Anemia in Malaria and the Role of Blood Transfusion

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OBJECTIVE: To determine the prevalence of anemia in falciparum and vivax malaria. To determine the rate of recovery from anemia in both diseases. To determine the role of blood transfusion (if any) in the management of the anemia.

BACKGROUND: There is little information on the prevalence of anemia in malaria. Anemia is a well-known complication of falciparum malaria but is less commonly a problem in vivax malaria. Comparative studies on the rate of recovery from anemia in falciparum and vivax malaria are not available. Most standard sources recommend blood transfusions as part of the general therapy for the hemolytic problem (2, 3). References, however, are extremely vague, and give no data on the results of blood transfusion.

DESCRIPTION: Anemia in this study is defined as a hematocrit (packed cell volume) below 35 per cent. Hematocrits have been determined on several hundred patients with falciparum malaria over the last few years. The hematocrit and other parameters were correlated in 236 unselected patients with falciparum malaria. Some data is also available on a small group of patients with vivax malaria. Daily hematocrits in hospital and weekly hematocrits during follow-up have been taken on the SEATO ward at Prachinburi Hospital since February 1975.

PROGRESS: In an unselected series of 142 patients with falciparum malaria, 63 (44 per cent) developed a hematocrit below 35 per cent during their hospital course and could therefore be considered to have developed anemia. Data on a much larger group of patients is being analyzed.

In a study of jaundice in falciparum malaria described elsewhere, two relevant correlations were discovered. The hematocrit correlated negatively with the parasite count ($r = -0.32$, $p < 0.001$); in other words, anemia is more common in patients with higher parasite counts. Also, the hematocrit correlated negatively with the total serum bilirubin ($r = -0.29$, $p < 0.01$) which indicates that anemia is more common in falciparum patients who are jaundiced.

Clinically the anemia of falciparum malaria improves steadily once the infection has been brought under control. The data in Figure 1 support this impression. Depicted are serial hematocrits on three patients who developed a worsening anemia after admission. When the malaria was successfully treated with quinine, the hematocrit steadily increased without blood transfusion or hematinics. These results are typical of most falciparum patients with anemia that we have studied.

Altogether five patients with severe anemia (defined as a hematocrit below 15 per cent) have been successfully managed without blood transfusion. One interesting patient is shown in Figure 2. This five year old boy was admitted almost in coma and with a parasite count of 41,000 per cu.mm. The patient weighed 15 Kg. He received six doses of intravenous quinine at the rate of two infusions daily administered in a total of 500 ml fluid daily. The parasitemia cleared in 64 hours but the patient remained in coma for five days. On day 6 the patient was conscious but very weak. The hematocrit had decreased from 19 to 12 per cent. A 300 ml blood transfusion was given and the hematocrit increased to 19 per cent. On the following day a second transfusion of 200 ml was given and the hematocrit increased further to 23 per cent. A dose of pyrimethamine with sulfadoxine (one tablet) was given and the patient made a steady recovery.

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DISCUSSION: Our preliminary results indicate that about 45 per cent of Thai patients with falciparum malaria develop anemia (defined as a lowest recorded hematocrit below 35 per cent). In one small study of U.S. troops with falciparum malaria in Vietnam, 22 per cent had anemia by this criterion. In another group of 50 U.S. troops, 58 per cent had a hematocrit less than 38 per cent.

Hemolysis is the principal cause of anemia in falciparum malaria but impairment of red cell production may also occur. The question arises as to what extent the anemia in falciparum malaria is due to background malnutrition or iron deficiency rather than to the disease itself. Our studies suggest that this is a minor factor. Anemia has not been a problem in the convalescence of our patients. The data in Figure 1 is typical in that it shows an increase in the hematocrit once the malaria is brought under control. Slightly low levels of the hematocrit (around 35 per cent) do persist in some patients in convalescence. We are now studying the effect of iron therapy in patients whose hematocrits have stabilized in convalescence. The probable answer is that anemia in falciparum malaria is mainly due to the disease but in some patients malnutrition, iron deficiency or helminthiasis are minor factors.

