Once-weekly Fluconazole in Children with Tinea Capitis due to *Microsporum canis*

Merete Haedersdal[1] and Else L. Svejgaard[2]
Departments of Dermatology, [1]Gentofte Hospital, University of Copenhagen, Hellerup, and [2]Bispebjerg Hospital, University of Copenhagen, Bispebjerg Bakke 23, DK-2400 Copenhagen NV, Denmark. E-mail: mhaedersdal@dadlnet.dk
Accepted September 13, 2004.

Sir,

Tinea capitis is a common scalp infection in children and in Europe it is most often caused by the zoophilic dermatophyte *Microsporum canis* (1). *M. canis* occurs worldwide because the infection is passed on by cats and dogs. However, during the last 10 years an increase in antrophophilic infections has been seen, especially in urban areas, predominantly caused by *Trichophyton violaceum, T. tonsurans* and *M. audouinii* (1). Systemic antifungal therapy is required to cure tinea capitis, as topical agents do not eradicate infection in hair shaft and hair follicles (2). For *Microsporum* infections, the best available evidence is found with griseofulvin and terbinafine, for which the highest reported cure rate is 84% after 12 weeks of treatment with griseofulvin (3, 4). Therapeutic alternatives have been sought, as treatment failures have been observed when terbinafine has been used for *Microsporum* infections (3). Fluconazole is a triazole that is widely used to treat mycoses (5). However, in the treatment of tinea capitis limited evidence is available from a few uncontrolled studies, which present only sparse data on *Microsporum* infections (6–8). This study evaluated the efficacy of once-weekly fluconazole for the treatment of tinea capitis due to *M. canis* in addition to local antifungal treatment.

MATERIAL AND METHODS

An open, prospective, uncontrolled multicentre study was carried out using fluconazole 8 mg/kg weekly for tinea capitis caused by *M. canis*. The patients were enrolled from six Danish private dermatology practices and from two outpatient dermatological clinics at University Hospitals of Copenhagen (2–6 patients were included from each centre). The inclusion criteria were tinea capitis with positive mycological identification of *M. canis*. Patients were included irrespective of age or previous antifungal therapy.

Patients were evaluated approximately every 4 weeks from the start of antifungal therapy, which included systemic treatment with fluconazole (tablets or mixture) at a dose of 8 mg/kg given once weekly and adjunctive topical treatment of ketoconazole (shampoo 2%) and terbinafine (cream). Antifungal treatment started when the mycological diagnosis was confirmed and was continued up to 17 weeks, depending on clinical and mycological responses. At each visit clinical examination of the scalp included assessment of (i) number and size of lesions and (ii) degree of inflammation evaluated on a four-point scale of absent (0), mild (1), moderate (2) and severe (3). The final evaluation was performed at the time of discontinuation of antifungal treatment. The effectiveness of therapy was graded as: 'complete cure' (clinical and mycological cure); 'mycological cure' (negative light microscopy and culture) or 'failure' (positive microscopy and/or culture); 'clinical cure' (no residual clinical signs of infection), 'improvement' (substantial clinical improvement) or 'failure' (no evident clinical efficacy of treatment).

RESULTS

Twenty-four children entered the study of which 20 children were evaluable (Table I; no. 21 was lost for follow-up, nos 22–24 were excluded due to insufficient data collection); mean age $\pm$ SE was 61.5 $\pm$ 6.3 months, range 10–126 months; mean weight $\pm$ SE was 18.6 $\pm$ 1.1 kg, range 10–30 kg. All the children were Caucasians. The majority of scalp infections presented with one or two lesions of mild inflammation, a few lesions with moderate inflammation, whereas no lesions were seen with heavy inflammation or kerion. No patients had tinea corporis.

The primary end-point, complete clinical and microbial cure, was observed in eight patients after 5–17 weeks of treatment (Table I, nos 1–8). Moreover, clinical cure without mycological cure was seen in two patients (nos 9 and 10) and clinical improvement with mycological cure in five patients (nos 11–15). Five patients improved substantially but had positive mycology after

Table I. *Patients with tinea capitis due to M. canis infection*

Patient no.	Sex/age (months)	Fluconazole (weeks)	Clinical response*	Mycological response*
1	F/126	5	Cure	Cure
2	M/67	8	Cure	Cure
3	M/30	16	Cure	Cure
4	M/106	12	Cure	Cure
5	M/70	16	Cure	Cure
6	M/24	7	Cure	Cure
7	M/10	17	Cure	Cure
8	F/82	8	Cure	Cure
9	F/68	8	Cure	Failure
10	M/60	8	Cure	Failure
11	F/95	13	Improved	Cure
12	M/42	12	Improved	Cure
13	M/104	8	Improved	Cure
14	M/59	10	Improved	Cure
15	M/57	11	Improved	Cure
16	F/19	16	Improved	Failure
17	M/44	16	Improved	Failure
18	M/49	16	Improved	Failure
19	F/110	16	Improved	Failure
20	F/56	16	Improved	Failure
21	F/27	4	Unknown	Unknown
22	M/70	7	Improved	Unknown
23	F/70	8	Improved	Unknown
24	M/31	8	Failure	Unknown

*At time of cessation of antifungal treatment.

