



COMPARATIVE EVALUATION OF SIMULTANEOUS BONE MARROW ASPIRATION AND BONE MARROW BIOPSY IN DIAGNOSIS OF LEUKEMIC PATIENTS – AN INSTITUTIONAL STUDY

Dr. Mohammed Azharuddin	Consultant Pathologist Triesta Sciences, HCG Cancer Hospital, Gulbarga
Dr. Uzma Alvi	Assistant professor, Department of Pathology, ESIC Medical College, Gulbarga
Dr. Sandeep Rao	Senior consultant and head, Hematopathology, Triesta Sciences, HCG Cancer Hospital, Gulbarga
Dr Ayesha Fatima	Associate professor, Department of Pathology ESIC Medical College, Gulbarga
Dr. Shilpa Uplaonkar*	Associate Professor, Mahadevappa Rampure Medical College, Gulbarga *Corresponding Author

ABSTRACT

Background Bone marrow examination is performed by two methods Aspiration and Trepine biopsy. Despite recent advances in field of molecules hematology and flow cytometry, bone marrow histology remains the corner stone in the diagnosis of acute leukemia. Hence, the present study is taken up to assess the significance (& complementary roles) of various observations on bone marrow aspiration and trephine biopsy in relation with clinical details and peripheral blood findings. **Methods** Retrospective data of leukemic cases whose bone marrow aspiration and Bone marrow biopsy were performed simultaneously were selected ranging from January 2020 to December 2021. **Results** 30 cases were reviewed retrospectively where bone marrow aspiration and biopsy was done simultaneously. Majority of Patients fall under the age group 31-40 and there was male Predominance. AML was found predominantly followed by CML, of these AML cases most common were of AML M3 type. Out of the 30 cases 22 showed a positive correlation between bone marrow aspiration and bone marrow biopsy; and 26 cases showed concordance on both aspirate and Biopsy. **Conclusion** Bone marrow evaluation is an important and effective tool in diagnosing and evaluating leukemia.

KEYWORDS : Leukemia; Bone Marrow Aspiration; Bone Marrow Biopsy; Trepine Biopsy; Hematological Disorders; French-American-British (FAB) Classification;

INTRODUCTION

Examination of bone marrow is useful investigative tool for the diagnosis of several haematological and non-haematological disorder.¹ Bone marrow examination is performed by two methods; Aspiration and trephine biopsy.² Bone Marrow aspiration is simple reliable and rapid method of marrow evaluation. It provides information about the numerical and cytological features of marrow cells whereas bone marrow biopsies provide excellent appreciation of spatial relationship between cells and of overall bone marrow structure. Bone marrow cytology and trephine biopsy histopathology complement each other and the superiority of one method over the other depends on the underlying disorder.³ Bone Marrow Biopsy (BMB) provides complete assessment of marrow architecture. BMB is required in conditions such as inadequate or failed aspirate, assessment of cellularity and bone marrow architecture, suspected focal lesion and bone marrow fibrosis.⁴ Despite recent advances in field of molecules haematology and flow cytometry, bone marrow histology remains the corner stone in the diagnosis of acute leukemia.⁵

OBJECTIVES OF THE STUDY

- 1) To assess the significance of various observations on bone marrow aspiration and trephine biopsy in relation with clinical details and peripheral blood findings.
- 2) To evaluate the complementary role of both the procedures done simultaneously and to see the advantages and disadvantages of these procedures.

MATERIALS AND METHODS

Source of Data:

The present study was carried out in the Department of Pathology, Khaja Banda Nawaz University Faculty of Medical Sciences, Gulbarga. The retrospective cases from January 2020 to December 2021 were reevaluated.

Method Of Collection Of Data (including Sampling Procedure, If Any):

Retrospective data from the cases of leukaemia in which 'Bone Marrow Aspiration' and 'Bone Marrow Biopsy' were performed simultaneously were selected.

Bone marrow aspiration was performed under local anaesthesia by using Salah's needle and 0.5 ml of aspirate was withdrawn from the posterior superior iliac spine and smears were stained with Leishman stain. Later, Bone marrow biopsy was performed through same incision by using Jamshidi's needle. Biopsy was processed and stained by haematoxylin and eosin.^{6,7}

RESULTS

In the present study 30 cases were reviewed retrospectively, where bone marrow aspiration and biopsy was done simultaneously. Among 30 patients; Majority of Patients (16) fall under age group 31-40 and there was male Predominance.

Table No.1: Age wise distribution of cases

Age in years	Number of cases	Percentage
10—20	7	23.3
21—30	4	13.3
31—40	16	53.3
> 40	3	10.0
Total	30	100.0

Table No.2: Cases Diagnosed on BMA and BMB

Diagnosis	BMA		BMB	
	Number	Percentage	Number	Percentage
AML	11	36.7	11	36.7
ALL	4	13.3	4	13.3
CML	10	33.3	10	33.3
Dry tap	0	0	4	13.3

Inadequate	2	6.7	0	0
Hypocellular	2	6.7	0	0
CLL	1	3.3	1	3.3
Total	30	100.0	30	100.0

Table 3: Different types of leukaemia based on both BMA and BMB

Type of Leukaemia	No of cases
AML	14
ALL	05
CML	10
CLL	01
Total	30

Out of 30 cases, AML was found predominantly followed by CML.

