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Comparative Study of Bone Marrow Aspiration and Bone Marrow Trephine Biopsy in Haematological and Non-Haematological Disorders.

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ABSTRACT

Background: This study was conducted in the Department of Pathology, GMC Patiala on 100 patients over period of three years with the objective to study the comparison of the bone marrow aspiration and bone marrow trephine biopsy in haematological and non-haematological disorders in elderly age patients.(Age >50years). **Methods:** 100 cases with different hematological and non-hematological problems were taken up for the present study with age >50 years. Salah"s bone marrow aspiration needle and Jamshidi's bone marrow biopsy needle were used to collect the samples. For staining Leishmann's and H&E stains were used. **Results:** Majority of the cases were in the age of 50-60. Majority of haematological disorders comprised of anaemia (62%), leukemia(17.7%), multiple myeloma (7.5%), primary myelofibrosis(2.5%), myeloproliferative disorders(2.5%), hypocellular marrow (2.5%), increased eoisinophils and precurcors(1.2%), NHL (1.2%) lymphocytosis(1.2%) and plasmacytosis (1.2%). Both of the 2 cases of non-haematological disorders were of metastatic carcinomatous deposists. **Conclusion:** The bone marrow aspiration and trephine biopsy were comparative in most of the haematological disorders except in primary and secondary myelofibrosis where biopsy provided clue to the diagnosis. Non-haematological disorders showed the same findings.

Keywords: Bone Marrow, Bone marrow biopsy needle.

INTRODUCTION

The bone marrow is one of the most widely distributed organs in the body. Bone marrow is either red marrow, containing hemopoietic cells, or yellow marrow, which is largely adipose tissue. The bone marrow produces the cellular components of blood like the red cells, white cells and platelets.[1] Today, bone marrow examination is a common hematological investigation and particularly useful in the diagnosis and staging of several hematological diseases, as well as in the assessment of overall bone marrow cellularity and morphology. Further, it serves as a key investigation in the diagnosis of many hematological and non – hematological disorders. The evaluation is considered essential in patients with unexplained abnormality of any peripheral blood cell type.[2] Indications have included the diagnosis, staging and therapeutic monitoring for lymphoproliferative disorders such as chronic lymphocytic leukemia (CLL), Hodgkin and Non-Hodgkin lymphoma (NHL), hairy cell leukemia, myeloproliferative disorders (MPD) and multiple myeloma. Furthermore, evaluation of cytopenias, thrombocytosis, leukocytosis, anemia and iron stores can also be done.[3]

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Aims and Objectives

To study the etiology, spectrum and correlation of various hematological and non –hematological disorders in elderly patients (above 50 years) using bone marrow aspiration and trephine biopsy.

MATERIALS AND METHODS

100 cases with different hematological and non-hematological problems were taken up for the present study. The sex of the patient had no criterion for selection of cases. Age more than 50 years was taken for the study. Hematological disorders (like severe anemia, leukemia, MPDs, Lymphoproliferative disorders, Lymphoma involving marrow) and non-hematological disorders include pyrexia of unknown origin, metastatic

disease and granulomatous disorders. Patients on treatment and follow up for the above mentioned conditions and patients on chemotherapy and radiotherapy were excluded.

RESULTS

Hundred patients participated in the current study. Patients with age >50 years were included in this study. Majority of them were in age group of 50-60 years. Only 2 patients were above 80 years of age. Among the total 100 patients 38% were female and 62% were male. M:F ratio 1.63:1. Out of the 100 cases studied 81 cases (81%) revealed either the diagnosis or diagnostic clue to disease process.

Among the 81 cases, 79 (79%) were of haematological disorders and 2 (2%) were of non-hematological disorders. 19 cases (19%) studied were normal. Among the 79 cases, most common were anemias comprising of 49 cases (62.06%). Fourteen cases (17.72%) of leukemias that is acute and chronic leukemias. Six cases (7.59%) of multiple myeloma. Two cases (2.53%) of myeloproliferative disorders, idiopathic myelofibrosis and hypocellular marrow. One case (1.26%) each of NHL, increase of eosinophils and precursors, lymphocytosis and plasmacytosis.

