



Clinical and epidemiological aspects of various forms of fungal infections caused by *Trichophyton tonsurans*

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Summary

In the years 1977-1996 103 cases of mycosis caused by *Trichophyton tonsurans* with lesions in a variety of locations were treated. *T. tonsurans* was most often cultured from the feet (61.2%), and toe nails (22.3%), although smaller quantities were also obtained from other locations. In 1990, an endemic focus of superficial ringworm of the hairless skin caused by *T. tonsurans* was observed in 23 village children. The endemic focus of trichophytosis caused by this dermatophyte gives evidence of a high infectious potential of this species. In favourable circumstances the dermatophyte can cause massive fungal infections also in our geographic region.

Key words

Trichophyton tonsurans, Ringworm of the body, Onychomycosis, Outbreak, Poland

Aspectos clínicos y epidemiológicos de diferentes tipos de infecciones fúngicas causadas por *Trichophyton tonsurans*

Resumen

Entre los años 1977 y 1996 se diagnosticaron 103 infecciones fúngicas de diferentes localizaciones causadas por *Trichophyton tonsurans* en el Departamento de Dermatología del Hospital MSWiA en Poznań (Polonia). La mayoría de los cultivos se obtuvieron de los pies (61,2%) y de las uñas de los pies (22,3%), el resto se aisló de piel glabra (8,7%), región inguinal, (3,9%) de formas diseminadas (2,9%) y solamente un caso correspondió al cuero cabelludo.

En 1990 se observó un brote epidémico de tiña de la piel lisa por esta especie en un grupo de 23 niños en una zona rural del Sudeste de Polonia. *T. tonsurans* es un típico hongo antropófilo que aparece principalmente en aglomeraciones urbanas, por este motivo el foco epidémico descrito merece una especial atención al demostrar que este dermatofito, cuando se dan las circunstancias favorables, presenta un elevado potencial infectante en Polonia.

Trichophyton tonsurans, Tiña, Onicomycosis, Brote epidémico, Polonia

Trichophyton tonsurans is a cosmopolitan anthropophilic fungus found in various geographical regions, but particularly often encountered in North and Central American countries, where it is the main cause of ringworm of the scalp in children. Gan *et al.* [1] report that in Texas, US, as much as 74% of cases of ringworm of the scalp are caused by *T. tonsurans*, and in subsequent paper describing patients from Trinidad [2] other authors state

that this dermatophyte causes almost 53% of scalp mycosis. In Europe of the sixties, the fungus was particularly often encountered in Romania [3], where it triggered deep lesions of the scalp and bearded parts of the face and neck in males.

In Poland, *T. tonsurans* is not detected very often at present. In 1970, Prochacki [4] reported a nation-wide percentage of *T. tonsurans* as 5.5% of all the cultured dermatophytes. In materials collected from all over the country and studied by Baran and Szepletowski in 1994 [5], the fungus constituted 4.2 of anthropophilic dermatophytes, and the figure corresponded to 2.7% of the total number of dermatophyte cultures. In the environs of Poznań [6] the percentage of *T. tonsurans* cultures is also less than 3% of the total number of isolated dermatophytes. Here, the fungus is extremely rarely encountered in the scalp, contrary to the Lower Silesian region [7], where it is somewhat more common, constituting 2.8% of all dermatophytes cultured from lesions of the scalp.

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Despite a relatively low incidence in our region, *T. tonsurans* merits our special attention in view of its potential for an endemic spread and the versatility of clinical presentations.

MATERIAL AND METHODS

In the years 1977-1996, 103 patients with mycosis caused by *T. tonsurans* and a wide variety of locations of the lesions were treated at Dermatological Out-patient Clinic and Dermatology Ward, MSWiA Hospital in Poznan, Poland (Table 1).

Table 1. Localization of infection sites by *T. tonsurans*.

Infection site	Number of cultures
Feet	63 (61.2%)
Toe nails	23 (22.3%)
Hairless skin (except feet and groins)	9 (8.7%)
Groins	4 (3.9%)
Generalized forms	3 (2.9%)
Scalp	1 (1.0%)
Total	103 (100%)

In 1990, an endemic focus of superficial ringworm of the hairless skin caused by *T. tonsurans* was noted in 23 village children from south-east Poland.

