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Anternational	ROLE OF BONE MARROW ASPIRATION AND TREPHINE BIOPSY IN THE DIAGNOSIS OF VARIOUS BONE MARROW PATHOLOGY ESPECIALLY HEMATOPOIETIC DISORDERS.			
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ABSTRACT Bone ma	rrow is frequently involved in various pathologies, especially hematological disorders ,which	are		

Bone marrow is frequently involved in various pathologies, especially hematological disorders , which are diagnosed by two interrelated techniques, bone marrow aspiration (BMA) and bone marrow biopsies (BMB).

AIM – To establish BMA and BMB as a simple, safe and relatively painless outdoor procedure, and to assess the diagnostic value of both when done simultaneously.

Methods - BMA and BMB was performed and morphological examination of bone marrow along with cytochemical staining was done and diagnostic value of bone marrow examination was established.

Result - Present study was done in 72 cases. The most common incidence was that of leukemias, 38 cases (52.78%), followed by 24 cases of anemias (33.33%) ,seven cases (9.72%) were of pancytopenia, two cases (2.78%) were of multiple myeloma and one case (1.39%) was of idiopathic thrombocytopenic purpura.

Conclusion-Morphological examination of bone marrow is an extremely helpful and specific diagnosic tool. BMA gives better morphology of the cell and BMB gives a good picture regarding the pattern of distribution of cells and the architecture in bone marrow.

**KEYWORDS** : Bone Marrow Aspiration, Bone marrow trephine biopsy, hematopoeitic disorders.

## INTRODUCTION

Now a days bone marrow examination is considered one of the most valuable diagnostic tools to evaluate haematological and non hematological disorder. The haematological evaluation includes diagnosing, staging and therapeutic monitoring of various haematological disorder i.e. leukemia ,myelodysplastic syndrome, and myeloproliferative disorder Hodgkin's disease and non Hodgkin's disease ,pancytopenia ,paraprotienemias, megaloblastic and unexplained anemia, pure red cell aplasia, thrombocytosis and thrombocytopenia. On the other hand non haematological disorders include diagnosis and evaluation of suspected carcino matous deposits, lipid and other storage disease (i. e. Gauchers, Niemann Pick disease), unexplained splenomegaly and hepatom egaly, dysprotenemias, unexplained hypercalcemia, fever of unknown origin, granulomatous disease ,infections and other disorders. Evaluation of marrow is also required for harvesting for  $transplantation\,and\,for\,iron\,store\,assessment.^{\scriptscriptstyle (1)}$ 

Bone marrow aspiration and bone marrow biopsy are indispensable and diagnostically inter-dependant procedures. When both the procedures are performed simultaneously, they complement each other to aide in diagnosis, improving the sensitivity and specificity. There is abundance of material to study the morphology and the pattern of distribution of the cells. (2,3) This study was conducted in our institute to see the advantage and disadvantages of the procedures and to evaluate the complementary role of both the procedure when done simultaneously.

# **MATERIALS AND METHODS**

The study was conducted on bone marrow examination of 72 patients in the department of Pathology at our institution from September 2016 to March 2017. The relevant history and clinical examination was recorded and informed consent was taken. Patients were investigated for complete blood count, coagulation profile, reticulocyte count and peripheral blood film (PBF) examination. BMA and BMB were done simultaneously in 30 patients especially where aspiration was difficult as in cases of pancytopenia.

Whenever a BMB was done, an imprint smear was made simultaneously to get the correct morphology of the cell in the sampled area of bone marrow.

BMA alone was performed by Salah's marrow puncture needle. Smears prepared were stained with leishman stain. BMA and BMB simultaneously were taken by Jamshidi biopsy needle and biopsy specimen were fixed in 10% formalin, decalcified in 10% formic acid -5% formaldehyde and processed with paraffin wax embedding. Sections were stained by hematoxylin and eosin stain. Other special stains such as PAS, reticulin, AFB were done wherever needed. Bone marrow aspiration and biopsy findings were analysed in context of clinical signs & symptoms, other laboratory investigations and diagnosis reached.

### RESULTS

During the study period of September 2016 to March 2017, a total 72 cases were included in the study. Age of patients ranging from 6 months to 72 years. 43 cases were of males and 29 case were of females. Male female ratio was 1.5:1. Maximum no of cases were seen in age group of 0-10 years (Table no. 1).

