

Original research article

Bone Marrow Profile in Geriatric Patients - An Institutional Experience

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Abstract

Background: Ageing is a complex process and comes with increased risk of acquiring hematologic and non-hematologic disorders. Bone marrow examination is an important modality in diagnosing these conditions in the elderly and helps guide therapy.

Objective: This study was therefore conducted to study the indications and morphological features of bone marrow examination in geriatric population.

Materials methods: The study was conducted over a period of 5 years in pathology laboratory in department of Belgaum institute of medical sciences, Belagavi from 1st January 2015 to 31st December 2019. A total of 156 bone marrow examination cases above 60 years were reviewed and results were recorded.

Results: Anemia was the commonest indication (37%) followed by bicytopenia/ pancytopenia (29%) Suspicion of leukaemia was an indication in 17% of cases. Megaloblastic anemia was the commonest diagnosis (39%). Iron deficiency anemia and combined deficiency was diagnosed in 14% and 8% cases respectively. Acute leukemia was seen in 11 cases (7%). 10 cases (6%) each of chronic myeloid leukemia and normal bone study were noted.

Conclusion: Bone marrow aspiration and trephine biopsy are complimentary tools in diagnosis of hematologic and non-hematologic disorders in the geriatric population

Key words: Bone marrow aspiration, trephine biopsy, geriatric

Introduction

Bone marrow examination is an important diagnostic modality for hematologic disorders and also plays a major role in determining the stage and treatment of hematologic and other malignancies [1]. Ageing is a complex process influenced by genetic and environmental factors. Increase in life expectancy comes with an increased risk of acquiring various malignant or nonmalignant blood disorders. This may be due to decreased organ function and hematopoietic stem cells and other tissues showing age-related changes at DNA and protein level [2,3]. The growth of geriatric population worldwide has paved the way to design research studies related to health problems in this age group [4]. There is paucity of published literature available regarding the indication and diagnostic usefulness of bone marrow examination in the elderly population. The indications and diagnoses on bone marrow examination is considered to be different for this subpopulation [5].

This study was therefore conducted to study the indications and morphological features of bone marrow examination in geriatric population.

Materials and methods

This was a retrospective study conducted in the haematology section of the pathology department in Belagavi institute of medical sciences for a period of 5 years from 1st January 2015 to 31st December 2019. The study included all the patients above 60 years of age who underwent bone marrow examination (aspiration/biopsy or both) in the department after informed written consent. Patients age, sex, clinical history, relevant laboratory, radiological investigations, indications for bone marrow examination and bone marrow diagnosis were noted for every case. The bone marrow aspiration was done from posterior superior iliac spine and the trephine biopsy was mostly performed in the same setting. Imprint smears were also prepared from the biopsy. Giemsa staining was done for aspiration and imprint smears while Haematoxylin & eosin stain was used for biopsy sections. Marrow iron stores quantification was done by Perl's stain. PAS, MPO, Reticulin stains were done wherever indicated. All the data were entered in the excel sheet and statistically analysed.

Results

During the five year study period, 156 cases were above 60 years of age on whom bone marrow examination was performed. The male-female ratio was 1.4:1 with the mean age of 66.10 years and ranging from 60 to 85 years. The hemoglobin levels in these patients ranged from 2 gm/dl to 12 gm/dl. The white blood cell (WBC) count was between 1400 to 1.4 lakhs/ μ l and platelets were between 20,000 to 3 lakhs/ μ l.

Out of the total 156 cases, bone marrow aspiration was performed on all the cases while bone marrow biopsy was done in 12 cases. Table 1 shows the indications of bone marrow examination in the study. It shows that most common indication for bone marrow examination in geriatric population was anemia (37%) followed by bicytopenia /pancytopenia (29%). 17 % cases had indication of suspicion of leukemia.

Table 2 shows the diagnosis made on aspirate/ bone marrow trephine biopsy or both. It shows that megaloblastic anemia (39%) was the most common diagnosis followed by iron deficiency anemia (14%) closely followed by combined deficiency (12).

Aspirate was diagnostic in 142 cases except in 12 cases which were diagnosed on biopsy. Total two cases were inadequate for diagnosis as bone marrow aspirate was hemorrhagic and trephine biopsy was not performed due to patient's reluctance.

On bone marrow aspirate, 6 cases were "dry tap" and 6 cases of "blood tap". Bone marrow biopsy was diagnostic in all these 12 cases. (Table 3)

Among the cases of normal bone marrow study, some of the patients underwent the procedure for PUO, or raised ESR or staging of lymphoma.

Table 1: Indications for bone marrow examination in geriatric population

Indications	Number of cases (%)
Anemia	58 (37)
Bicytopenia/pancytopenia	46 (29)
Thrombocytopenia	4 (3)
Suspicion of leukaemia	27 (17)
Suspicion of multiple myelomas	8 (5)
Leukocytosis	5 (4)
Myelodysplastic syndrome	4 (3)
Follow-up/staging of a known case of lymphoma/leukemia	4 (3)
Total	156

Table 2: Diagnosis of bone marrow aspirate/ biopsy/ both

Diagnosis	Number of cases (%)
Megaloblastic anaemia	61 (39)
Iron deficiency anaemia	21 (14)
Combined deficiency anaemia	12 (8)
Acute leukaemia	11 (7)
Chronic myeloid leukaemia	10 (6)
Normal bone marrow study	10 (6)
Multiple myelomas	6 (4)
Non-Hodgkin lymphoma	5 (3)
Myelodysplastic syndrome	4 (2.5)
Reactive lymphocytosis/plasmacytosis and eosinophilia	4 (2.5)
Myelofibrosis	3 (2)
Idiopathic thrombocytopenic purpura	3 (2)
Aplastic anemia	2 (1)
Metastasis	2(1)
Inadequate	2 (1)
Chronic lymphoid leukaemia	1 (0.5)
Chronic myelomonocytic leukaemia	1(0.5)
Total	156

