

Original Research Article

Bone marrow aspiration in haematological disorders: study at a tertiary care centre

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ABSTRACT

Background: The bone marrow examination is an essential investigation for the diagnosis and management of many disorders of the blood and bone marrow. Bone marrow aspiration (BMA) alone is usually sufficient to diagnose nutritional anaemias, and most of the acute leukaemias. Aim was to study the spectrum of haematological disorders diagnosed on bone marrow aspiration.

Methods: This study was conducted in the Department of Clinical Haematology in Sher e Kashmir Institute of Medical Sciences, Kashmir for a period of 2 years from December 2015 to December 2017. Bone marrow examination of 2131 cases of suspected hematological disorders was carried out. Bone marrow was aspirated from posterior superior iliac spine under local anaesthesia. Aspirates of dry tap were excluded from the study. Aspiration smears were stained with Leishmann stain for morphological examination.

Results: A total of 2131 cases were included in this study. Male to female ratio in our study was 1.9:1. The age range of cases was from 1-80 years and the mean age was 47.3 years. Anemia was the most common haematological disorder in our study accounting for 25.6% of cases followed by acute leukaemia accounting for 22.3% and multiple myeloma (13.3%). Among anemias, megaloblastic anemia was most common followed by dual deficiency anemia. Among leukaemias, acute myeloid leukaemia (13.2%) was more common than acute lymphoblastic leukaemia (9.1%).

Conclusions: Bone marrow aspiration cytology is a mildly invasive technique which can diagnose many hematological and non-hematologic diseases that can be confirmed by more advanced investigations viz. serological, biochemical or molecular. It is a highly informative test procedure performed for evaluating blood and blood related diseases in our environment.

Keywords: Anemia, Bone marrow aspiration, Leukaemia

INTRODUCTION

Bone marrow examination is useful in the diagnosis of both hematological and non-hematological disorders. The two most important techniques used for the diagnosis of hematological disorders are bone marrow aspiration and trephine biopsy. Bone marrow aspiration (BMA) is an invasive procedure whereby spongy bone marrow is

obtained through a needle aspiration for diagnostic evaluations especially cytology and stem cell harvest.¹⁻⁴ Bone marrow examination was first done by Mosler in 1876 using a regular wood drill to aspirate bone marrow particles from a patient with leukaemia.² Bone marrow aspiration (BMA) alone is usually sufficient to diagnose nutritional anaemias, and most of the acute leukaemias. In today's practice, use of BMA is not limited to

evaluation of haematopoietic and non-haematopoietic marrow cells. BMA specimens are useful in further diagnostic assays including cytochemical/special stainings, immunophenotyping, microbiologic tests, cytogenetic analysis and molecular studies.^{1,2,5} Aim was to study the spectrum of haematological disorders diagnosed on bone marrow aspiration.

METHODS

This study was conducted in the department of Clinical Haematology in Sher e Kashmir Institute of Medical Sciences, Kashmir for a period of 2 years from December 2015 to December 2017. BMA were performed using a standard unit protocol as adapted from ICSH guidelines and other authorities.¹⁻⁵ Written informed consent of all study subjects was obtained before undergoing the procedure. BMA was done from posterior superior iliac spine in all the patients with salah needle. the aspirate was drawn with a 20ml plastic syringe. Bone marrow smears were prepared immediately following aspiration. After being air dried these smears were stained with Leishmann stain for morphological examination. Iron stained (Perls stain) slides were examined in all the cases, Periodic Acid Schiff (PAS) stain, Sudan Black B(SBB) and Myeloperoxidase (MPO) stain was done wherever required. Aspirates of dry tap were excluded from the study.

RESULTS

A total of 2131 cases were included in this study. Male to female ratio in our study was 1.9:1. The age range of cases were from 1-80 years and the mean age was 47.3 years. Bone marrow examination are given in Table 1.

Table 1: Categories of diseases diagnosed by bone marrow aspirate cytology.

