International Journal of Medical Research Professionals
P-ISSN: 2454-6356; E-ISSN: 2454-6364
DOI: 10.21276/ijmrp

IJMRP

Original Research Article

Comparison of the Effectiveness of Bone Marrow Aspiration, Imprint and Biopsy in Patients Suffering From Acute Leukaemia

Dhanraj Sarda

Associate Professor, Department of Pathology,
Indira Gandhi Government Medical College, Nagpur, Maharashtra, India.

ABSTRACT

Background: Examination of bone marrow has wide applications in clinical medicine. Bone marrow can be evaluated by three ways – Bone marrow aspirate (BMA) smears, Imprints or touch preparations (BMI) of bone marrow core biopsies, and histological sections of core biopsies (BMBx). Hence; we planned the present study to assess and compare the effectiveness of bone marrow aspiration, imprint and biopsy in patients suffering from acute leukemia.

Materials & Methods: The present study included comparative evaluation of efficacy of bone marrow aspiration, imprint and biopsy in acute leukemia cases. We carried out bone marrow examination on 10 cases presenting with acute leukemia's. We included only those cases in which bone marrow examination was done by using all the three methods of BMA, BMI and BMBx will be included in the study. A Salah's needle was used to aspirate material from bone marrow. Biopsy was done using a Jamshidi/Janus trephine needle. After routine processing and paraffin embedding thin sections were cut and stained with Haematoxylin and Eosin stain. We analyzed all the results by SPSS software.

Results: Out of 10 cases, findings of BMA, BMI and BMBx were in concordance with each other in 70 percent of the cases. In two cases, dry tap was observed, which was further diagnosed with BMI and BMBx. Diluted marrow was observed in one case which was further diagnosed with BMI and BMBx. Findings of BMI and BMBx were in concordance with each other in 100 percent of the cases.

Conclusion: All the three diagnostic techniques are complementary to each other.

Key words: Aspiration, Biopsy, Bone marrow, Imprint.

***Correspondence to:**

Dr. Dhanraj Sarda,
Associate Professor,
Department of Pathology,
Indira Gandhi Government Medical College,
Nagpur, Maharashtra, India.

Article History:

Received: 04-06-2017, **Revised:** 01-07-2017, **Accepted:** 21-07-2017

Access this article online	
Website: www.ijmrp.com	Quick Response code
DOI: 10.21276/ijmrp.2017.3.4.061	

INTRODUCTION

Examination of bone marrow has wide applications in clinical medicine. It is a useful investigative tool for the diagnosis of many hematological and non-hematological disorders. The bone marrow evaluation may either confirm clinically suspected disease or may provide the previously unsuspected diagnosis.[1,2] Indications for bone marrow examination include further work-up of haematologic abnormalities observed in the peripheral blood smear; evaluation of primary bone marrow tumors; staging for bone marrow involvement by metastatic tumors; assessment of infectious disease processes, including fever of unknown origin and evaluation of metabolic storage diseases. It also forms an important prerequisite for follow-up of patients' undergoing chemotherapy, bone marrow transplantation and other modalities of medical treatment.[3]

Bone marrow can be evaluated by three ways – Bone marrow aspirate (BMA) smears, Imprints or touch preparations (BMI) of bone marrow core biopsies, and histological sections of core biopsies (BMBx).[4]

Under all the septic precautions bone marrow aspiration is done. Adequate local anaesthesia is important to minimize pain. The minimum amount of bone marrow needed for the tests indicated should be aspirated because the greater the volume of marrow aspirated the more dilution by peripheral blood occurs. It is useful to aspirate about 0.25 ml marrow fluid and films should be spread immediately. After thorough drying of slides staining is done and examined microscopically.[5-8]

Hence; we planned the present study to assess and compare the effectiveness of bone marrow aspiration, imprint and biopsy in patients suffering from acute leukemia.

MATERIALS & METHODS

The present study was planned in the department of general pathology of the medical institute and included comparative evaluation of efficacy of bone marrow aspiration, imprint and biopsy in acute leukemia cases. We carried out bone marrow examination on 10 cases presenting with acute leukemia's.

