

# MANUAL EXCHANGE BLOOD TRANSFUSION IN A YOUNG PATIENT WITH FALCIPARUM MALARIA IN A PERIPEHRAL HOSPITAL

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## ABSTRACT

We report a case manual exchange blood transfusion in a young patient having falciparum malaria along with its severe complications. Parasite load reduced to 2% from over 20% with significant improvement in neurological status but unfortunately, the patient succumbed to death due to acute renal failure.

**KEY WORDS:** Exchange transfusion, Malaria, *Plasmodium falciparum*.

## INTRODUCTION

Malaria is the most deadly vector-borne disease in the world. At least 10 of the more than 200 parasitic protozoa species of the genus *Plasmodium* can cause human malaria, including *P. ovale*, *P. vivax*, *P. malariae*, *P. knowlesi*, and *P. falciparum*. *P. falciparum* is responsible for more severe form of malaria with high morbidity and mortality.<sup>1,2</sup> The estimated mortality rate among patients with cerebral malaria exceeds 30% and, when the course is complicated by renal failure or respiratory failure, it may approach 80%.<sup>3</sup> Resistance to anti-malarial agent routinely used i.e chloroquine, artemether is found in many cases. Quinine Sulphate is drug of choice in severe case because of lack of resistance.<sup>4,5</sup> The mortality due to this disease parallels the degree of parasitemia and immune status of patient.<sup>6</sup> Therapeutic Red cell exchange (TREC) is successful in a large number of clinical conditions such as acute severe malaria, acute crises of sickle cell anemia, refractory warm autoimmune hemolytic anemia and in porphyria. In exchange transfusion, a system called apheresis is used to remove patient's blood and replace them with transfused blood. Exchange transfusion is usually done in cycles and the whole process may take 4-5 hours. There have been many anecdotal reports and several studies claiming benefit for exchange blood transfusion (EBT) in severe malaria.

Successful use of exchange blood transfusion as a therapeutic adjunct for this infection was first reported in 1974, although the efficacy of this procedure has not been established by randomized, controlled trials. The rationale for this form of therapy is based on (1) rapid reduction in the parasite load by direct removal (2) decreased risk

of severe intravascular hemolysis and its consequences (disseminated intravascular coagulation and renal dysfunction) (3) improved rheology with transfused blood and reduced microcirculatory sludging and (4) improved oxygen-carrying capacity with transfused erythrocytes. It is a useful adjunctive measure to conventional medical management.<sup>1</sup> We describe here a case of severe falciparum malaria and review the literature describing the use of manual exchange transfusion for treatment of this infection.

## CASE HISTORY

A 18 years old young boy was admitted with history of high grade fever, vomiting for 4 days and jaundice for 2 days with altered conscious level for 12 hrs. There was no previous history of jaundice, blood transfusion in the past and mucosal bleed from any site. His clinical examination revealed young boy deeply jaundiced with a temp of 102 °F, BP 110/70, pulse 110/min and was deeply comatosed. His neck was supple and had hepatomegaly while rest of examination was normal. Laboratory investigations are summarized in table 1. Keeping in view the high suspicion of falciparum malaria, a peripheral film for malarial parasite was advised. The film showed rings of *P. falciparum* (Fig 1.a) with an index of above 20% and diagnosis was also confirmed by immunochromatographic kit (ICT) as shown in fig 1.b. He was started on IV Quinine after loading dose, injection ceftriaxone 1g x BD, Zantac x 50mg BD, Decadron 4mg 8hrly, 10% DW, anti-pyretics and rest of the treatment of a comatosed patient.

Considering his high malarial parasite (MP) index his partial exchange transfusion (manual method) upto 2 litre over 6-7 hrs was also carried out. Fresh whole blood was infused in one fore-

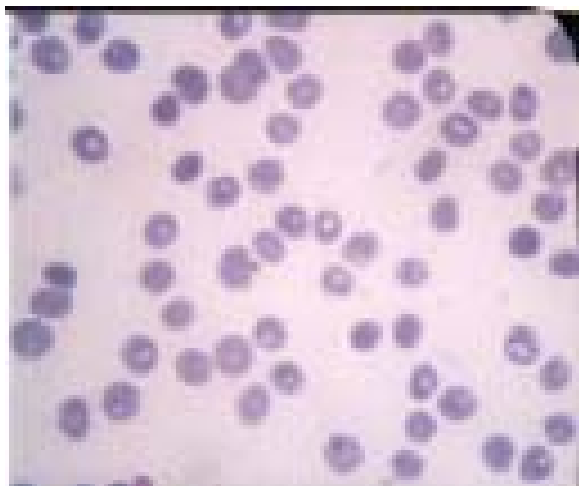


Fig 1: Peripheral blood film showing even three MT rings in RBCs.