Haematological disorder	Cases (n)	%
Anemias	550	25.6
Megaloblastic anemia	310	14.5
Iron deficiency anemia	70	3.2
Dual deficiency anemia	170	7.9
Acute leukaemia	476	22.3
Acute myeloid leukaemia	281	13.2
Acute lymphoblastic leukaemia	195	9.1
Aplastic anemia	60	2.8
Multiple myeloma	285	13.3
Normal marrow	147	6.8
Metastasis	95	4.4
Lymphoma infiltration	87	4.0
Chronic lymphocytic leukaemia	80	3.7
Myeloproliferative neoplasm	70	3.2
Relapse of acute leukaemia	80	3.7
Gauchers disease	02	0.09
Malaria	02	0.09
Leishmaniasis	02	0.09
Aparticulate	100	4.6
Myelodysplastic changes	95	4.4

Anemia was the most common haematological disorder in our study accounting for 25.6% of cases followed by acute leukaemia accounting for 22.3%. Among anemias, megaloblastic anemia (Figure 1) was most common followed by dual deficiency anemia.

Among leukaemias, acute myeloid leukaemia (Figure 2) was most common. Leukaemia was followed by multiple myeloma (Figure 3) constituting 13.3% of all cases.

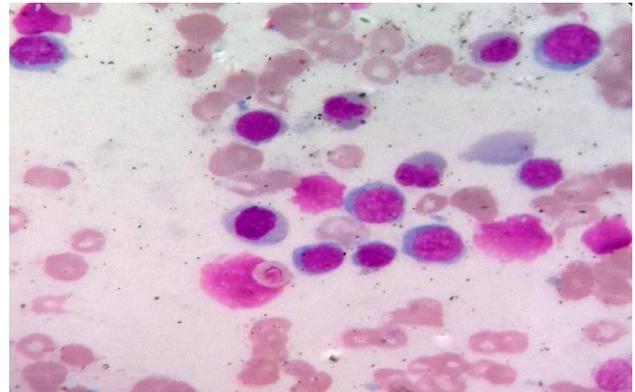


Figure 1: Photomicrograph of bone marrow aspirate smear showing megaloblasts with sieve like chromatin (100X, Leishman stain).

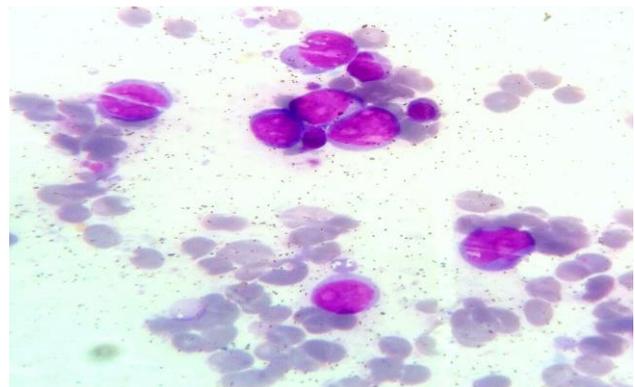


Figure 2: Marrow aspirate showing myeloblasts with high N:C ratio, fine chromatin and prominent nucleoli with Auer rod (100X, Leishman stain).

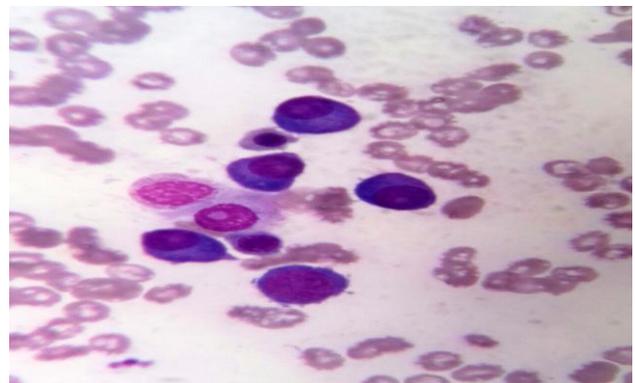


Figure 3: Marrow aspirate showing plasma cells with eccentric nucleus, perinuclear hoff and basophilic cytoplasm (100X, Leishman stain).

