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Bone marrow aspiration cytology study among patients with hematological disorders in a tertiary care hospital in Varanasi

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Abstract

Background-: Bone marrow aspiration remains an important diagnostic test for evaluation of various hematological disorders especially in resource poor settings. This study aims to evaluate the etiology of hematological disorders, its spectrum and its clinical indications among various age groups.

Materials and Methods: This was a cross sectional study of two years duration carried out in department of Pathology at Heritage institute of medical sciences, Varanasi from January 2019 to December 2020.

The bone marrow aspiration of 80 patients was performed and examined. The details of patients like relevant clinical history, physical examination and laboratory reports were noted.

Result: The study of bone marrow aspiration was performed among 80 subjects. The age range was from 7 months to 85 years and the mean age was 27.6 years. The most common indication for bone marrow aspiration was unexplained anemias in 63.75% cases. The spectrum of hematological disorders diagnosed on bone marrow aspiration in our study includes 31.25% cases of megaloblastic anemia, 15% cases of micro normoblastic erythroid hyperplasia, 13.75% cases of dimorphic anemia,11.25% cases of hypo proliferative bone marrow,6.25% cases of hematological malignancies,10% cases with immune thrombocytopenia and 2.5% cases of plasma cell dyscrasias.

Conclusion: Bone marrow aspiration remains an important diagnostic tool for hematological disorders specially in resource poor settings in eastern uttar Pradesh.This study provides an important guide into the causes of unexplained anemias.

Keywords: Bone marrow aspiration, hematological disorders

Introduction

During extra uterine life, hematopoesis is normally confined to the bone marrow. The bone marrow is either red marrow, containing hematopoetic cells or

yellow marrow which is largely adipose tissue[1].Examination of bone marrow is an invasive procedure for the diagnosis of various hematological and non hematological diseases. Specimens of bone marrow for cytological and histological examination may be obtained by aspiration biopsy, core biopsy by trephine needle or by an electric drill by open biopsy and autopsy. The two most useful procedure that are complimentary to each other are aspiration biopsy and core needle biopsy[2,3]

The scope of bone marrow specimen goes beyond assessment of hematopoetic and non hematopoetic marrow elements. Bone marrow specimens are further useful in cytochemical special staining, immuno phenol typing, microbiological tests, cytogenetic analysis and molecular studies.[4]

The bone marrow aspiration is performed from the ileum, particularly from posterior iliac crest. Aspiration from the medial surface of tibia can yield useful diagnostic specimens upto 18 months of age. Sternal aspiration should be carried out from the first part of body of sternum at the level of second intercostal space.[5]

Aspirates from the posterior iliac crest are usually taken from posterior superior iliac spine as both aspiration and biopsy can be performed from the same site at this position, which makes it preferable site for aspiration.[5]

Bone marrow aspiration has been proved to be an excellent diagnostic tool in cases of unexplained Pancytopenias, unexplained organomegaly, diagnosis of acute leukemias, megaloblastic anemia, plasma cell myeloma, chromosomal studies, staging of lymphoma and molecular genetic studies.[6-11]

A proper informed consent is mandatory before performing this procedure along with pre procedure work up of patient which should meet the criteria for performing the bone marrow aspiration that includes hemostatic status, explaining the procedure in language that patient can understand and taking proper consent.

This study was conducted with the aim of assessing the bone marrow findings among individuals with various hematological disorders.

Materials and Methods

This cross sectional study was conducted in the department of pathology in Heritage institute of medical sciences, Varanasi for two years from January 2019 to December 2020.

Bone marrow aspiration was performed by trained pathologists on the patients who were referred from department of medicine. All bone marrow aspirations were profiled according to relevant clinical data, laboratory tests and intra and post procedure details.

The aspiration was performed using standard guidelines adopted from ICSH. Patients were followed up for a minimum period of one week, post procedure. Patients with known disorders of coagulation or thrombocytopenia below 20000 per micro liter were deferred from the procedure. The slides were stained with Leishman stain. Peripheral smears, reticulocyte count and hemograms were obtained for all the cases. The slides were reported by two pathologists and the data was tabulated and analysed using SPSS 27 software.

Results

Table 1 show the age and sex distribution of the patients. In the present study bone marrow aspiration was performed among 80 subjects. The age range was from 7 months to 85 years and the mean age was 27.6 years. There were 55 males and 25 females in this study.

Table 2 shows the cellularity of the bone marrow aspirate which showed hypo cellularity in 45% cases,

hyper cellularity in 40% cases and norm cellular marrow in 15% cases.

Table 3 shows the indications for performing the bone marrow aspiration, commonest being unexplained anemias in 63.75% cases, unexplained bicytopenia in 10% cases, unexplained pancytopenia in 11.25% cases, suspected leukemia in 6.25%,unexplained splenomegaly in 1.25% cases, unexplained fever in 5% cases.