Poznan and its environs are located in the central-west lowlands, an area with well developed industry, high agricultural culture and rich inhabitants. The epidemics of *T. tonsurans*, observed by the second author, was noted among children living in the vicinity of the town of Przemysel. This is a much poorer, south-east part of Poland, situated at the foot of a mountain chain, with poorly developed industry and much lower agricultural culture.

In all the patients, following a microscopic examination of the collected samples, *T. tonsurans* infections were confirmed by through mycologic cultures, what is of a particular importance in the case of this fungus in view of the numerous similarities of its clinical (and laboratory) features to those characteristic of other dermatophytes [8].

RESULTS

Trichophyton tonsurans constituted 2.99% of all the 3,488 dermatophyte cultures obtained in 20 years (1977-1996) at the Laboratory of Mycology (MSWiA Hospital in Poznan), and thus it occupied the fifth place among all the fungi cultured in this period. In the years 1990-1996, all the specifications including materials originating from this laboratory showed that there occurred a clearly visible increase of the incidence of fungal infections by *Trichophyton rubrum*, a fungus which caused as much as 59% of all dermatophyte infections. *Trichophyton mentagrophytes* was a causing agent of 20.1% infections, *Microsporum canis* 9.3%, *Epidermophyton floccosum* 6.4%, and *T. tonsurans* triggered at that time already as much as 4.3% of all dermatophyte infections. The remaining 0.9% of cultures included dermatophytes which are presently rarely encountered in our region: *Microsporum gypseum*, *Microsporum persicolor*, *Trichophyton schoenleinii* and *Trichophyton violaceum*.

Mixed infections were also noted; they were caused by two dermatophytes, among them mixed infections by *T. tonsurans* were observed. Eight patients had mixed

infections by *T. tonsurans* and other dermatophytes (*T. tonsurans* and *T. mentagrophytes* var. *granulosum* in four cases; *T. tonsurans* and *T. rubrum* in three patients; *T. tonsurans* and *T. violaceum* in one case). Mixed infections by *T. tonsurans* and other dermatophytes were generally extensive and observed chiefly in patients with depressed immunity on long-term antibiotic, corticosteroid and immunosuppressive therapy for other, unrelated disease.

The distribution of lesions from which *T. tonsurans* was cultured is presented in table 1. As it follows from the table, *T. tonsurans* was definitely most often cultured from samples collected from the feet (61.2%) and toe nails (22.3%), although the fungus was also obtained in smaller amounts from other, grossly diversified locations.

An endemic focus of trichophytosis observed in 23 children from a rural area was included in this study. The described fungal infections in children occurred between September and November of 1990 and were noted in 14 boys and nine girls aged 3-15 years. Mycotic lesions 2-5 cm in diameter had a typical appearance of ringworm. In the majority of cases (17 patients) single foci were noted, whereas six children had multiple lesions. Mycotic foci chiefly involved the legs and trunk (nine patients in each case), and also the upper extremities (six children), face (two patients) and the borderline between the face and scalp in one patient.

All the children were treated topically with 1% clotrimazole cream applied three times a day. The lesions were completely cured after 10-70 days of therapy (mean, 24 days).

DISCUSSION

Trichophyton tonsurans infections evoke a wide variety of clinical lesions [3,10-12] and it could appear concomitantly with other species of dermatophytes, both anthropophilic and zoophilic.

When the clinical lesions are caused solely by *T. tonsurans*, they present a quite characteristic picture. Lesions observed in some of our patients took the form of extensive ring-shaped and blended foci with multicentric margins, and involved large areas of the trunk and extremities (Figures 1 and 2). They also involved the feet and toe nails (Figure 3) or markedly resembled facial lupus erythematosus (Figure 4). In the cases of lesions appearing on the lower legs, follicular lesions were observed involving the hair, where endothrix fungal fragments were found. *T. tonsurans* was subsequently cultured from hair samples.

