Ringworm of the scalp in children

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Summary

Scalp scrapings were collected from 651 children in the Cape Peninsula and along the Western Cape coast to determine which dermatophytic fungi occur in these areas. Fungi were isolated from 61% of specimens, by far the commonest being *Trichophyton violaceum*. Only half of these specimens showed fungal elements on direct microscopy. Among patients with scaly scalp lesions of varying severity the isolation rate was 64%, but dermatophytic fungi were also isolated from 16% of 50 asymptomatic children. Carriers of fungi without obvious ringworm may play an important role in the spread of the disease.

Ringworm of the scalp is a common condition among children in the Cape Peninsula and the Western Cape coastal region. About 3% of children seen at the dermatology clinics at the Red Cross War Memorial Children's Hospital attend specifically for tinea capitis, but possibly many more, particularly those of low socio-economic background, remain untreated. A wide range of presenting features is seen. Children may have circumscribed areas of scaling and alopecia, but more common manifestations include mild diffuse scaliness resembling dandruff, or seborrhoeic dermatitis. Those who are inexperienced in the diagnosis of dermatological conditions apparently often do not recognise the latter as being caused by a fungus. Along the West Cape coast and in Namaqualand a larger proportion of florid acute inflammatory reactions or kerion production is seen.

A study was undertaken to identify the fungi found in cases diagnosed clinically as typical ringworm of the scalp, as well as in children with less well-documented scalp changes, and to assess whether geographical or climatic differences are reflected in the organisms isolated.

Patients and methods

Scalp scrapings were collected from the following groups of children (Fig. 1): group A — 265 children with clinically suspected ringworm attending the Dermatology Outpatient Department at the Red Cross War Memorial Children's Hospital, representing the Cape Peninsula and surrounding environs; group B — 52 children with typical ringworm seen at community clinics along the Western Cape coastal belt; group C — 284 children, all with varying degrees of scaliness of the scalp, sampled by a school clinic sister with no formal dermatological experience at schools along the Western Cape coast; and group D — 50 children with apparently healthy scalps sampled by the same clinic sister at schools along the Western Cape coast.

Samples were collected by vigorously scraping the scalp and gathering the scales in sterile Petri dishes or envelopes. Microscopy was performed after clearing specimens of keratin with 15% potassium hydroxide. Samples were cultured on Mycosel agar (BBL 11462) and incubated at 25°C. Isolates were identified on the basis of their characteristics on culture and microscopic appearances.

Results

A total of 651 children was sampled. No systematic attempt was made to include children of all ages, but 84% were of primary school-going age (6 - 12 years). Forty-five per cent of the children were male.

Few children showed the circumscribed lesions well documented as typical of tinea capitis. In most cases mild local or diffuse scalp lesions were present, detectable only on close scrutiny. Exuberant kerion or extensive areas of permanent scarring were more common among children from Namaqualand. Dermatophytic fungi were isolated from 394 children (61%) (Table I), with 16 of these yielding two different fungi each. Of
the specimens that grew fungi, 225 (57%) showed hypophae or spores on direct microscopy. The range of fungi isolated is shown in Table II. In all groups of children Trichophyton violaceum constituted the overwhelming majority of isolates. Among children with scalp lesions the proportion of this organism in positive samples from the Cape Peninsula and the Western Cape coast was not significantly different (90% and 87% respectively; $P > 0.1$). Microsporum spp. (M. audouinii and M. canis) were grown only from patients attending the Red Cross Children's Hospital, which serves a region with a Mediterranean climate. In contrast, isolates of T. verrucosum occurred only along the West Cape coast (semi-desert). The total number of isolates of these organisms, however, was small. Infections with T. verrucosum were characterised by severe inflammatory reactions, and evidence of permanent scarring was noted in most cases.