Written consent was obtained from all the patients after explaining in detail the entire research protocol. We included only those cases in which bone marrow examination was done by using all the three methods of BMA, BMI and BMBx will be included in the study. A Salah's needle was used to aspirate material from bone marrow. Biopsy was done using a Jamshidi/Janus trephine needle. After routine processing and paraffin embedding thin sections were cut and stained with Haematoxylin and Eosin stain.

After obtaining biopsy with a Jamshidi needle, the biopsy specimen were extruded through the hub of needle and then gently rolled across a glass slide to prepare imprint smears before it is placed in fixative. The touch preparations were allowed to dry and are stained in the same manner as films. We analyzed all the results by SPSS software. One way ANOVA was used for assessment of level of significance. P- value of less than 0.05 was taken as significant.

Table 1: Age and gender distribution of cases

Age Group (In Years)	Male		Female		Total	
	NO.	%	NO.	%	NO.	%
0 to 10	1	10	0	0	1	10
11 to 30	1	10	0	0	1	10
31 to 50	2	20	3	30	5	50
51 and above	2	20	1	10	3	30
Total	6	60	4	40	10	100

Graph 1: Age and gender distribution of cases

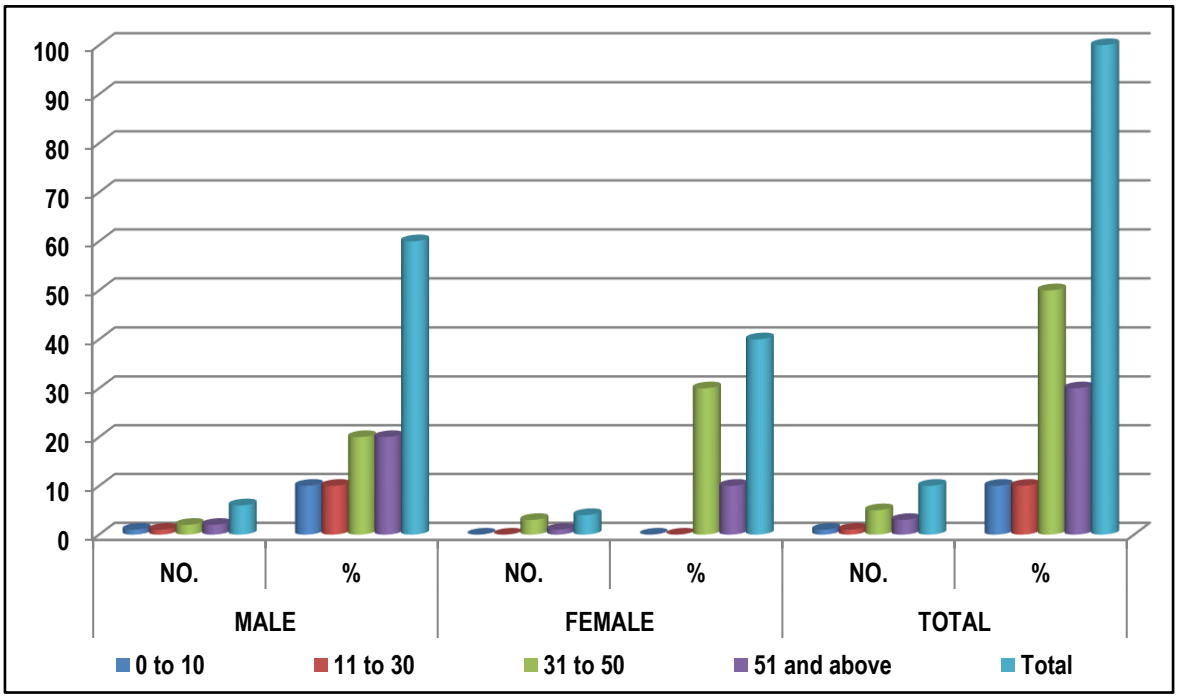

Table 2: Comparison of bone marrow aspiration, bone marrow imprint, bone marrow biopsy findings in acute leukemia

