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Original Research

Evaluation Of Various Hematological And Non-Hematological Conditions By Bone Marrow Aspiration And Biopsy

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ABSTRACT

Background: Bone marrow examination is a valuable diagnostic tool in hematology, providing essential information for the diagnosis and management of hematological and some non-hematological disorders. Bone marrow evaluation may either confirm clinically suspected disease or may provide the previously unsuspected diagnosis.

Aims: This study determine the diagnostic efficacy of the bone marrow aspiration and bone marrow biopsy findings for evaluation of haematological and non-haematological disorders.

Materials and Methods: This prospective study was performed on 100 patients who were referred for bone marrow examination by clinician at GMCH, Aurangabad, Simultaneous estimation of bone marrow aspiration (BMA) and bone marrow biopsy (BMB) was done on all patients and obtained finding were recorded and analysed.

Results: Among total studied cases, 90% were diagnosed as haematological disorders followed by 7% were non-haematological disorders and 3% were normal bone marrow. The most common indication of BME was anaemia under evaluation (42%), suspected lymphoma for staging (37%), pyrexia of unknown origin (31%) and pancytopenia (21%), The common haematological disorder encountered was anaemia (24.4%) followed by Plasma cell disorder (21.1%), Myeloproliferative neoplasms (16.6%), Lymphoproliferative disorder (11.1%), leukemia's (9.9%) and Immune thrombocytopenic purpura (6.6%). Non-haematological disorders included granulomatous lesions (42.8%), followed by metastatic solid tumour deposits (25%), infection (12.5%) and lymphoma (12.5%).

Conclusion: Bone marrow examination is a safe, and gold standard procedure foraccurate diagnosis of various haematological and non-haematological disorders. Bone marrow aspiration and biopsy complement to each other and should be performed simultaneously for complete bone marrow work up and evaluation.

Keywords: Bone marrow aspiration, Bone marrow biopsy, haematological disorder, non-haematological disorders.

INTRODUCTION

Bone marrow aspiration and biopsy is useful in the diagnosis of both haematological and non-haematological disorders. Bone marrow aspiration is procedure where bone marrow is obtained through a needle aspiration for diagnostic evaluations [1-2]. It may be useful in establishing the diagnosis of storage diseases and metastatic non-haemopoietic malignancies or when a leucoerythroblastic peripheral blood picture is present. Deviations from the normal may be qualitative with abnormal cell morphology or quantitative with aplasia, hypoplasia or hyperplasia [3]. Common indications for performing bone marrow aspiration are pancytopenia, refractory thrombocytopenia, leucopenia, malignant condition, Pyrexia of unknown origin, investigation of hypersplenism and lymphadenopathy [4]. Common indications for performing bone marrow biopsy are failed marrow (dry tap), Aplastic anemia, Hodgkin's and non Hodgkin's lymphoma, myelofibrosis and myelodysplasia [5]. Bone marrow aspiration (BMA) offers valuable insights into the bone marrow's

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cellularity, structure, and the maturity of different blood cells. This diagnostic tool is particularly useful for diagnosing and staging hematological malignancies, including leukemia's [6]. The diagnostic utility of both modalities differs in different conditions. Simultaneous assessment of BMA and BMB allows for a more detailed marrow assessment that may be impossible to achieve with the use of any one approach alone. Although both procedures are performed simultaneously, they are assessed at different points in time. Pathologists often view the BMA smears in the clinical pathology section in isolation from the BMB as it is processed rapidly. The BMB is received in the histopathology section, and its processing is a lengthy and tedious procedure as it requires decalcification; additionally, histopathologists may not have steady access to the aspirate smears [7-8].

AIMS AND OBJECTIVES

The purpose of this study was to investigate the hematological and non hematological disorders, through bone marrow aspirate examination and bone marrow biopsy findings in GMCH, Aurangabad.

MATERIAL AND METHODS

This prospective observational study was conducted in the Department of Pathology, in GMCH, Aurangabad India. The study subjects consisted of clinically suspected cases of either hematological or non-hematological disorders, that bone marrow aspiration and biopsy was advised by their clinicians attending the Department of Pathology in study period.

