

DIAGNOSIS OF THE SEVERELY ANAEMIC PATIENTS USING THE BONE MARROW ASPIRATION BIOPSY TECHNIQUE

By
HALIM NKD

Department of Haematology and Blood Transfusion, College of Medical Sciences, University of Benin, Nigeria

SUMMARY

Objective: To highlight the usefulness of bone marrow aspiration in the diagnosis of severely anaemic patients.

Methods: Fifty two patients, 26 males and 26 females aged 16 to 40 years were drawn from the wards and clinics of University of Benin Teaching Hospital, Benin. The criteria for inclusion in the study were unexplained anaemia; suspicion of leukaemia and aplastic anaemia. Patients with easily diagnosable haemoglobinopathies such as HbSS were excluded from the study.

Bone marrow aspirated from either the patients' anterior or posterior superior iliac spine were stained and examined. Smears were fixed in alcohol, stained with Leishman stain and examined under the microscope. Pearl's stain for haemosiderin was used to confirm presence of iron in the marrow.

Results: The smears were suggestive of acute myeloblastic leukaemia in 21 out of 52 patients or 40.4%; acute lymphoblastic leukaemia in 10 out of 52 patients or 19.2%; and megaloblastic anaemia in 5 patients or 9.6%. Hypocellularity was confirmed in 15 (28.9%) patients.

Conclusion: It is concluded that bone marrow aspiration with the Klime-Salah needle is a practical and cheap technique for the diagnosis of the severely anaemic patient.

Key Words: *Severe Anaemia, Bone Marrow Aspiration, Diagnostic Biopsy*

INTRODUCTION

Bone marrow aspiration with subsequent preparation of Leishman stained films is already a well established procedure. Its uses have been highlighted in previous studies^{1,2}. It is usually performed with a Klime-Salah needle³, with dimensions of 16G x 2 inches or 15mm length. The procedure is usually indicated for establishing a diagnosis of unexplained anaemia; pancytopenia; unexplained splenomegaly; suspected leukaemia; and a host of other conditions⁴. The bone marrow aspiration technique also offers the haematologist the opportunity to assess the cellularity of the bone marrow and the iron stores⁵.

Few reports have discussed the usefulness of bone marrow aspiration in this environment. Ahmed et al⁶, in a previous study examined the morphological features in anaemic

patients with acquired immune deficiency syndrome in Maiduguri, Nigeria.

Due to the increasing number of patients encountered in recent times that have unexplained anaemia, it has become necessary and justified to perform this study in order to demonstrate the effectiveness of bone marrow aspiration in aiding the diagnosis of severe unexplained anaemia. By obtaining an accurate diagnosis, patient care would be enhanced.

MATERIALS AND METHODS

Fifty two patients (26 males and 26 females) aged 16-40 years were selected and studied over the period November 1997 to May 2001. The patients were drawn from the Haematology clinic and wards of the University of Benin Teaching Hospital (UBTH), Benin City while the bone marrow aspirate and smears were prepared in the Haematology Laboratory of the UBTH, Benin City. Verbal consent was

Correspondence Author:

Dr. N.K.D. Halim, Department of Haematology and Blood Transfusion
College of Medical Sciences, University of Benin, Nigeria
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obtained from each patient or patient's relation in case of minors, prior to the study.

Inclusion criteria included the presence of unexplained anaemia, suspicion of leukaemia and aplastic anaemia. Prior to bone marrow aspiration, each patient had the following ancillary tests: blood film report, haemoglobin estimation and haemoglobin genotype using the cellulose acetate strip to exclude haemoglobinopathies. Patients with confirmed sickle cell haemoglobinopathy (HbSS), were excluded from the study as this group of patients are known to have low haemoglobin concentration and their diagnosis can readily be made using haemoglobin electrophoresis.

The bone marrow aspirate was obtained in all patients from either the anterior or posterior superior iliac spine. The site of aspiration and surrounding skin were cleaned with an antiseptic solution and draped. After infiltration with 1% xylocaine the Klime-Salah needle was used to penetrate the skin and advanced into the bone until a reduction in pressure was felt. At this point, the stylet was removed and a 10ml syringe attached to the outer needle. A small quantity of bone marrow was then aspirated and smears immediately made on clean glass slides. The smears were subsequently fixed in absolute alcohol and left to dry. Each slide was subsequently stained with Leishman stain and viewed under the microscope.

