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Original Research Article

Bone marrow evaluation of patients having pancytopenia at tertiary care center, M. Y. hospital, Indore, India: one-year study

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ABSTRACT

Background: Pancytopenia is reduction of all three formed elements of blood below the normal reference range leading to anemia, leucopenia, thrombocytopenia. Bone marrow aspiration is extremely helpful in evaluating the cause of pancytopenia by cellularity and cytology in order to prevent grave complications and mortality as the underlying pathology determines the management and prognosis of the patients. Aim of research study was to evaluate the patients having pancytopenia at tertiary care center, M.Y.H. Hospital, Indore, India.
Methods: The present study was carried out over a period of one year from 2017 to 2018, in the Department of Pathology, M. Y. Hospital, Indore. During this period, a total of 109 bone marrow smears were examined. Out of these, 42 cases had the clinical presentation of pancytopenia. A detailed study was done regarding clinical examination and hematological and radiological investigations.
Results: In this study 42 cases of pancytopenia were examined over a period of one year. The commonest cause of pancytopenia was megaloblastic anemia (33.34%) followed by aplastic anemia (19.05%). Others includes myelodysplastic syndrome (MDS), acute leukemia, erythroid hyperplasia and plasmacytosis.
Conclusions: Bone marrow aspiration can diagnose majority of the cases of pancytopenia. Megaloblastic anemia and aplastic anemia are the commonest causes of pancytopenia.

Keywords: Aplastic anemia, Bone marrow aspiration, Leucopenia, Megaloblastic anemia, Pancytopenia, Thrombocytopenia

INTRODUCTION

Pancytopenia is reduction of all three formed elements of blood (erythrocytes, leucocytes and platelets) below the normal reference range leading to anemia, leucopenia, thrombocytopenia.[1]

There are various mechanisms for developing pancytopenia in which most important is the decrease in hematopoitic cell production (hypocellular marrow). Other are ineffective erythropoisis, increase peripheral utilization or destruction of cells and bone marrow with malignant infiltration (hypercellular or normocellular marrow).[2,3]

The chief complaints and clinical presentation in the patients having pancytopenia are pallor, fatigue, fever, infection, bleeding, weight loss, organomegaly.[1,4]

With proper evaluation like proper clinical examination, hematological investigation as complete blood count, peripheral smear and bone marrow examination, early diagnosis for the cause of pancytopenia can be done. Bone marrow aspiration is extremely helpful in evaluating the cause of pancytopenia by cellularity and cytology in order to prevent grave complications and mortality as the underlying pathology determines the management and prognosis of the patients.[5]

METHODS

The present study was carried out over a period of one year from 2017 to 2018, in the Department of Pathology, M. Y. Hospital, Indore. During this period, a total of 109 bone marrow smears were examined. Out of these, 42 cases had the clinical presentation of pancytopenia. Criteria for diagnosis of pancytopenia were: haemoglobin less than10 gms/dl, TLC less than 3500/cumm and platelet count less than 100,000/cumm[6].

Proper clinical history was taken, and complete blood count done, and peripheral smears were prepared and stained with field stain. Smears were made by the bone marrow aspirate obtained from iliac crest and stained with field stain as well as Leishman stain. Various clinico-haematological parameters were noted.

The bone marrow aspirate is evaluated for: 1) cellularity of the fragments, 2) erythropoiesis-cellularity, maturation pattern and any cytological abnormalities, 3) myelopoiesis-cellularity, maturation pattern and any abnormalities, 4) M:E ratio, 5) megakaryopoiesis-number, morphology, presence of immature forms, 6) lymphocytes, 7) plasma cells, 8) parasites/abnormal cells/Granulomas/storage cells.

The cellularity was assessed by estimating the percentage of hematopoietic cells compared to fat spaces in the bone marrow. The categories were identified in the following way: 1) hypercellular: > 75% cells, 2) normocellular: 25-75% cells, 3) hypocellular: < 25% cells, depending upon the age of the patient.

Inclusion criteria

Patient with pancytopenia with hemoglobin less than 10gm/dl, Total leucocyte count of less than 4000/mm^3 and platelet count less than 100,000/mm^3.

Exclusion criteria

Patients receiving chemotherapy/radiotherapy were excluded from the study.

RESULTS

In Table 1, The commonest presenting complaint was fever in 15 cases. Pallor and easy fatigability were present in almost all the patients. Splenomegaly was seen in 10 cases and hepatomegaly in 3 cases. Rashes were seen in about 6 cases.

In Table 2, In the study period of one year, 42 cases of pancytopenia were included in the study. Patient with age ranged from 11 years to 80 years were included here. Maximum number of cases were seen in age group of 31 to 60 years i.e. 25 (59.52 %) while least number of cases i.e. 03 cases were beyond the age of 60 years.

Table 1: Clinical features of patients presenting with pancytopenia.

