ParaSight-F test to diagnose malaria in hypo-endemic and epidemic prone regions of Vietnam

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Summary

The antigen capture ParaSight-F test was evaluated during a drug sensitivity survey in a hypoendemic region of northern Vietnam. When only asexual blood forms of P. falciparum were considered, sensitivity of ParaSight-F was 100%, specificity 88% (95% CI 95-80%), positive predictive value 68% (95% CI 85-50%) and negative predictive value 100%

ParaSight-F proved very convenient for rapid screening and selection of patients to enrol in a drug sensitivity study. In northern Vietnam, the introduction of the test as a routine diagnostic tool is not justified, considering its high cost, the necessity to carry out the treatment of presumptive Plasmodium vivax cases and the persistence of positive reactions following treatment. However, the test will be a valuable tool in remote areas in emergency situations, where rapid confirmation of a P. falciparum outbreak is required.

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Introduction

The ParaSight-F test is a rapid diagnostic test for Plasmodium falciparum infection. The histidine rich protein-II antigen, present in asexual erythrocytic stages and to a certain extent in early gametocytes, is captured on a dipstick. This test requires only a drop of blood and can be applied and read by people with limited training and without any special equipment (Shiff et al. 1994). However, it gives no quantitative information about P. falciparum parasitaemia (Dietze et al. 1995) and cannot be used to detect other Plasmodium infections (Shiff et al. 1994). Further investigation is necessary to establish appropriate conditions for the use of this new diagnostic tool, taking into account other available diagnostic tools, the level of endemicity of malaria and the total cost of disease management.

In northern Vietnam malaria is mostly hypo-endemic but it remains an important public health issue. Vectors are evident, some pockets of P. falciparum and P. vivax remain and there is contact with areas endemic for malaria. Epidemics are a permanent threat and can lead to severe pathology and death in all age groups. Detection of parasitaemia is often associated with disease but microscopic facilities are scarce and accessibility is poor. A simple diagnostic tool would be very useful in remote areas. But ParaSight-F is expensive (c. $US7.6) and advantages need to be considerable before its systematic use can be justified.

In the present report we used the ParaSight-F test for rapid screening and selection of patients to enrol in a drug sensitivity study. Results obtained were compared to the 'gold standard' of thick film examination.

Materials and methods

In November 1995, ParaSight-F was used during a drug sensitivity study in Ban Luoc, a remote
community in Ha Giang Province, northern Vietnam, near the border with China, where a malaria epidemic of both \( P. falciparum \) and \( P. vivax \) was reported and confirmed by microscopic examination in the weeks previous to the study. The community is the most peripheral administrative entity and is composed of several hamlets and villages. Villagers who felt sick were invited to attend the community health centre. Blood samples were taken from all individuals with fever (>37.5°C axillary) or with a history of fever in previous days. Parasight-F testing was performed immediately. A standard thick film was prepared and read by an experienced technician unaware of the test result. For each slide at least 100 fields were examined.

### Results

Results are presented in Table 1. No mixed infections were detected. Among positive slides, the geometric mean of \( P. falciparum \) trophozoites was 6457/μl blood (range 2240–33 160). Of the 93 persons examined, 28 were found to be positive with the Parasight-F test. A prolonged re-examination of the slides from the 6 subjects who were positive by the test, but apparently had negative slides, did not reveal the presence of \( P. falciparum \) trophozoites. Five of these 6 persons claimed to have taken antimalarial drugs in the preceding days. Of the group with negative Parasight-F, 11/65 claimed to have taken previous antimalarial treatment. Two of these 11 persons had a positive slide for \( P. vivax \); the other subjects were negative on examination of the thick film.

### Discussion

When only asexual blood forms of \( P. falciparum \) were considered, sensitivity of Parasight-F was 100%, specificity 88% (95% CI 95–80%), positive predictive value 68% (95% CI 85–50%) and negative predictive value 100%. These data confirm the reliability and validity of the test for \( P. falciparum \) (Shiff et al. 1993; Premji et al. 1994; Dietze et al. 1995).

Parasight-F proved very convenient for rapid screening and selection of patients to enrol in the drug sensitivity study. Blood slides dried very slowly due to high humidity. For such limited surveys cost is a minor issue and the advantages of Parasight-F are obvious.

To justify the introduction of Parasight-F as a routine diagnostic tool by village health workers in the region, the test should decrease total cost of case management, and/or allow more rapid management of patients with malaria, allow earlier diagnosis and/or limit unnecessary treatment.

The introduction of Parasight-F as a routine tool would increase total cost. Routine adult treatments of malaria range from $US0.1 (chloroquine 25 mg/kg and sulphadoxine-pyrimethamine) to about $US1 (artemisinine derivatives over a 5-day period). Only the combination of mefloquine (1 day) with artemisinine (3 days) costs more ($US3) than the test but it is not routinely applied.

All patients with fever are treated for malaria but in fact most of them are not infected with Plasmodium parasites. The introduction of Parasight-F would not change this. Patients with fever and negative tests would still be treated for a presumptive \( P. vivax \) infection. Chloroquine and sulphadoxine-pyrimethamine treatments remain ‘first line’ treatment in northern Vietnam. The biggest advantages are low cost, short treatment duration and relatively few side-effects. Resistance of \( P. falciparum \) to both drugs, monitored by in vivo tests, was reported several years ago (Ngo et al. 1990), but clinical resistance to these drugs is less well documented and resistance of \( P. vivax \) has not been reported.

Alternative potent ‘second-line’ drugs, in particular artemisinine derivatives which are locally produced, are increasingly available at rural level. Artemisinin
derivatives are recommended when *P. falciparum* is confirmed or, in the absence of a microscope, when symptoms are severe or persist after a first-line drug treatment. However, costs are higher, frequent relapses in short duration regimens have been reported and compliance in longer regimens is lower (Hien & White 1993; Bunnag et al. 1991; Luxemburger et al. 1994). Some studies reported that the test may remain positive up to 2 weeks after parasite clearance (Shiff et al. 1994). In this region self-medication is frequent and the introduction of Parasight-F would lead to an increase in unjustified treatments with more expensive ‘second-line’ drugs, because erroneous conclusions might be drawn about drug failure. Further studies are required to determine the rate of *P. falciparum* antigen clearance before using the test as a tool for follow-up of treatment failure of first-line drugs.

Early detection and effective management of epidemics is one of the biggest challenges for malaria control in this region. Scarce laboratory facilities and accessibility can lead to serious delays if an epidemic occurs in a remote hamlet. If health workers in these areas kept a Parasight-F box they could diagnose *P. falciparum* epidemics themselves and request immediate help for vector control. However, they should open the box only when they are faced with an increased number of fever cases.

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**References**


