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COMPARATIVE ANALYSIS BETWEEN BONE MARROW ASPIRATION CYTOLOGY AND BONE MARROW BIOPSY EXAMINATION IN DIAGNOSIS OF LEUKEMIC PATIENTS

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ABSTRACT

Objective- bone marrow aspiration is main stay in diagnosis of leukemia. Though it is used from long time, sensitivity, diagnostic accuracy is yet not proven. So the objective of our study to find out diagnostic accuracy ,sensitivity ,specificity of bone marrow aspirate (BMA) cytology in diagnosis of leukemia and comparative diagnostic analysis of trephine biopsy with bone marrow aspirate cytology**. Material And Method:** In our study 30 Patients with suspected diagnosis of leukemia were included. Data was collected prospectively between Jan2015-Jan2016. The cytology smears were stained using appropriate stains. Bone marrow aspirate diagnosis and histo-pathological results of were compared and concordance was assessed**. Result:** In the present study we included 30 cases of leukemia in which BMA and bone marrow biopsy (BMB) was done, Out of which 19 cases were of chronic leukemia , 5 case were Acute leukemia, with mean age of 29 . Biopsy confirmation of the diagnosis was available in all the cases. Overall diagnostic sensitivity of BMA was 93.3 % for detecting malignancy. There were 02 false negative case were also diagnosed. Cyto-pathological Concordance was high in lymphocytic leukemia. **Conclusion:** Bone marrow aspiration is a safe and relatively non invasive procedure for diagnosis and evaluation of leukemia.

Keywords: Aspiration cytology, Bone marrow Biopsy, Leukemia.

INTRODUCTION:

The evaluation of leukaemia is a task encountered by all, from practitioners to super specialists. Essential steps in evaluating these conditions encompass integration of clinical data and laboratory studies. Inspection of bone marrow is considered one of the most valuable diagnostic tools for evaluating hematologic disorders.**(1)**The aspirate and trephine biopsy specimens are complementary in evaluation of the bone marrow. Aspiration of the marrow is primarily utilized for cytological assessment with analysis directed towards morphology and obtaining a differential cell count. Bone marrow aspirates are unequalled for demonstration of fine cytological details.

Only a biopsy of bone marrow allows a complete assessment of marrow architecture and pattern of distribution of any abnormal infiltrates.The final interpretation needs the involvement of peripheral blood, bone marrow aspirate and trephine biopsy findings.**(2,3)**

This study will be focusing on the Bone marrow features which can help in early diagnosis and

treatment of leukemia. The purpose of this study is to evaluate the significance of various observations on bone marrow aspiration and trephine biopsy in relation with clinical details and peripheral blood film findings.

MATERIAL AND METHODS

The present study was conducted in 30 clinically suspected patients of leukemia who attended inpatient and outpatient department of medicine, medical oncology, and pediatrics at Geetanjali Medical College and Hospital, Udaipur over a period of one year (June 2015 to June 2016).

A detailed history was taken in each case followed by clinical examination.CBC counts and peripheral blood film examination was performed in each case. Relevant bio chemical and serological investigations were done wherever required depending upon the clinical diagnosis and relevance.

Blood samples for hematological and other relevant investigations were drawn from study population after obtaining an informed consent in writing from the patients and or their close relatives.

All Patients with leukemia who underwent both bone marrow aspiration and bone marrow trephine biopsy examination were included in the present study.

Those patients, in whom only bone marrow aspiration examination was performed or where bone marrow aspiration was done at some other institution /lab. Or where only trephine biopsy was performed at our institution, were excluded from the present study.

Collection of sample: For complete blood count and PBF examination 2ml blood sample was collected in Ethylene diaminetetraacetic acid (K3-EDTA) anticoagulant vial.CBC was performed on HORIBA PENTRAXLR AND HORIBA 60automatic blood cell counter after proper pre calibration of the machines and running low and high control checks.

Bone marrow examination: Bone marrow examination included both aspiration and trephine biopsy in all the cases. The bone marrow aspiration and biopsy material were simultaneously obtained by using a single Jamshidi needle from right/left posterior superior iliac crest under local anesthesia under strict aseptic precautions as per standard procedure.

