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Single Case

Kerion Celsi in Elderly Female, Caused by *Trichophyton rubrum*: Case Report

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Keywords
Kerion celsi · *Trichophyton rubrum* · Dermatophytes · Autoinoculation · Onychomycosis

Abstract
Introduction: Kerion celsi is a form of deep inflammatory tinea capitis, presenting with suppurative, tender plaque, often with pustules and purulent drainage. Tinea capitis is believed to be increasing in incidence worldwide. It mostly affects children and is most commonly caused by zoophilic dermatophytes. Globally, the most common transmission route is anthropophilic. ***Case Presentation:*** Here, we present a case of a 92-year-old female without associated chronic diseases, who lived alone in urban apartment and developed kerion in addition to having chronic untreated toenail onychomycosis and tinea pedis. Using PCR, we confirmed *Trichophyton rubrum* as the causative pathogen of toenail onychomycosis and kerion, suspecting autoinoculation pattern of transmission of dermatophytes from feet to the scalp. With the literature review, we discovered sporadic case reports, linking toenail onychomycosis caused by *T. rubrum* to development of kerion and kerion-like lesions in adult patients. ***Conclusion:*** Our case report: (1) adds another interesting case to series of rare cases of *T. rubrum* causing kerion in elderly, suspecting it is in fact more common than thought, (2) highlights PCR as a useful diagnostic tool for fast diagnosis and implementation of appropriate antifungal therapy, (3) recognizes a pattern of autoinoculation transmission of *T. rubrum* from toenail onychomycosis to the scalp, causing kerion celsi in elderly.

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Introduction

Overview and Background

Tinea capitis is a dermatophyte infection of the scalp, most commonly caused by *Microsporum canis*, *Trichophyton violaceum*, and *Trichophyton tonsurans*, with causative pathogens and incidence varying significantly geographically [1]. It is more common in the developing countries, with the prevalence in some countries as high as 20%. Anthropophilic transmission is more common in the developing countries, while in developed world, especially Europe, zoophilic transmission is most common with the main causative agent being *M. canis* [1]. Incidence is believed to be increasing, even in Europe [2].

It predominantly affects children before puberty, with only 3%–11% global cases occurring in adults [3]. In adulthood, older females are more commonly affected, likely due to decreasing levels of estrogen, which may lower the production of protective sebum on the scalp [3].

Tinea capitis can be divided into non-inflammatory and inflammatory types. Non-inflammatory type presents with scaling, seborrheic form and broken hairs, while inflammatory types are characterized by tender plaques with pustules [4].

Kerion (or kerion celsi) is a severe and deep form of inflammatory tinea capitis, presenting as a suppurative and painful plaque, associated with purulent drainage and regional lymphadenopathy. It may initially present as dermatophytic folliculitis and dry lesions with scaling and broken hairs. In later stages, erythema, tenderness, and inflammatory plaque arise due to type IV hypersensitivity reaction [3, 4]. Bacterial superinfection and dermatophytic reaction are common and may lead to misdiagnosis, such as folliculitis decalvans, dissecting cellulitis, abscess, psoriasis, alopecia areata, lupus erythematosus, contact allergic dermatitis, atopic, or seborrheic dermatitis [5].

Diagnosis and Treatment

The gold standard for diagnosis is mycological examination, including microscopy and cultivation. Histopathology with Periodic acid-Schiff staining can provide useful diagnostic insight, as it may reveal fungal spores around the hair follicle and hyphae within the hair shaft. In the dermis, a nonspecific neutrophilic or granulomatous perifollicullar infiltrate, followed by fibrotic scarring is typically observed [5, 6]. Trichoscopy and reflectance confocal microscopy can also be used as an additional tool in the diagnosis of tinea capitis [3]. Cornerstone of treatment involves systemic antifungals, such as griseofulvin, terbinafine, itraconazole or fluconazole, which should be taken for 8–18 weeks, depending on the causative dermatophyte [7]. Adjunctive treatment includes topical antifungals. In some patients, antibiotics for bacterial superinfections and oral prednisone may be needed [8]. Surgical drainage is contraindicated [9].

