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BONE MARROW EXAMINATION AT A PAEDIATRIC HOSPITAL IN KENYA
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ABSTRACT

Objective: **To investigate the main indications for, and common conditions found in bone marrow examinations (BME) of children.**

Methods: **This was a retrospective study from September 1, 1993 to September 3 1998. All bone marrow aspirate and trephine biopsy results were retrieved. The clinical data provided by clinicians were also noted.**

Results: **A total of 97 BME were recorded from patients aged two months to 13 years. The peak ages for BME were six to eight years (24% of patients). The more frequent indications for BME were unexplained anaemia found in 26% request forms, investigation for solid tumours (10%) and lymphoma (10%) and remission assessment after treatment for leukaemia (26%). The main findings were malignancy (27%) with leukaemia being commonest (ALL) 16% of patients and acute myeloblastic leukaemia (5%). Haematinic deficiency was seen in 12.7% of cases with iron deficiency being the commonest. There were some notable differences and similarities in the study as compared to a similar one performed at a local referral hospital.**

Conclusion: **The importance of BME as a crucial investigational tool in the management of patients is underscored. Interpretation is more meaningful when the haematologist has adequate clinical data.**

INTRODUCTION

Bone marrow examination is of crucial importance in the study and management of many haematologic disorders. Some of the common indications for bone marrow examination (BME) include: investigations for unexplained anaemia or other abnormality in the peripheral blood involving the white cells or platelets; investigation for suspected cases of haematological neoplasm, including leukaemias and lymphomas; investigation of a neoplasm where the bone marrow is known to be a site of metastasis such as in neuroblastoma.

The marrow is also used for the diagnosis of many diverse haematologic disease conditions such as hepatosplenomegaly, suspected leishmaniasis and pyrexia of unknown origin (PUO), especially where infections, such as typhoid or disseminated tuberculosis, are suspected and cultures from conventional sites have been negative. Other indications for BME include suspected storage disease such as Gaucher's disease where the abnormal cells are seen and to assess the response to treatment for haematological diseases.

MATERIALS AND METHODS

A five-year retrospective study was undertaken at Gertrude's Garden Children's Hospital (GGCH), Nairobi; an 85 bed exclusively paediatric hospital in order to find out the most frequent indications for, and the common conditions found in BME. The results were also compared with those of a similar study undertaken at a large local referral hospital.

Records of all the bone marrow aspirates and trephine biopsies performed over a five year period from September 1, 1993 to September 3, 1998 at a paediatric hospital were retrieved. The clinical data including the sex, age of patients, indications for the BME given on the request form and bone marrow findings were noted.

RESULTS

A total of ninety seven bone marrow aspirates were examined during the study period. There were 58 males and 39 females who had BME performed giving a male/ female ratio of 1.5:1. The rate of bone marrow examinations performed was one per 27 admissions. The ages of the patients who had the BME ranged from six months to 13 years with a mean age of 5.1 years. The majority of patients were in the six to eight year age group representing 28.8% of the study group. Seven per cent of the patients were less than eight years old.

The two most frequent indications for BME were for the investigation of unexplained anaemia (26%) and suspected leukaemia (17%). The common indications included investigations for marrow involvement and staging by tumour in patients with lymphoma (10%), other solid tumour (10%) and for assessment of remission status following induction chemotherapy for acute leukaemia (14%). Some other indications for BME included patients with PUO, bleeding diasthesis not caused by thrombocytopaenia and investigations for hepatosplenomegaly (Table 1).

Table 1

Frequency of clinical indications for BME

	No. of aspirates	%
Investigation for anaemia	25	25.7
Suspected leukaemia	17	17.5
Remission assessment	14	14.4
Lymphoma investigation	11	11.3
Solid tumour investigation	7	7.2
Thrombocytopaenia	7	7.2
Hepatosplenomegaly	7	7.2
PUO	7	4.1
Others	5	5.4

Table 2

Bone marrow examination diagnosis and frequency

	No.	%
Reactive marrow	39	40
Malignancy	26	27
Haematenic deficiency	12	12.7
ITP	5	5
Normal marrow	4	4.6
Others	11	10.7
Total	97	100

The common bone marrow findings (Table 2) were a reactive marrow (40.0%), malignancy (27%) and haematinic deficiency in 12.7% of patients. Other marrow examinations showed features of ideopathic thrombocytopaenic purpura (ITP), hypoplasia, congenital dyserythropoietic anaemia, Gaucher's disease and kala-azar. A normal marrow examination was found in 4.6% of the patients undergoing the procedure.