Amongst the 72 cases ,the most common incidence were of leukemias seen in 38 cases (52.78%), followed by 24 cases of anaemias (33.33%), seven cases (9.72%) were of pancytopenia, two cases (2.78%) were of multiple myeloma and one case (1.39%) was of idiopathic thrombocytopenic purpura (Table no. 2).

A total of 40 (55.56%) cases of haematological malignancies were found in our study group. Out of these, 38 cases (95.00%) were of leukemia and two cases (5.00%)were of multiple myeloma. Out of the cases with leukemias 21 cases (55.26%) were of acute leukemia and 17 cases (44.74%) were of chronic leukemias. In the patients presenting with acute leukemias, 14 cases were of acute lymphoblas tic leukemia while seven cases were acute myeloid leukemia. In patients with chronic leukemia 13 cases were of chronic myeloid leukemia (chronic phase) and 4 cases were of chronic lymphocytic leukemia. (Table no. 3)

Out of 24 cases of anemia, the commonest type of anemia was macrocytic, seen in 14 cases. This included 12 cases of megaloblastic anemia and two cases of macrocytic anemia due to other causes. They showed megaloblastic and macrocytic erythropoiesis respectively on bone marrow examination. Three cases each were of microcytic hypochromic, normocytic normochromic and dimorphic anemia with micronormoblastic ,normoblastic and

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micronormoblastic mixed with megaloblastic erythroid hyperplasia on bone marrow examination.one case of normocytic hypochromic anemia showed normoblastic erythroid hyperplasia on bone marrow examination. (Table no. 4)

In 7 cases of pancytopenia, bone marrow was hypercellular in 5 cases. Bone marrow examination showed megaloblastic erythoid hyperplasia in two cases, infiltration by acute lymphoid leukemia, non-hodgkin's lymphoma (NHL) and granulomatous reaction were seen in one case each. Marrow was hypocellular in one case and show fibrosis in one patient of aplastic anemia.

Out of the 72 cases studied ,in 30 cases BMA and BMB were done simultaneously including 9 cases of anemia ,7 cases of pancytopenia,7 cases of chronic myeloid leukemia, 5 cases of acute lymphoid leukemia,1 case of chronic lymphoid leukemia and multiple myeloma each. There is a good positive correlation in findings of BMT and BMB in all cases and they complement each other.

## DISCUSSION

There is a broad range of haematological disorders including disease ranging from nutritional anemia to haematological malignancies. Spectrum of these disease is different among different geographical areas.

40 cases of haematological malignancies were found in our study group. Out of these, 21 cases (52.50%) were of acute leukemia, it being the most common haematological malignancy in our patients. There were 14 ( 35.00% ) cases of acute lymphoblastic leukemia while seven cases (17.5%) were acute myeloid leukemia. This is in agreement with the study done by Shazia et al.<sup>(16)</sup>

Other malignancy in this study was multiple myeloma seen in two cases. It was observed that in multiple myeloma bone marrow examination revealed collection of plasma cells. Babarovic E and fellows have mentioned the role of BMB for detection of minimal residual disease after treatment in case of multiple myeloma.<sup>(14)</sup>

Our study showed that nutritional deficiency anemias were most common non-malignant haematological disorder. Among these megaloblastic anemia has the highest incidence. This has also been shown by other studies done by Islam A et al.<sup>(2)</sup> Generally BMA usually is performed alone in case of clinically suspected megaloblastic anemia. Cases in which both the procedures were done simultaneously ,the BMA showed the typical megaloblast where as the BMB showed multiple blast which could have been mistaken for leukemia. Hence, BMA was much more helpful in giving correct diagnosis rather then BMB in cases of megaloblastic anemia.<sup>(4)</sup>

In our studies idiopathic thrombocytopenic purpura (ITP) was seen in one case. This incidence is quite low as compared to other studies. The frequency of ITP was 9.43% and 7.80% in studies conducted by Rahim et al and Zeb Jan et al respectively.<sup>(15,17)</sup>

An important limitation of bone marrow obtained by aspiration is the admixing of marrow and sinusoidal blood, which may not allow for reliable estimates for marrow cellularity. Also it is necessary that finding of a dry tap should never be dismissed as being due to faulty technique and always needs a bone marrow biopsy for further evaluation.<sup>(13)</sup>

In the present study in 30 cases BMA and BMB were done simultaneously including 9 cases of anemia, 7 cases of pancytope nia, 7 cases of chronic myeloid leukemia, 5 cases of acute lymphoid leukemia, 1 case of chronic lymphoid leukemia and multiple myeloma each. There is a good positive correlation in findings of BMT and BMB in all cases and they complement each otherout of total 72 cases showed comparable results between BMA and BMB.