Inclusion criteria

- Patients between 2 to 80 years of age with both genders
- Patients indicating Bone marrow aspiration and biopsy
- Patients whose parents or patients itself provided written informed consent

Exclusion criteria

- Patients with bleeding or coagulation disorders and terminally ill patients
- Patients have Diluted bone marrow samples
- Patients whose not provided written informed consent

Data collection: Details of the patient demographic profile of all study patients and a detailed clinical history including presenting complaints, dietary history, and drug history were recorded were taken from medical case records like age, sex, chief complaints, investigations, and clinical diagnosis.

Bone marrow aspiration slides were stained with Leishman stain and Bone marrow biopsy slides were made after tissue processing and then processed and stained with haematoxylin and eosin stains. Special stains were performed when ever required Microscopic evaluation of Bone marrow aspiration slide and biopsy slide were done. Relevant clinical details and results of previous investigations such as complete blood count (CBC), peripheral blood smear (PBS), reticulocyte count, immature reticulocyte fraction (IRF), and coagulation profile were reviewed.

Statistical analysis: Data were analysed by using SPSS version 22**.** For categorical variables, frequency and percentages; for continuous variables, mean, SD, or median and range were used. For analysis of variance, the chi-square test and the student's t-test were used; $P < 0.05$ was regarded as statistically significant.

RESULTS

A total of 100 cases were studied. Among the 100 cases studied, 90% were haematological disorders followed by 7% non-haematological disorders and 3% were normal bone marrow. The most common (35%) age group of presentation was 41 to 60 years, with a mean age of 43.27 years. Most of the patients were males accounting for 66%. Most of them (59%) resided in rural area and 39% belong to lower socio-economic class.

Table 1: Socio-demographic characteristics of study participants

Socio-demographic characteristics		Frequency	Percentage
Age groups	1-20 years	26	27.3%
	21-40 years	30	34.5%
	41-60 years	35	31.8%
	>60 years	09	6.4%
Gender	Male	66	66%
	Female	34	34%
Residential status	Rural	59	59%
	Urban	41	41%
Socio-economic class	Lower	39	39%
	Middle	35	35%
	Upper	26	26%

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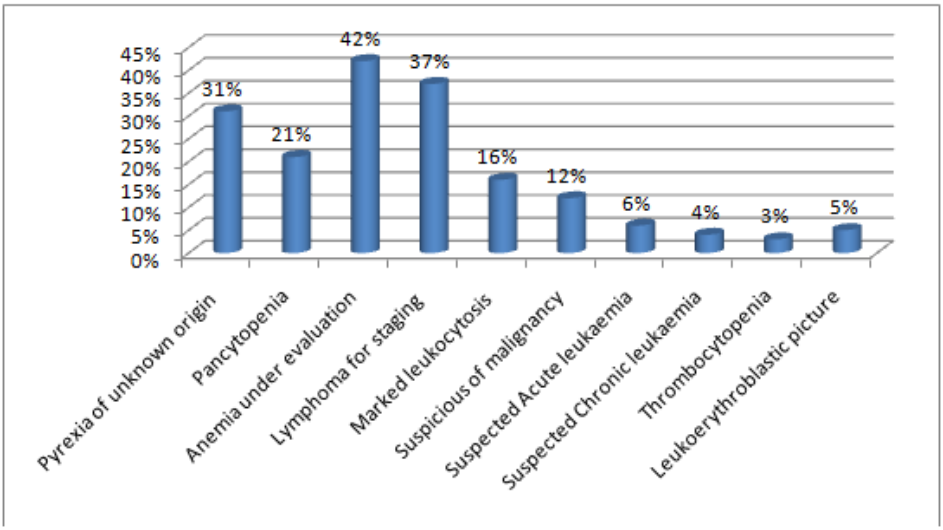
The most common indication was anaemia under evaluation (42%), followed by suspected lymphoma for staging (37%), fever/pyrexia of unknown origin (31%), pancytopenia (21%), marked leukocytosis (16%), suspicious of malignancy (12%), suspected acute leukemia (6%), Leukoerythroblastic picture (5%), suspected chronic leukemia (4%) and thrombocytopenia (3%).