Of the leukaemia, acute lymphoblastic leukaemia was the commonest accounting for 78.9%. The remainder were acute myeloid leukaemia. The patients with ALL ranged from eight months to seven years with a mean age of 3.9 years. There were eleven female and four male children giving a male/female ratio of 1:2. 75. The children with AML ranged from six years to 12 years with a male/female ratio of 3:1.

BME is also indicated for the investigation of tumour involvement in marrow. There were eleven children with lymphoma who underwent BME and 45% of these had evidence of marrow involvement. There were six children with solid tumour (non-lymphoma) who had marrow examination done as part of assessment. There was no evidence of involvement by tumour in these patients.

Haematinic deficiency features were seen in 12.7% of patients. This was mainly iron deficiency anaemia (45%), folate deficiency (36.3%) and combined deficiency (18.7%).

DISCUSSION

This study showed a wide spectrum of haematologic and non-haematologic features from bone marrow aspirates in children. Reactive marrow findings were the commonest and are seen in many conditions affecting children and infective causes including malaria are common causes. Clinically, these children often present with anaemia or cytopaenia. Two per cent of our cases had evidence of previous malaria infection. Our findings suggest that recurrent and chronic infections have a significant adverse effect on haemopoieis in children.

Bone marrow aspirate examination are important for confirming or excluding the diagnosis of malignancy and cor-relates with the large number of requests. The commonest malignancy was acute leukaemia with acute lymphoblastic leukaemia being the commonest (78.9%). The ALL to AML ratio was found to be 3.75:1, much higher that 1:2 as seen by Kasili(1). This was also different from findings of the study of BME by Mwangi(2) in a referral hospital, where AML was more frequent (1:17). This difference is due to the higher incidence of ALL in children as compared to adults. However, a study of acute leukaemia in Harare showed acute myeloid leukaemia to be more common in children with an increasing trend over the last three years of their study period (3).

Haematinic deficiency, predominantly iron, was seen in 12.7% of patients. These findings were similar to those of Mwangi in which iron deficiency was found to be the leading cause of deficiency anaemia(2). However, the magnitude of aspirates diagnostic of deficiency anaemia was much larger (over 33%) than this study. Although it is expected that deficiency anaemias are more prevalent in children, marrow aspiration for diagnosis are generally avoided as the procedure may be quite traumatic in the paediatric age group.

BME was also indicated in the evaluation and staging of lymphoma and other solid tumours in children. Bone marrow involvement by tumour was seen in 45% of the patients with lymphoma while no BM involvement was detected for other solid tumours. It must be emphasised that due to the limited character of bone marrow sampling false negative results may be obtained. Other workers have suggested that bone marrow aspiration (BMA) and bone marrow biopsy be performed to detect metastatic tumour in the marrow to give a high yield of detection(4). Only BMA were performed in this study.

The finding of ITP in five per cent of patients study is slightly higher that of a study performed at KNH where only two per cent was found. This indicates that ITP is common in childhood as compared to adults. Studies have indicated that where ITP is clinically suspected in children, the yield of leukaemia in this setting is low(5). The researchers of this study therefore suggest routine BMA is unnecessary in children with typical acute ITP. Yet another study suggests that reticulated platelet count may be performed in ITP to reduce the need for BMA(6).

BME was performed for assessement of remission status during chemotherapy for leukaemia. Some recent literature has suggested that routine BMA at end of therapy for ALL has no diagnostic or prognostic value(6,7). In most of our cases BMA was performed during induction to assess remission status. BME is important in the detection of parasite diseases like kala-azar with a positive yield varying from 60-80%. This yield rate can be improved by combined examinations of marrow and splenic aspirates as well as cultures of aspirates(8). Bone marrow examination is also invaluable in the diagnosis of the rare storage disorders such as Gaucher's disease. In the management of PUO, bone marrow aspirate apart from being examined can be cultured to improve the yield of causative organisms particularly when cultures from conventional sites have been non contributory.

In conclusion, BMA and examination is an extremely valuable tool in the diagnosis and management of many clinical, haematological and non-haematological conditions. As a rule the request for a bone marrow examination should be treated as a haematological consultation. Meaningful interpretation of bone marrow smears and biopsies require familiarity with the clinical data and it is much more useful and rewarding to view the bone marrow with knowledge of this data.

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