DIAGNOSIS OF MALARIA IN NON-ENDEMIC COUNTRIES BY THE
PARASIGHT-F® TEST

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Abstract. QBC®, examination of thin blood smears, and Parasight-F® were performed for every case of malaria
suspected between May 1997 and December 1998. Data from 310 patients were reported. Fifty had malaria infection
diagnosed by QBC® and thin blood film, among whom 39 had Plasmodium falciparum infection. Three of these 39
were negative with the Parasight-F® test. Eleven patients had a positive ParaSight-F® test but microscopic diagnosis
methods were negative. Interpretation of these 11 positive ParaSight-F® results is proposed to depend on clinical
criteria.

INTRODUCTION

In non-endemic areas, diagnosis of imported malaria on
the basis of microscopic examination remains the major di-
agnostic method. However, interpretation of thick and thin
blood smears requires trained microscopists and, for the
QBC® method (Becton Dickinson, Meylan, France), specific
and relatively expensive equipment (fluorescence micro-
scope and specific kits). Newer methods based on detection
in blood of a soluble glycoprotein specific to Plasmodium falciparum, the histidine rich protein-II (HRP-II), have been
developed.1–3 These commercially available tests do not re-
quire specific equipment and are rapid and simple to perform.
Their sensitivity and specificity are near 90% but vary in
different studies.1,3,4,5 To estimate the impact of the Para-
Sight-F® test (Becton Dickinson) on malaria diagnosis in a
clinical laboratory, we retrospectively analyzed the discrep-
ancy between ParaSight-F® test results and conventional di-
agnostic methods according to the clinical course and final
clinical diagnosis of patients in Grenoble, France.

MATERIALS AND METHODS

For each case of suspected malaria seen between May
1997 and December 1998, at Grenoble University Hospital,
QBC®, examination of thin blood smear, and ParaSight-F®
test were performed. Species identification and intensity of
parasitemia were determined on thick blood smears. Parasit-
emia was expressed as the percentage of infected erythro-
cytes. Data from 310 patients were analyzed. These febrile
patients were French travelers returning from malarial en-
demic areas or immigrants from endemic areas, mainly Af-
rica. Clinical information was collected. Rheumatoid factor
and anti-nuclear antibody were measured when discordance
was observed between QBC®/thin blood smear and antigen
detection by the ParaSight-F® test. Sensitivity, specificity and
predictive values were calculated using microscopy as the refer-
ce method.

RESULTS

Fifty of 310 patients had malaria infection according to
positive parasite detection by QBC® and thin blood film ex-
amination. Thirty-eight had P. falciparum (35 positive with
ParaSight-F®), one mixed infection with P. falciparum and
Plasmodium ovale (positive with ParaSight-F®) and 11 with
other species (seven P. ovale and four P. vivax; all were
negative with ParaSight-F®).

Accordingly, antigen detection resulted in three false-neg-
ative results. One of these patients had only sexual forms of
P. falciparum, and the other two had P. falciparum tropho-
zoites with parasitemia < 0.01%. During the follow-up of
one of these two cases, the ParaSight-F® test became positive
two days after diagnosis and treatment with halofantrine
whereas the microscopic examination became negative.

For 11 patients, the ParaSight-F® was positive and the
QBC® and thin smear were negative. These results are sum-
marized in Table 1. They show that: 1) for three patients,
positive ParaSight-F® test was present when the subjects
were empirically treated with anti-malarial drugs for several
days before diagnosis (cases 3 to 5); 2) for six patients, the
interpretation of the ParaSight-F® test was equivocal and it
was not possible to determine if this corresponded to true
malaria infection (cases 6 to 11). Another diagnosis was
made in five of these patients and only one was treated de-
spite the absence of positive antigenemia in repeated blood
samples. Three of these patients had previously received
chemoprophylaxis with chloroquine and proguanil associa-
tion or mefloquine during their stay in endemic areas. And
3) Two positive ParaSight-F® tests were false-positive.
The first patient had not traveled in a malarial endemic area (the
West Indies) and the rheumatoid factor level was high. The
final diagnosis for the second patient was a primary cyto-
megalovirus infection. The ParaSight-F® test was not consis-
tently positive in this group.

Overall, the sensitivity and specificity of the ParaSight-F®
test were 92.3% and 95.9% compared with QBC® and mi-
croscopy, respectively. The positive and negative predictive
values were 76.5% and 98.8%, respectively. If the three cas-
es with persistent antigenemia were not considered false-
positive, despite negative microscopy, the sensitivity and
specificity of the ParaSight-F® test were 92.8% and 97%.
The positive and negative predictive values were 82.9% and
98.8%.

DISCUSSION

This retrospective analysis adds to our understanding of
the ParaSight-F® test in non-endemic areas. In spite of the
## Table 1: Description of the 11 patients with positive ParaSight-F and negative microscopic examination

<table>
<thead>
<tr>
<th>Patient no.</th>
<th>(Country)</th>
<th>Treatment before diagnosis</th>
<th>Parasite density in blood samples</th>
<th>Final clinical diagnosis</th>
<th>RF/AA Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. (West Indies)</td>
<td>No</td>
<td>1/1</td>
<td>Pyelonephritis</td>
<td>280/Neg</td>
<td>Certain false-positivity</td>
</tr>
<tr>
<td>2. (Vietnam)</td>
<td>ND</td>
<td>2/4</td>
<td>CMV primary infection</td>
<td>Neg/Neg</td>
<td>Probable false-positivity</td>
</tr>
<tr>
<td>3. (Ivory Coast)</td>
<td>No</td>
<td>1/1</td>
<td>Malaria</td>
<td>ND</td>
<td>Persistence of antigenemia following empirical treatment by halofantrine</td>
</tr>
<tr>
<td>4. (Benin)</td>
<td>Paludrine chloroquine</td>
<td>1/1</td>
<td>Malaria</td>
<td>ND</td>
<td>Persistence of antigenemia after presumptive treatment by halofantrine</td>
</tr>
<tr>
<td>5. (Senegal)</td>
<td>Paludrine chloroquine</td>
<td>1/1</td>
<td>Schistosomiasis</td>
<td>ND</td>
<td>Undetermined efficacy of prophylaxis</td>
</tr>
<tr>
<td>6. (Vietnam)</td>
<td>Mefloquine</td>
<td>1/3</td>
<td>Fever of unknown origin</td>
<td>Neg/Neg</td>
<td>Undetermined efficacy of prophylaxis</td>
</tr>
<tr>
<td>7. (Benin)</td>
<td>Paludrine chloroquine</td>
<td>1/1</td>
<td>Schistosomiasis</td>
<td>ND</td>
<td>Undetermined efficacy of prophylaxis</td>
</tr>
<tr>
<td>8. (Tanzania)</td>
<td>Mefloquine</td>
<td>ND</td>
<td>Undetermined</td>
<td>ND</td>
<td></td>
</tr>
<tr>
<td>9. (Mali)</td>
<td>ND</td>
<td>1/1</td>
<td>Peritonitis, appendectomy</td>
<td>ND</td>
<td></td>
</tr>
<tr>
<td>10. (Ivory Coast)</td>
<td>ND</td>
<td>1/1</td>
<td>Hepatic encephalopathy, delirium tremens</td>
<td>ND</td>
<td></td>
</tr>
<tr>
<td>11. (Antecedent of malaria, Guinea)</td>
<td>ND</td>
<td>1/1</td>
<td>Rheumatoid arthritis</td>
<td>ND</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- **ParaSight-F** is an HRP-2-based test for malaria diagnosis.
- Rheumatoid factor (RF) and antinuclear antibody (AA) were tested. Ag: antigenemia; ND: not done; CMV: cytomegalovirus.

**Interpretation:**
- Certain false-positivity: definite false-positive result.
- Probable false-positivity: likely false-positive result.

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REFERENCES