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Pattern of hematological disorders on bone marrow examination: a tertiary care hospital experience

Abstract

Background: Hematological disorders are quite frequent in all age group. Most of these hematological disorders first present as anemia. Bone Marrow Aspiration plays a major role in the diagnosis of it's underlying cause. The aim of this study was to analyze the causes of hematological disorders, its spectrum and to interpret the bone marrow aspiration findings.

Objective: The aim of the study is to evaluate the clinical profile, spectrum, cytological and histological pattern of various hematological disorders reported in bone marrow aspiration and trephine biopsy respectively.

Study design: This was a Retrospective and prospective study. This study was carried out in the Haematology Department of CHK-Central Laboratory from Jan 2018- till date.

Methodology: Bone marrow examination of 280 cases of suspected hematological disorders was carried out, who presented to CHK-Central Laboratory for bone marrow Biopsy. Complete detailed history, examination and complete blood counts were recorded.

Results: Among 280 cases studied, age of patients ranged from 02 to 75 years with mean age of 38.5 years with male predominance (1.4:1). Most of the patients presented with fever, easy fatigability and generalized weakness. Out of 280 cases of bone marrow biopsy 57 (20.3%) cases showed normal haematopoiesis, while Erythroid Hyperplasia was observed in 10(3.5%) cases and Megaloblastic Anaemia in 05(1.7%) cases. ITP in 15 (5.3%), Hypocellular marrow in 19 (6.7%), Aplastic Anaemia in 24(8.5%) cases. Acute leukemia was seen in 46 cases with 23 (8.2%) cases of ALL and 12(4.2%) cases of AML. CML was seen in 37(13.2%), MPN in 10(3.5)% cases, LPD in 23 (8.2%) cases, Multiple myeloma in 02(0.7%). 01 case (0.3%) of granulomatous pathology and 01 case (0.3%) of Myelodysplastic syndrome were diagnosed exclusively on bone marrow biopsy. Leishmaniasis seen in 1 0.3(%) patient. In addition metastatic deposits of adenocarcinoma were observed in 2(0.7%) cases.

Conclusion: The present study showed the usefulness of bone marrow aspiration and trephine biopsy in evaluation of the bone marrow in routine haematological disorders and also for understanding disease progression.

Keywords: leukemia, haematological disorders, bone marrow biopsy

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Introduction

Bone marrow biopsy is the useful method to study the morphology of haematopoietic cells, M:E ratio on aspirate and cellularity, architecture and infiltration on trephine slides.[1] BMA can be used for cytogenetics, flowcytometry and molecular genetics. Interpretation of BMA and trephine needs numerous factors like special stains to differentiate different types of acute leukemia, immunohistochemistry is needed to diagnose acute leukemia and lymphomas. In the previous many years, examination of bone marrow specimens has come into extensive use for a correct diagnosis and staging of many haematological disorders.[2] The bone marrow biopsy investigation may either help to diagnosed the suspected hematological diseases.[3] In adults, complete bone marrow biopsy including aspiration and trephine biopsy is necessary for the most thorough morphological assessment of the marrow.[4] The distribution of hematological and non hematological diseases are different in the developing world than the developed world.[5,6]

A good quality of tissue sections and god coordination between hematologist and histopathologist are also needed to conclude the difficult cases. Commonly marrow aspiration & trephine biopsy carry out for the diagnosis of unexplained cytopenia and cancerous disorders such as leukemia. BMB is also perform for the staging of lymphomas and different types of storage disorders. The aim of this study to find out the causes and spectrum of different hematological diseases on bone marrow examination.

Methods

The study was carried out in the Hematology department, Central lab. Dr Ruth K.M.Pfau Civil hospital, Karachi, Pakistan. The study was conducted over a period of 3 years from Jan 2018- till date. Retrospective data was collected from record section of our lab. For prospective cases patients were enrolled for the procedure after complete blood count screening and clinical assessment. Written informed consent was taken before the procedure.

