Original Research Paper

Pathology

EVALUATION OF BONE MARROW ASPIRATE SMEARS TO STUDY CAUSES OF PANCYTOPENIA; IN A TERTIARY CARE CENTER OF SOUTHERN RAJASTHAN, INDIA

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ABSTRACT **Background & Objective** Pancytopenia, is an important hematological presentation which is associated with diverse causes. Awareness of common conditions linked to pancytopenia helps the clinician in the requisition of relevant tests, which would avoid potentially uncomfortable and costly procedures. This study intended to recognize causes of pancytopenia, with an emphasis to pinpoint commonest cause prevalent in our region. **Methods** It was a retrospective study, and bone marrow aspirate smears of 150 pancytopenia patients were evaluated in Pathology department of a tertiary care institute of Southern Rajasthan, India, during the period of 3 years from November 2019 to November 2022. **Results** Out of total 150 cases, majority of 60% were males. Megaloblastic anemia comprised majority 42.67% (64 cases) patients, while Aplastic anemia, Acute leukemia and Plasma cell dyscrasias contributed 25.33% (38 cases), 22.00% (33 cases) and 10.00% (15 cases) respectively to the total. **Conclusion** This study deduced that the most prevalent cause of pancytopenia is Megaloblastic anemia followed by Aplastic anemia, Acute leukemia and Plasma cell dyscrasias, sequentially in order. Bone marrow aspirate smear examination is a crucial technique which can help in determining underlying source contributing to pancytopenia.

KEYWORDS : Pancytopenia, Megaloblastic Anemia, Aplastic Anemia, bone marrow aspirate

INTRODUCTION

Pancytopenia is defined as the triad of Anemia, Thrombocytopenia and Leukopenia occurring simultaneously. It may be a result of various disorders primarily or secondarily showing involvement of the bone marrow. Bone marrow aspiration plays a pivotal role in determining the cause of pancytopenia[1]. Occurrence of pancytopenia could be accredited to bone marrow suppression, decreased production of hematopoietic cells resulting in aplastic anemia, infiltration of bone marrow by atypical or malignant cells. Certain non-malignant conditions such as nutritional anemia, autoimmune diseases and infections also contribute to pancytopenia.

Due to its wavering presentations, diagnosis of pancytopenia often gets delayed. The cause of the disease alters the composition and cellularity of bone marrow. A hypocellular marrow is seen in pancytopenia cases with marrow production defects. A hypercellular or normocellular marrow is seen in cases with ineffective hematopoiesis, increased peripheral utilization and destruction of bone marrow during invasive process.

AIM & OBJECTIVE

The given study aims to identify the underlying causes of pancytopenia, with an objective to arbitrate, most common cause of pancytopenia amongst the diverse cases identified on the bone marrow aspirate smears.

MATERIAL & METHODS

This was a retrospective study which was undertaken from November 2019 to November 2022, i.e. for a period of 3 years on 150 patients of pancytopenia in department of pathology of a tertiary care center of Southern Rajasthan, India. Bone marrow aspirate (0.5 ml – 1 ml) were received in EDTA and were processed with standard Romanowsky (Leishman) stain. Routine complete blood count results were obtained from all patients.

Inclusion Criteria:

All cases with Hemoglobin < 10gm%, TLC < 4,000 /mm^3 and Platelet count < 1 lakh /mm^3.

Exclusion Criteria:

Inadequate sample of bone marrow aspirate i.e. < 0.5 ml.

RESULTS

A total of 150 cases of pancytopenia, were evaluated on bone marrow aspirate smears, in this retrospective study during the period of 3 years. Out of total, 90 (60.00%) were males and 60 (40.00%) were females (M:F = 3:2). Age of cases observed in the study ranged from 09 years to 79 years. Hemoglobin range observed was from 3 gm/dl to 9.8 gm/dl (average Hb = 6.4 gm/dl). Total leucocyte count range observed was from 500/mm^3 to 3,900/mm^3 (average TLC = 2,805/mm^3). Platelet range observed was from 5,000/mm^3 to 98,000/mm^3 (average Platelet = 52,650/mm^3).

Out of total 150 cases of pancytopenia evaluated on bone marrow aspirate smears, megaloblastic anemia was seen in majority (64 cases; 42.67%), followed by aplastic anemia (38 cases; 25.33%). Other causes include Acute Leukemia (33 cases; 22.00%) and plasma cell dyscrasias (15 cases; 10.00%).

Table: Distribution of cases evaluated for pancytopenia

S. No	Diagnosis	No. of Cases (Out of total 150)	Percentage
1	Megaloblastic anemia	64	42.67%
2	Aplastic anemia	38	25.33%
3	Acute leukemia	33	22.00%
4	Plasma cell dyscrasias	15	10.00%
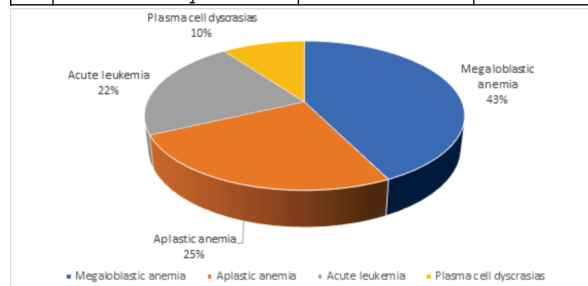
Graph: Percentage distribution of cases evaluated for pancytopenia

DISCUSSION

Pancytopenia is defined as the decrease of all three cell lineages resulting in anemia, leucopenia and thrombocytopenia. Neutropenia may present with febrile illness due to increased susceptibility to infections. Thrombocytopenia may result in mucocutaneous bleed or bruising while anemia commonly manifests as easy

fatiguability. Any patient presenting with unexplained anemia, prolonged fever and bleeding tendency should be thoroughly investigated for pancytopenia.

The most common cause of Pancytopenia identified in our study is Megaloblastic anemia which comprises 64 cases out of total 150 i.e. 42.67%. Aplastic anemia is second most common cause contributing 25.33% to the total. It is in concordance with other Indian studies like Tilak B et al, Khodke K et al, Gayathri BN et al stating Megaloblastic anemia as their commonest cause followed by aplastic anemia[3,6,7,8]. Agarwal P et al states the commonest cause of Pancytopenia/Bicytopenia is Megaloblastic anemia constituting 30 out of 80 cases making up 37.5% of all cases[4]. The etiology of pancytopenia also varies widely depending upon age and geographical distribution. Vaidya M et al states the commonest cause in their study along with many other Indian study is Megaloblastic anemia comprising 44 cases out of total 102 cases i.e. 43.1%[3]. Bone marrow aspirate is a useful study that aided the diagnostic process allowing the final diagnosis of diverse cases of pancytopenia. This is similar to what is reported elsewhere[5].

CONCLUSION
Bone marrow aspiration is an important technique which can diagnose majority of cases of pancytopenia. Megaloblastic anemia is the most important cause of pancytopenia. A detailed clinico-hematological study of the patients with pancytopenia can help in identification of the underlying disease process.

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