Analysis was with the Student t-test. P value of less than 0.05 was considered statistically significant.

RESULTS

Table 1 shows the various appearances observed in the bone marrow of the 52 patients studied. Of these patients 21 (40.4%) consisting of 8 males and 13 females had numerous myeloblasts in the bone marrow smear. This was suggestive of acute myeloblastic leukaemia. In 5 (9.6%) patients, all females, there was evidence of megaloblastosis in keeping with megaloblastic anaemia associated with pregnancy and folate deficiency.

Table 1: Bone Marrow Appearance in 52 Patients

Diagnosis	Male	Female	Total	%
Acute Myeloblastic Anaemia ^a	8	13	21	40.4
Aplastic Anaemia ^b	8	7	15	28.9
Acute Lymphoblastic Anaemia ^c	9	1	10	19.2
Megaloblastic Anaemia ^d		5	5	9.6
Unascertained	1		1	1.9
Total	26	26	52	100.0

^a Presence of Myeloblasts and Myelocytes

^b Presence of Hypocellularity with > 75% fat cells

^c Presence of lymphoblasts, increased nucleus/cytoplasm ratio and presence of nucleoli

^d Anaemia in pregnancy

Table 2 shows the mean age and Hb \pm SEM for the 52 patients. There was no difference between the mean ages of the male and female patients. However, the males had a higher mean haemoglobin concentration of 4.5mg% as against 3.38 \pm 1.15 for the females ($p < 0.05$).

Table 2: Mean Age and Hb in 52 Patients

Parameter	Male (n = 26)	Female (n = 26)	p-value
Mean Age \pm SEM	21.92 \pm 1.85	22.38 \pm 1.67	>0.05
Mean Hb \pm SEM	4.50 \pm 0.00	3.38 \pm 1.15	<0.05

Figures 1, 2 and 3 show a film each of a patient with megaloblastosis, acute lymphoblastic leukaemia and hypocellularity respectively.