RESULTS

A total of patients in all age groups of both sexes admitted with clinical diagnosis of leukemia in medicine ,medical oncology and paediatric wards of GMCH, Udaipur over a period of one years(June 2015 to June2016) were included in the present study .A detailed history, clinical examination, CBC, peripheral smear examination, Bone marrow aspiration(BMA) as well as Bone marrow biopsy (BMB) were done in every patient .The age of the patients ranged from 1 to 60 years. Maximum number of cases was observed in the age group of 20 to 40 years (40%) followed by 0 to 20 years (33.34%); while minimum number of cases was found in the age group of 40 to 60 years (26.66%) The most common clinical presentation in the present study was pallor, followed by fever, fatigue, hepatospleenomegaly, bleeding tendencies, back pain and pathological fractures. Few cases also presented with breathlessness, loss of weight, anorexia, gum hyperplasia, sternal tenderness and weakness in legs.**(4,5)**

Maximum number of cases in neoplastic category was Chronic myeloid leukemia (60%) 11 cases of acute leukemia were diagnosed (7AML and 4 ALL) which were confirmed by flow cytometric analysis. **(6,7)**

Out of 30 cases in 2 cases no diagnosis was made on Bone marrow aspiration as that was dry tap & inadequate. Sensitivity of BMA is 93.33% as compared to BMB, which is considered as gold standard. **(8)**

DISCUSSION

Bone marrow examination remains a cornerstone in the diagnosis of various hematological disorders. The comparative evaluation of BMA and BMB is essential to determine the diagnostic

utility of both the procedures in various hematological diseases. Age and sex distribution of our study was comparable with other studies, Tripathy and Dulani , Mahajan et al, Kaur et al, Aljadayeh et al. **(9,10,11,12)** However, Mahajan et al and Aljadayeh et al included in their studies patients only above 18 years of age.**(11,12)**

Authors	Age distribution	Number of cases
Tripathy and Dudani (2013)[9]	3 – 83 years	466
Mahajan et al (2013)[10]	Above 18 years	460
Kaur et al (2014)[11]	4 – 74 years	50
Aljadayeh et al (2015)[12]	18 – 91 years	500
Present study (2017)	1– 60 years	30

The most common clinical presentation in the present study was pallor in 28 cases (93.33%). Tripathy et al had emphasized on the significance of pallor and its association with non neoplastic cases .**(9)** Second most common complaint was fever which was seen in 15 cases followed by loss of weight and weakness .Goyal et al and James et al also observed similar clinical presentation of the cases .**(13,16)** The most common indication for bone marrow examination in our study was pancytopenia on peripheral blood examination. The most common indication for bone marrow examination was anemia and leucopenia in a study done by Kaur et al .**(11)** Other common indications for BMA and BMB in the present study were Leukemia, AML, ALL, anemia. In our study the diagnostic yield of BMA and BMB were 93.33%, and 100% respectively. Only slight difference was observed between the two with yield of BMB being higher followed by BMA . This is in contrast to a study done by Chandra and Chandra where the diagnostic yield of BMB was 99.2% followed by BMA (77.5%) .**(19)** However, Aljadayeh et al reported a diagnostic yield of BMB as 91.80% and of BMA 76.20 %.**(12)**

Author	No of cases	Diagnostic yield of BMA (%)	Diagnostic yield of BMB (%)
Chandra (2011)[14]	565	77.5	99.2
Aljadayeh et al (2015)[12]	500	76.20%	91.80%
Present study(2017)	80	93.33%	100%

The sensitivity of BMA and BMB in our study are compared to the studies done by Aljadayeh at al.**(12)**Chandra and Chandra and Khan et al. **(14,15)**

Author	No of cases	Sensitivity of BMA (%)	Sensitivity of BMB (%)
Aljadayeh et al (2015)[12]	500	78.3	99.1
Chandra and Chandra (2011)[14]	500	77.5%	99.2%
Khan et al (2014)[15]	200	73.8%	99%
Present study(2017)	30	93.33%	100%

Our findings on aspiration were satisfactory .However there was an added advantage of biopsy regarding the pattern of involvement of the marrow. Thus our findings were agreeable with those of , Mahajan et al where 6 out of these 10 cases revealed a packed marrow pattern on bone marrow biopsy and had given a dry tap on aspiration.**(10)** Kaur et al who confirmed added advantage of biopsies over aspiration in this case. **(11)**

CONCLUSION

Bone marrow evaluation is an important and effective tool in diagnosing and evaluating leukemia. Complete evaluation of bone marrow samples requires a detailed patient history, CBC, Peripheral blood examination, BMA smears and biopsy sections. Bone marrow aspiration and biopsy are complementary to each other with aspiration smears being primarily used for cytological diagnosis and biopsy sections mainly useful to identify histological features like architectural pattern and fibrosis. Hence, BMA and BMB should be performed in all cases of bone marrow examination

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Table 1: Clinical presentation in the present study:-

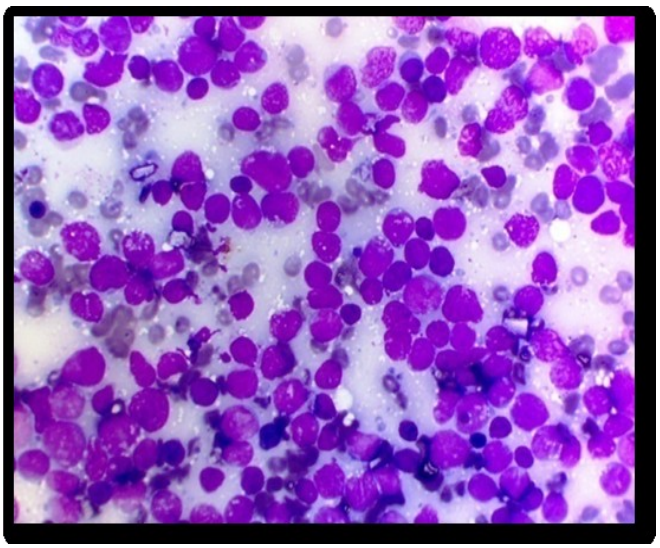
Clinical Presentation	Frequency	Percentage
Pallor	28	93.33%
Fever	15	50%
Loss of weight	10	34%
Weakness/fatigue	12	40%
Breathlessness on exertion	11	38.75
Hepatosplenomegaly	30	36.5%
Anorexia	9	30%
Bleeding tendency	3	10%
Gum Hyperplasia and Bleeding	3	10
Lymphadenopathy	2	6.6%

Table 2: Frequency of different neoplastic lesions on bone marrow examination

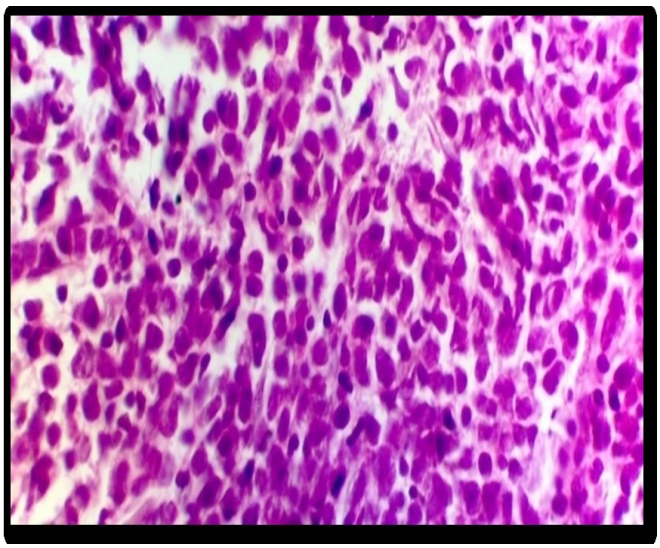
Diagnosis	Number of Cases	Percentage (%)
Chronic myeloid leukemia	18	60%
Acute myeloid leukemia	7	23.33%
Acute lymphocytic leukemia	4	13.33%
Chronic lymphocytic leukemia	1	3.33%
Total	30	100

Table 3: Cases diagnosed on bone marrow aspirate, and trephine biopsy

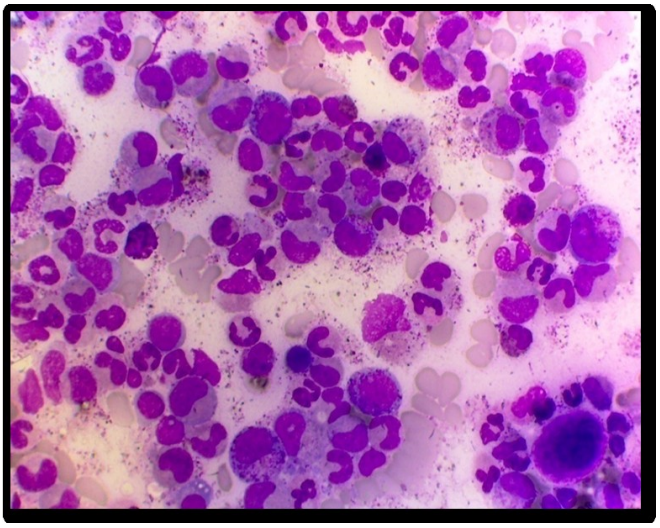
Diagnosis	Number of Cases	BMA Cytology		BMB	
		DD	NDD	DD	NDD
Chronic myeloid leukemia	18	17	01	18	0
Acute myeloid leukemia	7	6	01	7	0
Acute lymphocytic leukemia	4	4	0	4	0
Chronic lymphocytic leukemia	1	1	0	1	0
Total	**30**	**28**	**2**		
Diagnostic yield		93.33%	6.66%	100%	



