Improved Screening of Donor’s Blood for Malaria: 
A Qatari Experience

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Abstract:
Malaria is one of the most widespread infections globally and is undoubtedly responsible for the majority of all cases of transfusion-transmitted disease in the world. Qatar is free from endemic malaria. However, cases are seen with the large expatriate work force imported from malarious areas. These constitute a significant percent of the blood donors’ pool (34%). Over a 27-month period, among 5845 volunteers tested for malaria, 21 were deferred (0.36%) showing positive result when screened by the Giemsa-stained thick smear technique, with 2 undiagnosed cases that led to transfusion-transmitted malaria. Since then and for the last 21 months, the Falciparum-Spot immunofluorescence (IF) test was implemented in an attempt to ensure accurate screening. Among 6367 donors tested, 274 (4.3%) were deferred. Careful questioning about donor travel history, expansion of deferral policy and the use of a more sensitive screening test have all resulted in increasing layers of safety where no transfusion-transmitted malaria was reported in the last 21 months. These measures were necessary to regain the trust of the public in the safety and stewardship of the blood supply.

Introduction:
Transfusion-associated malaria is often severe and even fatal because diagnosis is frequently delayed and it complicates an already serious underlying disorder. Policies for preventing malaria transmission by blood transfusion rely on a multi-layer system of safety. Sensitive screening tests are necessary but represent only one component. Other layers of safety include detailed donor education, stringent screening, selection and deferral procedures, post donation product quarantine and donor tracking and notification when instances of any infectious agents occur. Each element plays a role in preventing tainted units from entering the blood inventory. In some areas of the world, in U.S.A. for instance, donors’ questionnaire was only relied on, although the necessity for reviewing donor screening process has recently emerged.

One hundred years ago, Giemsa-stained thick smears were adopted for the first time for malaria diagnosis and still continue to be the method of choice in most malarious countries, although in the recent past, several alternatives have been developed that exhibit some advantages. We herewith report our experience over a period of 48 months in our struggle for a malaria free blood supply.

Materials and Methods:
Giemsa stained thick smears used to be our test of choice for screening donors’ blood for malaria. However, after the occurrence of 2 blood transfusion-transmitted malaria cases, and since April 2002, we decided to shift to the Falciparum-Spot immunofluorescence test (BioMerieux, France). The test was applied following the manufacturer’s instructions. Non-specific fluorescence of the parasite was avoided by preliminary absorption of the test serum with group A erythrocytes. Screening for malaria included those donors who have traveled in the previous 6 months to an endemic area or those emigrants who revisited endemic areas in the previous year and those who have had antimalarial treatment in the previous year. We compared the screening results during the period from April 2002 till December 2003 (21 months), with those seen in the preceding 27 months when Giemsa-stained smears were used (from January 2000 till March 2002).
Results:

The total donors' pool/year ranges from 10,468 to 12,151 with a mean±SD of 11,564.7±758.1 donors/year (Table 1). Donors from malarious areas constitute a significant proportion (35.3%) (Figure 1). During the 27-month period, a total of 5845 were tested, in whom 21 positive cases were detected (0.36%). In the next 21-month period, 6367 cases were tested with IF technique and 274 cases were positive (4.3%) (p<0.0005) (Figure 2). Positive blood was excluded from the blood inventory and the donors notified and deferred.

Discussion:

There are currently no FDA approved assays for screening blood donors for Malaria (2,6), and so far, all suggested protocols are based on individual recommendations reported from various endemic and non-endemic areas of the world. In our experience, since April 2002 when the IF-spot test was introduced in the blood bank for screening blood donors, no transfusion-transmitted malaria case was reported compared to the previous era when Giemsa-stained thick smear technique was used, reflecting a better sensitivity of the test. Several conclusions in favor of the IF-spot test were reported in various parts of the world suggesting that the IF assay is by far the most reliable test for use in malaria serodiagnosis (7,8,9), whereas others preferred combining malaria antigen and antibody detection to confer a better screening (10). The use of PCR was also reported as a valuable tool (11) especially in low-level parasitaemia (12). In our experience, the use of IF spot test seems so far quite convenient having 98.7% specificity and 98% sensitivity in providing a retrospective confirmation of an attack of malaria (7).

A risk still exists especially in low parasite load. The fact that partial immunity can extend the incubation period is also of concern. The unexceptionally long incubation periods of some vivax strains reaching up to 250-637 days (13,14) also constitutes an incurring threat. The limited donors' pool stands as a stubborn obstacle against expansion of the deferral policies. It should also be born in mind that the quest to eliminate potential risky blood donors and the solitary dependence on malarial antibody detection as a screening test might lead to the loss of many healthy donors thus further reducing the blood pool. In our opinion, combining IF antibody test with antigen detection would probably help overcome this problem. The cost-effectiveness of such protocol should however be evaluated locally prior to its implementation.

New and innovative methods of malaria diagnosis should be developed. Concurrently, the World Health Organization has opened a dialogue with scientists, clinicians and manufacturers on the realistic possibilities for developing accurate, sensitive and cost-effective rapid diagnostic tests for malaria (15). Other promising technological approaches to blood safety include pathogen inactivation in cellular components (8). Until this is achieved, a high index of suspicion should be maintained in those with suggestive travel history. Formulation and updating of appropriate donor selection policies should help reduce the incidence of transfusion-transmitted disease.

The need for a safe blood supply constitutes a never-ending struggle for man. The slogan used by the American National Red Cross blood program rightfully refers to blood as the “Gift of Life”. Like many good things, it comes with risks.
References:

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