Indian Journal of Pathology and Oncology 2021;8(2):228–231

Content available at: https://www.ipinnovative.com/open-access-journals

Indian Journal of Pathology and Oncology

Journal homepage: www.ijpo.co.in

Original Research Article

Comparative study of bone marrow clot section with bone marrow aspiration smears in various haematological conditions

Vidya Vasudev[1], Anil J[1,*], Bharathi M[1]

[1] *Dept. of Pathology, Mysore Medical College and Research Institute, Mysore, Karnataka, India*

ARTICLE INFO

Article history:
Received 11-03-2021
Accepted 24-03-2021
Available online 19-05-2021

Keywords:
BMA
Paraffin embedded clot section
Leishman stain
H&E

ABSTRACT

Introduction: Bone marrow examination has become an indispensable in diagnosis of Haematological and Non haematological diseases. It is very easy and rapid compared to other expensive and time consuming investigation, bone marrow examination i.e. aspiration and clot section done simultaneously, can yield good diagnostic material.

Aims a nd Objectives: This study was aimed to assess diagnostic value of BMA and Bone Marrow Clot section and role of both procedures to reach final diagnosis when done simultaneously.

Materials a nd Methods: This study was done on 30 cases in which peripheral blood smear, bone marrow aspiration and cell blocks were available and included in study. Bone marrow aspiration was performed, cell block was prepared and stained with H&E and smears were stained with Leishman stain.

Results: BMA Smears were compared with Paraffin embedded cell block section. Out of 30 cases there were 20 cases (66.66%) of anaemias, 04 cases (13.33%) lymphoid neoplasms, 04 cases (13.33%) Acute leukemia, 01case (3.33%) MPD, 01case (3.33%) Metastatic deposit. In 09 cases i.e. 30% cell block was unsatisfactory.

Conclusion: Morphology was better in aspirate smear than clot section but Megakaryocytes, Eosinophilic precursor and Megaloblastic changes was appreciated in cell block sections. The advantage of both procedures done together provide more material and may help in more accurate diagnosis.

1. Introduction

Aspiration of the bone marrow is very common procedure in haematology practice.[1] Bone marrow examination is a very useful investigation and helps in diagnosis of various haematological diseases.

Bone marrow studies not only aid in diagnosis but also staging and monitoring of various diseases, follow up of patients on chemotherapy, transplant and other form of medical treatment.[2,3]

Marrow can be involved by metastatic tumour which affects the clinical treatment and prognosis. Bone marrow examination is indeed beneficial, in cases where malignancy are not suspected clinically and is useful in detecting non hematologic malignancies. Bone marrow aspirate smears are used primarily for the assessment of differential count, (M: E) myeloid erythroid ratio, maturation status and morphological details. In addition, biopsy is usually performed to study architecture of marrow and to look for cellularity, fibrosis in conditions like lymphoma, myeloma, metastatic tumour or granulomas, where the involvement can be focal.[4]

The blood that is obtained along with the bone marrow aspirate is usually discarded though it can be used to prepare a clot section, similar to cell block that is extensively used in cytological practices.[5]

Bone marrow aspirate clot technique is not being frequently utilized in clinical practice though it has been described in literature. Very few studies have assessed its role in diagnosis and follow up in various haematological

* *Corresponding author.*
E-mail address: draniljjayaram@gmail.com (Anil J).

https://doi.org/10.18231/j.ijpo.2021.045

diseases. Hence the present study was conducted to evaluate the role of paraffin embedded clot section in diagnosis of various marrow disease and to evaluate the complementary role of both procedures when they are done simultaneously and also to see the advantage and disadvantage of this procedures.

2. Materials and Methods

This study was done on 30 cases in which had peripheral blood smear, bone marrow aspiration and cell block were included in the study. Bone marrow aspiration was performed clot section was prepared from the blood left over after aspirate smears have been made. Blood containing admixed marrow particle is transferred to container with 10% formal saline for fixation and further processing is carried out as for routine histopathology specimen. Cell block was prepared and stained with H&E and aspiration smears were stained with Leishman stain.

2.1. Inclusion criteria

The selection of cases was based on the clinical examination and peripheral blood smear of patients in which a haematological disorder was suspected.

2.2. Exclusion criteria

Patient having platelet count less than 20,000 and the cases which were bleeding severely, like hemophilic patient were excluded.

3. Observations

Total 30 cases were selected in which complete peripheral smears, bone marrow aspirate and cell blocks were available. The findings obtained are as follows (Tables 1, 2 and 3).

