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Spectrum of Haematological Disorders Detected By Bone Marrow Aspiration in a Span of 3 Months Period.

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Abstract:
Background*: Hematological disorders have diverse modes of presentation that often requires bone marrow examination for both diagnosis and management. Most of the hematological disorders first present as anemia. Bone Marrow Aspiration plays a major role in the diagnosis of its underlying cause.*
Aim*: The aim of study to emphasize the crucial role of bone marrow aspiration in the diagnosis of hematological disorders.*
Materials and Methods: *This was a retrospective study carried out in the department of Pathology, Rangaraya Medical College in a period of three months (April 2015 - June 2015). Bone marrow examination of 43 cases of suspected hematological disorders was carried out. All details of the patients were obtained from the record file in the department of pathology.*
Results*: 43 cases of bone marrow aspiration were taken. Erythroid hyperplasia was 9 cases (20.9%), Idiopathic Thrombocypenic Purpura was7 cases (16.4%) , Megaloblastic anemia was 5 cases (11.8%) , Hypoplastic marrow was 4 cases,(9.3%) and Acute leukemias was 3 cases(7%) . Chronic myeloid leukemia, Multiple myeloma, Gauchers disease and Infiltrative marrow were 2 cases each (4.6%) . Transient Myeloproliferative Disorder, Congenital Dyserythropoietic Anemia, Myelofibrosis and Megakaryocytic hypoplasia were each 1 case (2.3%). Normal marrow was 3 cases(7%).*
Conclusion: *Bone marrow aspiration plays a crucial role to arrive and confirm the diagnosis of many hematological disorders.*
Keywords: *Bone marrow aspiration, diagnostic role, hematological disorders.*

I. Introduction

Anemia is common in worldwide and particularly in developing countries. Hematological disorders in any age group usually presents with anemia[1,2]. The spectrum of hematological disorders is relatively different in the developing world than the developed countries[10]. Most of the time the diagnosis can be arrived at by detail clinical examination and few simple investigations. However without bone marrow examination, the diagnosis is usually not a confirmatory. Bone marrow examination also gives explanation for unexplained cytopenias, leukemias and rare disorders like CDA and TMD. It gives a more complete picture of the abnormality of the haemopoietic tissue than can be gained from peripheral blood smear (PBS) alone[1,2]. Bone marrow aspiration (BMA) is the most frequent and safe invasive procedure done routinely in the hospitals for the diagnosis and management of hematological disorders [1,2]. There is very little or no risk of bleeding and can be safely done in case of severe thrombocytopenia [1].

II. Materials and methods

This was a retrospective study done in the Department of Pathology, Rangaraya Medical College for a period of three months (April 2015 to June 2015). A total number of 43 cases were included in this study. Bone marrow aspiration reports of the patients were retrieved from the record file in the department. Peripheral blood smear along with necessary hematological and clinical parameters were also noted from the record file. Aspirates of inadequate material or dry tap were excluded from the study. Then data was manually collected and subsequently analyzed.

III. Results

A total number of 43 patients were included in this study aged between 6 days and 70 years. The mean age was 35.1 years. 18 (41.8%) were males and 25 (58.2%) were females with M:F =1:1.4. Maximum number of patients (27.9%) of hematological disorder who underwent bone marrow aspiration was in the age group of 0-10 years. In (Table-1) shows the age distribution of the patients. In our study 18(42%) cases were presented with pallor and weakness,

11(25.6%) cases presented with fever, 6 (14%) cases were bleeding manifestations, 5 (11.6%) cases were organomegaly and 3 (7%) cases were presented as backache (Table-2) . Though most of the bone marrow aspirations were hypercellular, we did come across normocellular marrows as well. (Table-3).

Bone marrow examination findings given in (Table- 4). Erythroid hyperplasia was the common finding in our study. In these cases, there were no other significant findings. Out of 9 cases of erythroid hyperplasia, 5 cases were micronormoblastic hyperplasia and 4 cases were normoblastic hyperplasia . Idiopathic thrombocytopenic purpura(ITP) was seen in 7 (16.4%) cases ,within that 2 cases were ITP with erythroid hyperplasia and remaining 5 cases were only ITP. Megaloblastic anemia was seen in 5 cases(11.8%). In 4 cases of hypoplastic anemia, all 3 cell lineages were suppressed. In 3 cases of Acute leukemia, 2(4.6%) cases were AML and 1 (2.3%) case was ALL. Chronic myeloid leukemia was seen in 2(4.6%) cases, both were correlated with Peripheral blood smear findings. 2 cases of multiple myeloma showed 40% plasma cells with plasma blasts and correlated with biochemical, radiological and clinical findings. 2 (4.6%) cases of bone marrow aspiration showed adenocarcinoma deposits, 2(4.6%) cases were diagnosed as Gaucher's disease . Transient Myeloproliferative Disorder (TMD), Congenital Dyserythropoietic Anemia (CDA), Myelofibrosis and Megakaryocytic hypoplasia were 1 case (2.3%) each.