Extensive skin lesions, persisting for many years, were more frequent in patients with diabetes, tuberculosis, neoplastic diseases and in patients subjected to chronic corticosteroid and antibiotic therapy. These individuals required prolonged local treatment with imidazole derivatives, as well as systemic administration griseofulvin and ketoconazole. In recent years, oral terbinafine has been successfully employed.

In the majority of patients with onychomycosis caused by *T. tonsurans*, a highly successful (90% cure rate) therapeutic management consisted in surgical nail plates excision combined with thorough local management after the procedure and prolonged (several months) administration of systemic antimycotic agents. Initially, griseofulvin, and later ketoconazole were employed.

In the past 4 years, patients with toe nails *T. tonsurans* infections were subjected to conservative treatment only with 250 mg of terbinafine daily for 12-16 weeks.



Figure 1. Extensive mycosis caused by *T. tonsurans* in a patient with tuberculosis.



Figure 2. Mycosis caused by *T. tonsurans* involving the upper extremity in a patient on prolonged systemic corticosteroids.



Figure 3. Extensive mycosis caused by *T. tonsurans* involving the lower extremities.



Figure 4. Ringworm of the face caused by *T. tonsurans* resembling lupus erythematosus.

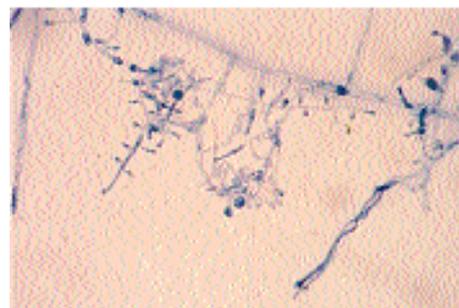


Figure 5. Microculture of *T. tonsurans* (x 400).

The cure rate was 100%, what justifies the opinion that in onychomycosis caused by *T. tonsurans* oral terbinafine can be recommended as a method of choice.

In patients in whom there were no above mentioned factors exacerbating the course of mycosis, the foci on the hairless skin most often presented as single ring-like eruptions with clearly intensified desquamation and peripheral blisters. Here the course of the disease was generally brief, and the lesions most often subsided after 2-3 weeks of local treatment with imidazole derivatives, as well as 1% terbinafine cream and 1% ciclopiroxolamine cream.

Mycotic foci observed in 23 village children in the fall of 1990 had the same character. That infections by *T. tonsurans* had been rarely encountered in this region [11]. Although *T. tonsurans* is presently detected in small amounts on the hairless skin of children [14], yet endemic incidence of this anthropophilic fungus is exceptional. It confirms the strong infectious potential of *T. tonsurans* which - favorable circumstances - may be cause of mass mycotic infections also in our geographical region.

T. tonsurans is a typical endothrix fungus. It can be isolated from samples collected from various lesions in the hairless and pilose skin, as well as in nails, and the clinical features of the above lesions are usually very similar to those characteristic of infections caused by other dermatophytes. Macro-cultures of *T. tonsurans* on Sabouraud's agar with antibiotics also have a very diversified appearance [8] what has led to the differentiation of as many as four main variations (*T. tonsurans* var. *sulfu-*

rea, *T. tonsurans* var. *cerebriforme*, *T. tonsurans* var. *crateriformis* and *T. tonsurans* var. *acuminata*), which are additionally very similar to macrocultures of other dermatophytes (e.g. the sulphur type can closely resemble *E. floccosum*).

In these cases it is very helpful to culture the fungus on urea Christensen medium, where the urease test for *T. tonsurans* yields positive results, what makes it possible to differentiate the fungus from *T. rubrum*, as well as on caseine thiamine agar which induces an intensive growth of *T. tonsurans*.

Yet the decisive factor in proper identification of *T. tonsurans* is its micro-culture (Figure 5). The mycelium is composed of thin, light hyphae with infrequent spindle-like macroconidia with 2-10 cells and smooth and thin walls. The microconidia are numerous and arranged in acladium-type spikes. They produce ball-like forms, similar in shape to matches. The lateral branching of the microconidia from the hypha may cause its characteristic worm-like appearance. Numerous chlamydo spores are also encountered in micro-cultures [9,10].