Among the non- hematological disorders only two cases (100%) of metastatic carcinomatous disorders were seen. Most of the patients were in age group of 50 to 70 years comprising 39 out of 49 cases (80%).

There are total of 49 cases of anemias among them most common is megaloblastic anemia comprising of 30 cases (61%) then is Dimorphic anemia comprising of 17cases (35%) and last is aplastic anemia comprising of 2 cases(4%). Two cases (14%) of hypocellular marrow was diagnosed on bone marrow aspiration among them 1 was diagnosed as aplastic anemia on bone marrow biopsy.

There were 14 cases of leukemia, mainly between age of 50-60 years. Among 14 cases, cases 9 were male and 5 were female. M:F ratio was 1.8:1.Among all the cases of leukemias, chronic myelogenous leukemia was the most common comprises of 9 cases (64%). Among these 9 cases, 4 were showing increased fibrosis in bone marrow biopsy and one was inadequate. There were 3 cases (22%) of chronic lymphocytic leukemia, among these 1 case shows nodular infiltrate on bone marrow biopsy. There were 2 cases (14%) of acute leukemia diagnosed among these 1 case was showing bloody tap on bone marrow aspiration.

Multiple myeloma was diagnosed in 6 case. It was seen that there were 2 cases (33.3%) each in age group of 50-60,61-70,71-80 years. It was found that all the 6 cases of multiple myeloma diagnosed on bone marrow aspiration are positively correlated with bone marrow biopsy. In 2 cases of dry tap on bone marrow aspiration, the corresponding bone marrow biopsy revealed primary myelofibrosis (in cellular phase and fibrotic phase) as evidenced by increased reticulin staining. No correlation was seen between bone marrow aspiration and biopsy. Four cases of CML on bone marrow biopsy shows secondary myelofibrosis.

Out of the 2 cases of metastatic carcinomatous deposits found on bone marrow aspiration and biopsy, 1 case was of metastatic adenocarcinoma and 1 case was of metastatic squamous cell carcinoma.

Table 1: Comparative Evaluation Of Bone Marrow Aspiration (N=100) And Bone Marrow Biopsy (N=100) Findings.

Sr No.	Disorder	Bone marrow aspiration	Bone marrow biopsy	p-value
1.	Megaloblastic anemia	30	29	<0.001
2.	Dimorphic anemia	16	14	<0.001
3.	Aplastic anemia	1	2	0.020
4.	Chronic myelogenous leukemia	8	4	<0.001
5.	Chronic lymphocytic leukemia	1	3	0.030
6.	Acute leukemia	1	2	0.021
7.	Primary myelofibrosis	0	2	-
8.	Secondary myelofibrosis	0	4	-
9.	NHL	1	1	0.010
10.	Myeloproliferative disorder	2	2	<0.001
11.	Multiple myeloma	6	6	<0.001
12.	Hypocellular marrow	1	2	0.020
13.	Increased eosinophils and precursors	1	1	0.010
14.	Lymphocytosis	3	1	0.030
15.	Plasmacytosis	1	1	0.010
16.	Metastatic carcinomatous deposits	2	2	<0.001
17.	Normal	18	15	<0.001
18.	Blood tap	4	0	-
19.	Dry tap	4	0	-
20.	Inadequate	0	9	-
	TOTAL	100	100	

In the comparison of 100 bone marrow aspirations and biopsies, p- values for significance were calculated wherever applicable. A significant p-value (<0.05) was found for the correlation between aspiration and biopsy in nutritional anemias, acute leukemias, CML, CLL, NHL infiltration, multiple myeloma, metastatic carcinomatous deposits,

increased eosinophils and precursors, lymphocytosis, plasmacytosis and myeloproliferative disorders.