Table 4 shows the spectrum of hematological disorders diagnosed on bone marrow aspiration which includes 31.25% cases of megaloblastic anemia,15% cases of micronormoblastic erythroid hyperplasia,13.75% cases of dimorphic anemia,11.25% cases of hypoproliferative bone marrow,6.25% cases of hematological malignancies,10% cases with immune thrombocytopenia and 2.5% cases of plasma cell dyscrasias.[Figure 1-4]

Discussion

Peripheral blood smears, bone marrow aspiration and biopsy are suitable diagnostic tools especially in areas of eastern Uttar Pradesh where costlier tests like molecular diagnostics and immunophenotyping is still not widely available. Bone marrow aspiration is a useful tool in various hematological and non hematological disorders. The common hematological conditions are acute leukemias, myeloproliferative disorders, hematological and lymphoid tumors and nutritional deficiency disorders. Common non hematological conditions include infectious diseases like tuberculosis, parasitic infections and metastatic deposits [14,15]

The age range of the patients was from 7 months to 85 years with mean age of 27.6 years, with 55 males and 25 females, M:F=2.2:1.This was similar to studies by Prasanna et al[16] and Gohil et al[17].

The most common indication for referring the patient for bone marrow aspiration was unexplained anemia in 63.75% cases. Most of the cases were diagnosed as anemia(60% cases)with megaloblastic anemia(31.25% cases) as most common type of anemia. Other common disorders were aplastic anemia(11.25%) and immune thrombocytopenia (10%). Normocellular bone marrow finding was evident among 05% cases. These are similar to studies by Prasanna etal[16],Gohil et al[17] and Adenola et al[18].

The limitation of bone marrow aspiration procedure is mixing of aspirate with peripheral blood which may affect the correct estimation of cellularity. However it is important to include “dry tap” and follow up with bone marrow biopsy and should not be discarded due to faulty procedure.

Conclusion

Bone marrow aspiration remains an important diagnostic tool for hematological disorders especially in resource poor settings in eastern Uttar Pradesh. This study provides an important guide into the causes of unexplained anemias.

This can be performed routinely and does not require any specialized equipment. This study establishes the usefulness of bone marrow aspiration in various hematological disorders.

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Legend Tables and Figures

Table 1: Age and Sex distribution of BMA subjects				
Age (years)	Number of cases	Males (55)	Females (25)	Percentage
< 15	16	08	08	20%
15-30	12	07	05	15%
31-45	21	14	07	26%
> 45	31	26	05	38%

Table 2: Cellularity of bone marrow in aspirated smears	
Marrow cellularity	Number of cases %
Hypercellular	32
Normocellular	12
Hypocellular	36

Table 3: Indication of BMA	
Indication	Number of cases %
Unexplained anemia	51(63.75%)
Unexplained Leuco-thrombocytopenia	08 (10%)
Unexplained pancytopenia	09(11.25%)
Suspected leukaemia	05(6.25%)
Unexplained splenomegaly	01(1.25%)
Unexplained fever	04(5%)
Others	02(2.5%)

Table 4: Spectrum of haematological disorders diagnosed with BMA Cytology		
Broad Category (%)	Diagnosis	Number of cases (%)
Nutritional anemia	Micro normoblastic	12 (15%)
	Megaloblastic	25 (31.25%)
	Dimorphic	11(13.75%)
Aplastic anemia	Aplastic anemia	09 (11.25%)
Haematological malignancy	CML	01 (1.25%)
	AML	01(1.25%)
	ALL	01(1.25%)
	CLL	01(1.25%)

Immune thrombocytopenic purpura	ITP	08 (10%)
Others	HLH	01(1.25%)
	MDS	01(1.25%)
	PLASMA CELL DYSCRASIA	02(2.5%)
	HYPERSPLENISM	01(1.25%)
Infections	INFECTIONS	02(2.5%)
Normal bone marrow	NORMAL Bone Marrow	04 (5%)

