



BONE MARROW ASPIRATION; ROLE AND SIGNIFICANCE IN HAEMATOLOGICAL DISORDERS.

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ABSTRACT

Introduction: Bone marrow examination is regarded as one of the most important diagnostic procedures to assess various haematological disorders. The advantages of bone marrow aspiration are numerous. This study was conducted with the aim to evaluate the role of bone marrow aspiration and its significance in haematological disorders.

Methods and Materials: This study was carried out in the Department of Pathology, Rohilkhand Medical College and Hospital, Bareilly from January 2014 to December 2015. Total 144 patients came in our department for bone marrow examinations. Patients of all age groups and genders were included in the study. Those with inconclusive reports or inadequate samples were excluded from study. After taking history, clinical examination and complete blood counts, bone marrow was aspirated from posterior superior iliac spine under aseptic conditions. Smears were made, stained and examined under microscope.

Results: Total 144 patients came in our department for bone marrow examinations. Out of which, 139 patients were included in this study. Among these, 86(61.8%) cases were diagnosed as anaemia, out of which 19(13.7%) cases of combined deficiency anaemia, 12(8.6%) cases of iron deficiency anaemia, 39(28.1%) cases of megaloblastic anaemia and 16(11.5%) cases of anaemia of chronic diseases. Total 17 (12.2%) cases of leukemia, 12(8.6%) cases were of Chronic Myeloid Leukemia (CML), 4(2.9%) cases were of Acute Myeloid Leukemia (AML) and 1(0.7%) case of Acute Lymphoblastic Leukemia (ALL). Other cases included plasma cell dyscrasia 2(1.4%) cases, Immune Thrombocytopenic Purpura (ITP) 4 (2.9%) cases, hypoplastic/ Aplastic marrow 13(9.4%), normal reactive marrow 15(10.8%) and 1(0.7%) case each of microfilaria and metastatic malignancy.

Out of 139 cases, 81(58.3%) were males and 58 (41.7%) were females. The male to female ratio was 1.3:1. According to cellularity of marrow, 15(10.8%) cases showed normocellular marrow, 111(79.9%) cases showed hypercellular marrow and 13 (9.4%) cases showed hypocellular marrow.

Conclusion: Bone marrow examination remains a simple, reliable and effective technique in the diagnosis of haematological conditions. The bone marrow examination is helpful in cases where routine investigations fail to reach a definite diagnosis.

KEYWORDS : Bone marrow, anaemia, leukaemia, metastatic.

INTRODUCTION:-

Bone marrow aspiration (BMA) is an invasive procedure in which we take representative specimens of spongy bone marrow through a bone marrow aspiration needle. It is done routinely for diagnosis and management of different haematological disorders. [1-4] In early 1876, Mosler used a regular wood drill to aspirate bone marrow particles from a leukaemia patient. [2] Bone marrow examination is used in the diagnosis of a number of conditions, including leukemia, multiple myeloma, lymphoma, anaemia and pancytopenia. It is helpful in patient where diagnosis remains inconclusive after examination of Complete blood count (CBC) or peripheral blood film (PBF) and also for monitoring of success of cancer chemotherapy, staging of lymphoma and other metastatic solid tumors. The Bone marrow aspiration specimens are useful in further diagnostic assays including cytochemical/ special stainings, immunophenotyping, microbiologic tests, cytogenetic analysis and molecular studies. [1,2,5] It is also useful for haemopoietic stem cell transplantation as it is a major source of stem cells. [3] This study was conducted with the aim to evaluate the role of bone marrow aspiration and its significance in haematological disorders.

MATERIAL AND METHODS

This retrospective study was conducted at Rohilkhand Medical Collage, Bareilly from January 2014 to December 2015. A sample of 144 patients was selected. All patients referred for bone marrow aspiration were included. Those with inconclusive report or inadequate sample were excluded from this study. Detailed history and complete blood count was collected from records. Before a BMA is performed, clinical history and laboratory tests including CBC, reticulocyte count and PBF must be evaluated. A patient education and written consent for BMA is taken from patient before the procedure is performed. Patient must be fit for the procedure. The procedure was done following aseptic technique. The most common site used was posterior iliac crest. Local anaesthesia should be given at site of procedure. Before giving LA patch test should do in every patient. Once the marrow blood is aspirated in aseptic protocol, the smear is made. After the procedure, patients were observed to make sure that

their vitals remained stable. Aspiration site was also observed for bleeding.