DISCUSSION

Majority (53%) of the patients included in this study were between 50-60 years of age with 62 males (62%) and 38 females (38%) with male to female ratio of 1.6:1 showing a male predominance. The male to female ratio in the present study was comparable to that of Gilotra M et al (2017) where cases of >50 years were 48;[4] among them 34 were males and 14 were females with M:F ratio of 2:1, in study by Kaur M et al (2014) where cases >50 years were 15 among them 10 were male and 5 were female with M:F ratio in this age group was 2:1 and in present study M:F ratio was 1.6:1.[5]

Out of the 100 cases examined, 81 cases provided a diagnosis or diagnostic clues to the disease process. The study was normal in 19 cases. Of the 81 positive cases, 79 cases were of hematological disorders while 2 cases were of non-hematological disorders. There are very few studies on the bone marrow in this age group patients showing the profile of hematological and non-hematological disorders some of them are Mahajan V et al (2013) and Khatik D et al (2017).[6,7] A few studies have been done on the bone marrow profile across wider age groups in specific disorders like Pancytopenia (Sindhu et al) (2016),[8] NHL infiltration (Musolino A et al) (2010),[9] Hodgkin lymphoma (Moid F et al) (2005),[10] PUO (Ben- Baruch et al) (2012),[11] multiple myeloma (Stifter S et al) (2010),[12] metastasis in the bone marrow (Mehdi SR et al) (2011).[13]

Out of the 100 cases of hematological disorders in the present study, the most common diagnosis in this age group is anemia in 53% of the cases followed by Leukemia in 14%. This part of present study matches with study by Uniya U et al (2016) in which anemia is the most common hematological disorder that is 50% in this age group followed by Acute leukemia and Lymphoproliferative disorders (25%) each. In the present study,[15] megalobastic anemia was most common among all the anemias that is 61%,this is comparable with study by Uniya U et al (2016) where most common were megaloblastic anemia that is 50%.[14]

Cases of CLL in present study are 3 (3.8%) in the >50 years age, this is comparable to study by Manju et al (2013) where there were also 3 cases (3%) in this age group.[15] Cases of primary myelofibrosis in present study were 2 (2.5%) in the age group of 50-60 years, this is comparable with the study by Manju et al (2013) where there was 1 case(1%) in the age group of 50 -60 years.[15] Cases diagnosed on bone marrow biopsy alone in present study were of primary and secondary myelofibrosis in CML this is comparable to the study done by Hota R et al (2017) where the finding were same.[16]

In a study by Khatik D (2017),[7] there were 6 (4%) cases diagnosed as multiple myeloma. Male to female ratio was 1:1. All the patients presented with bone pain and osteolytic punched out lesions on radiograph as in the present study. A study by Singhal et al (2004) reported 30 (61.22%) males and 19 (38.77%) females,[17] out of 49 patients. The median age was 57 years. The most common symptom was bone pain in 22 (45%) cases, pathological fractures in 17 (34.7%) cases similar to Bartl R et al (1987).[18] In the present study out of 6 cases of multiple myeloma, all gave the positive correlation on BMA and biopsy as in study by Mahajan V et al (2013).[6]

Table 2: Comparison Of Results Of Bone Marrow Aspiration And Bone Marrow Biopsy In Present Study In Various Haematological And Non - Haematological Disorders With Other Studies

DISORDERS	RakaHota et al[16] (2017)	Mahajan V et al[6] (2013)	Gudelivahaniet al[22] (2015)	Patil K et al[21] (2015)	Present study
Megaloblastic anaemia	-	96%	100%	90%	97%
Dimorphic anaemia	-		-	33.3%	87.5%
Aplastic anaemia	85.7%	-	-	-	50%
Acute leukemia	95.6%	96%	45%	28%	50%
Chronic myelogenous leukemia	81.8%			-	50%
Chronic lymphocytic leukemia	-			-	33.3%
Multiple myeloma	96%	100%	96%	100%	100%
Myeloproliferative disorder	-	-	100%	-	100%
Metastatic carcinomatous deposits	100%	33.3%	-	100%	100%
Hypocelluar marrow	100%	-	100%	-	50%

In the present study number of normal marrow is 19%, no. dry tap were 4% and of blood tap were also 4% this is comparable to the study by Bhut K et al (2017) where number of normal marrow were 18%,[19] dry tap were 6% and blood tap was also 6% in this age group.