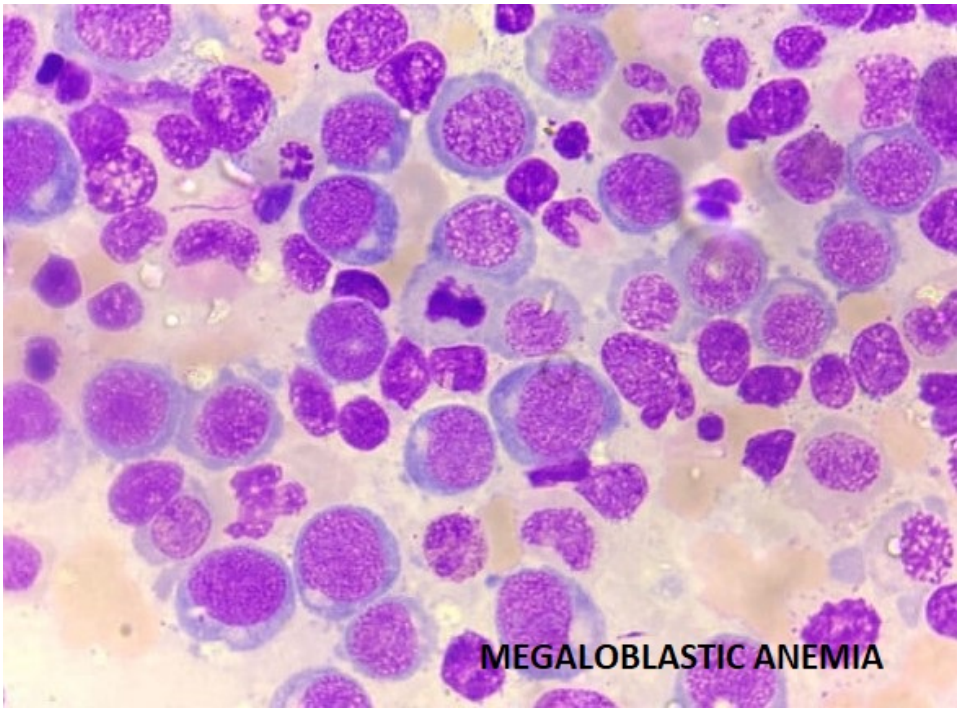

Figure 1

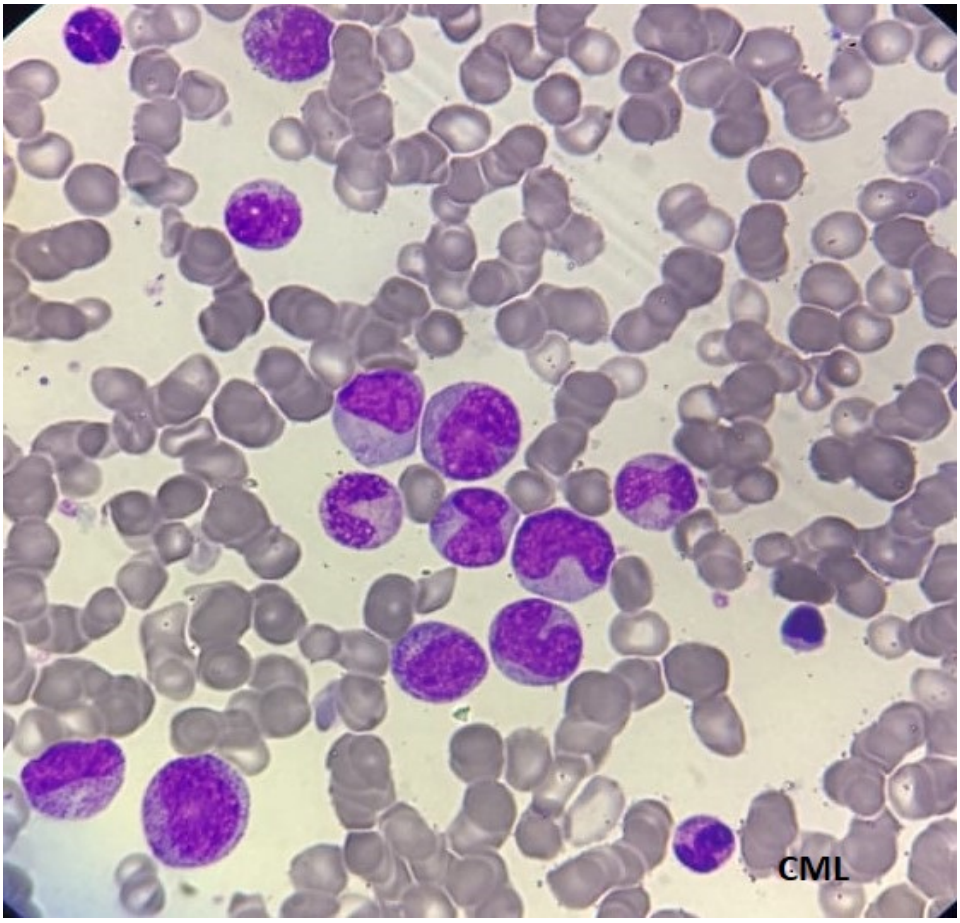

Figure 2