**Table 1: Various laboratory parameters of patient.**

Total Leucocyte count	12 x 10 <sup>9</sup> /L
Hemoglobin	12.4g/dL
Platelets	33 x 10 <sup>9</sup>
Malarial Parasite index	MT Rings were seen and index was above 20%
Blood Sugar Random	9.9 mmol
Serum Urea	42.3 mmol/L
Serum Creatinine	270 umol/L
PT/PTTK	Prolonged
FDPs	More than 200 ng/mL
Serum K	4.8 mmol/L
Urine routine examination	Numerous RBCs

arm while venesection was carried out in other forearm to draw the blood in repeated cycles. This manual method was carried out due to critical condition of the patient and non-availability of apheresis system required for exchange transfusion. Post transfusion MP Index dropped to 2% and platelet improved to 98x10<sup>3</sup>/uL. Over next 12 hrs his conscious level improved markedly. He became aurosauble to vocal command but he went into oliguric renal failure. He had no renal output since the time of admission and 6- 8 hrs later he developed generalized seizure with frothing from mouth and tongue bite. His renal function showed further



Fig. 2: ICT kit showing positive band for *P. falciparum*.

deterioration and due to non-availability of renal dialysis system, he was referred to tertiary care hospital but unfortunately he died in the way.

## DISCUSSION

Therapeutic erythrocytapheresis has been used over the years for a large no of clinical conditions. It is indicated if a remarkable damage of RBCs is related to an emergent organ failure (e.g Kidney). *Plasmodium falciparum* is most dreadful form of malaria. *Plasmodium falciparum* poses the greatest threat of death because is capable of invading a high proportion of red blood cells of all ages and rapidly leading to severe or life-threatening multi-organ disease. It is often drug resistant, and is the only one of the plasmodia species that produces microvascular disease. High mortality depending on degree of parasitemia and development of complications such as cerebral malaria, renal or acute lung injury and DIC. Hyperparasitemia itself might be an important factor for the development of fatal event in malaria.<sup>7</sup>

Exchange blood transfusion (EBT) is the quickest way to remove parasitized red cells. This procedure involves withdrawing blood from patient at the same time that donor blood is being injected. During this exchange, the amount of blood in the body stays constant. Quinine is given by needle into a vein (intravenously) at the same time as the blood transfusion. Quinine hydrochloride has rapid schizonticidal activity, so that the parasites in erythrocytes become metabolically inactive within a few hours.<sup>8</sup> Parasite density is checked every 12 hours until it is less than 1%. It offers a rapid approach to treat acute, severe cases of malaria. Exchange transfusion results in improving the rheological properties of blood, rapid correction of anaemia, rapid decrease in the level of parasitemia by removing infected red cells and reducing toxic factors such as parasite-derived toxins, harmful metabolites, and cytokines. It is

therefore useful adjunctive measure to conventional medical treatment.<sup>9</sup> It offers a rapid approach to treat acute, severe cases of malaria. EBT be performed in *P. falciparum* infection when parasitemia is equal or greater than 10% or in patients with coma, renal failure, or adult respiratory distress syndrome, even if parasitemia is less than 10%.<sup>7</sup>

Reports of use of EBT in adults are published from all around the world. However efficacy of exchange transfusion as urgent treatment for severe malaria is controversial. Some studies advocate about its beneficial effect associated with better survival rate when used as compared to conventional chemotherapy alone.<sup>8,9</sup> We performed a whole blood exchange by an intermittent “draw and infuse method”. This is labor intensive and time consuming. This is because no facility for plasmapheresis was available here. Fresh blood was used instead of stored to avoid further decrease in platelet counts. Significant hemodynamic compromise can occur if the aliquots removed per cycle are too large and this is exacerbated if the patient is critically ill. Since we draw 100-150ml of blood at a time and CVP monitoring along with continued vitals monitoring was done throughout the procedure, so hemodynamic fluctuations were minimal.

The risks of exchange transfusion include fluid overload, febrile and allergic reactions, metabolic disturbances (e.g., hypocalcemia), red blood cell alloantibody sensitization, transmissible infection, and line sepsis.<sup>10</sup> In a peripheral setup of developing countries in which monitoring in intensive care units may not be possible, hyperkalemia and fluid overload may become problems during therapy. Thus, the potential benefits of exchange transfusion should be weighed against the risks. The parasite density should be monitored every 12 hours until it falls below 1%, which usually requires the exchange of 8-10 units of blood in adults.<sup>11</sup> Although controversial, still manual exchange blood transfusion can be a good alternate where facility for apheresis system is not available and the clinical condition of the patient does not allow for a referral to a tertiary care hospital in resource starved settings.

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