Symptoms	No. of cases
Fever	15
Generalized weakness	42
Pallor	40
Easy fatigability	41
Splenomegaly	10
Lymphadenopathy	3
Hepatomegaly	3
Rashes	6

Table 2: Age distribution of patients for bone marrow aspiration.

Age	No. of patients	Percentage
0-10	0	00
11-20	9	21.43
21-30	5	11.90
31-40	10	23.81
41-50	7	16.67
51-60	8	19.05
61-70	2	4.76
71-80	1	02.38
Total	42	100

Table 3: Sex distribution of patients for bone marrow aspiration.

Sex	No. of patients	Percentage
Male	22	52.38
Female	20	47.62
Total	42	100

In Table 3, Out of 42 cases, 22 were male and 20 cases were female, male to female ratio is 1.1:1.

Table 4: Bone marrow cellularity.

Cellularity	No. of cases	Percentage
Hypercellular	24	57.14
Normocellular	8	19.03
Hypocellular	10	23.81
Total	42	100

In Table 4, Out of the 42 patients of pancytopenia, 24 (57.14%) cases had a hypercellular marrow, 10 (23.81%) had hypocellular marrow and 8 (19.03%) cases had normocellular marrow.

In Table 5, The commonest cause of pancytopenia was megaloblastic anemia seen in 14 cases (33.34%) followed by aplastic anemia in 8 cases (19.05%). The other causes of pancytopenia were acute leukemia, plasmacytosis, myelodysplastic syndrome and erythroid hyperplasia.

Table 5: Findings of bone marrow examination.

Diagnosis	No. of patient	Percentage
Megaloblastic anemia	14	33.34
Hypoplastic/aplastic marrow	8	19.05
Acute leukemia	1	2.38
Myeloproliferative/CML	0	0
Lymphoma	0	0
Multiple myeloma	0	0
Plasmacytosis	1	2.38
Myelofibrosis	0	0
Metastatic deposits	0	0
MDS	4	9.52
Normal study	2	4.76
Erythroid hyperplasia	1	2.38
Dysplastic changes	5	11.90
Inconclusive /diluted marrow	6	14.29
Total	42	100

The peripheral blood film show hypersegmented neutrophils in all the cases of megaloblastic anemia and almost all the cases of myelodysplastic syndrome. In cases of megaloblastic anemia anisocytosis, dimorphic picture, nucleated red cells and reticulocytosis were seen.

Majority of the patients had the hemoglobin percentage from 4g/dL to 7g/dL, total leucocyte count below 3500/cmm and platelet count between 40000 to 80000/cmm.

DISCUSSION

In this study, most cases were seen in the age group of 31-60 years. Male patients slightly more than female with male to female ratio 1.1:1 and this was similar to study of Pathak et al 1.5:1, Jha et al (1.3:1) However Aziz et al found more in females.[3,6,7]

In this study, megaloblastic anemia (33.34%) is the most common cause of pancytopenia. Similar results are also there in the study done by tilak and Khodke et al in which megaloblastic anemia is a common cause of pancytopenia.[8,9]

The second major cause of pancytopenia was aplastic/hypoplastic anemia in present study (19.05%). Tilak et al and Khodke et al also found the same results.[8,9] Although Pathak et al and Jha et al have aplastic anemia as common cause of pancytopenia.[3,6] This may be due to the reason that Aplastic anemia is caused due to environmental factors or exposure to pesticides, drugs and toxic chemicals.

Myelodysplastic syndrome constitutes 4 cases in our study. It was the second most common cause of pancytopenia in studies by International agranulocytosis and aplastic anemia group.[10]

In our study, only one cases of Acute leukemia was found which corresponds to the result of Tilak et al who also found only 1 case of acute leukemia as a cause pancytopenia.[8] However, in the study done by Aziz et al, acute leukemia constituted almost 10% of cases of pancytopenia and was third most common cause of pancytopenia.[7] While in the study of Jha et al in which it constituted 19.59% of total cases of pancytopenia.[6] This difference in results may be due to the possibility of dry tap obtained in cases of acute leukemia. To avoid this, bone marrow biopsy is the mandatory for diagnosis.

One case of eythroid hyperplasia was noted. Erythroid hyperplasia by itself is not the cause of pancytopenia. Proper clinical history and laboratory investigation should be done and hypersplenism and hemolytic anemia should be ruled out in cases erythroid hyperplasia.[3] No splenomegaly was seen in case of erythroid hyperplasia in present study.

Difference in the frequency of disorders causing pancytopenia has been due to variation in study design, diagnostic criteria, geographic area, duration of observation, genetic differences and varying exposure to cytotoxic or chemical agents.

CONCLUSION

The present study concludes that Pancytopenia can be evaluated by physical examination, basic hematological investigation along with bone marrow examination. Thus, the cause of pancytopenia is easy to understand and can be diagnosed so that the further management can be planned. Megaloblastic anaemia, aplastic anaemia and acute leukemia are the major causes of pancytopenia.

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