Important of Morphological Examination of Bone Marrow for a Hematological and Non-Hematological Disorder

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Abstract

Background: The bone marrow examination is important for the investigation, diagnosis, and management of the blood, bone marrow and many systemic disorders. Morphological Bone marrow examination alone is sufficient to diagnose nutritional anemias and most acute leukemia.

This study aimed to determine the importance of morphological examination of bone marrow to diagnose hematological and non-hematological disorders like various systemic illnesses that affect the bone marrow.

Methods: A prospective study carried out for one year at the Hematology lab, Ninava Ibn Sena Teaching Hospital, A total of 201 cases were investigated. The bone marrow examination was taken from the posterior superior iliac spine.

Results: The age range was (15-87) years. The male-to-female ratio was 1:1.2. The most common disorder finding was acute leukemia 17% (include AML & ALL) and AML is more common than ALL, whereas lymphoproliferative disorders was second bone marrow finding fallowed by Megaloblastic anemia of Myeloid dysplasia syndrome (MDS) and Essential thrombocythemia (ET).

Conclusion: Morphological bone marrow examination is a useful procedure in ascertaining the diagnosis of several hematological and non-hematological disorders.

Keywords: *AML (acute myeloid leukemia), ALL(acute lymphoid leukemia), MDS(Myeloid dysplasia syndrome), Essential thrombocythemia (ET).*

Introduction

Diagnosis and management of many hematologic diseases depend on bone marrow evaluation. Bone marrow examination usually involves two separate, but interrelated, specimens. The first is a cytologic preparation of bone marrow cells. The second specimen is a needle biopsy of the bone and associated marrow [1].

Marrow biopsy is useful for diagnosing and following the course of disorders such as megakaryoblastic leukemia, hairy cell leukemia, and chronic myeloproliferative neoplasms. In myelodysplastic syndromes, marrow biopsy is useful for evaluating abnormal localization of immature precursor cells and abnormal megakaryocytes [2, 3]. Satisfactory samples of bone marrow can usually be aspirated from the sternum, iliac crest, or anterior or posterior iliac spines. In most circumstances, the posterior superior iliac spine is the preferred biopsy site and selection of this site has the advantage that, if no material is aspirated, a trephine biopsy can be performed immediately [4].

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Methods

A cross-sectional study was conducted in the Hematology lab, Ninava Ibn-Sena Teaching Hospital, from January 2019 to December 2019. Clinical data concerning age, sex, dietary habits, mode of onset, history of drug intake or exposure to toxic chemical agents, H/O bone pains, hepatosplenomegaly, and lymphadenopathy respectively, were recorded. This study excluded patients who are present for assessment response of bone marrow to the treatment of previous diagnosis patients. Amongst all the subjects, peripheral smears, reticulocyte counts, and bone marrow aspiration and biopsy were obtained.

The procedure of BMA was done after giving local anesthesia from the posterior iliac spine. Bone marrow trephine biopsy was performed. Bone marrow examination was done on Leishman stained for smears and Hematoxylin-eosin-stained for trephine biopsy sections.

Results

The age group ranged from 15 years to 87 years. Most of the patients are belonged to the 51-60 years old group. 89 of 201 cases were male and 112 cases were female, and male-female-ratio is 1:1.2 (Table 1). The commonest mode of presentation was anemia; other main symptoms were pancytopenia, organomegaly, whereas fever was the rare presentation (Figure 1). Finding of Bone marrow aspiration normal active bone marrow was (29.3%) cases, AML (9%) cases, Megaloblastic anemia (7.4%) cases, Multiple myeloma (7%) cases, CML (5.4%) cases, secondary metastasis (4.4%) cases, erythroid hyperplasia (4%) cases, were plasma cell leukemia, ET and MDS (0.5%) cases for each of them (Table 2).

Table 1. Patients features.

		No.	%
Age group	15-20	25	12.4
	21-30	28	13.9
	31-40	31	15.4
	41-50	24	12
	51-60	44	21.8
	61-70	29	14.4
	> 70	20	10
Sex	Male	89	44.3
	Female	112	55.7