IV. Discussion

The spectrum of hematological disorders is vary wide. Bone marrow examination is safe procedure and a useful tool in reaching the final diagnosis. In our study, most common age group 0 – 10 years. In a study done by Pudasaini et al, the majority of the patients were between 31 – 45 years[1]. In our study the age of the patients ranged from 6 days to 70 years . Age and sex distribution was compared with other studies as shown in (Table-5).The commonest indication in our study was pallor with weakness(41.8%) followed by fever (25.6%). Similar to our findings, anemia was the commonest indication in a study done by Timothy et al[5], but in Ahmed et al study anemia was the second common indication (28.6%). [3]

Erythroid hyperplasia was seen in 9 (20.9%)cases of our study, (19.6%) and (14%) cases of erythroid hyperplasia was seen in study done by Jha et al[4] and Khodke et al [6] . ITP (Fig-1) was the 2nd common diagnosis (7 cases) in present study, other studies Kibria SG et al, Ahmed SQ et al, and Khujuria et al showed (6.21%), (14.5%), and (6.8%)[10,3,8] . In my study,Megaloblastic anemia was seen in (11.8%) cases,compared to other studies Pudasaini S et al, Ahmed SQ et al and Khodke K et al showed (12.3%),(11.9%) and (6.5%)cases [1,3,5]. Hypoplastic anemia was seen in 4 cases (9.3%). Diagnosis was based on Bone marrow aspiration and bone marrow biopsy findings. It is recommended that both aspiration and trephine biopsy be done simultaneously in a case of pancytopenia especially if hypoplastic anemia is suspected though aspiration smears are superior for morphological details. Compared to other study Pudasaini S et al showed (5.3%) [1]. Acute leukemia (Fig-2)was seen in 3 cases(7%), out of this, 2 cases (4.6%) were AML and 1 case (2.3%) was ALL. Other studies also showed that acute leukemia is the commonest hematological malignancy and AML is more common than ALL [1,2,4,9.]. Other malignancies in our study , Multiple myeloma (Fig-3) was seen in 2(4.6%) cases. Similar findings was seen in other studies conducted by Timothy AE et al, Khodke K et al, Pudasaini S et al and Ahmed et al showed (10%),(8.1%),(3.5%) and (1.2%) cases[8,5,1,3]. Our study also showed that Adenocarcinomatous deposits in 2(4.6%) cases (Fig-4),2 cases (4.6%) of Gaucher's disease (Fig-5), 1 case (2.3%) Transient Myeloproliferative Disorder (Fig- 6), Congenital Dyserythropoietic Anemia (Fig-7), 1case (2.3%) 1 case (2.3%) Megakaryocytic hypoplasia were closely approximate (2.9%) with study conducted by Shilpa et al .[7]

Transient Myeloproliferative Disorder (TMD) or Transient Abnormal Myelopoiesis is unique among clonal neoplastic disorders by its universal linkage with trisomy 21, its restriction to the neonatal period, and its natural history of spontaneous regression. It most often has characteristics of megakaryocytic lineage and is now shown to be universally associated with GATA1 mutations in the myeloblasts. In general patients with trisomy 21 may present during TMD's proliferative phase or in the ensuing regression phase which contributes to the variable presentation incidences described in the literature. Though TMD eventually resolves in most infants, a small but significant percentage will succumb to the uncontrolled proliferation of megakaryoblasts or to the associated fibrosis and ensuing complications of either. In 20-30% a significant risk remains for the development of acute myeloid leukaemia (AML) among the survivors of TMD[13].Clinical features of TMD range from asymptomatic leucocytosis to fatal conditions like hepatic fibrosis, hepatic failure and leucocytosis with high blast count (25%) in peripheral smear. TMD is the self limited course resolving in 2-12 weeks, but in fatal conditions require the treatment.

In our case , peripheral smear on 6th day showed increased WBC count with high blast cell count, normocytic normochromic RBC and decreased platelet count, in bone marrow examination on 7th day showed increased of blast cell count(11%) and on follow up with repeated peripheral smear examination from 8th day, we noticed blast cell count came down to normal by 13th day. TMD is very rare presentation.

Congenital dyserythropoietic anemia (CDA) was first described in 1967. Soon after the first reports, it became evident that different types exist , which share ineffective erythropoiesis as the main mechanism of the anemia and which are all characterized by morphological abnormalities of the erythroblasts, but which are of distinct phenotype and genotype.[15] CDA are classified into type1,type11 and type111. CDA 11 being most common. In our case,Peripheral blood picture showed RBC with moderate anisipoikilocytosis, mostly of normocytic normochromic cells. Plenty of erythroid precursors with few dyserythropoietic forms are seen. Sickling test-Negative and osmotic fragility test with in normal limits. In bone marrow finding ,majority of erythroid cells showing features of dyserythropoiesis like nuclear budding, binucleation and multinucleation. Incorrelation with clinical features, peripheral smear, bone marrow findings and after exclusion of other conditions with necessary lab tests we diagnosed the case as CDA, probably CDA type11.

V. Conclusion

Bone marrow aspiration examination is safest and out patient procedure . An important step to arrive at the confirmatory diagnosis of wide varieties of hematological disorders and rare cases like TMD and CDA.

