

## Scanning electron microscopy of superficial white onychomycosis\*

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**Abstract:** Superficial white onychomycosis is characterized by opaque, friable, whitish superficial spots on the nail plate. We examined an affected halux nail of a 20-year-old male patient with scanning electron microscopy. The mycological examination isolated *Trichophyton mentagrophytes*. Abundant hyphae with the formation of arthrospores were found on the nail's surface, forming small fungal colonies. These findings showed the great capacity for dissemination of this form of onychomycosis.

**Keywords:** Microscopy, electron, scanning transmission; Nails; Onychomycosis

### INTRODUCTION

Onychomycoses are classified clinically as distal and lateral subungual onychomycosis (DLSO), proximal subungual onychomycosis (PSO) and superficial white onychomycosis (SWO).<sup>1</sup>

Superficial White Onychomycosis (SWO) is characterized by opaque, friable, whitish superficial spots on the nail plate, beginning at the dorsal surface, mainly of the feet.<sup>2</sup> Baran et al.<sup>3</sup> demonstrated that SWO may show infection in patches or in a striate pattern and it may sometimes be combined with either distal and lateral subungual onychomycosis or proximal white subungual onychomycosis, which is a common form of nail alterations found in patients infected with HIV and therefore a contributing factor for the diagnosis.<sup>4</sup>

The different features of SWO allow it to be divided into three subcategories with therapeutic implications. Classic SWO is characterized by superficial nail plate involvement. Another subcategory of SWO presents a double invasion of the nail plate, either superficial or ventral, making it difficult to determine if the source is due to superficial involvement or whether it is proximal white subungual variant. The latter may be observed in children (with thin nail plates) and is often present in HIV-positive individuals. A deep and diffuse SWO, characterized by massive penetration of the nail plate by fungi, also called pseudo-SWO, represents the third subcategory.<sup>5</sup>

Classic SWO is commonly caused by *Trichophyton mentagrophytes* (*interdigitale* variety), although in

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**FIGURE 1:** Whitish and friable patches on the nail surface of the left big toe

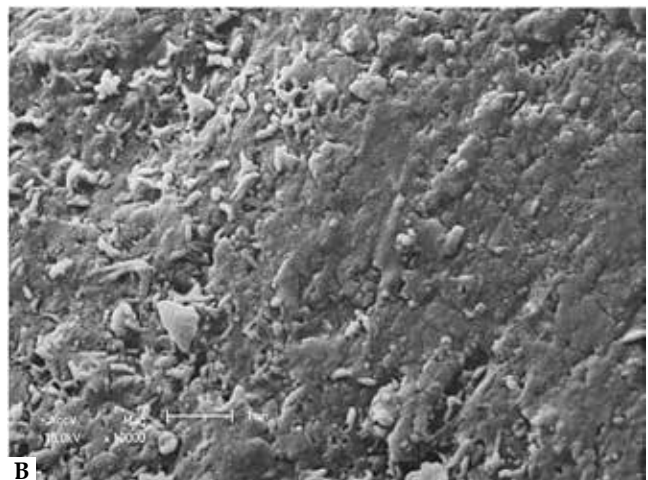
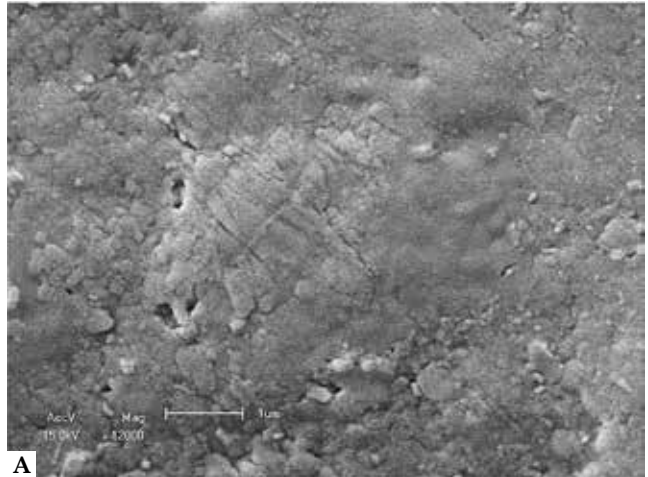