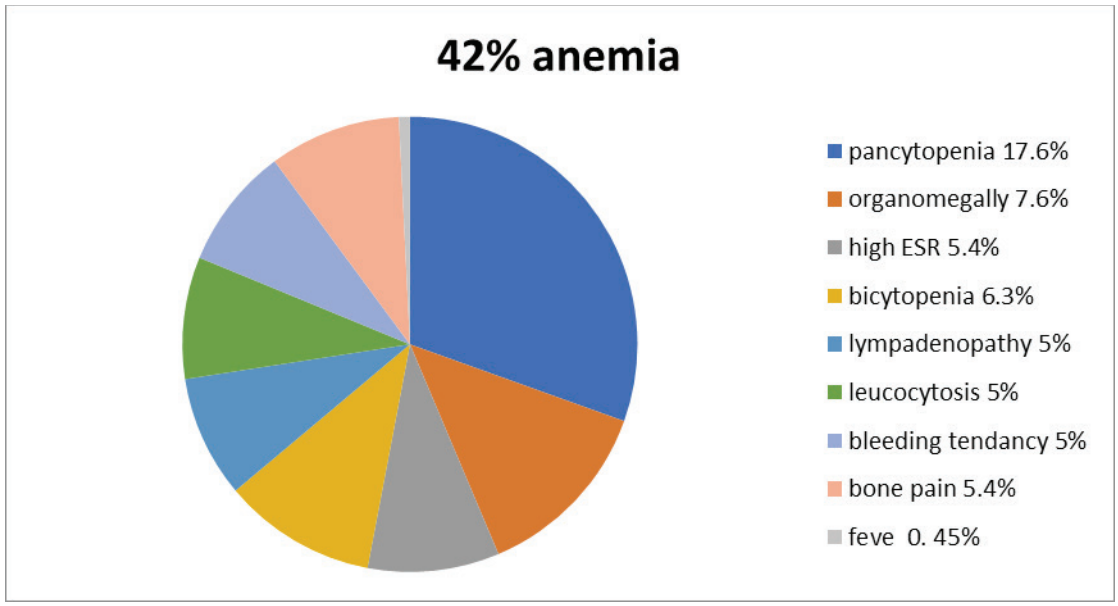

Figure 1. Indication of bone marrow examination

Table 2. Bone marrow examination finding:

BMA diagnosis	No.	%
Normal	59	29.3
Blood tap	13	6.5
Lymph proliferative disorder	17	8.4
Acute leukemia including: 1-AML 2- ALL 3-M3 4- M3V	34 18 10 5 1	17 9 5 2.5 0.5
Chronic myeloid leukemia	11	5.4
Essential thrombocythemia	1	0.5
Erythroid hyperplasia	8	4
Multiple Myeloma	14	7
Megaloblastic anemia	15	7.4
Hairy cell leukemia	4	2
Secondary metastasis	9	4.4
Dry Tap (primary myelofibrosis)	2	1
Aplastic Anemia	3	1.4
Plasma cell leukemia	1	0.5
Idiopathic thrombocytopenic purpura	2	1
Hemophagocytic syndrome	7	3.4
Myeloid dysplasia syndrome	1	0.5
Total	201	100

Discussion

Hematological disorders include a wide range of diseases ranging from reactive hyperplasia to hematological malignancies.

Male to female ratio was 1:1.2 which similar to the study done by Sreedevi et al [5] and Chand et al [6]. The majority of the patients in the study belonged to (51-60) years old which similar to the studies done by Joshi1 et al [7] and Saeed et al [8]. The commonest indication in our study was anemia (42%). Similar findings, anemia was the commonest indication in a studies done by Sreedevi et al [5], Saeed et al [8], Kumar et al [9], Timothy et al [10].

Bone marrow examination showed (29.3%) of patients with normal findings, which similar to the study done by Saeed et al [8], which reporting normal bone marrow 29.05% of biopsy. About (70.7%) of bone marrow was pathological and largest hematological malignancy is acute leukemia 17% (inclued AML, ALL, M3 and M3V) and AML is more common than ALL similar result reported by other studies [11-14].

Lymphoproliferative disorders are the second pathological bone marrow finding followed by Megaloblastic anemia which different from the percentage report by other studies [6, 8, 15], this difference may be due to the difference in sample sizes.

The lowest percentage (only one case) of myeloid dysplasia syndrome and Essential thrombocythemia was diagnosed in similar reported by the study done by Shah et al [8, 16, 17].

Conclusion

Morphological examination of bone marrow aspirate is important for the diagnosis of many diseases hematological disorders like leukemia, lymphoma, multiple myeloma, and myeloproliferative neoplasm, and non-hematological diseases like the cause of anemia, thrombocytopenia, and pancytopenia.

Conflict of Interesting - Nil

Source of Funding - Self

Ethical Clearance – Taken from Ninava Ibn-Sena Teaching Hospital committee.

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