In present study dry tap comes to be in 4 cases that is in 2 cases of myelofibrosis, 1 case of hypocellular marrow and 1 case of aplastic anemia this is comparable to the study done by Ahmad SQ et al (2015) where dry tap in this age group were seen in 3 cases of primary myelofibrosis and 1 case of hypocellular marrow.[20] Non-hematological cases comprised of 2 cases both of them are metastatic

carcinomatous deposits. The metastatic deposits comprised of 1 case of adenocarcinoma and 1 case of squamous cell carcinoma. A frequency of 67% and 33% was found for metastatic carcinomatous deposits across cases of non- hematological disorders in age >50 years is seen in the study by Mahajan V et al (2013).[6]

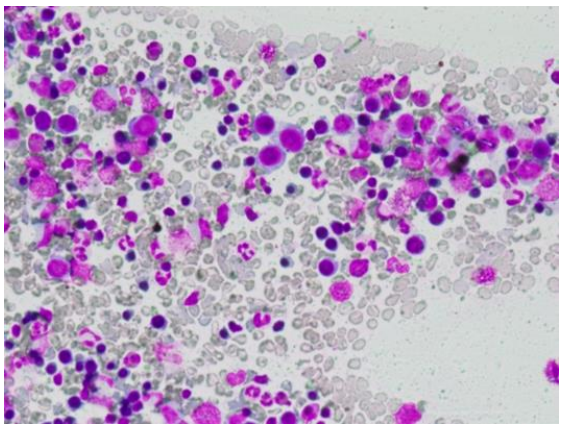

Figure 1: Megaloblasts In Bone Marrow Aspirate In Megaloblastic Anaemia (Leishman, 400x)

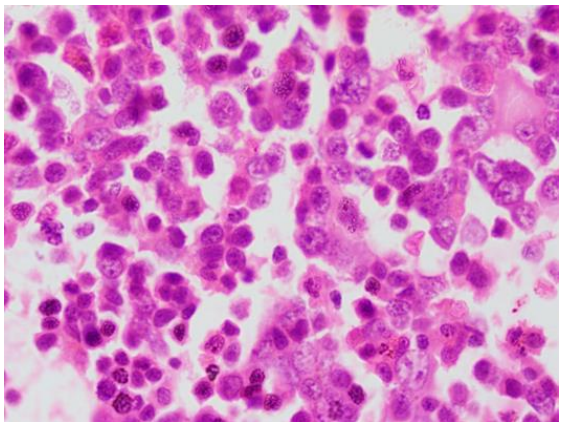

Figure 2: Megaloblasts In Trephine Biopsy In Megaloblastic Anaemia (H&E, 1000x)

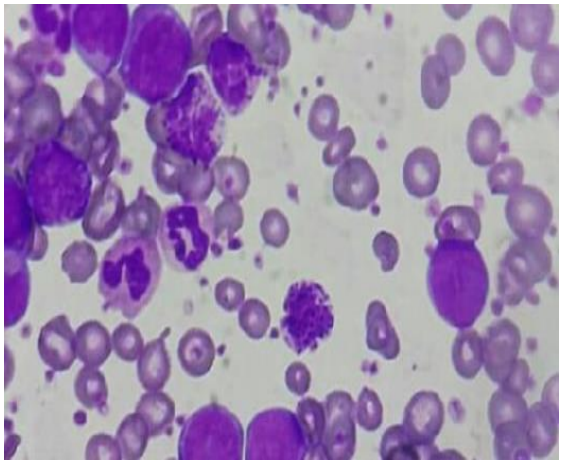

Figure 3: CML On Bone Marrow Aspiration (Leishman, 1000x)

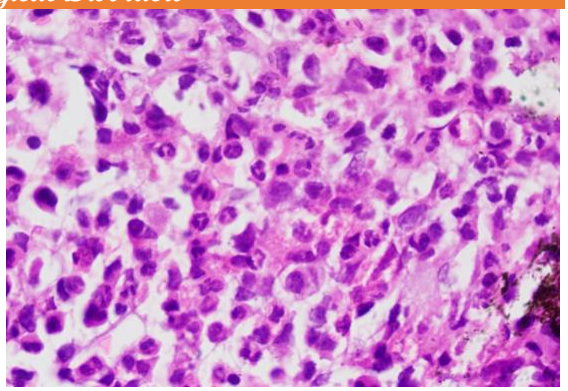

Figure 4: CML On Bone Marrow Biopsy (H&E, 1000x)