**FIGURE 2:** Linear, whitish lesions on the nails of the fourth and fifth toes

some cases it is due to *Acremonium strictum* or *Ornitho-  
la canadensis*. SWO with deep and diffused features can  
be observed in infections caused by *Fusarium* and *As-  
pergillus*, or by *Trichophyton rubrum* in healthy children  
and patients infected with HIV.<sup>2</sup>

#### CASE REPORT

A 20-year-old, male patient presented with whitish, superficial spots on the nail plates of his left foot. The exam revealed large, whitish, friable patches spread on the nail surface of his left big toe (Figure 1). The nail of the third toe exhibited similar features; the fourth and fifth toes showed linear whitish lesions; the nail of the second toe had discrete distal involvement (Figure 2, arrows). The mycological examination iso-



**FIGURE 3:** Scanning electron microscopy A. compact keratin (x 12,000). B. affected area with fungal filaments (x 10,000)

lated *Trichophyton mentagrophytes*. A nail fragment of the left big toe was obtained and its surface was examined through scanning electron microscope.

The patient was treated with topical terbinafine for 30 days and the nails were completely healed, confirming the superficial nature of his condition.

#### RESULTS

Examination of the nail fragment showed its compact keratin structure (Figure 3A). The transition from the normal area to the affected area can also be documented (Figure 3B). Fungal colonies could be observed in the sites examined, with the formation of arthrospores (Figure 4, arrows). Images at 20,000x mag-

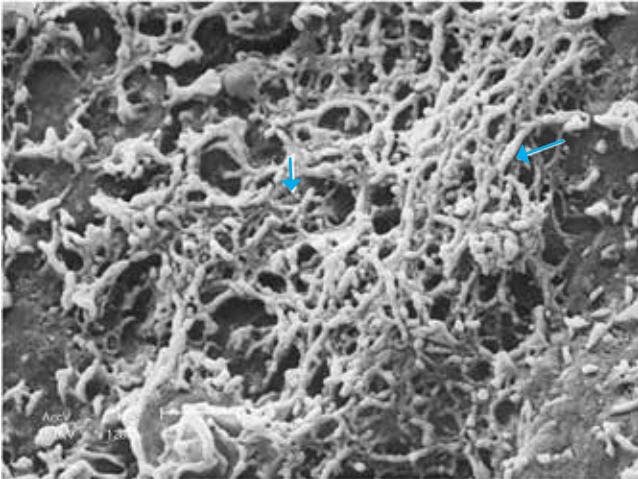


FIGURE 4: Scanning electron microscopy . Fungal colonies with the formation of arthrospores (arrows) (x 12,000)

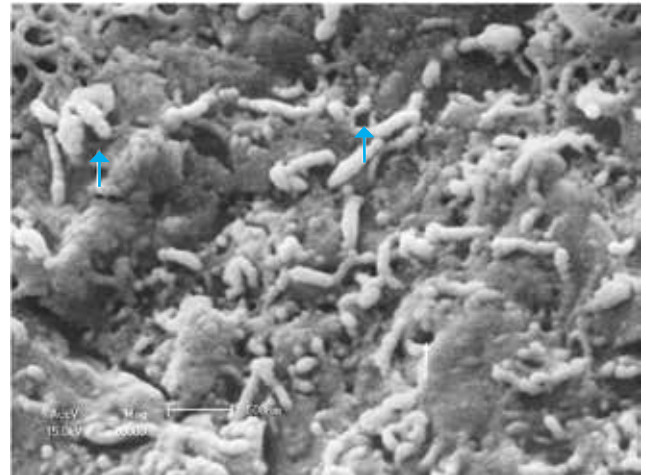


FIGURE 5: Scanning electron microscopy. Hyphae and tunnel openings (x 20,000)

nification revealed filamentous structures and small tunnel openings, showing some degree of nail invasion (Figure 5, arrow).

#### DISCUSSION

SWO is a common subtype of onychomycosis. We reported a case in which the toenail exhibited friable patches, whilst other nails showed linear lesions, a linear variant described in SWO (Figure 2).

The ultrastructural analysis indicated coloniza-

tion of the nail plate by *T. mentagrophytes*. Abundant hyphae and arthrospores were found on the nail's surface, forming small colonies. These findings showed the great capacity for dissemination of this form of onychomycosis. □

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