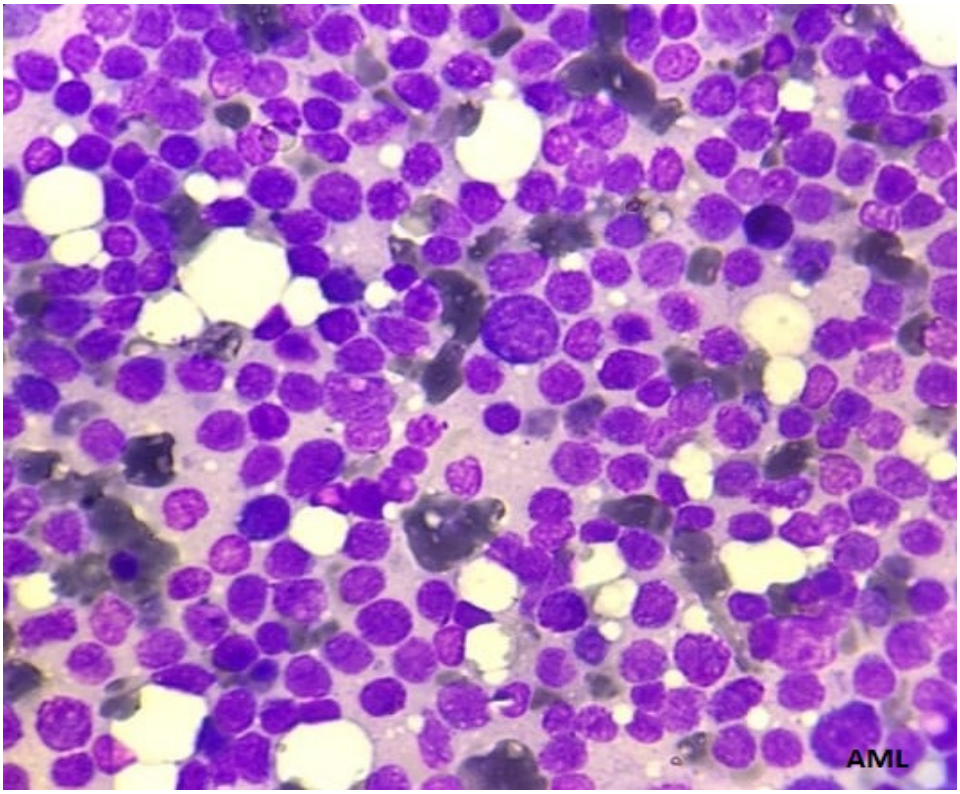

Figure 3

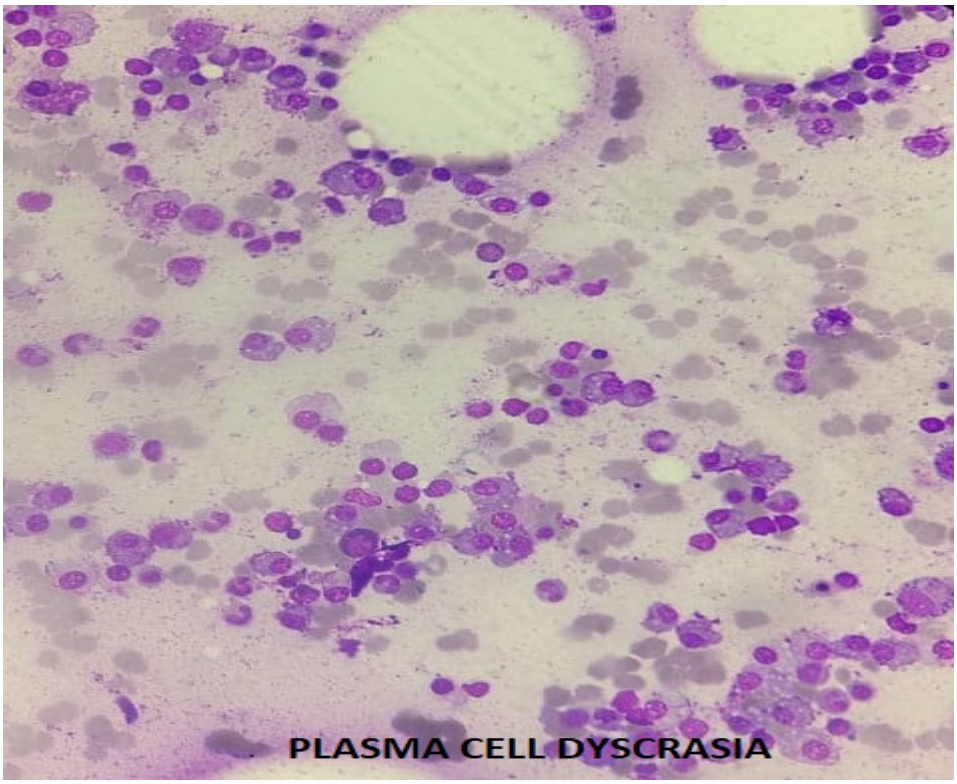

Figure 4