Journal of Pathology of Nepal (2012) Vol. **2**, 309 - 312

Journal of
PATHOLOGY
of Nepal

www.acpnepal.com

Original Article

Interpretation of bone marrow aspiration in hematological disorder

Pudasaini S[1], Prasad KBR[1], Rauniyar SK[1], Shrestha R[1], Gautam K[1], Pathak R[1], Koirala S[1], Manandhar U[1], Shrestha B[1]

[1]*Department of Pathology, Nepal Medical College Teaching Hospital, Kathmandu, Nepal*

Keywords:

Anemia;
Bone marrow aspiration;
Leukemia;
Megaloblastic anemia

ABSTRACT

Background: Hematological disorders are quite frequent in all age group. Most of this hematological disorder first present as anemia. Bone Marrow Aspiration plays a major role in the diagnosis of its underlying cause. The aim of this study was to analyze the causes of hematological disorders, its spectrum and to interprete the bone marrow aspiration findings.

Materials and Methods: This was a retrospective and prospective study carried out in the department of Pathology of Nepal Medical College in a period of two years. (July 2010 - June 2012). Bone marrow examination of 57 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: Out of 57 cases of bone marrow aspiration, erythroid hyperplasia was seen in 12 cases (21%). Megaloblastic anemia was seen in 7 cases (12.3%) and microcytic anemia was seen in 4 cases (7%). There were 6 cases (10.5%) of Idiopathic Thrombocypenic Purpura. Acute leukemia was diagnosed in 7 cases (12.3%) and among this acute myeloid leukemia (10.5%) was more common than acute lymphoid leukemia (1.8%). Myelodysplastic syndrome and multiple myeloma was seen in 3.5 % cases each. Aplastic anemia and kalaazar was seen in 5.3% and 1.8% cases respectively.

Conclusion: Bone marrow examination is an important step to arrive at the confirmatory diagnosis of many hematological disorders.

INTRODUCTION

Anemia is common worldwide and particularly so in developing countries.[1] Hematological disorder in any age group usually presents with anemia. The spectrum of hematological disorders is relatively different in the developing world than the developed countries.[2] 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 and leukemia.[2] It gives a more complete picture of the reaction of the hemopoietic tissue to anemia than can be gained from peripheral blood smear (PBS) alone.[1]

Bone marrow aspiration (BMA) is the most frequent and safe invasive procedures done routinely in the hospitals for the diagnosis and management of hematological disorder.[1-3] There is very little or no risk of bleeding and can be safely done in case of severe thrombocytopenia.[2]

Correspondence:
Dr. Sujata Pudasaini,MD
Assistant Professor, Department of Pathology
Nepal Medical College Teaching Hospital, Kathmandu, Nepal
E-mail: sujatap2000@yahoo.com

This study was carried out with the aim of finding out the causes of haematological disorders, its spectrum and to interprete the BMA findings.

MATERIALS AND METHODS

This was a retrospective and prospective study done in the Department of Pathology of Nepal Medical College for a period of two years July 2010 to June 2012). A total of 57 cases were included in this study. BMA reports of the patients were retrieved from the record file in the department. PBS along with necessary hematological and clinical parameters were also noted from the record file. Geimsa stained slides along with Iron stain, Periodic Acid Schiff (PAS) stain and Myeloperoxidase (MPO) stained slides were examined in the available cases. Aspirates of inadequate material or dry tap were excluded from the study. Then data was manually collected and subsequently analyzed.

RESULTS

A total number of 57 patients were included in this study aged between 9 months and 75 years. The mean age was 37.9 years. 27 (47.4%) were males and 30 (52.6%) were females with (M:F=1:1.1). Maximum number of patients (42.1%) of hematological disorder who underwent BMA was in the age group of 31- 45 years. Table 1 shows the age distribution of the patients.

Blood count and PBS revealed anemia in 86% cases. Pancytopenia was seen in 50 % cases and bicytopenia was seen in 36% cases. Thrombocytopenia alone was seen in 14 % cases. Though most of the bone marrow was hypercellular we did come across normocellular marrows as well (Table 2).