4. Results

The present study was conducted for comparison between Bone marrow aspirate smears stained by Leishman and Paraffin embedded cell block section stained by Haematoxylin and Eosin stain. Out of 30 cases there were 20 cases (66.66%) of anaemias, 04 cases (13.33%) lymphoid neoplasms, 04 cases (13.33%) Acute leukemia, 01case (3.33%) MPD, 01case (3.33%) Metastatic deposit. In 09 cases i.e. 30% cell block was unsatisfactory.

The comparison between bone marrow aspiration and bone marrow clot sections are shown in Table 4.

5. Discussion

The present study was undertaken to assess the efficacy of paraffin embedded cell block of the bone marrow aspirate in comparison with bone marrow aspirate smear in diagnosis of various haematological disorders.

Megaloblastic anemia was the commonest lesion in the present study. Megakaryocytes, eosinophil precursors and megaloblastic changes were better appreciated in cell blocks (Figures 1 and 2). Megaloblastic anemia was most common in the age group of 41-50 years and showed male:female ratio of 1.3:1, which was similar to the studies done by Kuperan, Rajshekar Swamy et al.[6] in which commonest age group was 31-40 years with male to female ratio of 1.3 :1.

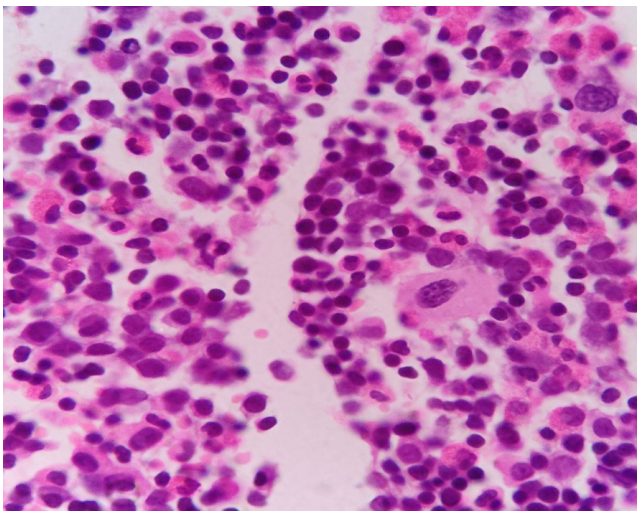

Fig. 1: BMC showing Megakaryocytic precursor and eosinophilic precursors H&E (oil immersion)

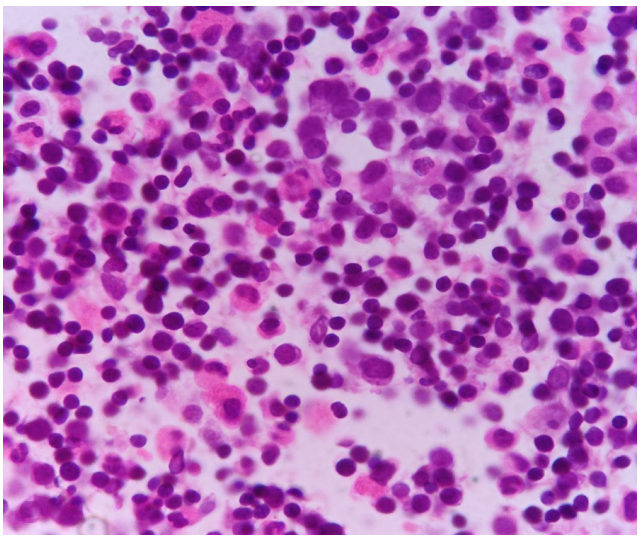

Fig. 2: BMC showing Megaloblastic changes. H&E (oil immersion)

The present study showed male predominance 3 cases (75%) of acute leukemia, which is in similar to Jaishree Sharma and Shoba Mahindrao et al.[7] which showed male preponderance 20 cases (55.5%).