After bone marrow aspiration slide was fixed by air dry method or methanol. Leishman, Geimsa and Perl's stain was used for staining. After staining it was examined for the presence of cellularity, number and morphology of erythroid series, myeloid series, megakaryocytes, plasma cells and lymphocytes. Any atypical cells, hemoparasites and the presence or absence of the iron stores using Prussian blue stain were also observed.

RESULT:-

There were 139 patients included in this study. Among these, 86 cases were diagnosed anaemia, out of which 19(13.7%) cases of combined deficiency anaemia, 12(8.6%) cases of iron deficiency anaemia, 39(28.1%) cases of megaloblastic anaemia and 16(11.5%) cases of anaemia of chronic diseases. Total 17 cases of leukemia, 12(8.6%) cases were of CML, 4(2.9%) cases of AML and 1(0.7%) case of ALL. Other cases included plasma cell dyscrasia 2(1.4%) cases, 4 (2.9%) cases of ITP, 13(9.4%) cases of hypoplastic/Aplastic marrow, 15(10.8%) cases of normal reactive marrow and 1(0.7%) case each of microfilaria and metastatic malignancy. (Table 1)

In this study total 139 cases were included, out of which 81(58.3%) were males and 58 (41.7%) were females. The male to female ratio was 1.3:1. The distribution of cases into different age groups was studied. The maximum number of male 26(32.1%) and female 23(39.7%) in age group 11-20 years. (Table 2)

Out of 139 cases, 15(10.8%) of cases show normocellular marrow, 111(79.9%) of cases show hypercellular marrow and 13 (9.4%) cases have hypocellular marrow. (Table 3)

Figure 2 (A):-CML Bone marrow. (L&G 400x). (B):-AML Bone marrow (L&G1000x). (C):- BMA show microfilaria with micronormoblast. (L&G400x). (D):- Bone marrow smear show cluster of metastatic tumour cells. (L&G100x). (E):- ITP Bone marrow. (L&G 100x). F:-Bone marrow of Multiple Myeloma. (L&G400x).

Table 1:-Show distribution of cases according to differential diagnosis

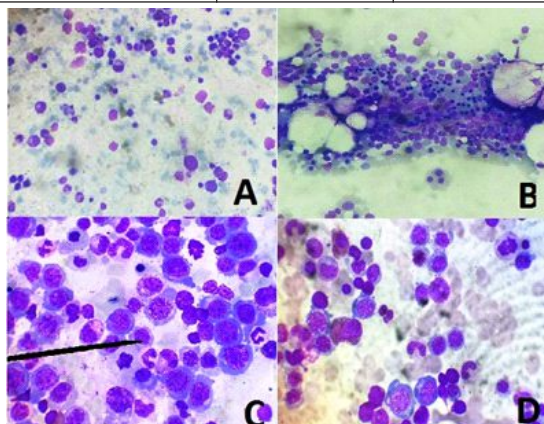
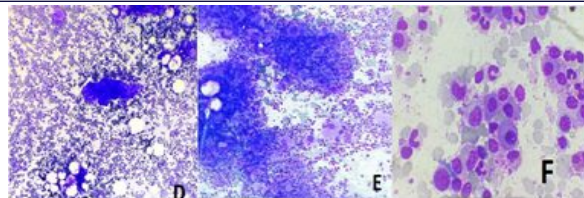
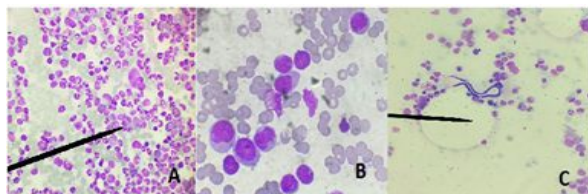
S. NO	DIAGNOSIS	NUMBERS	PERCENT AGE
1	COMBINED DEFICIENCY ANAEMIA	19	13.7%
2	IRON DEFICIENCY ANAEMIA	12	8.6%
3	MEGALOBLASTIC ANAEMIA	39	28.1%
4	ANAEMIA OF CHRONIC DISEASE	16	11.5%
5	CML	12	8.6%
6	AML	4	2.9%
7	ALL	1	0.7%
8	PLASMA CELL DYSCRASIS	2	1.4%
9	PARASITE	1	0.7%
10	METASTATIC MALIGNANCY	1	0.7%
11	ITP	4	2.9%
12	NORMAL REACTIVE MARROW	15	10.8%
13	HYPOLASTIC MARROW	13	9.4%
	TOTAL	139	

Table 2:-Distribution of Cases according to Age groups and Gender.