Table 3: Diagnosis on biopsy in dry and blood tap

Biopsy diagnosis	Dry tap	Blood tap
Myelofibrosis	1	2
Aplastic anemia	-	2
Non-Hodgkin lymphoma	1	2
Acute leukaemia	2	-
metastasis	1	1
Multiple myeloma	1	-

Discussion

With increase in elderly population, disorders in people aged 60 years and older are contributing to nearly 23% of the total global burden of disease [3]. There is paucity of available published literature regarding bone marrow profile exclusively in geriatric patients.

As age advances, the bone marrow progressively concentrates axially in the central skeleton with reduced cellularity, without causing significant reduction in blood cell counts [6].

Ageing is characterized by reduction in hematopoietic progenitor cells replication and blunt response of stem cells to growth factors. This is attributed to loss of telomeric DNA from hematopoietic progenitor cells [7]. Bone marrow study indications and diagnostic usefulness in elderly patients differs from those of bone marrow studies in children or young to middle aged adults [8].

In this study, cytopenias were the most common indication, accounting for 69% of the cases. Other common indications were suspicion of leukaemia followed by suspicion of plasma cell myeloma. Other rare indications were leucocytosis, myelodysplastic syndrome and follow up/staging of known cases of leukaemia / lymphoma.

In the present study, anemia was the most common diagnosis with megaloblastic anemia being the most common subtype which was comparable to study by Gulati, et al [9] and Sidharthan Simi et al. [10] who attributed it to nutritional deficiency. This study results also correlated with a study on Chinese and Caucasian population where megaloblastic anemia was reported to occur more in older age group [11]. In third US National health and nutritional examination survey, nutritional deficiency of folate, B12 or iron deficiency alone or in combination accounted for one third of anemia in the elderly [12]. With advancing age, atrophic gastritis and hypochlorhydria may progress and may be partly responsible for the 12% of patients over age 75 years who will have a low B12. Post gastrectomy states, pancreatic insufficiency, and disease or resection of the terminal ileum impair absorption of B12 [8].

In our study the second commonest diagnosis was iron deficiency anemia. Iron deficiency is commonly seen in the elderly and is usually a result of acute or chronic blood loss throughout the gastrointestinal tract. Another common cause of anemia in elderly is Anemia of chronic disease associated with several conditions like inflammatory conditions, malignancy, diabetes, heart failure, stroke, liver and renal diseases. In most studies, 15-30% patients studied will not have an explanation for their anemia [8, 13].

Acute leukaemia was seen in 11 (7%) cases followed by Chronic myeloid leukemia in 10 cases. Two out of 11 cases of acute leukaemia were dry tap on aspirate and showed increase in fibrosis on trephine biopsy which was comparable to study by Bashir. et al. [14]

Multiple myeloma was diagnosed on 6 cases of which one was dry tap on aspirate and two were blood tap. These were diagnosed on biopsy sample which was similar to study by Gulati et al. [9] Manion et al in their study found that bone marrow biopsy was helpful in dry/ blood tap cases as compact clusters of plasma cells without stroma are identified which help in diagnosis [5].

Of the 5 cases of non-Hodgkin lymphoma infiltration, 3 cases were diagnosed only on biopsy and in two cases, aspiration was diagnostic. This reinstates the fact that both the procedures should be performed for staging in cases of NHL.

Myelodysplastic syndrome is a well-known etiology of anemia in the elderly population. In our study, 4 cases were diagnosed as myelodysplastic syndrome. As age advances, the abnormal clones of hematopoietic cells proliferate due to long term exposure to oxidative stress and disturbed cytokine production and makes them prone to leukemic transformation [9].

A diagnosis of Myelofibrosis was made on 3 cases and all three cases were diagnosed on biopsy as aspiration was dry/ blood tap. All three cases presented with only anemia. Primary

myelofibrosis usually presents in individuals above 60 years of age and one third of these are asymptomatic [8].

Idiopathic thrombocytopenic purpura was diagnosed on 3 cases on aspiration sample. All three cases underwent the procedure due to persistent thrombocytopenia.

Aplastic anemia was diagnosed in two cases and both were done on biopsy. This finding was similar to study by Gulati et al. [9] and Bashir et al. [14]. Bone marrow biopsy is of utmost importance in diagnosing aplastic anemia as it is an accurate tool to assess marrow cellularity [15].

Two cases of Metastatic deposits were diagnosed on bone marrow biopsy. One was known case of prostate carcinoma and primary was unknown in other case. Our finding emphasizes that bone marrow examination is an important tool to diagnose unsuspected non hematologic malignancy.

One case each of chronic lymphocytic leukemia and chronic myelomonocytic leukemia were diagnosed on bone marrow aspiration.

In our study, 10 cases showed normal bone marrow profile. Two of the cases showed hypocellularity where normal hematopoietic cells were replaced by fat cells. Four cases were diagnosed as reactive lymphocytosis/ eosinophilia and plasmacytosis.

Conclusion

Anemia in elderly is very common and has a significant impact on quality of life. Also the risk of malignancy increases with age and contributes to mortality and morbidity in the elderly. Bone marrow aspiration and trephine biopsy are important tools in work up of elderly patients with hematologic and non hematologic disorders. Combine use helps in better diagnosis of disorders and help guide therapy.

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