



A COMPARATIVE STUDY OF BONE MARROW ASPIRATION AND BONE MARROW BIOPSY IN HAEMATOLOGICAL DISEASES IN A TERTIARY CARE CENTER OF CENTRAL INDIA-A RETROSPECTIVE STUDY

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ABSTRACT

Introduction: Bone marrow examination is a diagnostic tool which is very important to evaluate various hematological disorders including neoplastic and non-neoplastic both. The two most important techniques are bone marrow aspiration (BMA) and bone marrow trephine biopsy (BMB) used for the diagnosis; are complementary to each other. Bone marrow aspiration (BMA) provides information about the number and cytological features; whereas bone marrow trephine biopsies (BMB) provide excellent appreciation of spatial relationships between cells and to overall bone marrow structure. **Aim and Objectives:** To compare the diagnostic values of bone marrow aspiration and Bone Marrow biopsy. **Material and Methods:** A total of 217 cases with both bone marrow aspiration and biopsy were included in this study. All the aspirate smears were routinely stained by Leishman Giemsa while the trephine biopsy sections were stained by routine Hematoxylin and Eosin (H&E) stain. All the smears and sections were reviewed and the findings on BMA & BMB were compared and the final correlation done. **Result:** Chronic Myeloid Leukemia (C.M.L.) was the most common diagnosis followed by Acute Leukemia. The diagnostic accuracy of C.M.L. was 100% as compared to Acute Leukemia (96.6%). The diagnosis accuracy of BMA in our study was 84.09%. **Conclusion:** Bone marrow aspiration and Bone Marrow biopsy are complementary to each other and the superiority of one method over the other depended on the underlying disorder. BMA provides better study of the cell, whereas biopsy provides details about the pattern of cellular distribution, level of fibrosis etc. hence when performed together it gives better diagnostic accuracy and correlation. Furthermore, application of ancillary techniques such as flow cytometry and IHC proved to be an additional advantage in further typing of various diseases.

KEYWORDS : Bone marrow aspiration, Bone marrow biopsy, C.M.L

INTRODUCTION

Bone marrow examination having two techniques for making the diagnosis are bone marrow aspiration (BMA) and bone marrow trephine biopsy (BMB) which are complementary to each other. Bone marrow Aspiration is an important diagnostic tool to evaluate various disorder including both neoplastic and non-Neoplastic hematological diseases. The bone marrow evaluation may either confirm clinically suspected disease or may provide the previously unsuspected diagnosis (1,2). The most important uses of the marrow is primarily utilized for cytological assessment with analysis directed towards morphology and obtaining a differential cell count. Biopsy is essential for diagnosis in a dry tap or blood tap which occurs when the marrow is fibrotic or densely cellular because of increase in no. of any type of native cells or infiltration of foreign cell population. BMB allows a complete assessment of marrow architecture and pattern of distribution of any abnormal infiltrates (3).

The present study was conducted to compare Bone marrow aspiration cytology and trephine biopsy to formulate an effective and rapid method for diagnosing wide spectrum of hematological diseases.

Bone marrow aspiration (BMA) is simple, reliable, and rapid method of marrow evaluation. It provides information about the numerical and cytological features of marrow cells. These cells are also well suited to further examination by cytogenetics, molecular and flow cytometric methods. However, BMA has low sensitivity in detecting solid tumor metastasis and lymphoma involvement (10,11). Nowadays, aspirate and trephine biopsy specimens are considered complementary and when both are obtained, they provide a comprehensive study of bone marrow. However, biopsy is a painful procedure and its processing takes at least 48–72 h. Hence, to perform trephine biopsies in all patients may not be cost effective in terms of clinician and laboratory personnel time, efforts, and patient discomfort (12).

Aim and Objectives

To compare the diagnostic value of bone marrow aspiration and biopsy.

MATERIALS AND METHODS

This was a Two year retrospective study done in the department of pathology, Gajra Raja Medical College, Gwalior (M.P) from March 2021 to March 2023. A total of 217 cases presented with clinical hematological disorders; of which 216 were biopsied and the correlation done. The bone marrow Aspiration samples were obtained most frequently from the posterior superior iliac spine. All aseptic precautions have been taken & after that the aspiration needle was passed perpendicular into the cavity of the bone and when we enter the bone marrow cavity proper a sudden give away is felt. A total of 0.3 - 0.6 ml of marrow content was aspirated with the help of a 10 ml Syringe. The trephine biopsy was performed using Bone marrow biopsy needle Jamshidi bone marrow biopsy needle with Luer lock adapter was used, 13 gauge needle for lower age group and 11 gauge needle for higher age groups.

