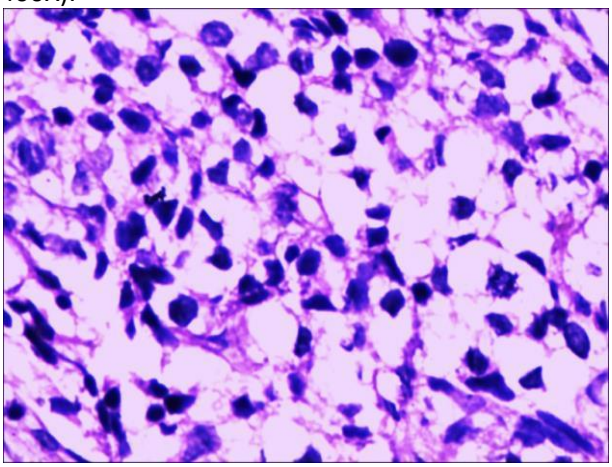

Fig. 4: Photomicrograph of metastatic deposits: Trephine biopsy shows clusters of pleomorphic cells with clear cytoplasm and darkly stained nucleus. (H&E 400x).

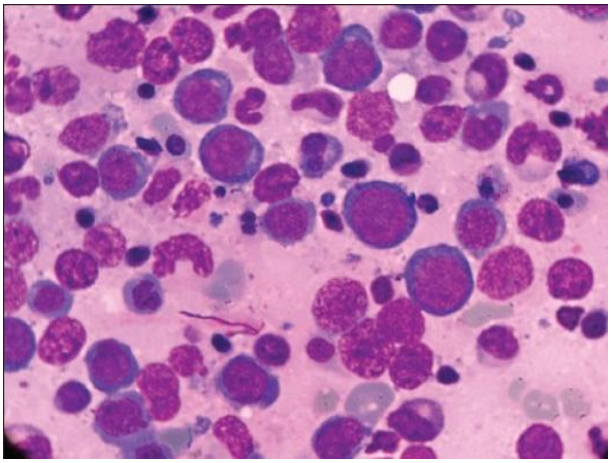

Fig. 5: Bone marrow aspiration smear showing megaloblasts with open sieve like chromatin and royal blue cytoplasm (Leishman, ×100).

Discussion:

There is wide spectrum of hematological disorders. In diagnosing of hematological disorders examination of the bone marrow is one of the most important diagnostic pillars. Bone marrow aspiration and trephine biopsy are the two procedures which are done for diagnosis of hematological and non-hematological disorders. "Frequently it is a combination of clues gathered from examination of several different preparations that leads to a correct diagnosis"[viii]. In this study 60 cases were diagnosis by aspiration and 40 cases were diagnosis by trephine biopsy. This study showed male to female ratio is 1. 3:1 with the age range from 1 year to 60 years which is similar to the study of Tilak et al[ix], Khodke et al[x] and Jha et al[xi]. Pancytopenia was commonest indication of BMA. In some cases bone marrow biopsy provide a corroborative evidence for bone marrow aspiration. In this study out od 100 patients 37 patients were suffer from pancytopenia (37%) with the age range from 4-60 years. The male to female ratio is 1.3:1. Studied of Kumar et al[xii] showed that bone marrow aspiration and biopsy can be done simultaneously in pancytopenic when the diagnosis is elusive which is similar to this study. In this study bone marrow aspiration and trephine biopsy were done. The commonest cause for pancytopenia was megaloblastic anemia followed by aplastic anemia which is similar to studied of Gayatri et al[xiii]. Another studied done by Chandra et al[xiv], Parajuli et al[xv] and Khan et al[xvi] predominant diagnosis as erythroid hyperplasia was reported which were comparable to this study. According to the study of Boon TH et al[xvii] macrocytic blood picture was found in 64% of patients and normocytic normochromic picture in 36% of patients. In all the patients' Relative lymphocytosis was also seen which is similar to this study.

Conclusion:

This study was done for the analyzed underlying pathology, different clinic-hematological features and importance of bone marrow examination. Bone marrow examination is important to diagnosis, prognosis or evaluate therapeutic response for a variety of hematologic and non-hematologic problems. Nowadays, Bone marrow aspiration & bone marrow biopsy are used routinely as diagnostic procedures because it is easier and does not require advance equipments. Therefore both the procedures are complementary to each other.

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