The procedure was done under local anesthesia (Inj. 2% xylocaine). Posterior superioir iliac spine was the most common site used for the procedure. For aspiration we used LP 16 G needle and for biopsy we used jamshedi needle. Aspirate slides were checked macroscopically for presence of particles and 1.5-2 cm biopsy was considered adequate on gross examination. Aspirate slides were stained with Leishman

stain. Perls stain for iron stores was done in all cases. Trephine biopsy was processed as per standard protocol and stained with Hematoxylin and Eosin stain. Reticulin stain applied on marrow sections in case of myelofibrosis and reactive fibrosis according to WHO grading system. Complete blood count (CBC), Peripheral smear examination was done in all cases.

Inclusion criteria

All cases where both aspiration and biopsy were available were selected.

Exclusion criteria

Cases where only aspiration was available. Chi square test was used for statistical analysis.

Results

Total 280 patients included, patient's age ranged from 02 -75 years with mean age of 38.5 years with male predominance (1.4:1). Clinical features of most patients are high temperature, fatigue and generalized weakness. Total of 280 cases of bone marrow biopsy includes 57 (20.3%) cases showed Normal haematopoiesis, while Erythroid Hyperplasia was observed in 10 (3.5%) cases, Megaloblastic Anaemia in 05(1.7%) cases, ITP in 15 (5.3%), Hypocellular marrow in 19 (6.7%) and Aplastic Anaemia in 24(8.5%) cases. Acute leukemia was seen in 46 cases with 23 (8.2%) cases of ALL and 12(4.2%) cases of AML. CML was seen in 37(13.2%), MPN in 10(3.5%) cases, LPD in 23 (8.2%) cases, Multiple myeloma in 02(0.7%). 01 case (0.3%) of granulomatous pathology and 01 case (0.3%) of Myelodysplastic syndrome were diagnosed exclusively on bone marrow biopsy. Leishmaniasis was observed in 1 patient (0.3%). In addition metastatic deposits of adenocarcinoma were observed in 2(0.7%) cases. The patients included in our study, age ranged from 01-80 years. The peak frequency was observed in the age group of 15-30 years (Table 1). Table 2 showing distribution of malignant haematological disorders in which increased case of CML seen. Table 3 showing histopathological diagnosis of haematological disorders.

In the present study we observed that malignant hematological disorders were more frequent in males 89 (53.9%) out of 165 cases in males than females 41 (35.6%) out of 115 cases in females, with male: female ratio of 1.4:1. Most of the malignant hematological disorders were seen above 40 years of age.

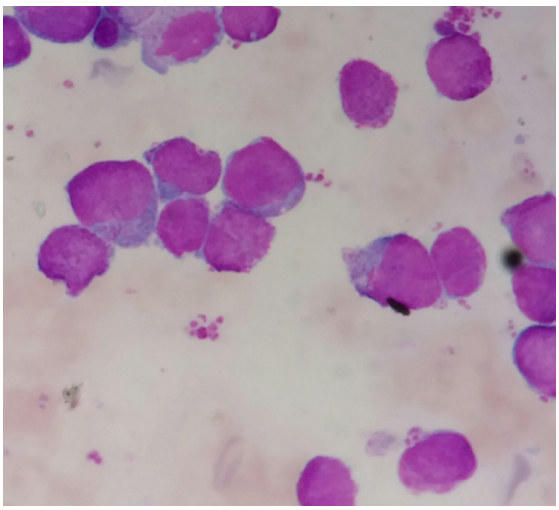

Figure 1 Bone marrow aspiration smear showing blasts cells in a case of AML.

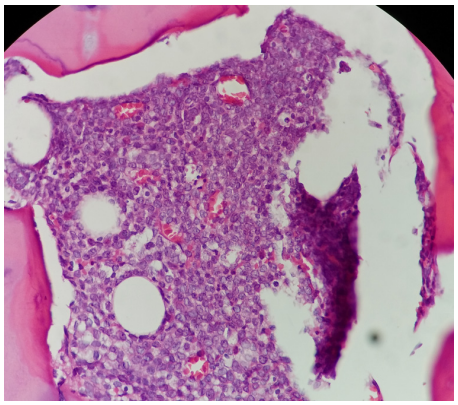

Figure 2 Bone marrow trephine sections showing infiltration by blast cells in a case of Acute leukaemia.

