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Original Article

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

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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; present study was planned 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. Bone marrow examination on 10 cases presenting with acute leukemia's were carried out. Only those cases in which bone marrow examination was done by using all the three methods of BMA, BMI and BMBx were included. 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.

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.

KEYWORDS: Aspiration, Biopsy, Bone Marrow, Imprint.

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; present study was planned 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 Pathology, Dhanalakshmi Srinivasan Medical College and Hospital, Perambalur, Tamil Nadu (India) and included comparative evaluation of efficacy of bone marrow aspiration, imprint and biopsy in acute leukemia cases. Bone marrow examination on 10 cases presenting with acute leukemia's were carried out. Ethical approval was taken from the institutional ethical committee and written consent was obtained from all the patients after explaining in detail the entire research protocol. Only those cases in which bone marrow examination was done by using all the three methods of BMA, BMI and BMBx were 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. Analysis of results was done 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.

RESULTS

The present study was planned in the Department of Pathology, Dhanalakshmi Srinivasan Medical College and Hospital, Perambalur, Tamil Nadu (India) and included comparative evaluation of efficacy of bone marrow aspiration, imprint and biopsy in acute leukemia 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.

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

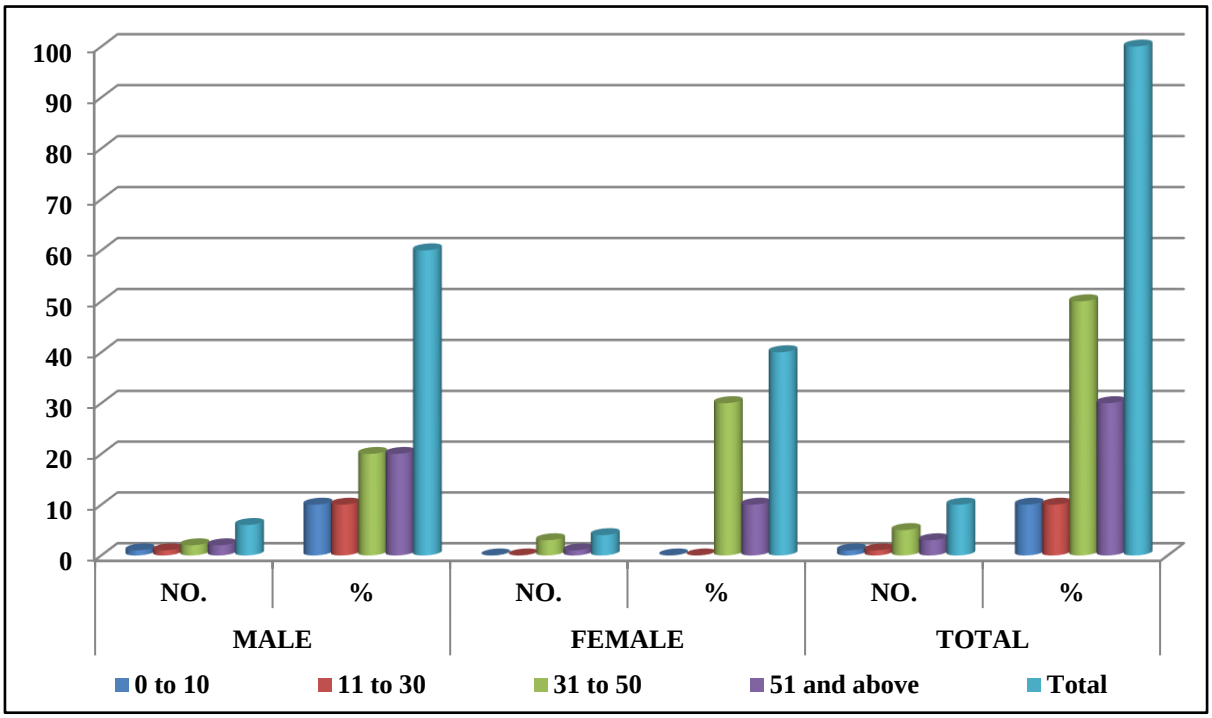

Table 2: Comparison of bone marrow aspiration, bone marrow imprint, bone marrow biopsy findings in acute leukemia

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

DISCUSSION

In the present study, it was observed that findings of BMA, BMI and BMBx were in concordance with each other in 70 percent of the cases. Also the 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]

Atla BL et al evaluated the clinical profile, spectrum, cytological and histological pattern of various hematological disorders reported in bone marrow aspiration and trephine biopsy respectively. Bone marrow aspiration was diagnostic in 53 (50%) cases and trephine biopsy was diagnostic in 52 (50%) cases. Anemias (50%) and leukemias (16%) are most common hematological disorders. This study showed the usefulness of bone marrow aspiration and trephine biopsy in evaluation of the bone marrow in routine haematological disorders and also for understanding disease progression, for diagnosis and therapeutic evaluation. These are also helpful in planning further investigation and management.[9] Damulak Obadiah Dapus carried a study among 97 bone marrow aspiration samples in hospital in Nigeria within the study period. 55(56.8%) were males while 42(43.2%) were females. Eighty four (87.6%) had pathologic outcome while 13(13.4%) had normal or reactive marrow appearance. Pathologic marrow outcome were 28.6% leukaemias, 33.3% nutrient deficiency anaemias, 11.9% burkitt's lymphoma, 4.1% multiple myloma, 8.3% bone marrow failure and others 13.I%. Common haematologic disorders in our setting are nutritional anaemias and leukaemias. There is need to expand the scope of laboratory investigations beyond morphology. [10] Bashwari L carried a study among a total of 1813 bone marrow biopsies or aspirations, or both, performed. The main indications for bone marrow examination in a descending order of frequency were the following: The diagnosis and management of acute leukemia 403 (22.2%), staging for lymphoma 276 (15.2%), evaluation of pancytopenia 215 (11.9%), thrombocytopenia 173 (9.5%), investigation of anemia 151 (8.3%), fever (pyrexia of unknown origin) 130 (7.2%), lymphadenopathy 120 (6.6%), and hepatosplenomegaly 80 (4.4%). The most common diagnoses encountered were: acute lymphoblastic leukemia 242 (13.3%), immune thrombocytopenia 123 (6.8%), acute myeloblastic leukemia 80 (4.4%), hypersplenism 79 (4.4%), chronic granulocytic leukemia 73 (4.0%), megaloblastic anemia 66 (3.6%), bone marrow positive for lymphomatous infiltration 63 (3.5%), chronic lymphocytic leukemia 40 (2.2%), and multiple myeloma 32 (1.8%). Thus, bone marrow examination is a very important investigation for establishing the diagnosis in many conditions, especially hematological neoplasms.[11]

CONCLUSION

From the above results, it can be 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.

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