Bone Marrow Aspiration Study in Pancytopenia: Study for Diagnostic Efficacy from Central India

Isha, Rakesh Singh Hazari, Yogesh Patle
Department of Pathology, People’s College of Medical Sciences & Research Centre, Bhopal

(Received: December, 2016) (Accepted: January, 2017)

ABSTRACT

Pancytopenia can be caused by a wide variety of etiologies that require evaluation of bone marrow. This is a cross sectional study carried out to identify the various findings in bone marrow aspiration in patients with pancytopenia on peripheral smear examination. Bone marrow aspiration was performed in 103 cases with pancytopenia over a period of 2 years. Bone marrow was hypercellular in 46.6% cases, normocellular in 28.2% cases, inconclusive in 14.5% cases and hypocellular in 10.7% cases. Bone marrow showed megaloblastoid picture in 34% cases, iron deficiency in 9.8% cases, combined iron deficiency and megaloblastoid picture in 8.8% cases, plasmacytosis in 9.8% cases, hypoplastic anemia in 4.9% cases, reactive changes in 2.9% cases, acute leukemia in 1.9% cases, chronic myeloid leukemia chronic phase in 2.9% cases, acute lymphoblastic leukemia in 2.9% cases, idiopathic thrombocytopenic purpura in 1.9% cases and non-hodgkin’s lymphoma in 0.9% cases. Study was normal in 3.8% and inconclusive in 15.5% cases. Amongst the total cases 6.8% were below 10 years of age and a total of 46.7% were 30 years and below. Bone marrow aspiration was able to establish diagnosis in 80.7% cases. In conclusion, bone marrow aspiration can diagnose the etiological factors in majority of cases of pancytopenia.

KEY WORDS: bone marrow, diagnostic efficacy, pancytopenia

INTRODUCTION:

Pancytopenia is a common finding in routine hematological investigation. It is an important clinico-hematological entity encountered in our day to day clinical practice. It is defined as the reduction of all three formed elements of blood (erythrocytes, leucocytes and platelets) below the normal reference range leading to anemia, leucopenia, thrombocytopenia. It can result from variety of disease processes which may be primarily or secondarily affecting the marrow. The etiology of pancytopenia varies due to genetic and geographical factors. The chief complaints and clinical manifestations are due to reduction in blood elements i.e. pallor, fatigue, fever, infection, bleeding, weight loss, organomegaly. The management and prognosis depends upon the etiology and therefore establishment of correct diagnosis is crucial. Early diagnosis of various causes of pancytopenia is very crucial and requires prompt clinical examination and investigations like complete blood count, peripheral smear and bone marrow examination as marrow cellularity and composition in cases of pancytopenia differ in relationship to underlying pathologic conditions. Bone marrow examinations such as bone marrow aspiration and biopsy are extremely helpful in evaluating the cause of pancytopenia in order to prevent grave complications and mortality as the underlying pathology determines the management and prognosis of the patients.

In this study, bone marrow aspiration and evaluation was done to establish the cause of pancytopenia.

MATERIALS AND METHODS:

This was a cross sectional study carried out in the Department of Pathology, People’s College of Medical Sciences, Bhopal, Madhya Pradesh during May 2014 to June 2016.

The patients included in the study had hemoglobin less than 10g/dl, leukocyte count less than 4000 cells/cumm and platelet less than 100,000/cumm.
After their complete blood count and peripheral smear examination, the patients were counseled and their bone marrow aspiration was performed after taking their written consent. The site of aspiration was sternum in all the cases.

The bone marrow aspiration studies were stained with leishman stain and examined. One hundred and three cases of pancytopenia were examined during the study period. Out of them, 52 cases were males and 51 females. Maximum number of cases were seen in the age group 21 to 30 (total 21, 20.5%) followed by 10 to 20 & 41 to 50 age groups (19.4% in both the age groups; Table 1).

### Table 1: Age Distribution.

<table>
<thead>
<tr>
<th>Age (Years)</th>
<th>No. of Cases</th>
<th>% of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;10</td>
<td>07</td>
<td>6.8</td>
</tr>
<tr>
<td>10-20</td>
<td>20</td>
<td>19.4</td>
</tr>
<tr>
<td>21-30</td>
<td>21</td>
<td>20.5</td>
</tr>
<tr>
<td>31-40</td>
<td>14</td>
<td>13.6</td>
</tr>
<tr>
<td>41-50</td>
<td>20</td>
<td>19.4</td>
</tr>
<tr>
<td>51-60</td>
<td>14</td>
<td>13.6</td>
</tr>
<tr>
<td>61-70</td>
<td>06</td>
<td>5.8</td>
</tr>
<tr>
<td>&gt;70</td>
<td>01</td>
<td>0.9</td>
</tr>
</tbody>
</table>