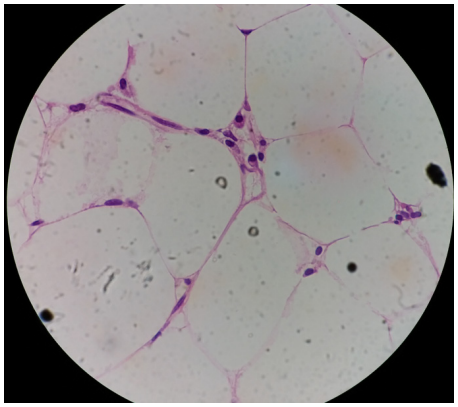

Figure 3 Bone marrow section showing hypocellular marrow with diminished. haematopoiesis.

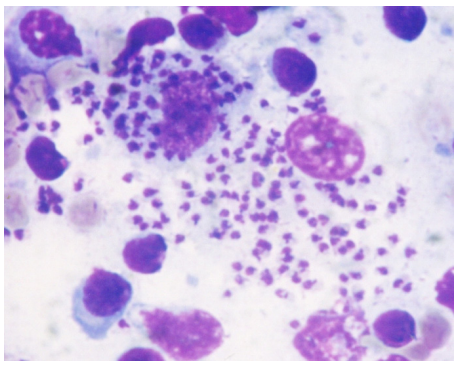

Figure 4 Bone marrow aspiration smear showing intracellular LD bodies in a case of visceral leishmaniasis.

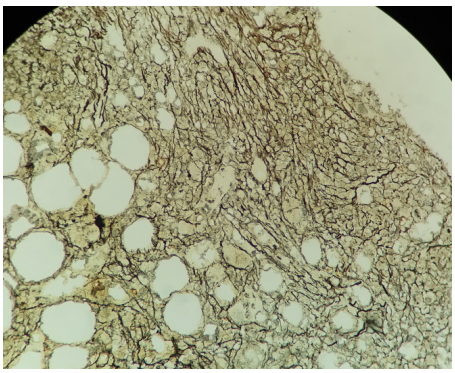

Figure 5 Reticulin stain showing increased fibrotic activity.

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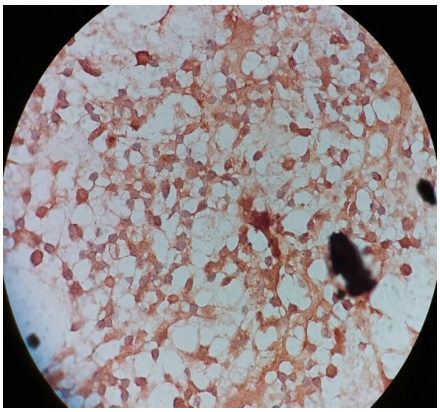

Figure 6 Immunohistochemistry showing lymphoma infiltration CD20 +ve.

Table 1 Age distribution of the patients

Age group	No. of patients	Percentage (%)
< 15 years	45	16.0
15-30 years	88	31.4
30-45 years	73	26.2
>45 years	74	26.4
Total	280	100

Table 2 Distribution of Malignant Hematological Disorder

Malignant hematological disorders	No. of cases	Frequency (%)
Chronic myeloid leukaemia	34	31.4
Myeloproliferative neoplasm	10	9.2
Acute lymphoid leukaemia	23	21.2
Acute myeloid leukaemia	11	10.1
CLL	08	7.4
NHL	15	13.8
Multiple myeloma	04	3.7
Myelodysplastic syndrome	01	0.9
Metastatic deposits	02	1.8
Total	108	100

Table 3 Histopathological diagnosis of hematological disorders.