The role of blood transfusion (if any) in falciparum anemia needs to be clearly defined. Blood transfusion is recommended by some authorities (2), and indeed Manson (3) implies that transfusion should be considered if the hematocrit falls below 30 per cent. We agree with Canfield (1) who asserts that blood transfusion is rarely required. In patients that we have observed, blood transfusion often results in pulmonary edema. Another sequel of transfusion is severe hemoglobinuria which obviously is due to hemolysis of the transfused cells. In this situation the transfusion has obviously been unsuccessful since the hematocrit does not rise. There are several problems with transfusing blood in hospitals in remote malarious areas. The donor blood may contain malaria parasites. Also it may be difficult to cross—match the blood as precisely as in more sophisticated hospitals in non—endemic areas. It is probably true that red cells transfused during the acute phase of the disease are more likely to be hemolyzed than during convalescence. This concept is supported by the patient depicted in Figure 2; after the parasitemia had been eliminated by quinine; blood transfusion caused a satisfactory increase in the hematocrit. Our largely anecdotal evidence suggests that blood transfusion is rarely indicated in falciparum malaria. A protocol of a controlled study of blood transfusion in falciparum anemia has been submitted to the Ministry of Health of Thailand. Patients who develop a hematocrit between 12 and 20 per cent will be randomly assigned to blood transfusion or conservative management. All patients will receive quinine therapy by intermittent intravenous infusions. Patients with hematocrits below 12 per cent will be treated according to the clinical picture and patients with a hematocrit above 20 per cent will usually be treated conservatively. The patients will be closely followed clinically and detailed relevant hematologic and biochemical tests will be performed.

REFERENCES:

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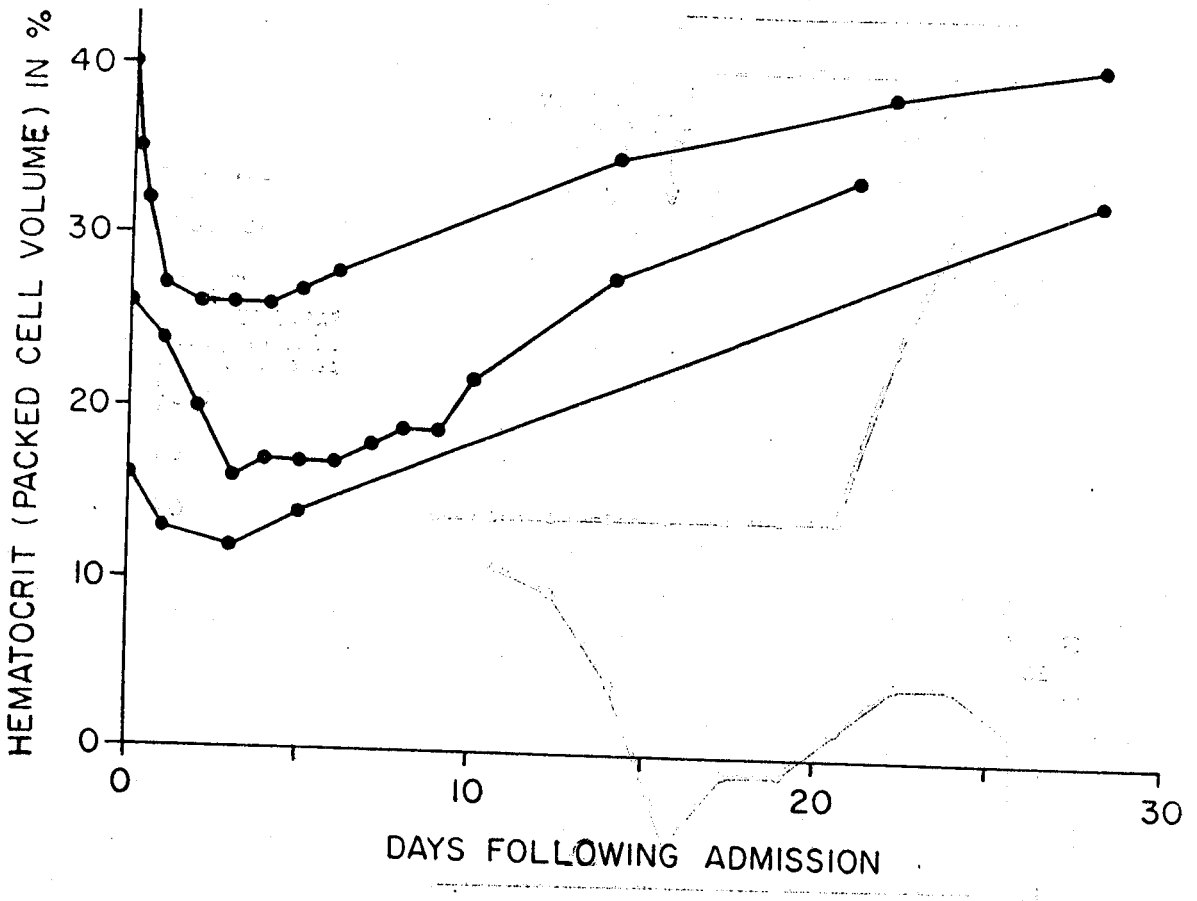

Figure I. Three patients with falciparum malaria. Recovery from anemia was associated with cure of malaria. Blood transfusion and hematinics were not used.

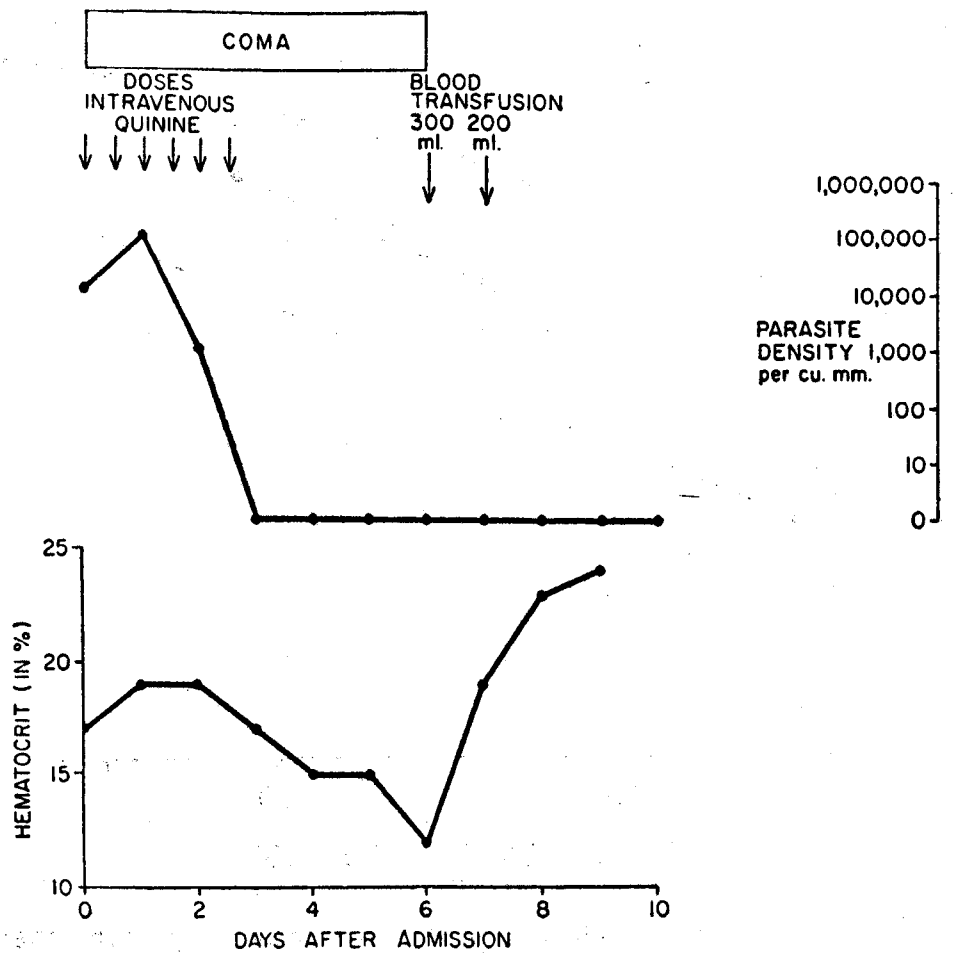

Figure 2 Boy with falciparum malaria aged 5 years. After eradication of parasitemia with quinine therapy, a satisfactory increase in hematocrit followed blood transfusion