Graph 1: Indication for bone marrow aspiration and biopsy among study subjects



On bone marrow examination Megaloblastic anaemia (24.4%) were the most common hematological disorders followed by Plasma cell disorder (21.1%)**,** Myeloproliferative neoplasms (16.6%), Lymphoproliferative disorder (11.1%), leukemia's (9.9%) and Immune thrombocytopenic purpura (6.6%). Details shown in table: 2.

Table 2: Distribution of various haematological disorders by bone marrow examination

Indication	Total case (90)	Percentage
Megaloblastic marrow	22	24.4%
Plasma cell disorder	19	21.1%
Myeloproliferative neoplasms	15	16.6%
Lymphoproliferative disorder	10	11.1%
Myelodysplastic syndrome	03	3.3%
Acute myeloid leukaemia	02	2.2%
Acute myeloid leukemia with myelodysplastic syndrome	01	1.1%
Hypereosinophilic syndrome	01	1.1%
Immune thrombocytopenic purpura	06	6.6%
Haemophagocytic syndrome	01	1.1%
Hypoplastic marrow	03	3.3%
ALL	04	4.4%
CML	03	3.3%

Among non hematological disorder granulomatous lesion were most common (42.8%) followed by Metastatic solid tumour deposit (25%), Infection (12.5%) and Lymphoma (12.5%).

Table 3: Various non-haematological lesions by bone marrow examination

Clinical Diagnosis	Frequency	Percentage
Granulomatous lesion	3	42.8%
Metastatic solid tumour deposit	2	25%
Infection	1	12.5%
Lymphoma	1	12.5%

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DISCUSSION

Bone marrow aspiration is one of the well established, cost effective diagnostic test for evaluation of many haematological and non-haematological disorders and thereby, enabling to formulate an effective treatment, staging and management of malignant lesions. It also helps in early diagnosis compared to bone marrow biopsy.

In this study the majority of cases encountered were haematological disorders by bone marrow examination, concordance with various studies by Khatik, et al [9] and Goyal, et al. [10].

Present study observed that the majority of the cases were 41-60 years age group with the mean age being 43.27 years. The age distribution was comparable to the studies conducted by Shashidhar M R, et al [11] and Atchyuta, et al.[12].

Male were predominance than female in the current study, in agreement with the Renuka Verma et al [13] and Birare, et al. [14].

The common indications for bone marrow examination include unexplained anaemia, cytopenia, leukocytosis due to suspected leukaemias, leuko-erythroblastic picture raising suspicion of BM infiltration, treatment monitoring and staging of some malignancies, unexplained splenomegaly, pyrexia of unknown origin and assessment of iron stores in current research, similar findings reported by Nirali, et al [15] and Shubhangi Agale et al [16].

The relative frequency of different hematological disorders was studied, Anemia was the commonest disorder found in bone marrow examination. Amongst anemia, most common type was megaloblastic anaemia, our results consistent with the Verma N, et al [17] and Jawed M, et al [18].

Other than anaemia Lymphoma and leukemias were the common hematological disorder seen in bone marrow examination in the present study, correlates with the Joshi-S et al [19].

The cause of dry tap in MPNs was probably due to increased bone marrow fibrosis or cellularity. Biopsy was satisfactory and cellular in all the cases. Bone marrow biopsy not only helps in differentiation of MPN, but also to assess cellularity, histo-topographic cell distribution, morphology of blasts as well as megakaryocytes and degree of marrow fibrosis.

The most common myeloproliferative disorder encountered in the present study was Chronic Myeloid Leukaemia (CML).

In our study, most common non-haematological disorder encountered was granulomatous lesion followed by metastatic solid tumours which was in concordance with the studies conducted by Piplani G, et al. [20], and Vijaymohanan, et al. [21].

Biopsy gives additional information about pattern of involvement and prognosis. The diagnostic accuracy of bone marrow aspiration was found to be lower as few cases showed unsatisfactory marrow aspirate/dry tap due to faulty technique.

CONCLUSION

Bone marrow examination is helpful in arriving at final diagnosis of various haematological and nonhaematological lesions. In bone marrow aspiration morphology of the cells are well preserved, whereas cell distribution, tumour infiltration, granuloma cells and storage cells are better appreciated on bone marrow biopsy. The bone marrow biopsy remains the gold standard for the diagnosis in negative aspiration. Simultaneous evaluation of bone marrow aspiration and biopsy show good correlation and increases the efficacy of diagnosis.

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