In 9 cases of anemia both BMA and BMB examination revealed

erythroid hyperplasia depending upon the type of anemia. These observation was nearly similar to the findings seen in a study conducted by Ch Toi P et al. <sup>(7)</sup> It was observed that correlation of bone marrow aspiration and biopsy were harmonizing with each other.

Out of 8 cases of pancytopenia the most common cause of pancytopenia in the present studies was megaloblastic anemia. Different studies conducted across India also showed megaloblastic anemia as the most common cause of pancytopenia.<sup>(23,4)</sup> The second major cause of pancytopenia was aplastic/hypoplastic anemia in present study seen in two cases which was correlated with Tilak et al and Khodke et al.<sup>(0,11)</sup> Jha et al and Pathak et al have aplastic anemia as common cause.<sup>(10,12)</sup>

Granulomatous lesion in the bone marrow was diagnosed by BMB in our study. In one case of granulomatous reaction on correlation with clinical details possibility of tubercular pathology was kept .Chi toi P et al have mentioned that 80% cases of granulomatous lesions were diagnosed by BMB alone.<sup>(7)</sup> Granulomatous changes may be specific or non specific.<sup>(56)</sup>

One case of NHL in present study presented as pancytopenia, where BMB furnished information which couldnot be determined from aspiration. This also implies that trephine biopsy may be more useful in post chemotherapy patients to assess the residual tumour burden and degree of chemotherapy response.<sup>(8)</sup>

Hence it was observed that preparation of aspiration and trephine biopsy are easy, rapid, cost-effective and complementary to each other in majority of the lesions. The advantage of both the procedure done together enabled us to study the cyotmorphology of the cells along with the pattern of distribution of the cells depending on the cases, thus assissting in making the diagnosis accurately.

## Conclusion

The present study showed that BMA and BMB are easy ,rapid, costeffective and more or less of equal value in diverse spectrum of haematological and non-haematological disorders and are used in routine practice now-a-days. Both the procedure are complement ary to each other as BMA gives better morphology of the cell and BMB gives a good picture regarding the pattern of distribution of cells, grading of fibrosis, pattern of infiltration with lymphomas and granulomatous lesions. Both the procedures should be done concurrently as they play imperative role in providing findings , essential for making final diagnosis.

### Table no. 1

Age range (in years)	Male	Female	Total
0-10	9	7	16
11-20	10	3	13
21-30	2	5	7
31-40	6	3	9
41-50	5	3	8
51-60	7	7	14
61-70	3	1	4
71-80	1	0	1
81-90	0	0	0
91-100	0	0	0
	43	29	72

# Table no. 2

S.no	Diagnosis	No. of cases	percentage
1	Leukemia	38	52.78%
2	Anemia	24	33.33%
3	Pancytopenia	7	9.72%
4	Multiple myeloma	2	2.78%
5	ITP	1	1.39%
Total		72	100%

#### Table no. 3

Type of leukemia	Total number of	Percentage
	cases	
1. Acute lymphoblastic leukemia	14	36.84%
2. Chronic myeloid leukemia	13	34.21%
3. Acute myeloid leukemia	07	18.42%
4. Chronic lymphocytic leukemia	04	10.53%
Total	38	100%

## Table no. 4

Type of anemia	Sub types of anemia	No. of cases	Percentage
1.Macrocytic	a) Megaloblastic	12	50.00%
	b) Macrocytic	2	8.33%
2. Microcytic	a) Hypochromic	3	12.50%
3. Normocytic	a) Normochromic	3	12.50%
	b) Hypochromic	1	4.17%
4. Dimorphic		3	12.50%
Total		24	24

### Table no. 5

Pancytopenia	Number	Bone marrow	Number	Percentage
	of cases	findings	of cases	
1. Hypercellular marrow	5	a) Megaloblastic erythroid hyperplasia	2	28.55%
		b) Acute lymphoblastic leukemia	1	14.29%
		c) Infiltration by NHL	1	14.29%
		d) Granulomatous reaction	1	14.29%
2. Hypocellular marrow	2	a) Hypocellular marrow	1	14.29%
		b) Fibrosis	1	14.29%
Total			7	100%

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