The length of the biopsy core ranging from 0.8 to 1.5 cm. The biopsy was then fixed for minimum of 24 hours in 10% neutral buffered formalin and then decalcified overnight in picric acid. The fixation of the biopsy core was followed by automated tissue processing, paraffin embedding and sectioning like other normal biopsy tissue processing. All the aspirate smears were routinely stained by Jenner Giemsa while the trephine biopsy sections were stained by routine Hematoxylin and Eosin (H&E stain). All the BMA smears and BMB sections were reviewed and the findings were compared for final correlation to be done.

Statistical Analysis

All the data were compiled and entered in MS-excel. Statistical analysis was performed by using Cohen's test and software used was SPSS-20, Social Sciences Software version 20 (SPSS, Armonk, NY: IBM Corp).

RESULT

A total of 217 cases were subjected to bone marrow aspiration and 216 for bone marrow biopsy. Chronic Myeloid Leukemia (C.M.L.) was the most common diagnosis followed by Acute Leukemia in bone marrow aspiration as well as in the Bone marrow biopsy. On talking about Bone marrow aspiration and biopsy correlation CML, ITP & multiple myeloma are the most correlated diagnosis with accuracy is 100%. Total of six cases came out to be dry tap while doing bone marrow aspiration.

Among them Hypoplastic marrow was the most common case (4/6). One case each of leukemia and myelodysplastic disorder was also encountered.

The overall diagnostic accuracy of bone marrow aspiration cytology in diagnosing hematological disorders was 84.09%.

Table-1 : Comparative Evaluation Of Bone Marrow Aspiration And Bone Marrow Biopsy Diagnosis.

Disorder	Bone Marrow Aspiration	Bone Marrow Trephine Biopsy	Diagnostic accuracy (%)
CML	33	33	100%
Acute Leukemia	30	29	96.6%
Mixed Nutritional Deficiency	22	15	68.1%
Megaloblastic Anemia	19	7	36.8%
ITP	13	13	100%
MDS	12	9	
Multiple Myeloma	9	9	100%
Aplastic/Hypoplastic anemia	9	8	88.8%
MRD Negative	9	7	77.7%
CLL	7	7	100%
Iron Deficiency Anemia	2	2	100%

Table-2: Cases With Dry Tap On BMA

Cases	Biopsy Diagnosis
Hypoplastic	3
MDS	1
Leukemia	2

Table 3: Age and Sex Distribution

Age(Years)	Male	Female	Total
0-10	5	3	8
10-20	18	10	28
20-30	15	13	28
30-40	20	19	39
40-50	14	13	27
50-60	17	15	32
60-70	15	13	28
70-80	16	10	26
>80	01	0	1

Fig. 1 : Bone Marrow Aspiration & Bone Marrow Trephine Biopsy

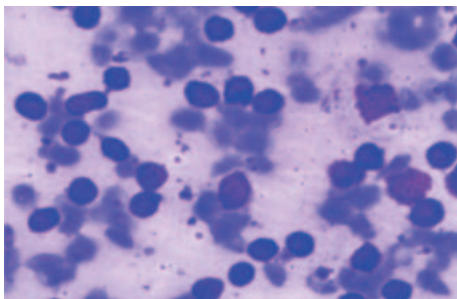


Fig.1.1 : CLL Bone Marrow (100X)

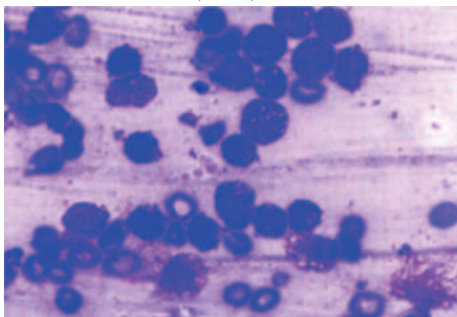


Fig.1.2 :ALL Bone Marrow (100X)

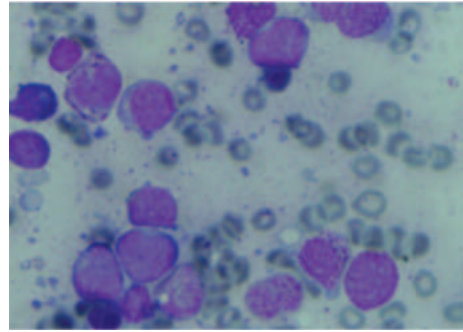


Fig.1.3 : AML Bone Marrow (100X)

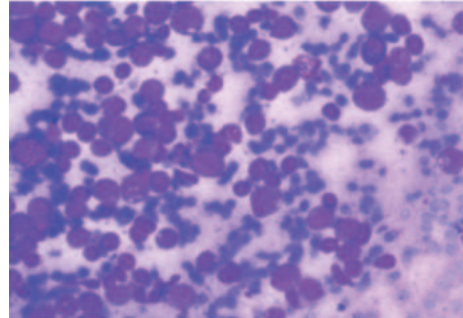


Fig.1.4 : AML Bone Marrow (40X)

