



## Role of Bone Marrow Biopsy in Myeloproliferative Neoplasm: Study of 49 Cases

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### ABSTRACT

The aim of the current study was to analyze the value of bone marrow biopsy and imprint smears in myeloproliferative neoplasm. Chronic myeloid leukemia is the most common leukemia amongst MPN as well as all acute and chronic adult leukemia. Diagnosis can be made on peripheral blood, bone marrow examination and molecular pathology findings. But in some cases bone marrow plays a very valuable role in the diagnosis. In the present study, bone marrow biopsies were re-examined in 49 patients with MPN. And it was found that BMB helped in 10 cases of MPN for making final diagnosis.

**Keywords:** Chronic Myeloid Leukemia, Bloody Tap, Bone Marrow Biopsy, Smear Imprint

### Introduction

In India as mentioned in various cancer registries, chronic myeloid leukemia (CML) amongst myeloproliferative neoplasm (MPN) is one of the most common adult leukemias in Indian population. It constitutes 30% to 60% of all adult leukemias [1, 2]. Median age at presentation is 38-40 years in India and it is a decade younger compared with the age presented in European as well as in American literature. MPN is predominantly diseases of adults with a minority of patients are children and young adults [3]. Clinical presentation, peripheral blood film (PBF) examination, bone marrow examination (BME) along with molecular studies is essential for the diagnosis [4]. Bone marrow biopsy (BMB) with smears imprints (SI) is still a vital tool as it can further help in the diagnosis and categorization especially when bone marrow aspiration comes out to be dry tap or bloody tap [5].

### Material and Method

The present study, 49 bone marrow biopsy cases of MPN were taken into consideration. Age at presentation, sex,

absence/presence of splenomegaly along with duration of symptoms and total leukocytic count was re-analysed. Total leucocyte count, bone marrow aspiration and imprint smears were re-examined and findings obtained were correlated with bone marrow biopsy sections. Diagnosis of MPN was reassessed and histopathological findings were analyzed.

### Results

A total of 49 bone marrow biopsies of MPN patients were analyzed. The mean age of presentation was  $41.2 \pm 15.4$  years (range 16 - 70 years). There were 23 males and 26 females (M:F ratio, 1.1:1). The males had a higher mean age than the females (42.7 vs. 40.0 years). Total leucocytes count ranges from 3000 cells/ cmm to 5,00,000 cells/ cmm in all the cases. Amongst 49 biopsies done, 39 cases showed complementary results of BMA, SI and BMB.

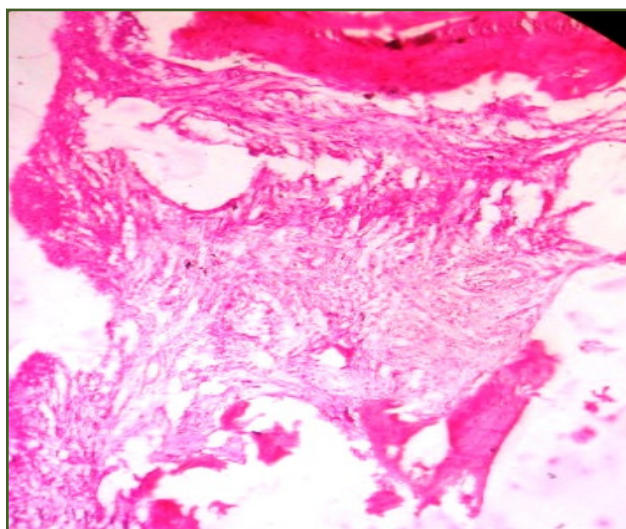
The final diagnosis was made on BMB imprint smears and histopathological examination in 10 cases (*Table 1&2*). Out of 10, 8 cases underwent biopsy after the complete treatment of CML.