Table 4: FAB classification of Acute Myeloid leukaemia (AML)

FAB Classification of AML	No of cases
M1	01
M2	02
M3	07
M4	02
M5	02
M6	-
M7	-
Total	14

Out of 14 cases of AML according to FAB classification, most common Cases were of AML M3 type

Table 5: FAB classification of Acute Lymphoblastic Leukaemia (ALL)

FAB Classification of AML	No of cases
L1	00
L2	03
L3	02
Total	05

Out of 5 cases of ALL according to FAB classification, ALL L2 was most common

Table 6: Distribution of cases according to main clinical and laboratory indication of bone marrow examination

Indications of Bone Marrow Examination	No. of cases
Pancytopenia	12
PUD	03
Bleeding	03
Anaemia	02
Splenomegaly	06
Hepatomegaly	04
Total	30

Table 7: Cases diagnosed only on bone marrow aspiration which showed hypocellularity on bone marrow biopsy

Diagnosis	Cases
AML	3
ALL	1
CML	0
Total	4

04 cases were diagnosed on marrow aspiration alone where bone marrow biopsy shows hypocellularity and was not contributory to the diagnosis.

Table 8: No. of cases diagnosed on bone marrow Biopsy which showed dry tap on aspiration

Diagnosis	No. of cases
AML	03
ALL	01
CML	00
CLL	00

Total	04
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04 cases were diagnosed on marrow biopsy alone, where bone marrow aspiration shows dry tap and was not contributory to the diagnosis

Table 9: No of cases showing positive correlation between Bone marrow aspiration and Biopsy

Diagnosis	No of cases
AML	10
ALL	03
CML	08
CLL	01
Total	22

Table no. 10: Concordant and discordant of cases with BMA and BMB

Sl no.	Result	BMA	BMB	No. of cases	Percentage
1	Positive	Positive	Correlate	22	73.3
2	Negative	Negative	Discordant	8	26.7
	Total	----	----	30	100.0

Out of 30 cases studied 22 cases shows positive correlation between bone marrow aspiration and bone marrow biopsy.

Out of 30 cases 26 cases (86.7%) showed concordance on both aspirate and Biopsy.

Table No.11: Values of association between BMA and BMB

BMA	BMB		Total
	Positive	Negative	
Positive	22	3	25
Negative	3	2	5
Total	25	5	30

χ^2 -test value and P-value $\chi^2 = 2.27, p = 0.20$ Not Significant

There was no statistical significant association between BMA and BMB diagnosis ($P < 0.001$)

Table no. 12: Diagnostic test evaluation

	Diagnostic Tests	Values	95% CI
1	Sensitivity	88.00%	68.78% to 97.45%
2	Specificity	40.00%	5.27% to 85.34%
3	Positive Predictive Value	88.00%	77.94% to 93.83%
4	Negative Predictive Value	40.00%	12.84% to 75.11%
5	Diagnostic Accuracy Rate	80.00%	61.43% to 92.29%
6	Positive Likelihood Ratio	1.47	0.71 to 3.04
7	Negative Likelihood Ratio	0.30	0.07 to 1.36
8	Disease Prevalence	83.33%	65.28% to 94.36%

DISCUSSION

In the present study majority of patients were found in the age group of 31-40years, but in Srikanth M et al study showed, most common age group found was 21-30 years⁸. Male preponderance was observed in our study which was similar to Joshi et al study⁹. Most common indication for BMA was pancytopenia and similarly it was observed in Bhagya Lakshmi et al study¹⁰. In the present study majority of cases were AML, it was concordant to Meenu Giotra¹¹, Rahim et al study¹² and was discordant with Kaur et al study¹³, which showed most common indication for bone marrow examination was anaemia and leukopenia.

Present study showed most common AML found was FAB M3 which was discordant with Usman Younus study, which showed FAB M2 cases were found predominantly¹⁴.

In our study, 30 cases underwent BMA and BMB simultaneously, and concordance between the methods was 73.3% and discordance was 26.6% and the similar findings were found in Shweta Joshi et al study⁹ Where as in a study conducted by Jemi Ghodasara¹⁶ percentage of cases

concordance was 73.9%. In a study conducted by Toi PCh et al¹⁷ the percentage of concordance cases was 68.25% and Taj Ali Khan¹⁸ study showed 73.8% positive correlation which were similar to our study. This high concordance between the methods clearly indicates that the methods are complementary to each other.

Table 13: Comparison of diagnostic yield

Author	No of cases	Diagnostic yield BMA	Diagnostic yield BMB
Chandra et al19	565	77.5	99.2
Aljadayeh et al20	500	76.2	91.8
Shubhnita Garg15	80	93.33	100
Present study	30	86.6	86.6

Table 14: Comparison of sensitivity of present study with others studies

Author	No of cases	Sensitivity of BMA %	Sensitivity of BMB
Aljadayeh et al20	500	78.3%	99.1
Chandra et al19	500	77.5	99.2
Khan et al18	200	73.8	99
Shubhnita Garg et al15	30	93.33	100
Present study	30	88	88

CONCLUSION

Bone marrow evaluation is an important and effective tool in diagnosing and evaluating leukaemia. BMA and BMB procedures complement each other with aspiration specimen primarily used for cytological diagnosis and trephine biopsy for histological diagnosis as cellularity, fibrosis and architecture pattern are better visualized. Hence bone marrow aspiration and BMB should be performed simultaneously in all cases of bone marrow examination.

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