The authors would like to draw attention to a case of ringworm of the scalp caused by *T. tonsurans* in an 8-year old boy, as the pronounced inflammatory reaction within the mycotic focus, although described in the literature [14,15], is not typical for anthropophilic fungi. The disease was markedly persistent and subsided only after a more than 3-month local treatment combined with hair epilation and oral administration of terbinafine.

CONCLUSIONS

1. *Trichophyton tonsurans* is a dermatophyte which is rather rare in Poland. It is encountered on the hairless skin, nails and scalp. The fungus causes a wide variety of clinical lesions, often similar to other dermatological diseases.

2. The dermatophyte can cause extensive clinical lesions, mostly in patients with severe systemic diseases

and in the course of prolonged immunosuppressive treatment, as well as antibiotic and corticosteroid administration.

3. A marked infectious potential of *T. tonsurans* is confirmed by the endemic focus of ringworm of the hairless skin in village children.

References

1. Gan VN, Petruska M, Ginsburg CM. Epidemiology and treatment of tinea capitis: ketokonazole vs. griseofulvin. *Pediatr Infect Dis J* 1987; 6: 46-49.
2. Moore MK, Suite M. Tinea capitis in Trinidad. *J Trop Med Hyg* 1993; 96: 346-348.
3. Alteras I. Some data on the occurrence of *Trichophyton tonsurans* in Romania. *Mycopathologia* 1965; 27: 151-154.
4. Prochacki H. Mycological flora isolated from people in Poland. *Mycopath Mycol Appl* 1970; 40: 65-72.
5. Baran E, Szepletowski J. Rozmieszczenie geograficzne dermatofitów izolowanych ze zmian skórnych na terenie Polski. *Mikol Lek* 1994; 1: 11-18.
6. Maleszka R, Rzepecka B, Mazurek M. Grzyby chorobotwórcze w materiale Pracowni Mikologicznej Szpitala MSW w Poznaniu w latach 1977-1991. *Przeg Dermatol* 1993; 80: 283-287.
7. Baran E, Szepletowski J, Walów B *et al.* Grzybica owłosionej skóry głowy u dzieci na Dolnym Śląsku. *Post Dermatol* 1993; 10: 75-84.
8. Kurnatowska A. Wazniejsze dane o grzybach chorobotwórczych. Kowszyk-Gindifer Z, Sobiczewski W (Eds.). *Grzybice i sposoby ich zwalczania*. Warszawa, PZWŁ, 1986: 86.
9. de Hoog GS, Guarro J. Atlas of clinical fungi. Centraalbureau voor Schimmelcultures, Baarn and Delft, The Netherlands / Universitat Rovira i Virgili, Reus, Spain, 1995.
10. Sowiński W, Rzepecka B, Mazurek M *et al.* *Trichophyton tonsurans* - studium kliniczne i mikologiczne. *Post Dermatol* 1986; 3: 349-354.
11. Ratka P. Epidemiologia grzybic w Polsce w latach 1977-1988. *Post Dermatol* 1990; 7: 207-213.
12. Sonck CE. Kerion caused by *Trichophyton sulfureum*. *Mykosen* 1972, 15: 233-236.
13. Kamalam A, Thambiach AS. Lupus erythematosus like tinea capitis caused by *Trichophyton tonsurans*. *Mykosen* 1984; 27: 316-318.
14. Wilkowska A, Siedlewicz A, Nowicki R *et al.* Grzybica skóry u dzieci w rejonie Gdańska w latach 1984-1993. *Mikol Lek* 1995; 2: 23-31.
15. Olbrycht-Roguska J, Wojas-Pelc A. Epidemiologia grzybicy strzygacej głębokiej w rejonie Polski południowo-wschodniej w oparciu o material chorych hospitalizowanych w Klinice Dermatologicznej AM w Krakowie w latach 1967-1982. *Post Dermatol* 1986; 3: 321-325.