DISCUSSION

Examination of the bone marrow is one of the most important pillar in diagnosing hematological disorders. The age range of cases were from 1-80 years and the mean age was 47.3 years with male to female ratio of 1.9:1. Similar results were seen by Niazi et al, in their study with patients in the age range of 1 to 75 years and male predominance (1.7:1).⁶ Male predominance was also seen by Adewoyin AS et al.⁷ Table 2 shows comparison of different studies regarding age and sex distribution.

Table 2: Comparison of age and sex distribution in different studies.

Study	Age (years)	M:F
Pudasaini S et al ¹⁰	9 m-75	1:1.1
Egesie et al ¹³	3-80	1.5:1
Gayathri et al ¹⁴	2-80	1.2:1
Kibria et al ¹²	3.5-80	1:0.59
Niazi et al ⁶	1-75	1.7:1
Jha et al ¹⁵	1-79	1.5:1

In our study, Anemia was the most common haematological disorder (25.6%) with megaloblastic anemia being predominant accounting for 14.5%. In a similar study conducted by Atla BL et al, megaloblastic anemia was the most common finding (44.0%) followed by aplastic anemia (11.9%).⁸ Similar result was seen by Ranabhat S et al, with megaloblastic anemia being most common.⁹ Adewoyin AS et al, conducted a study where anemia constituted most common aspiration haematological disorder with combined (substrate) deficiency (26.1%) being the predominant one.⁷

Acute leukaemia was the second largest group accounting for 22.3% with acute myeloid leukaemia constituting 13.2%. Cytogenetic and flow cytometric investigations were advised to classify leukemia based on WHO/REAL classification system. In a study conducted by Ranabhat S et al, malignancy was the second most common group after anemias diagnosed on BMA.⁹ Also, in that study among leukaemias, acute myeloid leukaemia was found to be the most common type of leukemia. Pudasaini S et al, in their study, diagnosed acute leukaemia in 12.3% with acute myeloid leukemia (10.5%) more common than acute lymphoid leukemia (1.8%).¹⁰ Ghartimagar D et al, in his study found acute myeloid leukaemia (52%) to be more common than acute lymphoblastic leukaemia (10%).¹¹ Acute myeloid leukemias were the common cause of haematological malignancies in a study conducted by Atla BL et al.⁸ Similar results are seen in some other studies.^{12,13}

Mutiple myeloma was the second most common malignant disorder seen in our study accounting for 13.3%. Our study was comparable to that of Ranabhat S et al.⁹ In their study, leukemia constituted 80% of

malignant haematological disorders followed by multiple myeloma constituting 13.3%

Aplastic anemia is more common in developing countries than in developed countries. Aplastic anemia was seen in 2.8% of cases in our study. Comparable to our study, hypoplastic anemia was seen in 5.3% cases in a study done by Pudasaini et al.¹⁰ However in some studies it has shown high incidence.⁹ In the study of Atla et al, 19% cases had aplastic anemia.⁸ MDS was seen in 4.4% cases. Other series showed incidence of MDS ranging from 2% to 7.9%.^{12,14-16}

In our study, metastatic deposits were seen in 4.4% of cases. Adewoyin AS et al, in their study had seen marrow carcinomatosis in 7.9% cases.⁷ D Ghartimagar et al in their study showed metastasis in 6%, normal marrow findings were seen in 6.8% cases.⁶ Normal marrow study was seen in 3.8% cases in the study of Atla et al.⁸ while 10.5% cases had a normal marrow in study by Pudasaini et al.¹⁰

CONCLUSION

Bone marrow aspiration cytology is a mildly invasive technique which can diagnose many hematological and non-hematologic diseases that can be confirmed by more advanced investigations viz. serological, biochemical or molecular. It is a highly informative test procedure performed for evaluating blood and blood related diseases in our environment. However, bone marrow sample cannot be obtained (dry tap) in a proportion of cases. In such cases, a bone marrow biopsy needs to be performed.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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