**Table 1: haematological findings of ten undiagnosed cases with correlation with gender distribution.**

PBF	Total cases	M	F
Pancytopenia	4	Nil	4
Thrombocytopenia	1	1	Nil
Pancytopenia	2	Nil	2
Accelerated phase	1	Nil	1
Pancytopenia	1	1	Nil
Pancytopenia	1	1	Nil
<b>Total</b>	<b>10</b>	<b>3</b>	<b>7</b>

**Table 2: Bone marrow examination findings of ten undiagnosed cases**

Total cases	BMA	BMB	SI
4	Bloody tap	MF	No findings
1	Dry tap	ET	Increased dysplastic megakaryocytes
2	Dry tap	Blast crises	Myeloblasts
1	Bloody tap	Accelerated phase	Accelerated phase
1	Dry tap	Lymphoma	Atypical lymphoid cells
1	Bloody tap	Marrow repair	No findings
10			

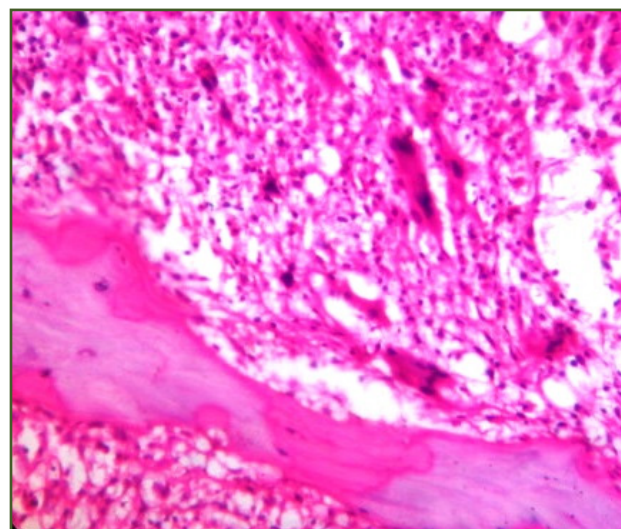
**Fig 1: Showing fibrosis of marrow (Haematoxylin & Eosin stained section 20X).**

### Discussion

Diagnosis of MPN included complete blood count (CBC), comprising differential and platelet count, marrow aspiration, and marrow biopsy with recent development in diagnosis including sensitive tests such as standard cytogenetics [6]. The bone marrow examination is valuable investigation in hematology. These procedures are also useful for follow up of the patients undergoing chemotherapy [7, 8].

In the present study 39 out of total 49 cases showed comparable results of CML between BMA and BMB [5]. An important limitation of bone marrow obtained by aspirate in 6 cases was dilution of the sample. The admixing of marrow and sinusoidal blood results in false low cellularity hence BMB is In rest of the four out of ten cases, dry tap was obtained and ultimately diagnosis was made on BMB [9].

Four out of six cases of bloody tap presented with pancytopenia, was found to be cases of myelofibrosis (Fig 1).

**Fig. 2: Showing abnormal topographic arrangement of megakaryocytes (H&E stained sections 40x).**

As mentioned in the literature BMA does not have much role in diagnosis of primary myelofibrosis, as it can be confirmed on BMB only [10]. In one known case of CML, bone marrow aspiration yielded diluted blood only. BMB and imprint smears provided the clue for diagnosis of accelerated phase [11,12]. One young male who was undergoing treatment of CML, presented with pancytopenia showed bloody tap on BMA. Bone marrow biopsy showed changes of marrow repair histopathologically [7]. In addition role of trephine biopsy in association with imprint smear examination is critical to measure the marrow cellularity, topographic arrangement and blasts. In two cases of dry tap, BMB revealed blast crises in known case of CML [11]. The histopathological examination in another case of dry tap showed increased number of megakaryocytes with abnormal topographic arrangement (Fig2) [13].

One another case of treated CML presented with pancytopenia and biopsy revealed second malignancy of lymphoid origin [14].

## Conclusion

These days diagnosis of myeloproliferative neoplasm depends upon the molecular genes studies along with basic investigations and clinical presentation. Bone marrow biopsy with the help of imprint smears still plays a crucial role in making the diagnosis.

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## Abbreviations and Symbols

MPN – Myeloproliferative Neoplasm

BMA- Bone marrow aspiration

BMB- Bone marrow biopsy

SI- Smear imprint

MF- Myelofibrosis

ET- Essential thrombocythemia

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