HYPOCHROMIC ANAEMIA IN CHRONIC INFECTIONS

E. B. ADAMS, M.D. (RAND), F.R.C.P. (LOND.) AND F. G. H. MAYET, M.D. (NATAL), *Department of Medicine, University of Natal and King Edward VIII Hospital, Durban*

Textbooks of haematology[1] and medicine,[2] a review of 378 patients in Oxford,[3] and a recent annotation in *The Lancet*[4] indicate that iron deficiency is usually considered to be by far the commonest cause of hypochromic anaemia. When there is a block in the incorporation of iron into haemoglobin, as in thalassaemia, pyridoxine-responsive anaemia and refractory sideroblastic anaemia, hypochromia may also occur. However, these conditions are apparently uncommon among the Bantu in South Africa.

Some years ago we were impressed by the frequency with which hypochromia was reported in patients admitted to this hospital suffering from a variety of chronic infections. We found this surprising in a hospital population composed largely of Bantu patients, in the majority of whom high tissue-iron deposits may be expected[5] and in whom iron-deficiency anaemia should therefore be relatively infrequent.

We accordingly started a controlled investigation of the anaemia associated with long-standing infections. Our results in Bantu patients with amoebic liver abscess have already been published.[6] We have since studied a further series of 34 patients selected on the grounds only that they suffered from chronic infection. Thirty-two were Bantu and 2 Indian, and all but 6 were male. Pulmonary tuberculosis was the commonest infection (23 cases). Six patients had pyogenic lung abscess, while the remainder suffered from bacterial endocarditis, polyarthritis, empyema, pleural effusion and tuberculous peritonitis.

For the purpose of control our results were compared with the haematological findings in 51 subjects, all of whom were in apparent good health (30 Bantu males, 8 White females and 13 White males).

METHODS

Morning specimens of blood were taken shortly after admission to hospital and before treatment had been instituted. Haemo-

globin was estimated as oxyhaemoglobin in an EEL colorimeter and the packed-cell volume was determined by a microhaematocrit method, as described by Dacie.[7] Both were done in duplicate.

The methods of Bothwell and Mallett[8] and Bothwell *et al.*[9] were used for the plasma iron and the unbound iron-binding capacity. From these 2 estimations the total iron-binding capacity (TIBC) was calculated by addition.

A specimen of bone marrow was aspirated from the sternum in each case. It was stained for iron by hydrochloric acid and 3% potassium ferrocyanide, the iron stores being graded 0 - 6 as described by Rath and Finch.[10] The technique of Douglas and Dacie was used for sideroblast counts.[11]

Hypochromic anaemia was diagnosed when the Hb. was under 12·0 G./100 ml. and the mean corpuscular haemoglobin concentration (MCHC) was 30% or less.

RESULTS

Examination of the bone marrow showed that erythropoiesis was normoblastic in all patients and all showed the presence of haemosiderin, which we graded 1 - 2 in 6 patients and 3 - 6 in 28.

Our findings in the peripheral blood are summarized in Table I while Table II shows 5 examples of haematological patterns encountered. It is seen that the MCHC ranged from 25 to 33% and that hypochromic anaemia was a common feature in this series (24 out of 34 patients), despite the adequacy of the iron stores, while there was no anaemia and only 1 case of hypochromia (MCHC 30%) in the controls.

As expected in infection, and unlike iron-deficiency anaemia, both plasma iron and TIBC values were reduced (with means of 44 and 162 μg./100 ml. respectively) and in most patients the percentage saturation was normal (mean 27%) although the range was wide (9 - 62%). Among the controls the results were similar to those of other workers, except that in a few of the Bantu the plasma transferrin was almost fully saturated with iron (Table I).

Four patients had plasma iron patterns similar to those found in iron-deficiency anaemia. Their plasma iron levels were very low (10 - 35 μg./100 ml.) and the saturation less than 16%. Iron deficiency was excluded in these patients, however, by the presence of adequate amounts of haemosiderin in the bone marrow (grades 2, 3, 3, 4).

