Fungal infections of the nails in Western Australia

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Abstract

Between 1963 and 1972, 986 fungi were isolated from the nails of patients in Western Australia. Three clinical types of infections in both finger and toe nails were studied. All 3 types occurred more commonly in adults over the age of 20. Multiple infections were relatively frequent. Two hundred and fourteen of the nail infections were caused by dermatophyte fungi. Trichophyton rubrum was the predominant aetiologic agent isolated from both finger and toe nails, T. mentagrophytes and other dermatophytes were involved to a lesser degree. Paronychia of the finger nails was common and mainly caused by C. albicans. Aspergillus species were the most frequent fungi grown from superficial white onychomycosis.

Introduction

As part of a 10 year study of superficial and cutaneous mycoses, a total of 986 fungal infections of nails were investigated. Nail infections have been studied in detail in some countries (2, 7, 8, 9, 10) but no previous work had been done on these diseases in Western Australia.

This report deals with both finger and toe nail infections of fungal aetiology. Aspects studied include the different clinical types which occurred, the relative frequency of the causal fungi, their epidemiology and their occurrence in relation to age and sex.

Materials and methods

Over 80 per cent of the patients studied were sent for investigation by dermatologists and medical practitioners in the Metropolitan area of Perth, and the rest were examined indirectly from specimens sent by medical practitioners in country areas throughout the State. All patients had nail problems suspected to be of fungal aetiology, no survey specimens were collected.

Standard techniques for collection and culture of specimens were followed (1). Extra care was exercised in collection procedures to ensure accurate results. The specimens varied depending on the type and stage of the infection, and included were clippings, parings from the sides, base and centre of the nail, epidermal detritus and pus.

Microscopy was performed using Parker Quink stain with 30% KOH, and specimens were cultured on 2 Sabouraud's dextrose agar slopes (1), one with added cycloheximide 0.5 mg/ml and chloramphenicol 0.05 mg/ml and the other with chloramphenicol only added. Cultures were held at 26 °C for 28 days before they were discarded.

Persons aged up to 14 years were classified as children and from 15 years upwards as adults.

Results and discussion

Clinical features

Three main clinical types of nail infections were seen in Western Australia. Onychomycosis of both
finger and toe nails due to dermatophyte fungi showed the usual range of symptoms and involved toe nails more frequently than finger nails. Paronychia type infections of the finger nails were of frequent occurrence and most commonly affected the index and middle fingers of the most used hand. Superficial white onychomycosis most frequently affected the great toe nails.

This third type of infection usually gave the nail a white matted appearance resembling paper-bark. It commenced with small opaque white spots on the surface of the nail (Fig. 1) which gradually spread and joined, often to include the whole nail (Fig. 2). These 2 figures are from the right foot of the same patient. The title ‘paper-bark effect’ was adopted by me in 1966 to describe this clinical entity, because of its appearance and the way tissue could be pared off with a blade in strips reminiscent of peeling paper bark.

Predominant organisms involved in Western Australia

Fungi responsible for these 3 clinical types were:

a) Dermatophytes. There were 214 dermatophyte infections of nails over the 10 year period, 62 infections of the finger nails and 152 of the toe nails. *Trichophyton rubrum* was the chief dermatophyte causing nail infections (Table 1), followed by *T. mentagrophytes*.

*T. rubrum* caused 75.8% of the finger nail infections; *T. mentagrophytes* and *T. tonsurans* 8.1% each, and *M. canis* and *E. floccosum* caused 4.8% and 3.2% respectively. For toe nails the proportions were somewhat different. *T. rubrum* was the causative agent in 63.8%, next *T. mentagrophytes* 29.6%, *T. tonsurans* 3.9% and then *E. floccosum* and *M. canis* each with 1.32%.

b) *Candida* species. In paronychial infections of the fingernails *C. albicans* was most frequently isolated, 58.6% of the total, followed by *C. parapsilosis* 24.6%, *C. tropicalis* 6.5%, *C. guilliermondii* 5.3% and *C. krusei* 5.0%. The most common *Candida* species isolated from toe nails was *C. parapsilosis* 40% then *C. guilliermondii* 25.7%, *C. albicans* 17.1%, *C. krusei* 12.9% and *C. tropicalis* 4.3%.

An interesting feature with paronychia infections of the finger nails was the relative frequency of mixed infections involving *Candida* and *Aspergillus niger* which were isolated together from 43 patients. From one patient a heavy growth of *Candida* and *Cladosporium* were isolated together from both finger and toe nails. The significance of this was not known.

The green-nail usually attributed to infection of the finger nails with *Pseudomonas pyocyanea*, was most often caused by a *Candida* species and when of bacterial origin the pathogen was usually *Staphylococcus aureus*.

c) Non-dermatophyte filamentous fungi were the