**TABLE I. FUNGAL ISOLATION FROM SCALP SCRAPINGS**

<table>
<thead>
<tr>
<th>Group</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>No. of positive samples</th>
<th>Total No. tested</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>265</td>
<td>52</td>
<td>284</td>
<td>50</td>
<td>186 (70%) 48 (92%) 152 (54%) 8 (16%)</td>
<td></td>
</tr>
</tbody>
</table>

**TABLE II. SPECTRUM OF FUNGI ISOLATED FROM SCALP SCRAPINGS**

<table>
<thead>
<tr>
<th>Group</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>T. violaceum</td>
<td>176</td>
<td>43</td>
<td>146</td>
<td>6</td>
<td>371</td>
<td>90.5</td>
</tr>
<tr>
<td>T. yaouendi</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>8</td>
<td>2.4</td>
</tr>
<tr>
<td>T. verrucosum</td>
<td>5</td>
<td>3</td>
<td>8</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M. canis</td>
<td>17</td>
<td>3</td>
<td>7</td>
<td>1.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M. audouinii</td>
<td>6</td>
<td>6</td>
<td>1.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T. mentagrophytes</td>
<td>6</td>
<td>2</td>
<td>1</td>
<td>1.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T. tonsurans</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Discussion**

Information on the microbiology of ringworm in South Africa is relatively sparse and sometimes confusing.

Brede, investigating the organisms involved in superficial fungal infections in the Western Cape in 1959, found a predominance of Trichophyton species (T. mentagrophytes constituting 31% of the total and T. violaceum 24%). This contrasted with Lurie's findings in the Transvaal (Johannesburg), where M. canis was isolated from 75% of cases and Trichophyton species in only 16%. Brede considered that this variance in spectrum was due to different climatic conditions in the two areas. However, he was to report in 1972 that the isolation rate of M. canis in the Transvaal (Pretoria) had dropped to 35%, while that of T. violaceum had increased to 55%. In the Cape coastal belt at the time the proportions of T. violaceum (63%) and T. mentagrophytes (13%) had reversed. Furthermore, in a major review of dermatophyte infections occurring on the African continent, Verhagen concluded that climate played no role in the prevalence of dermatophytes. He demonstrated that anthropophilic fungi predominated in all areas, but that no clear difference existed in the specific fungi isolated in different regions. The emergence of anthropophilic fungi, especially Trichophyton spp., as causes of tinea capitis has also been seen in the USA and the UK.

Our study confirms the importance of Trichophyton spp. in scalp ringworm. The overwhelming preponderance of T. violaceum is particularly striking. This organism is anthropophilic and close physical contact among young scholars or siblings must be an effective method of propagation. Our findings furthermore suggest that zoophilic fungi are of little importance in the causation of tinea capitis, T. verrucosum and M. canis together accounting for only 4% of isolates.

In this study T. yaouendi constituted 2.4% of isolates. It therefore does not appear to have increased in importance as a cause of scalp ringworm in South Africa since it was first described in 1976. In contrast T. schoenleinii was not isolated at all, whereas previously it accounted for 9% of infections.

With regard to geographical distribution of fungi, our findings for T. violaceum support the conclusions of Verhagen. While differences for Microsporum spp. and T. verrucosum were found, the number of isolates was too small to draw any convincing conclusions.

Direct microscopic examination was positive in only half the specimens which subsequently yielded fungi on culture. This highlights the need for an adequate sample from a representative area of the lesion, preferably examined by a person experienced in mycological techniques. Specimens from mild lesions with little scaling are less likely to show fungal elements on microscopy. Since the decision to use systemic antifungal therapy is often based solely on positive microscopy, many patients may be denied effective treatment for a considerable period unless more reliance is placed on laboratory culture.

The isolation rate of fungi varied in the different groups of patients with scalp lesions. Dermatologists are generally aware of the wide clinical spectrum of fungal skin infections and are therefore more likely to submit specimens even from mild cases, some of which may not be of fungal causation. This may explain the lower isolation rate in group A (patients at the dermatology clinic) than in group B (patients with typical ringworm only). The proportion of positive cultures in group A was, however, greater than that in group C, where many of the lesions were inconspicuous and adequate samples for culture difficult to obtain.

An interesting finding was the relatively high isolation rate from apparently healthy heads or from children with inconspicuous scaliness only. This emphasises the importance of the role of carriers in the spread and persistence of scalp ringworm in communities and serves to endorse the view of Payne on the possible communicability of 'dandruff' in children. Systematic treatment of all such children is obviously impractical. There is a need to evaluate the role of shampoos or topical lotions as control measures in preventing the spread of ringworm.

We wish to thank Sister J. Arendse for her assistance with the collection of specimens from schoolchildren. We would also like to thank members of the Dermatology Department at the Red Cross War Memorial Children's Hospital for their support and encouragement.

**REFERENCES**