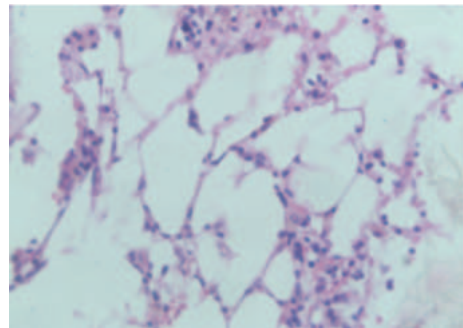


Fig.1.5 : Trephine Biopsy Aplastic Naemia (10X)

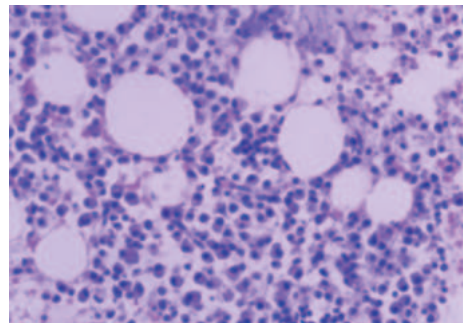


Fig.1.6 : Trephine Biopsy Multiple Myeloma(10X)

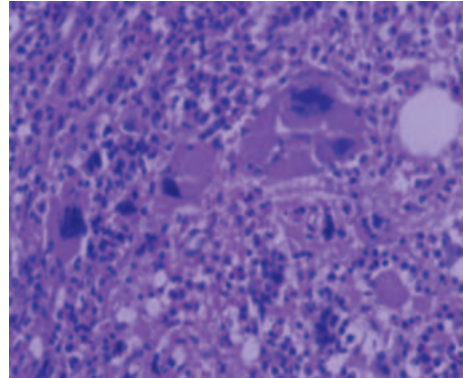


Fig.1.7 : Trephine Biopsy Myelofibrosis (10X)

DISCUSSION

Bone marrow examination is an important investigation carried out in the routine practice for the diagnosis for the hematological and some non-hematological disorders. Bone marrow trephine biopsy (BMTB) is a relatively safe procedure with adverse event reported in only 0.12 to 0.34% of procedures. The commonest complication of BMTB was mild hemorrhage.(4)Major risk factor for hemorrhage was meloproliferative disorder (MPD) and increased bleeding in a case of polycythaemia vera(5). The commonest hematological disorder in the present study was Chronic Myeloid Leukemia with 33 cases. In the study done by parajuli et al (6) megaloblastic anemia was the most common diagnosis while the study done by Vidisha Mahajan et al (7) nutritional anemia was the most common diagnosis. The diagnosis accuracy of BMA in our study was 84.09% which was similar to the study done by parajuli et al (6).

Diagnosis accuracy of BMA was slightly lower in the study done by Smita Chandra et al (77.5%) (8).We encountered a single case of Non Hodgkin's lymphoma (NHL) infiltrating the bone marrow which was diagnosed both on BMA and BMB, where as in the study done by vidisha et al (7) much of the cases could not be diagnosed on the BMA alone, which stressed out point that both aspiration and biopsy should be done to reach the diagnosis accurately.(7). 2 out of 3 (66%) Metastatic carcinoma were diagnosed on bone marrow aspiration which are as similar to the study done by Smita Chandra (8). 33% of metastatic carcinoma was only found to be positive in BMA in the study done by Donald et al (9).

To conclude, Bone marrow aspiration and biopsy complement each other. It is always a clinician decision to choose whether to perform a Bone marrow aspiration or a biopsy or both. Better result is yielded out when both are perform simultaneously. Bone marrow aspiration provides better study of the cell, whereas biopsy provides detail about the pattern of cellular distribution, cellularity, infiltration by tumor cells and provides a block on which immunohistochemistry is to perform later on.

CONCLUSION

Our study concludes that BMA cytology and trephine biopsy histopathology complement each other and the superiority of one method over the other depended on the underlying disorder. Among nonmalignant disorders BMA was superior to BMB in megaloblastic anemia, iron deficiency anemia, and ITP cases. BMB was the sole diagnostic tool in MF cases where BMA aspiration yielded diluted marrow or dry tap. BMB was more helpful in diagnosing MPDs, aplastic/hypoplastic anemia, granulomatous lesions, NHL, and acute leukemia. Furthermore, application of ancillary techniques such as flow cytometry and IHC proved to be an additional advantage in further typing of various diseases in our study

Conflicts of Interest

There are no conflicts of interest.

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