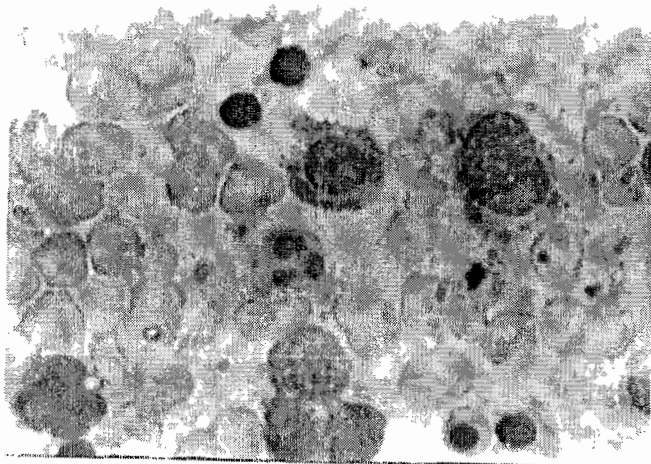


Fig. 1: Bone Marrow Smear of a Patient with Megaloblastic Anaemia

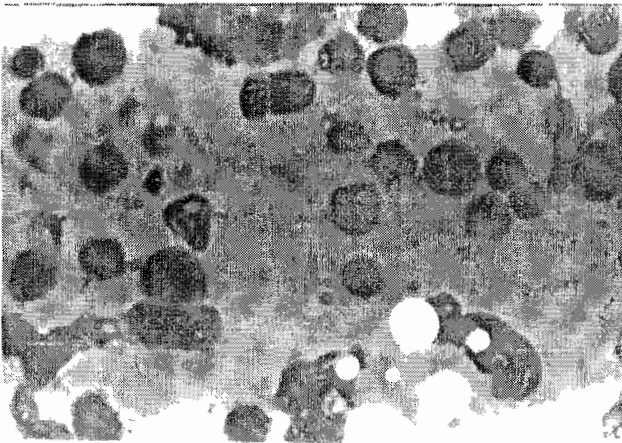


Fig. 2: Bone Marrow smear of a Patient with Acute Lymphoblastic Anaemia

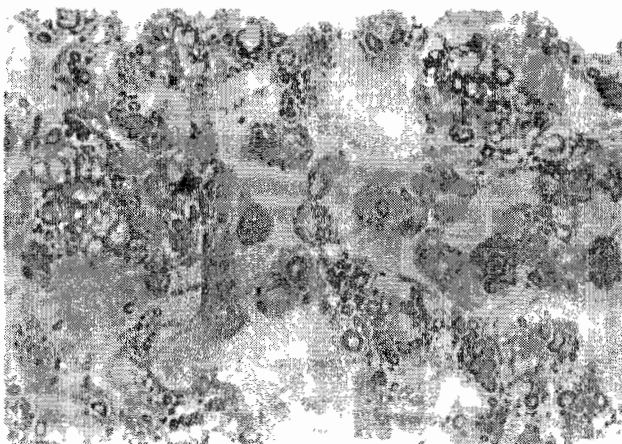


Fig. 3: Bone Marrow Smear of a Patient with Hypocellularity

DISCUSSION

This study reveals the usefulness of the bone marrow aspiration technique as a useful and practical diagnostic tool for confirming the diagnosis of various haematological disorders. Without the benefit of bone marrow aspiration it would have been difficult to arrive at a diagnosis in this environment for conditions such as acute myeloblastic leukaemia; acute lymphoblastic leukaemia; megaloblastic anaemia in pregnancy; and hypocellularity of the bone marrow.

In a previous report on the evaluation of bone marrow findings in 166 severely anaemic patients Kumar et al² in India, reported aplastic anaemia in 49 patients; megaloblastic anaemia in 37 patients; leukaemia or lymphoma in 30 patients; and hypersplenism in 19 patients. They however, excluded patients with leukaemic cells in their peripheral blood smears. Their study result is similar to ours and illustrates the usefulness of bone marrow aspiration biopsy as a diagnostic tool.

A previous study by Hammerstrom⁷ in Norway also corroborates our finding on the benefits derivable from bone marrow aspiration biopsy. The Norwegian study revealed that the diagnostic yield was highest for conditions related to bone marrow function and low for unspecific conditions such as fever of unknown origin. The selective use of bone marrow aspiration is advocated especially for cases of reticulocytopenia.

Trephine bone marrow biopsy has been recommended as a useful adjunct to bone marrow aspiration in this environment by Okafor⁸. Kumar et al² also advocated the use of both aspiration and biopsy simultaneously in pancytopenic patients when diagnosis is elusive.

This study reveals that a good proportion of severely anaemic patients seen in this environment, excluding those with sickle cell anaemia, may have some form of leukaemia. Others may have hypocellularity of the bone marrow probably due to aplastic anaemia while megaloblastic anaemia accounts for a few cases. It is not easy to explain the reason for the frequency order but there is a need for prompt

referral of severely anaemic patients to the haematologist.

CONCLUSION

It is concluded that bone marrow aspiration is capable of confirming the diagnosis of unexplained severe anaemia. This is pertinent because in this environment, most hospitals and clinics do not have the facilities for the more sophisticated and expensive tests necessary for diagnosis of haematological disorders such as karyotyping for chromosomal abnormalities, various assays for serum iron and a host of other tests.

In view of the low cost involved in procuring the bone marrow aspiration needle and the ease of the technique, it is advocated that provisions be made for the procedure in various health care institutions.

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REFERENCES

1. Bain BJ. Bone marrow aspiration. *J Clin Pathol.* 2001; 54(9): 657-63
2. Kumar R, Kalra SP, Kumar H et al. *Assoc Physicians India.* 2001; 49: 1078-81.
3. Brown BA. Special haematology procedures. In: *Haematology: Principles and Procedures* 5th Edition. Lea and Febiger, Philadelphia 1988: 123.
4. Hoffbrand AV and Petit JE Bone Marrow Aspiration. In: *Essential Haematology* 3rd Edition. Blackwell Science Pty Ltd. Victoria Australia 1995.
5. Dacie JV and Lewis SM. *Practical Haematology.* 8th Edition. Churchill Livingstone, London 1995: 28-383.
6. Ahmed SG and Ibrahim UA. Bone marrow morphological features in anaemia patients with acquired immune deficiency syndrome in Nigeria. *Niger Postgrad Med J* 2001; 8(3): 112-5
7. Hammerstrom J. Bone marrow aspiration. Use and benefits. *Tidsskr Nor Laegetoren* 1992; 112 (7): 909-11.
8. Okafor LA. Usefulness of trephine bone marrow biopsies in the diagnosis of diseases in Nigeria. *E. Afr. Med. J.* 1984; 61(II): 824—828.