S. No.	BMA	BMI	BMBx
1.	AML	AML	AML
2.	AML	AML	AML
3.	AML	AML	AML
4.	Hypocellular ALL	Hypocellular ALL	Hypocellular ALL
5.	Dry tap	ACUTE LEUKEMIA	ACUTE LEUKEMIA
6.	Diluted marrow	ACUTE LEUKEMIA	ACUTE LEUKEMIA
7.	AML	AML	AML
8.	AML	AML	AML
9.	AML	AML	AML
10.	Dry tap	ACUTE LEUKEMIA	ACUTE LEUKEMIA

RESULTS

The present study was conducted in the department of pathology of medical college. We evaluated a total of 10 cases, in which bone marrow examination was indicated for acute leukaemia cases. Majority of the cases were more than 31 years of age. 60 percent of the cases were males while remaining 40 percent were females. Out of 10 cases, findings of BMA, BMI and BMBx were in concordance with each other in 70 percent of the cases. In two cases, dry tap was observed, which was further diagnosed with BMI and BMBx. Diluted marrow was observed in one case which was further diagnosed with BMI and BMBx. Findings of BMI and BMBx were in concordance with each other in 100 percent of the cases.

DISCUSSION

In the present study, we observed that findings of BMA, BMI and BMBx were in concordance with each other in 70 percent of the cases. We also observed that findings of BMI and BMBx were in concordance with each other in 100 percent of the cases. Parajuli S et al compared the role of bone marrow aspirate and trephine biopsy to formulate an effective and rapid method for diagnosing wide spectrum of hematological diseases. This is a three year retrospective study done from July 2010 to June 2013. A total of 95 cases presented with clinical haematological disorders; of which only 89 were biopsied and the correlation done. All the smears and sections were reviewed for morphological details and findings on aspirate and biopsy and compared to each other. Out of the 89 cases selected for study; bone marrow aspiration revealed diagnostic materials in 75 cases and 14 cases were inconclusive for a definite diagnosis. The diagnostic accuracy of the bone marrow aspiration cytology was 84.26%. Eighty eight cases were diagnosed on trephine biopsy of bone marrow with diagnostic accuracy of 98.87%. Both the aspiration cytology and trephine biopsy complement each other for evaluating any haematological disorder. Though cellular morphology is better understood in marrow aspirates and is equally effective to biopsy in diagnosing various anemias and leukemias; however it is the histopathological study of trephine biopsy that gives well preserved marrow architecture with its all cellular and stromal components.[1]

Sreedevi P et al emphasized on the crucial role of bone marrow aspiration in the diagnosis of hematological disorders. This was a retrospective study carried out in the department of Pathology, Rangaraya Medical College in a period of three months (April 2015 - June 2015). Bone marrow examination of 43 cases of suspected hematological disorders was carried out. All details of the patients were obtained from the record file in the department of pathology. 43 cases of bone marrow aspiration were taken. Erythroid hyperplasia was 9 cases (20.9%), Idiopathic Thrombocypenic Purpura was 7 cases (16.4%), Megaloblastic anemia was 5 cases (11.8%), Hypoplastic marrow was 4 cases, (9.3%) and acute leukemias was 3 cases (7%). Chronic myeloid leukemia, Multiple myeloma, Gauchers disease and Infiltrative marrow were 2 cases each (4.6%). Transient Myeloproliferative Disorder, Congenital Dyserythropoietic Anemia, Myelofibrosis and Megakaryocytic hypoplasia were each 1 case (2.3%). Normal marrow was 3 cases (7%). Bone marrow aspiration plays a crucial role to arrive and confirm the diagnosis of many hematological disorders.[9] Manju et al correlated the bone marrow aspiration and biopsy findings. This study was hospital-based prospective study in which 35 consecutive patients with haematological disorders were evaluated by both bone marrow aspiration and biopsy. The results were compared with that of previously published literature. Out of 35 cases, maximum number of cases were of acute leukemias 12 (34.28%) followed by lymphoprotiferatide disorders 7 (25%), and one case (2.86%) of myelodysplastic syndrome. Bone marrow aspiration resulted in dry tap in 4 (11.42%) cases, which was observed in aplastic anaemia, myelodysplastic syndrome, primary myelofibrosis and NHL, one case in each. Bone marrow biopsy is more reliable in assessing cellularity, bone marrow architectural pattern, distribution and fibrosis. Bone marrow biopsy is diagnostic investigation in 'dry tap' aspiration cases, which occur when the marrow is fibrotic or densely cellular. Overall both the procedures are complementary to each other and must be performed together for better evaluation of bone marrow.[10] Chauhana S et al evaluated sensitivity and specificity of trephine biopsy test for haematological and non-haematological disorder patients in comparison to bone marrow aspiration test. In this 1 year prospective study (June 2014–May 2015), we evaluated the haematological and non-haematological disorder patients by BMA and BMB (aided with I.H.C. whenever needed). The sensitivity and specificity of the tests were calculated. Among, final 504 hemotological/non haematological disorder patients, 416 cases were diagnosed (+ve) in BMA test, where as it was 494 in BMB test and with chi2 test it was highly significant as p = 0.0001. It was concluded that True positive cases were 416, True negative were 9 cases, false negative 78 cases and false positive was in one case only. The sensitivity and specificity of bone marrow trephine biopsy test was 84% and 90% respectively. BMB (aided with I.H.C) is a gold standard test for detecting different haematological and non hamatological disorders. In our study the sensitivity and specificity of BMB test was 84% and 90% respectively. When performed in association with BMA in the same sitting, significantly augments the chances of reaching a correct diagnosis.[11]