Sideroblasts, counted in 20 patients, were all abnormally low (under 20%) with one exception (33%); in 12 cases no sideroblasts could be seen. Ring-sideroblasts were not observed, and this fact together with the absence of hyperferraemia effectively excludes the sideroblastic anaemias[12] as the cause of the hypochromic anaemia in this series.

DISCUSSION

The anaemia observed in our patients appears to be the anaemia of chronic infection. What is surprising is the frequency with which it is hypochromic. This has been previously observed[13-16] but insufficiently stressed, so that the terms 'hypochromic anaemia' and 'iron-deficiency anaemia' still tend to be regarded as synonymous, probably because most of the extensive literature on hypochromic anaemia has come from studies on patients in whom anaemia was the major clinical feature.

When low MCHC values are encountered, iron deficiency can readily be excluded by examination of the bone marrow for iron, and this was done on every patient. In iron-deficiency anaemia the stores are depleted, whereas normal or increased amounts are found in the presence of infection,[14] as shown in our cases.

Although the plasma iron pattern usually also helps to distinguish between these 2 conditions, this is not invariably so. It will be noted that 4 patients in this series had patterns like those of iron-deficiency anaemia, but their iron stores were adequate. Case 4 (Table II) is a good example. The MCHC, plasma iron and saturation suggest iron-deficiency anaemia, which is ruled out by finding a normal amount of iron in the marrow.

How frequently is hypochromia found in the anaemia of infection? In our experience with chronic infections the incidence appears to be high. Among Bantu patients in the medical wards at King Edward VIII Hospital, where severe infection still dominates the scene, infection is probably the commonest cause of hypochromic anaemia. Twenty-four out of 34 patients in the present series and 15 out of the 31 patients with amoebic liver abscess previously reported[6] had hypochromic anaemia, an over-all incidence of 60%. These results are comparable with those of Bainton and Finch in Seattle,[16] although the incidence in Durban is somewhat higher.

When severe hypochromic anaemia is encountered in patients with chronic infection, treatment with iron is irrational since the anaemia is due to a block in the incorporation of iron into haemoglobin and not to an inadequate supply. In such cases, the only rational therapy is blood transfusion. If circumstances permit, examination of the bone marrow for iron should be undertaken but, in the absence of facilities, transfusion should not be delayed and

TABLE I. HAEMATOLOGICAL FINDINGS IN 34 PATIENTS WITH VARIOUS INFECTIONS AND IN 51 CONTROLS

	Hb. (*G*/100 *ml.*)	*MCHC* (%)	*Plasma iron* (μg./100 *ml.*)	*TIBC* (μg./100 *ml.*)	*Percentage saturation*	*Hypochromic anaemia*
Patients						
Mean	9·6	29·4	44	162	27	24
Range	4·8–13·5	25–33	10–80	25–287	9–62	
Controls						
Mean	15·0	33·3	126	328	38	0
Range	12·0–16·8	30–36	42–267	215–485	15–99*	

*Range for Bantu 16–99, for Whites 15–49.

TABLE II. HAEMATOLOGICAL PATTERNS IN 5 PATIENTS WITH THE ANAEMIA OF INFECTION

Case	*Hb.* (*G*/100 *ml.*)	*MCHC* (%)	*Plasma iron* (μg./100 *ml.*)	*TIBC* (μg./100 *ml.*)	*Percentage saturation*	*Marrow iron grade*	*Sideroblasts* (%)
1	4·8	26	37	154	24	3	4
2	6·1	31	80	174	46	3	0
3	8·1	30	44	178	25	5	8
4	10·4	29	10	106	9	2	0
5	12·3	32	57	265	22	2	0

valuable time wasted by embarking on a trial course of iron to the detriment of the patient.

SUMMARY

Hypochromic anaemia is shown to be a common feature in a series of 34 patients with various chronic infections. Iron deficiency was excluded as the cause in each case by demonstrating the presence of haemosiderin in the bone marrow.

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