Bone marrow examination findings are given in Table 3. Erythroid hyperplasia was the common finding in our study. In these cases there were no other significant findings. Out of 12 cases of erythroid hyperplasia, 2 cases show few micronormoblast and 3 cases show mild megaloblastoid changes however they were not of the significant number. Hence they were grouped under erythroid hyperplasia. Megaloblastic anemia (12.3%) was more common than microcytic anemia (7%). Infective pathology (12.3%) includes all the cases with normal to slightly hypercellular marrow with increased myeloid erythroid (M:E) ratio and cells of myelopoiesis showing shift to left. Clsuters of LD bodies were seen (fig.1).

In all cases of hypoplastic anemia the marrow was hypocellular and all 3 lineages of cell were suppressed. BMA findings were correlated with PBS which also showed pancytopenia. However bone marrow biopsy was not done in these cases. Myelodysplastic syndrome (MDS) was diagnosed in cases with increased erythroid series of cells with megaloblastic changes and dyserythropoiesis.

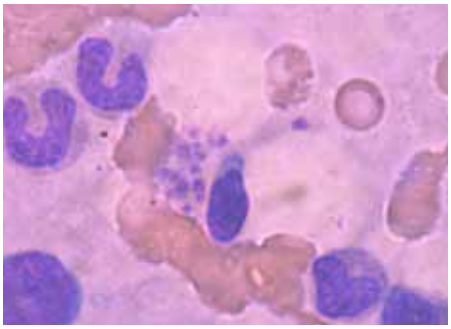

Figure 1: *Bone marrow aspirate smears showing LD bodies (Giemsa stain, X1000)*

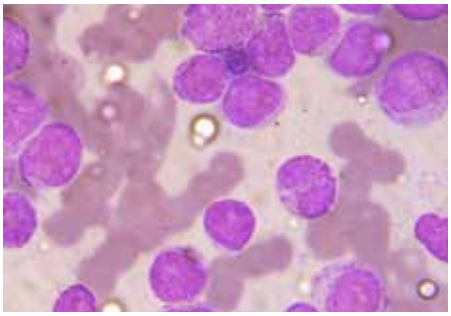

Figure 2: *Myeloblast with auer rods in AML (Wright stain, X1000)*

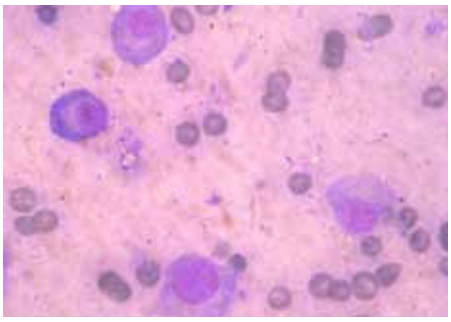

Figure 3: *Bone marrow aspirate showing plasma cells (Wright stain,X1000)*

The differential diagnosis of megaloblastic anemia was commented in each of these cases as clinical correlation with biochemical and other parameters are required to diagnose. Acute leukemia was seen in 7 cases (12.3%). Out of this, 6 cases (10.5%) were AML and 1 case (1.8%) was ALL. Out of 6 cases of AML, the commonest type was AML M3 (3 cases; fig.2), followed by AML M2 (2 cases) and AML M1 (1 case). There were 2 cases of multiple myeloma where 22% and 16% of the nucleated cells were plasma cells. Though the diagnosis was given as multiple myeloma (fig.3), biochemical, radiological and clinical correlation was recommended in each case.

DISCUSSION

The spectrum of hematological disorders is very wide. Bone marrow examination is safe and a useful test in reaching the final diagnosis.[2]

In our study the most common age group undergoing BMA was 31- 45 years. In a study done by Niazi et al, the majority of the patients were from the age group 1- 30 years.[4] In our study the age of the patients ranged from 9 months and 75 years with the mean age of 37.9 years. 27 (47.4%) were males and 30 (52.6%) were females with (M: F=1:1.1). Age and sex distribution was compared with other studies as shown in Table 4.

The commonest indication of BMA was pancytopenia (50 %) followed by bicytopenia (36%). Similar to our finding pancytopenia was the commonest indication in a study done by Ahmed et al.[7] But in contrast to these studies, pancytopenia was the third common indication (11.9%) in a study done by Bashawri et al.[8] In our study, thrombocytopenia alone was seen in 14 % cases.