Table 1: Distribution of various hematological disorders

S. No	Disorders	No. of cases	Percentage
1	Megaloblastic Anemia	20	66.66
2	Acute leukemia	04	13.33
3	Lymphoid Neoplasms	04	13.33
4	MPD	01	3.33
5	Metastasis	01	3.33
Total		30	100

Table 2: Distribution of haematological disorders according to sex

S. No	Disorders	Total No. of cases	Male		Female	
			No.	Percent	No.	Percent
1	Megaloblastic Anemia	20	11	55	09	45
2	Acute leukemia	04	03	75	01	25
3	Lymphoid Neoplasms	04	02	50	02	50
4	MPD	01	00	00	01	100
5	Metastasis	01	00	00	01	100

Table 3: Distribution of haematological disorders according to age

S. No.	Disorders	0-10	11-20	21-30	31-40	41-50	51-60	61-70	Total
1	Megaloblastic anemia	0	1	3	5	7	4	0	20
2	ALL	2	0	0	0	0	0	0	2
3	AML	0	0	1	1	0	0	0	2
3	Lymphoid Neoplasm	0	0	0	0	1	2	1	4
4	MPD	0	0	0	1	0	0	0	1
5	Metastasis	0	0	0	0	0	1	0	1
Total		2	1	4	7	9	7	1	30

Table 4:

S.No.	Disorders	BMA		BMC	
		Satis	Non-satis	Satis	Non-satis
1	Megaloblastic anemia	20	00	17	03
2	Acute leukemia	04	00	01	03
3	Lymphoid Neoplasm	04	00	03	01
4	MPD	01	00	00	01
5	Metastasis	01	00	00	01
	Total	30	00	21	09

Sitalaxmi et al.,[8] found that diagnosis of acute leukemia could be done on aspiration alone. Trephine biopsy provided additional useful information. In the present study also acute leukemia were diagnosed on aspiration alone clot section should be used as an adjuvant to bone marrow aspiration to increase the diagnostic yield (Figure 3).

In the present study 4 cases of lymphoid neoplasm which had 2 cases of Hodgkin's lymphoma, 1 case of Multiple myeloma and 1 case of NHL. In the study by Goyal et al.,[9] they found aspirate high sensitivity for acute leukemia (89.4%), Multiple myeloma (88.5%) moderate for NHL (67.6%) and non-hematopoietic metastasis (58.3%) and low for aplastic anemia (38.5%) and Hodgkin lymphoma (5%). Aspiration had no role in granulomatous myelitis and myelofibrosis. Condition like lymphoma, multiple myeloma, metastasis tumours and granulomatous disorders may have focal bone marrow involvement. Bone marrow aspirate alone in these condition may result in false negative diagnosis and an added trephine biopsy sometime from two sites is vital to establish the diagnosis.[9]

Bone marrow aspiration and paraffin embedded clot section are still very useful tools in diagnosis of unsuspected non haematological malignancies. But in our present study one case of metastasis was diagnosed on aspirate but clot section was unsatisfactory (Figure 4).

But in cases of Naveen Kakkar et al.,[10] diagnosed a case of Relapse of multiple myeloma with clot section alone with negative bone marrow aspirate and trephine biopsy.

Clot section can also be used for specialized procedure like immunohistochemistry. Compared with trephine

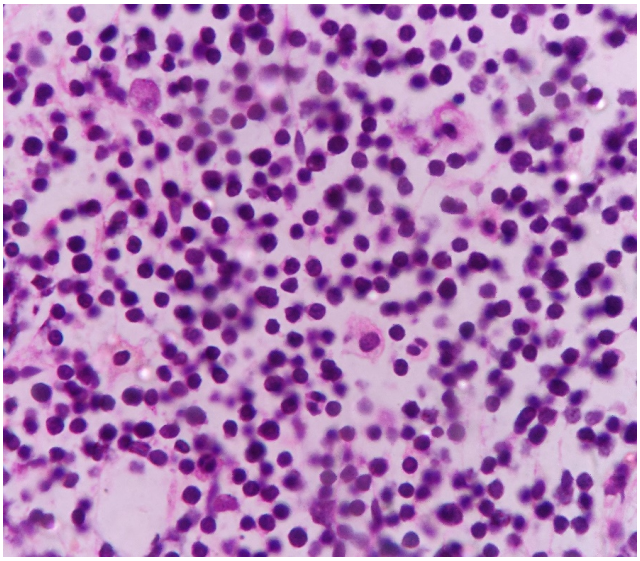

Fig. 3: BMC showing leukemia. H&E (oil immersion)