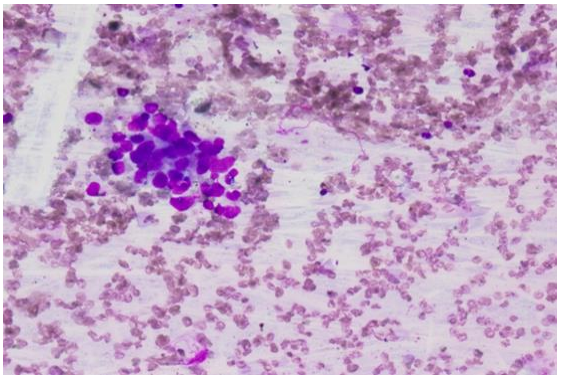

Figure 5: Metastatic Adenocarcinoma Deposists In Bone Marrow Aspiration (Leishman, 400x)

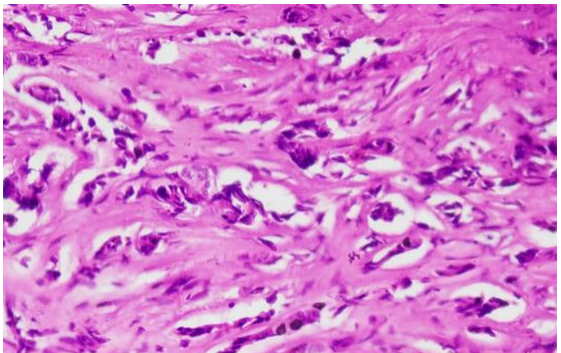

Figure 6: Metastatic Adenocarcinoma Deposists In Trephine Biopsy (H&E, 400x)

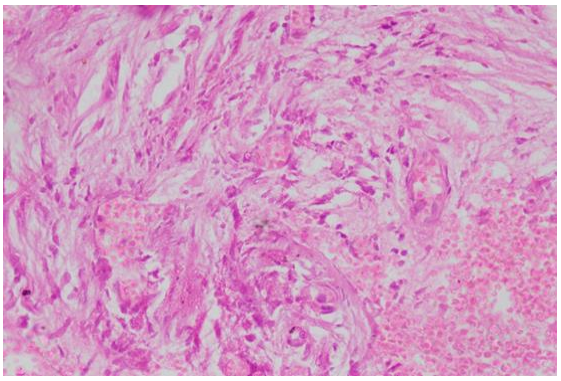

Figure 7: Myelofibrosis In Bone Marrow Biopsy (H&E, 400x)

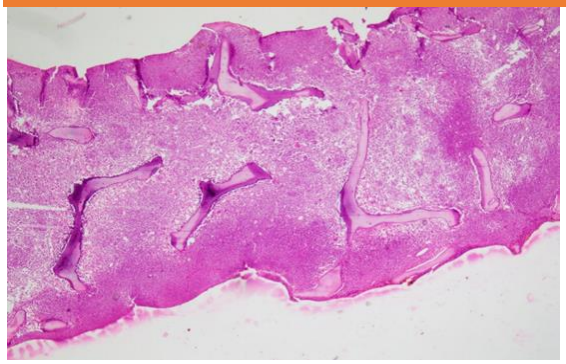

Figure 8: Diffuse Pattern In Bone Marrow Biopsy In Nhl Infiltration (H&E, 40x)

CONCLUSION

The study of bone marrow examination in age > 50 year patients in Punjab region showed that a great majority of the patients had pathological abnormalities in the bone marrow. The common hematological disorders seen were anemia, leukemia and multiple myeloma. Non – hematological disorders were less frequent. The bone marrow aspiration and trephine biopsy were comparative in most of the hematological disorders except in primary and secondary myelofibrosis where biopsy provided clue to the diagnosis. The comparison of bone marrow aspiration and trephine biopsy in non-hematological disorders showed the same findings but exact significance cannot be drawn due to the less number of cases. The results of the present study correlated well with the previous studies. We expect present study to add to existing knowledge on this topic.

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