Table-1 Age distribution of the patient

Age group	No. of patients	Percentage%
0-10 years	12	27.9%
11-20 years	6	13.9%
21-30 years	5	11.6%
31-40 years	4	9.4%
41-50 years	5	11.6%
51-60 years	7	16.2%
61-70 years	4	9.4%
Total	43	100%

Table-2 Clinical findings of the patient

Clinical findings	No. of patients	Percentage %
Pallor & weakness	18	41.8%
Fever	11	25.6%
Bleeding manifestations	6	14.0%
Organomegaly	5	11.6%
Backache	3	7.0%
Total	43	100%

Table-3 cellularity of the bone marrow aspiration

Cellularity of the marrow	No. of cases	Percentage %
Hypercellular	26	60.5%
Normocellular	11	25.5%
Hypocellular	6	14.0%
Total	43	100%

Table- 4 Bone marrow examination findings

BMA diagnosis	No. of cases	Percentage %
Erythroid hyperplasia	9	20.9%
ITP	7	16.4%
Megaloblastic anemia	5	11.8%
Hypoplastic anemia	4	9.3%
Acute leukemia	3	7.0%
Chronic myeloid leukemia	2	4.6%
Multiple Myeloma	2	4.6%
Marrow secondaries	2	4.6%
Gaucher's disease	2	4.6%
Myelofibrosis	1	2.3%
CDA	1	2.3%
TMD	1	2.3%
Megakaryocytic hypoplasia	1	2.3%
Normal marrow	3	7.0%
Total	43	100%

Table-5 Comparison of age and sex distribution in different studies

Study	Age(months-yrs)	M:F
Pudasaini et al [1]	9 months- 75	1:1.1
Timothy et al [5]	2- 75	1.2:1
Ahmad et al [3]	8months-106	1.1:1
Jha et al [4]	1-79	1.5:1

Egesie et al [2]	3-80	1.5:1
Shilpa et al [7]	3-70	2.4:1
Present study	6days- 70	1:1.4

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Images

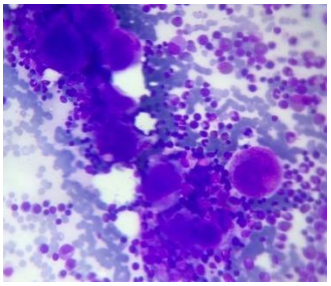

Figure 1: BMA showing hypogranular & hypolabated megakaryocytes in ITP. (leishman X100)

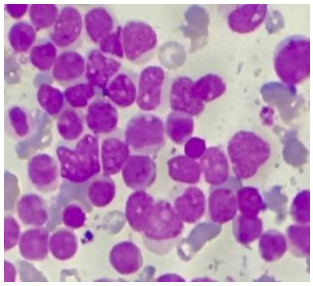

Figure 2: BMA showing blasts in Acute Leukemia (leishmanX100)

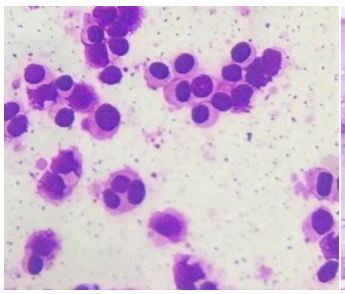

Figure 3: BMA showing plasma cells in Multiple myeloma (leishman X100)

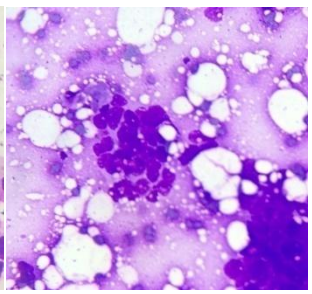

Figure 4: BMA showing Adenocarcinoma deposits (leishmanX100)

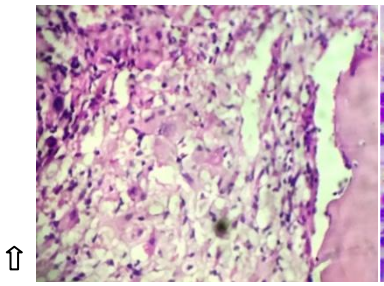

Figure 5: Gaucher cells in Gaucher's disease (H&E 40X)

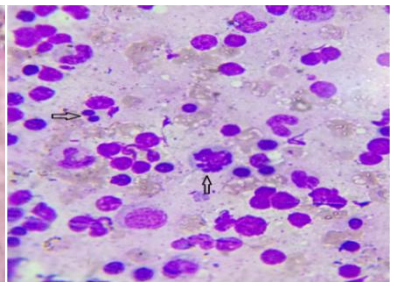

Figure 7: BMA showing dyserythropoiesis in CDA (leishmanX100)

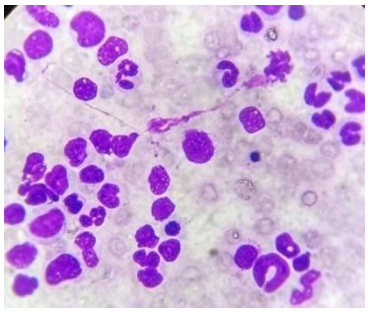

Figure 6: BMA in TMD showing increased number of blast cells.(leishman X100)