Diagnosis	No of cases (n)	% of cases
Erythroid hyperplasia	10	3.5
Normal study	57	20.3
Chronic myeloid leukaemia	40	14.2
Myeloproliferative neoplasm	10	3.5
Acute lymphoid leukaemia	35	12.5
Acute myeloid leukaemia	12	4.2
CLL	08	2.8
NHL	20	7.1
Multiple myeloma	04	1.4

Table Continued...

Diagnosis	No of cases (n)	% of cases
Myelodysplastic syndrome	01	0.3
Metastasis	02	0.7
Aplastic Anaemia	24	8.5
ITP	15	5.3
HLH	02	0.7
Storage cell disorder	01	0.3
Leishmaniasis	01	0.3
Megaloblastic Anaemia	05	1.7
CGD	01	0.3
Inconclusive	05	1.7
Hypersplenism	06	2.1
PRCA	02	0.7
Hypocellular marrow	19	6.7
Total	280	100

Discussion

Bone marrow examination is the procedure which is useful for the diagnosis of hematological and non-hematological disorders. it is a combination of clinical assessment from history & examination of patient and different staining preparation on bone marrow aspiration and trephine slides.[6]

The spectrum of hematological disorders is very wide. Bone marrow biopsy test is easily available in most hospitals and safe and a useful test in conclusion of the final diagnosis.[2] In our study the mostly patient fall in age group between 31- 45 years. In a study done by Niazi et al, the majority of the patients were from the age group 1- 30 years.[7] In our study the age of the patients ranged from 9 months and 75 years with the mean age of 37.9 years. 27 (47.4%) were males and 30 (52.6%) were females with (M: F=1:1.1).

The most of the patient who came for bone marrow biopsy with pancytopenia (50 %) followed by bicytopenia (36%). Similar to our finding pancytopenia was the commonest indication in a study done by Ahmed et al.[8] But in contrast to these studies, pancytopenia was the third common indication (11.9%) in a study done by Bashawri et al.[9] In our study, isolated thrombocytopenia was seen in 14 % cases.

Erythroid hyperplasia was seen in 12 cases (21%). Similar finding (19.6% cases of erythroid hyperplasia) was seen in a study done by Jha et al.[10] In a study done by Khodke et al 14% cases showed erythroid hyperplasia.[11]

Acute leukemia was diagnosed in 7 cases (12.3%). Out of 7 cases if acute leukemia, 6 cases (10.5%) were AML and 1 case (1.8%) was ALL. Out of 6 cases of AML, the commonest type was AML M3 (3 cases), followed by AML M2 (2 cases) and AML M1 (1 case). Other series also showed that acute leukemia is the commonest hematological malignancy and AML is more common than ALL.[12,13]

We diagnosed 3.5% cases of multiple myeloma compared to Jha et al, Kibria et al and Laishram et al who reported an incidence of 9.04%, 20.5% and 0.94% in their studies respectively.[10,14,15] ITP was diagnosed in 6 cases (10.5%)in our study. Other studies showed 6.21%, 14.5%, 6.8% and 5% cases of ITP respectively in their studies.[11,13,16]

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Infective pathology was seen in 7 cases (12.3%) out of which Leishmaniasis was seen in one case (1.8%). Similar finding was seen in a study done by Santra et al.[17] Other studies showed 2.82%, 1.2%, 0.67% of leishmaniasis[7,10,14] but the maximum number of cases (14%) was seen in a study done by Khodke et al.[11]

Conclusion

This study showed the importance of bone marrow aspiration and trephine biopsy in the dianosis of the haematological disorders and also for evaluate the disease progression. Bone marrow aspiration and biopsy though invasive but relatively safe investigations in diagnosing various hematological disorders and can even be carried out in outpatient settings. It gives a better understanding of the basic pathology behind various hematological conditions.

Acknowledgments

None.

Conflicts of interest

The authors declare no conflicts of interest.

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