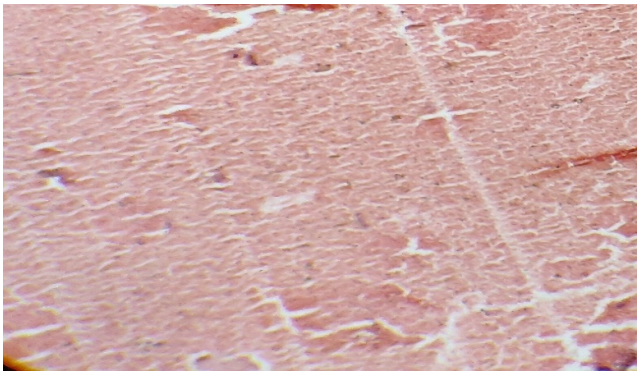

Fig. 4: BMC - Unsatisfactory smear

biopsy section, clot have a better antigen retrieval for immunohistochemistry as decalcification is not required. In situ hybridization studies too have shown better results with clot section as compared to conventional trephine biopsy.[2]

In the study by Jasim et al.[11] 81% of cases marrow clot sections were diagnostic. However, trephine was still necessary in 19% of cases in whom the clot sections were of poor quality and unconvincing. In present study clot sections were unsatisfactory in 30% of cases which were of poor quality composed of blood clot only or with few scattered hematopoietic cells. Because it will be difficult to anticipate which patient will be diagnosed by clot section so it would be advisable to combine clot section along with bone marrow aspirate and biopsy as an adjuvant procedure to increase the diagnostic yield.

6. Conclusion

The study concludes that preparation of bone marrow aspirate and clot section is easy, rapid and complementary to each other in majority of lesions. Megakaryocytes and eosinophilic precursors can be better appreciated in cell block, further cell block can be stored and used for specialized procedures like IHC. The advantages of both procedures done together improves the diagnostic yield.

7. Source of Funding

None.

8. Conflict of Interest

The authors declare that there is no conflict of interest.

References

1. Brain BJ. Bone Marrow aspiration. *J Clin Pathol*. 2001;54:657–63.
2. Riley RS, Hogan TF, Pavot DR, Forysthe R, Massey D, Smith E, et al. A pathologist's perspective on bone marrow aspiration and biopsy: I. performing a bone marrow examination. *J Clin Lab Anal*. 2004;18(2):70–90. doi:10.1002/jcla.20008.
3. Islam A. Bone marrow aspiration prior to bone marrow core biopsy using the same bone marrow biopsy needle. A good or bad practice. *J Clin Pathol*. 2007;60:212–5.
4. Dee JW, Valdivieso M, Drewinko B. Comparison of the Efficacies of Closed Trephine Needle Biopsy, Aspirated Paraffin-embedded Clot Section, and Smear Preparation in the Diagnosis of Bone-marrow Involvement by Lymphoma. *Am J Clin Pathol*. 1976;65(2):183–94. doi:10.1093/ajcp/65.2.183.
5. Tkachuk DC, Hirschmann JV. Approach to microscopic evaluation of blood and bone marrow. In: Tkachuk DC, Hirschmann JV, editors. Wintrobe's Atlas of Clinical Hematology. Philadelphia: Lippincott Williams and Wilkins; 2007. p. 275–328.
6. Kuperan P, Swamy R. Megaloblastic anemia - A review from university hospital kuala Lumpur. *Ann Acad Med Singapore*. 1998;17(2):261–6.
7. Sharma J, Mohindroo S. FAB classification of leukaemia: A cytochemical study. *Indian J Pathol Microbiol*. 2004;47(3):336–339.
8. Sitalaxmi S, Srikrishna A, Devi S, Damodar P, Alexander B. The diagnostic utility of bone marrow trephine biopsies. *Indian J Pathol Microbiol*. 2005;48(2):173–6.
9. Goyal S, Singh UR, Rusia U. Comparative Evaluation of bone marrow aspirate with trephine biopsy in hematological disorders and determination of optimum trephine length in lymphoma infiltration. *Mediterr J Hematol Infect Dis*. 2013;6(1). doi:10.4084/mjhid.2014.002.
10. Kakkar N, Das S. Relapse of multiple myeloma: Diagnosis by clot section alone with negative bone marrow aspirate and trephine biopsy. *Indian J Pathol Microbiol*. 2009;52:290. doi:10.4103/0377-4929.48957.
11. Al-Diab JMA. Paraffin embedded marrow clot sections as an adjuvant procedure in the diagnosis of bone marrow diseases. *Med J Basrah Univ*. 2016;34(1):15–9. doi:10.33762/mjbu.2016.111183.

Author biography

Vidya Vasudev, Assistant Professor

Anil J, Post Graduate

Bharathi M, Professor and HOD

Cite this article: Vasudev V, Anil J, Bharathi M. Comparative study of bone marrow clot section with bone marrow aspiration smears in various haematological conditions. *Indian J Pathol Oncol* 2021;8(2):228-231.