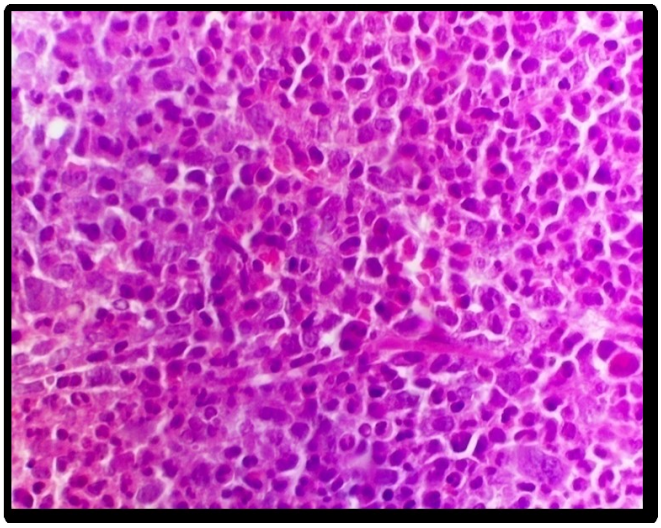
Photomicrograph 12– Aspirate smear of a case of ALL showing blasts (Leishman,x400)



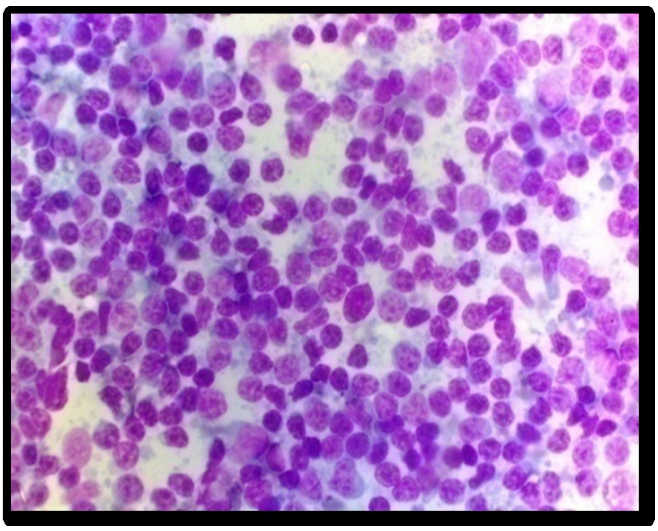
Photomicrograph 13- Biopsy of a case of ALL showing blast cells (H&E,x400)



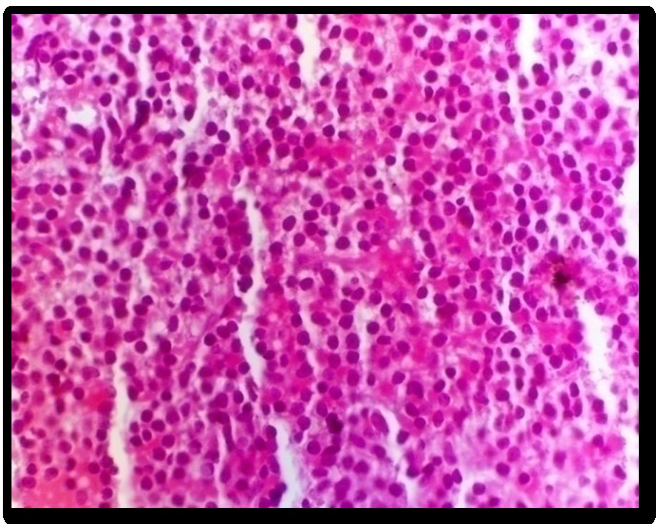
Photomicrograph 14 – Aspirate of a case of CML showing immature forms of myeloid lineage and Arrow shows a basophil (Leishman,x400).



Photomicrograph 15– Biopsy of a case of CML showing increased number of immature forms of myeloid lineage (H&E,x400)



Photomicrograph 16 – Aspirate of a case of CLL/SLL showing monotonous population of lymphoid cells (Leishman,x40)



Photomicrograph 17–Biopsy of a case of CLL/SLL showing diffuse population of lymphoid cells (H&E,x40)