### Table 2: Cellularity.

<table>
<thead>
<tr>
<th>Cellularity</th>
<th>Number of Cases</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypercellular</td>
<td>48</td>
<td>46.6</td>
</tr>
<tr>
<td>Normocellular</td>
<td>29</td>
<td>28.2</td>
</tr>
<tr>
<td>Hypocellular</td>
<td>11</td>
<td>10.7</td>
</tr>
<tr>
<td>Inconclusive</td>
<td>15</td>
<td>14.5</td>
</tr>
</tbody>
</table>

On aspiration, maximum number of cases showed hypercellular marrow (48 cases with 46.6%) followed by normocellular marrow (28.2%), inconclusive (14.5%) and hypocellular marrow (10.7%; Table 2).

The commonest marrow finding was megaloblastoid picture (35 cases, 34% of total) followed by IDA (9.8%) and plasmacytosis (9.8%); combined nutritional deficiency (8.8%); hypoplastic anemia (4.9%); reactive changes, CML and ALL (2.9% each); acute leukemia and ITP (1.9% each) and NHL (0.9%). The marrow was inconclusive in 15.5% cases and normal in 3.8% cases (Table 3).

The bone marrow aspiration was able to establish diagnosis in 83 out of 103 cases (80.7%) and was inconclusive or normal in 20 out of 103 cases (19.3%; Table 4).

**DISCUSSION:**

Pancytopenia is a common finding in routine hematological investigation. It is a disorder in which all three major formed elements of blood (red blood cells, white blood cells and platelets) are decreased in number. It is not a disease entity but a triad of findings that may result from a number of disease processes—primarily or secondarily involving the bone marrow. The severity of pancytopenia and the underlying pathology determine the management and prognosis of the patients.

The causes of pancytopenia can be:

(a) Ineffective haematopoiesis with cell death in the marrow.

(b) Formation of defective cells which are rapidly removed from circulation.

(c) Sequestration and/or destruction of cells by the action of antibodies or,

(d) Trapping of normal cells in a hypertrophied and over-reactive reticuloendothelial system.

Till date there are a limited number of studies on the frequency of various causes of pancytopenia. Of these some have been reported from the Indian subcontinent. The commonest cause of pancytopenia in the present study is megaloblastic anaemia (34%); whereas in other series, the incidence of MA varies from 0.8% to 68%.

In this study, most cases were seen in the age group 21 to 30 years which is low as compared to study by Jha et al where out of 148 cases, 42 were children.
Khunger et al. reported maximum number of cases in the third decade of life \(^6\). Male: female ratio \((1:1.2)\) in our study was almost equal. This was similar to Khunger et al. who reported a M:F ratio of \(1.2:1\) \(^6\).

In this study, marrow cellularity was hypercellular in 46.6 % cases. This study concluded that the most common cause of pancytopenia was megaloblastic anemia \((34\%)\) which is consistent with the study done by Makaju et al, Tilak and Jain and Khodke et al with percentage of megaloblastic anemia being 42.85 %, 68 % and 44% respectively \(^3,7,8\).

On the basis of bone marrow examination, the most common cause of pancytopenia in our study was Megaloblastic Anemia \((34\%)\). This is in concordance with the study of Varma et al., Kumar et al, Santra et al \(^9,13,14\).

In a study conducted by Uniya, Patle and Jain, the commonest finding on bone marrow aspiration was anemia out of which megaloblastic anemia was the commonest \(^13\). In our study, it was found that combined nutritional deficiency was slightly more common in males \((5 \text{ out of } 9 \text{ cases})\). In our study acute leukemia constituted 1.9%. Similarly in studies conducted by Khodke et al and Tilak et al one cases of AML was detected as the cause of pancytopenia \(^3,7\).

In our study, one case of NHL was found while in a study done by Pathak, Jha and Sayami, 2
cases out of 102 cases of NHL were found on bone marrow aspiration. Bone marrow was inconclusive and normal in 20 cases (16 inconclusive and 4 normal) while in a study done by Pathak, Jha and Sayami, 6 cases out of 102 cases were found inconclusive on bone marrow aspiration which is lower than our study.[16]

Bone marrow aspiration was able to diagnose maximum cases of pancytopenia (80.7%). Despite the use of genetics, molecular biology and immunology for the diagnosis, routine hemogram and bone marrow examination still cannot be replaced.

CONCLUSION

Bone marrow aspiration should be considered in all possible cases of pancytopenia. Majority of cases are due to nutritional deficiency (megaloblastoid picture being the commonest).

A combination of diagnostic parameters namely peripheral smear finding, bone marrow aspiration finding along with clinical and radiological findings should be considered while establishing the final diagnosis.

REFERENCES:


