



Efficacy of bone marrow examination techniques in diagnosing chronic myeloid leukemia cases

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Abstract

Background: Bone marrow aspiration biopsies are conducted not only for carrying out cytological assessment but also for immunophenotypic, cytogenetic, molecular genetics, and other specialised investigations. Hence; we planned the present study to evaluate and compare the effectiveness of bone marrow aspiration, imprint and biopsy in patients suffering from chronic myeloid leukemia (CML).

Materials & Methods: We planned the present study to compare the effectiveness of bone marrow aspiration, imprint and biopsy in patients suffering from various haematological disorders. A total of 10 cases of CML were included in the present study. Complete demographic and clinical details of all the patients were obtained. Findings of bone marrow aspiration (BMA), Bone marrow imprint (BMI) and bone marrow biopsies (BMY) were compared. All the results obtained were subjected to statistical analysis by SPSS software.

Results: A total of 10 subjects diagnosed with CML were included in the present study. Among these 10 subjects, 6 were males while the remaining 4 were females. In 7 out of 10 cases, findings of BMA, BMI and BMY were in concordance with each other.

Conclusion: All the three bone marrow examination techniques are complementary to each other.

Keywords: Bone marrow aspiration, Bone marrow biopsy, Bone marrow imprint.

Introduction

Bone marrow aspiration biopsies are carried not only for conducting cytological evaluation but also for immunophenotypic, cytogenetic, molecular genetics, and other specialised investigating techniques. A trephine biopsy is usually conducted as part of the same protocol.^{1,2} Only trained professionals should be allowed to conduct bone marrow aspirations as only those individuals are aware of the indications, contraindications, and hazards of the procedure.^{3,4} They should follow a standard operating procedure. The clinician should have made a

satisfactory evaluation of clinical and haematological features to ensure both that appropriate indications exist and that all relevant tests are performed. The bone marrow aspirate and biopsy are significant medical procedure for the diagnosis of hematologic neoplasms and other diseases, and for the follow-up evaluation of patients undergoing chemotherapy, bone marrow transplantation, and other forms of medical therapy.⁵⁻⁷ During the procedure, liquid bone marrow is aspirated from the posterior iliac crest or sternum with a special needle, smeared on glass microscope slides by one of several techniques,

and stained by the Wright-Giemsa or other techniques for microscopic examination.⁸Hence; we planned the present study to evaluate and compare the effectiveness of bone marrow aspiration, imprint and biopsy in patients suffering from chronic myeloid leukemia (CML).

Materials & Methods

We planned the present study in the department of general pathology of the medical institute and it included evaluation and comparison of the effectiveness of bone marrow aspiration, imprint and biopsy in patients suffering from various haematological disorders. Ethical approval was obtained from institutional ethical committee and written consent was obtained after explaining in detail the entire research protocol. A total of 10 cases of CML were included in the present study. Complete demographic and clinical details of all the patients were obtained. Complete haematological and biochemical investigations were carried out in all the patients. These included evaluation of Hemoglobin, haematocrit value, red

cell indices, reticulocyte count and peripheral blood film. Bone marrow aspiration was done using Salah's needle. Jamshidi needle was used for carrying out bone marrow biopsy and biopsy specimen was used for preparing imprint smears. All the results obtained were subjected to statistical analysis by SPSS software. Univariate regression curve was used for assessment of level of significance.

Results

A total of 10 subjects diagnosed with CML were included in the present study. Among these 10 subjects, 6 were males while the remaining 4 were females as shown in Graph 1. Majority of the subjects (40 percent) belonged to the age group of 31 to 50 years as shown in Table 1. In 7 out of 10 cases, findings of BMA, BMI and BMV were in concordance with each other. In remaining 3 cases, there was discordance between the findings. In a single case, BMA revealed dry tap, in which, BMI and BMV were used for confirming the diagnosis.

Table 1: Distribution of patients according to age and gender

Age group(in years)	Male		Female		Total	
	NO.	%	NO.	%	NO.	%
11 to 30	2	20	1	10	3	30
31 to 50	2	20	2	20	4	40
51 to 70	2	20	1	10	3	30
Total	6	60	4	40	10	100

Graph 1: Distribution of patients according to age and gender

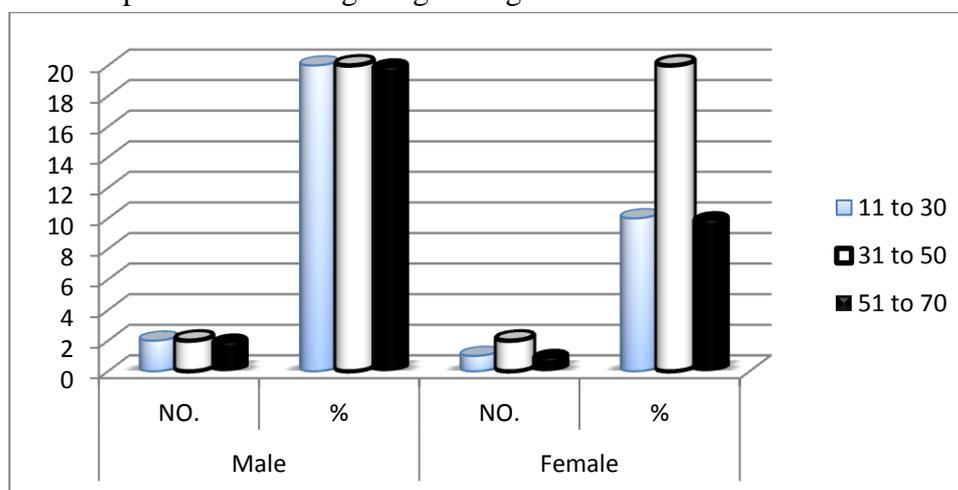


Table 2: Comparison of BMA, BMI and BMY bone findings in CML cases

S. No.	BMA	BMI	BMY
1.	Diluted	CML	CML with fibrosis
2.	CML	CML	CML
3.	CML	CML	CML
4.	CML	CML	CML
5.	CML	CML	CML
6.	Dry tap	CML	CML with fibrosis
7.	CML	CML	CML
8.	Diluted	CML	CML with fibrosis
9.	CML	CML	CML
10.	CML	CML	CML

Discussion

In the present study, we observed that findings of BMA, BMI and BMY were in concordance in 70 percent of the cases. In one of the previous study, Kaur M et al evaluated the diagnostic efficacy of BMA and BMY in a prospective study. They correlated the findings of BMY sections with BMA smears and analyzed the data, thus obtained. They assessed a total of 50 patients. In their study, the male to female ratio was 1.6 to 1. Age of the patients ranged from 4 years to 74 years. In 23 cases, out of total 50 cases, they observed a strong positive association between BMA and BMY. However, it was found that in the cases of aplastic anaemia, different phases of myeloproliferative neoplasm (MPN), multiple myeloma, tubercular granulomas and hemato-lymphoid neoplasm, involvement of the marrow was detected better in bone marrow biopsies. From their results, the authors concluded that it is easy to prepare aspirate and trephine biopsy. Also in majority of the lesions, they were complementary to each other. The benefit of both the processes done together permitted them to investigate the cytomorphology of the cells along with the pattern of distribution of the cells depending on the cases, hence help in making the diagnosis accurately.⁹ In another previous study, Sah SP et al assessed the chronic lymphoid disorder and assessed the diagnostic efficacy of BMA, BMY and flow cytometry (FC) in these lesions. Assessment and evaluation techniques were applied in 110 diagnostic and follow up samples from B cell disorders, chronic lymphocytic leukaemia (CLL; 65), non-Hodgkin's lymphoma (NHL; 39), and hairy cell leukaemia (HCL; 6). For both the FC

and immunohistochemistry specimens, they used a chosen panel of monoclonal antibody specimens. In CLL there was concordance among the three investigations in 71% of samples and in 88% while comparing FC and BMY only. In nine of 65 samples, FC and BMB were positive, although the aspirate was reported as negative. Four BMY negative samples had minimal residual disease (MRD) detected by FC, whereas two samples were positive both on BMB and aspirate but showed no evidence of disease on FC. In NHL, there was agreement between the three investigations in 22 of 39 cases, and in 27 of 39 cases there was agreement between FC and BMY. In eight of 39 NHL cases, FC was negative but the BMY was either positive (five) or uncertain (three), whereas in three of 39, FC was positive but BMY was either negative (one) or uncertain (two). In three of five uncertain BMY, no clonal population was detected by the polymerase chain reaction, whereas in the remaining two cases the nodular aggregates disappeared on further sectioning. Both BMY and FC are better than bone marrow aspirates for the detection of infiltration in B cell disorders. FC might be slightly more sensitive than BMY to detect MRD in CLL, whereas BMY may be slightly better than FC in NHL.¹⁰ In another study, conducted by Gilotra M et al, authors assessed and compared the efficacy of BMA with BMY in the diagnosis of different haematological disorders. On a total of 130 cases, they performed by BMA and BMY and performed comparative evaluation in 100 cases to see the complementary role of both the procedures. They excluded a total of 30 cases due to inadequacy of performing BMA, BMY, or

both. Wherever required, Immunohistochemistry (IHC) was performed. In their study of 100 cases, 87% of cases were confirmed on bone marrow biopsy and in remaining 13% of cases final diagnosis was achieved with the help of other ancillary investigations. These cases were excluded for calculation of concordance rate between BMA and BMJ. They observed that 72.4 percent and 27.6 percent were the concordance and discordance rate between BMA and BMJ respectively. BMJ cytology and trephine biopsy histopathology complement each other and the superiority of one method over the other depended on the underlying disorder.¹²

Conclusion

Under the light of above results, the authors conclude that all the three bone marrow examination techniques are complementary to each other.

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