CONCLUSION

From the above results, the authors concluded that all the three diagnostic techniques are complementary to each other. However; future studies are recommended for better exploration of this field of pathology.

REFERENCES

1. Parajuli S, Tuladhar A. Correlation of bone marrow aspiration and biopsy findings in diagnosing hematological disorders – a study of 89 cases. Journal of Pathology of Nepal 2014; 4, 534- 38.
2. Tilak V, Das S, Bundhun S. Value of Bone Marrow Imprint Smears in Early Diagnosis of Bone Marrow Pathologies. Journal of Clinical and Diagnostic Research. 2014; 8(11): 01-03.
3. Bain BJ, Clark DM, Wilkins BS. The normal bone marrow. In: Bain BJ, Clark DM & Wilkins BS. Bone marrow Pathology. 4th Ed. Oxford: Wiley- Blackwell; 2010.p1-51.
4. Riley RS, Hogan TF, Pavot DR, Forysthe R et al. A Pathologist's Perspective on Bone Marrow Aspiration and Biopsy: I. Performing a Bone Marrow Examination. Journal of Clinical Laboratory Analysis 2004; 18:70–90.
5. Bain B. Bone marrow aspiration. Journal of Clinical Pathology. 2001;54(9):657-63.

6. Metikurke SH, Rashmi K, Bhavika R. Correlation of Bone Marrow Aspirate, Biopsies and Touch Imprint Findings in Pancytopenia. J Hematol 2013; 2(1):8-13.
7. Bain BJ. Morbidity associated with bone marrow aspiration and trephine biopsy – a review of UK data for 2004. Haematologica. 2006; 91:1293–94
8. Aboul-Nasr R, Estey EH et al. Comparison of Touch Imprints With Aspirate Smears for Evaluating Bone Marrow Specimens. Am J Clin Pathol. 1999 Jun; 111(6):753-8.
9. Sreedevi P et al. Spectrum of Haematological Disorders Detected By Bone Marrow Aspiration in a Span of 3 Months Period.Journal of Dental and Medical Sciences.2016;15(4):52- 56.
10. Manju, Kumar V, Gupta N et al. Role of bone marrow aspiration and biopsy in diagnosis of hematological disorders: a prospective study. J Pharm Biomed Sci 2016; 06(03):150–154.
11. Chauhan S, Pradhana S, Mohantya R et al. Evaluation of sensitivity and specificity of bone marrow trephine biopsy tests in an Indian teaching hospital. Alexandria Journal of Medicine. In Press. Available online 5 May 2017.

Source of Support: Nil.

Conflict of Interest: None Declared.

Cite this article as: Dhanraj Sarda. Comparison of the Effectiveness of Bone Marrow Aspiration, Imprint and Biopsy in Patients Suffering From Acute Leukaemia. Int J Med Res Prof. 2017; 3(4):266-69. DOI:10.21276/ijmrp.2017.3.4.061