DOI: 10.1080/00015550410024706

16 weeks of treatment (nos 16–20). The patients obtaining complete cure had been treated with no topical or oral antifungal agents for 2 and 4 weeks, respectively, before inclusion in this study, except for no. 1, who was pretreated with fluconazole 5 mg/kg twice weekly for 8 weeks until inclusion.

DISCUSSION

In the present uncontrolled study 33% (8/24) of patients with *M. canis* tinea capitis obtained complete cure (clinical and mycological cure) after 5–17 weeks of treatment with fluconazole once weekly at a dose of 8 mg/kg, in addition to topical ketaconazole and terbinafine treatment. This cure rate is considerably lower than previously reported for a similar treatment regimen; Gupta et al. found a complete cure rate of 94% in 17 patients with *M. canis* tinea capitis after 8–16 weeks of treatment with fluconazole 8 mg/kg once weekly (6). The discrepancy may be due to differences in baseline lesional inflammation and severity. In addition, the uncontrolled, non-randomized design of the studies with several different investigators may have introduced unknown biases.

Generally, scalp infections due to *Microsporum* species are less susceptible to therapy than *Trichophyton* species and require long-term systemic treatment up to 12 weeks or even longer (6, 9). Therefore the long treatment period required in this study is not exceptional. The reduced susceptibility of *Microsporum* infections may partly be explained by the ectothrix pattern of hair infection, in which the fungal spores and hyphae are located mainly on the external surface of the hair shaft and to a lesser degree inside the hair shaft (9). Most *Trichophyton* infections, on the other hand, cause endothrix hair infection with the arthrospores located inside the hair shaft, which may result in a more optimal drug exposure (9). Available antifungal drugs used to treat tinea capitis include griseofulvin, terbinafine, itraconazole and fluconazole (2). However, only few countries have paediatric license for itraconazole, griseofulvin is no longer available in some European countries, and treatment failures are reported with terbinafine. Therefore, there is a need to evaluate the efficacy of alternative treatments for *Microsporum* tinea capitis. No controlled comparative clinical trials are available by which to evaluate the efficacy of fluconazole versus griseofulvin, terbinafine, or itraconazole. This and previous uncontrolled studies do, thus, represent the present best available evidence for fluconazole in the treatment of *Microsporum* tinea capitis.

ACKNOWLEDGEMENTS

This study was supported in part by Pfizer, who provided the patients with fluconazole free of charge. The following dermatologists kindly recruited patients: E. Foged, K. Kaaber, P.O. Larsen, R. Lindskov, T. Nielsen, A. Otkjaer and N.K.Veien.

REFERENCES

1. Hay RJ, Robles W, Midgley G, Moore MK. Tinea capitis in Europe: new perspective on an old problem. J Eur Acad Dermatol Venereol 2001; 15: 229–233.
2. Fuller LC, Child FJ, Midgley G, Higgins EM. Diagnosis and management of scalp ringworm. BMJ 2003; 326: 539–541.
3. Lipozencic J, Skerlev M, Orofino-Costa R, Zaitz VC, Horvath A, Chouela E, et al. A randomized, double-blind, parallel-group, duration-finding study of oral terbinafine and open-label, high-dose griseofulvin in children with tinea capitis due to *Microsporum* species. Br J Dermatol 2002; 146: 816–823.
4. Fuller LC, Smith CH, Cerio R, Marsden RA, Midgley G, Beard AL, et al. A randomised comparison of 4 weeks of terbinafine vs. 8 weeks of griseofulvin for the treatment of tinea capitis. Br J Dermatol 2001; 144: 321–327.
5. Silling G. Fluconazole: optimized antifungal therapy based on pharmacokinetics. Mycoses 2002; 45: 39–41.
6. Gupta AK, Dlova N, Taborda P, Morar N, Taborda V, Lynde CW, et al. Once weekly fluconazole is effective in children in the treatment of tinea capitis: a prospective, multicentre study. Br J Dermatol 2000; 142: 965–968.
7. Montero-Gei F. Fluconazole in the treatment of tinea capitis. Int J Dermatol 1998; 37: 870–873.
8. Gupta AK, Adam P, Hofstader SLR, Lynde CW, Taborda P, Taborda V, et al. Intermittent short duration therapy with fluconazole is effective for tinea capitis. Br J Dermatol 1999; 141: 304–306.
9. Hay RJ. Diagnosis and management of tinea capitis. Mosby-Wolfe Medical Communications 1999; 1–86.