Age group	Sex			
	Male	Percentage	Female	Percentage
0-10	6	7.4%	6	10.3%
11-20	26	32.1%	23	39.7%
21-30	13	16.0%	6	10.3%
31-40	14	17.3%	8	13.8%
41-50	10	12.3%	5	8.6%
51-60	7	8.6%	4	6.9%
61-70	2	2.5%	5	8.6%
71-80	3	3.7%	1	1.7%
TOTAL	81	58.3%	58	41.7%

Table3:-Distribution of cases according to cellularity of marrow.

Cellularity of the marrow	No of cases	Percentage
Normocellular	15	10.8%
Hypercellular	111	79.8%
Hypocellular	13	9.4%
TOTAL	139	

**Figure1 (A):- BMA show Erythroid hyperplasia with micronormoblastic maturation. (L&G400x). (B): - Erythroid hyperplasia with normoblastic maturation. (L&G400x). (C):- Erythroid hyperplasia with megaloblastic maturation. (L&G 1000x). (D). Erythroid hyperplasia with micronormoblastic and megaloblastic maturation.****Figure2 (A):-CML Bone marrow. (L&G 400x). (B):-AML Bone marrow (L&G1000x). (C):- BMA show microfilaria with micronormoblast. (L&G400x). (D):- Bone marrow smear show cluster of metastatic tumour cells. (L&G100x). (E):- ITP Bone marrow. (L&G 100x). F:-Bone marrow of Multiple Myeloma. (L&G400x).**

DISCUSSION:-Haematological disorders include a wide range of diseases ranging from nutritional anaemia to haematological malignancies. Bone marrow aspiration plays a very important role not only in determining the cause of disease but also help in establishing a definitive diagnosis. It's a relatively safe procedure which can be performed on outpatient basis. Thus, bone marrow examination could be used effectively in most cases to determine the cause of anaemia.

In this study, we analyzed the data obtained from these patients to know the relative frequency of different haematological disorders.

In present study bone marrow examination shows megaloblastic anaemia was very common disorder among anaemia's. Similarly Anjum et al study showed that megaloblastic anaemia is more frequent than other anaemia.^[6] Whereas studies of other authors reported Iron deficiency anaemia was most common cause of nutritional anaemia globally.^[7]

Combined deficiency anaemia 19(13.7%) was second common cause of anaemia observed in our study. Whereas study done in Nigeria, where most common cause of anaemia diagnosed on bone marrow examination is Combined deficiency anaemia (26.1%).^[8]

4(2.9) % cases of Idiopathic thrombocytopenia purpura (ITP) were found on bone marrow examination in our study. Compared to our study 10.5% and 6.21% cases of Idiopathic thrombocytopenia purpura (ITP) were seen in other studies.^[9,10]

In our study 9.4% cases of Aplastic or hypoplastic anaemia found. Khodke et al^[11] reported 14% cases. Whereas other authors studies reported 5 %, 19% and 29%.^[9,12,13] Epidemiologically, Aplastic anaemia has a pattern of geographic variation opposite to that of leukemias, with higher frequency in the developing world than in the industrialized West.^[14]

Hemoparasites can be a cause of haematological disorders and they should be specifically looked for while examining the bone marrow aspirate. In our study one (0.7%) case was reported erythroid hyperplasia with micronormoblastic maturation with microfilaria infestation. Tummidi et al reported microfilaria with metastatic deposits in bone marrow aspirate.^[15] Whereas as Umashankar et al reported microfilaria with pancytopenia and megaloblastic marrow.^[16]

One (0.7%) case of metastatic deposits was diagnosed on bone marrow aspiration. Whereas Mainali et al reported metastatic deposits in two cases.^[17]

In this study, 17 cases of leukemia were found. Of these, five cases were of acute leukemia and 12 cases of were chronic leukemia. This shows that chronic leukemia is the most common leukemia in our patients. There was only 1 case of acute lymphoblastic leukemia (ALL) while 4 cases of acute myeloid leukemia. Compared to our study, other studies showed that acute leukemia is the commonest leukemia.^[9,18]

Anjum et al studied spectrum of haematological disorders on bone marrow aspiration in 168 patients. Out of which 92 (54.76%) were males and 76 (45.23%) were females. The male to female ratio was 1.2:1.^[6] Similarly in our study, out of 139 patient, 81 (56.75%) were males and 58(41.7%) were female patient diagnosed on bone marrow aspiration and male to female ratio was 1.3:1.

CONCLUSION:-

Bone marrow aspiration is very helpful in arriving at the correct diagnosis and ascertaining the cause of disease. But it is not a first line of investigation. It is indicated in patient where initial investigation not much helpful to diagnosed blood or blood related diseases. Along this knee search for parasite should be done in endemic areas so patient gets treatment for both diseases at same tie.

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