Erythroid hyperplasia was seen in 12 cases (21%). Similar finding (19.6% cases of erythroid hyperplasia) was seen in a study done by Jha et al.[6] In a study done by Khodke et al 14% cases showed erythroid hyperplasia.[9]

Megaloblastic anemia was 2nd common diagnosis in the present study as well as in studies done by Niazi et al and Jha et al.[4,6] In a study done by Gayathri et al megaloblastic anemia was the commonest cause of pancytopenia and was the commonest finding in BMA.[5] Similar to study done by Jha et al[6], we could not identify the exact deficiency leading to megaloblastic anemia as serum folic acid or vitamin B12 levels were not assessed. The increase incidence of megaloblastic anemia reflects the higher prevalence of nutritional deficiency in our country.

Microcytic anemia seems to be an uncommon finding as we came across only 7% cases. However in a study done by Ahmad et al, 23.8% cases were microcytic anemia and diagnosed as iron deficiency anemia.[7]

Acute leukemia was seen in 7 cases (12.3%). Out of this, 6 cases (10.5%) were AML and 1 case (1.8%) was ALL. Out of 6 cases of AML, the commonest type was AML M3 (3 cases), followed by AML M2 (2 cases) and AML M1 (1 case). Other series also showed that acute leukemia is the commonest hematological malignancy and AML is more common than ALL.[1,2,5,6]

Other malignancies in this study were multiple myeloma (3.5%) and MDS (3.5%). Other series showed the incidence of multiple myeloma ranging from 0.94% to 4.1%.[2,3,5,6]

We encountered 3.5% cases of multiple myeloma compared to Kibria et al, Laishram et al and Jha et al who reported an incidence of 9.04%, 20.5% and 0.94% in their studies respectively.[2,3,5] Other series showed incidence of MDS ranging from 2% to 7.9%.[2,5,6,9]

Hypoplastic anemia was seen in 3 cases (5.3%). Diagnosis was based on BMA findings and bone marrow biopsy was not available. It is recommended that both aspiration and trephine biopsy be done simultaneously in cases of pancytopenia especially if hypoplastic or aplastic anemia is suspected though aspiration smears are superior for morphological details. Bone marrow biopsy provides a more reliable index of cellularity and reveals bone marrow infiltration, fibrosis and granulomas.[6] Compared to our study 19%, 29% and 14% cases of hypoplastic anemia were seen in other studies.[5,6,9]

ITP was seen in 6 cases (10.5%). Other studies showed

Table1: Age distribution of the patients

Age group	No. of patients	Percentage (%)
< 15 years	4	7%
15- 30 years	17	29.9%
31- 45 years	24	42.1%
>45 years	12	21%
Total	57	100%

Table 2: Cellularity of the bone marrow in the aspirates smears

Cellularity of the marrow	No. of cases	Percentage (%)
Hypercellular	35	61.4%
Normocellular	15	26.3%
Hypocelullar	7	12.3%
Total	57	100%

Table 3: Bone marrow examination findings

BMA diagnosis	No. of cases	Percentage (%)
Erythroid hyperplasia	12	21%
Megaloblastic anemia	7	12.3%
Acute leukemia	7	12.3%
ITP	6	10.5%
Microcytic anemia	4	7%
Infective pathology	7	12.3%
Hypoplastic anemia	3	5.3%
MDS	2	3.5%
Multiple myeloma	2	3.5%
Leishmaniasis	1	1.8%
Normal marrow	6	10.5%
Total	57	100%

Table 4: Comparison of age and sex distribution in different studies

Study	Age (years)	M:F
Egesie et al[1]	3-80	1.5:1
Gayathri et al[6]	2-80	1.2:1
Kibria et al[2]	3.5-80	1:0.59
Niazi et al[5]	1-75	1.7:1
Jha et al[7]	1-79	1.5:1

6.21%, 14.5%, 6.8% and 5% cases of ITP respectively in their studies.[2,7,9]

Infective pathology was seen in 7 cases (12.3%) out of which Leishmaniasis was seen in one case (1.8%). Similar finding was seen in a study done by Santra et al.[11] Other studies showed 2.82%,1.2%, 0.67% of leishmaniasis[2,4,6] but the maximum number of cases (14%) was seen in a study done by Khodke et al.[9]

CONCLUSION

Bone marrow examination is an important step to arrive at the confirmatory diagnosis of wide varieties of hematological disorders.

The commonest cause of pancytopenia in our study was megaloblastic anemia. The study provides a valuable insight into the causes of anemia or pancytopenia in our country.

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