Purpose of the Case Report

Transmission mode of kerion has been rarely reported. Over the years, some authors have described cases of kerion in adults, especially elderly individuals with associated toenail onychomycosis, suggesting autoinoculation, though no official pattern has been recognized as of yet. *T. rubrum* is most commonly cited as the responsible pathogen in those cases [10–12].

Our case further supports this observation, as the patient lived alone in relatively isolated conditions, and developed kerion celsi, with the only plausible mode of transmission being autoinoculation from existing toenail onychomycosis and tinea pedis. PCR testing and fungal culture subsequently confirmed *T. rubrum* as the causative pathogen of kerion as well as of toenail onychomycosis.

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Case Presentation

A 92-year-old female patient, without any associated chronic diseases or prescription medication use, was hospitalized at the Department of Dermatovenereology, University Medical Centre Ljubljana, for a slowly progressing, erythematous, and edematous lesion frontally on the scalp. According to patient's history, skin symptoms had been present for approximately 6 weeks at the time of admission. The affected area, measuring 9 × 7 cm, was painful and most hair have fell out. It was covered with deep yellowish crusts and many pustules were visible (Fig. 1a). Regional lymphadenopathy was noted. Additionally, the patient had erythematous and scaling skin on feet, consistent with chronic moccasin-type of tinea pedis, and onychomycosis affecting all toenails (Fig. 1b).

Kerion celsi was suspected clinically, and diagnostic procedures were initiated to confirm the diagnosis. Wood's lamp examination was negative and microscopic examination of scalp skin scrapings with potassium hydroxide did not reveal any fungal elements. Skin swab for bacteria was negative. Microscopic examination of toenail scrapings with potassium hydroxide preparation showed hyphae. Further laboratory diagnostic procedures included the cultivation of biopsy sample and scalp skin scrapings, as well as nail scrapings, on mycological media, alongside molecular DNA detection of the most common fungal species causing epidermal and skin infections using the CE-IVD PCR kit. In brief, skin and nail samples were inoculated on Sabouraud agar with 2% glucose and supplemented with chloramphenicol and gentamicin (SGC2) (bioMérieux, Marcy-l'Étoile, France) and dermatophyte agar with phenol red (Oxoid Limited, Hampshire, UK).

Cultures grew from all samples after 7 days of incubation under aerobic conditions at 30°C. The fungal growth was identified as *T. rubrum* based on macro- and micromorphological characteristics. Identification was confirmed by MALDI-TOF MS: a toothpick moistened with 70% formic acid was used to scrape a single colony from SGC2, which was applied to a MALDI steel plate preloaded with 1 µL of 70% formic acid. The sample was spread evenly and dried. Then, 1 µL of saturated α-Cyano-4-hydroxycinnamic acid matrix in 50% acetonitrile-2.5% trifluoroacetic acid (Bruker Daltonik, Bremen, Germany) was added and dried before analysis with a Linear-Mode microflex LT/SH MALDI-TOF MS system (Bruker Daltonik). Spectra were analyzed using the MALDI-TOF Biotyper® (MBT) Compact HT software with the Main Spectra Library Filamentous Fungi v. 2023 for molds (Bruker Daltonik).

Additionally, the CE-IVD DermaGenius 3.0 Complete PCR Kit (PathoNostics, Maastricht, The Netherlands) was used directly on biopsy and nail scrapings, enabling simultaneous detection of 15 common fungal pathogens, including seven dermatophytes. Both scalp biopsy and nail scrapings tested positive for *T. rubrum*/*T. soudanense* but were reported as *T. rubrum* due to the absence of travel to *T. soudanense*-endemic areas. Molecular results were available about 6 days before culture results. Histopathological examination of the skin from the scalp revealed mixed inflammatory response in the epidermis and dermis and numerous hyphae in the epidermis (Fig. 2).

Upon admission, we continued previously, from family doctor prescribed peroral antibiotic treatment with flucloxacillin 1.000 mg every 8 h for a total duration of 8 days. Once confirming *T. rubrum* as the causative pathogen, terbinafine 250 mg orally once daily was initiated, planned for a total duration of 12 weeks because of associated toenail onychomycosis. Topically, for initial few days, 10% salicylic acid ointment was applied as a keratolytic agent and compresses with physiological saline solution to remove crusts. Additionally, clotrimazole cream twice daily was used for kerion lesion, and terbinafine cream once daily for tinea pedis.

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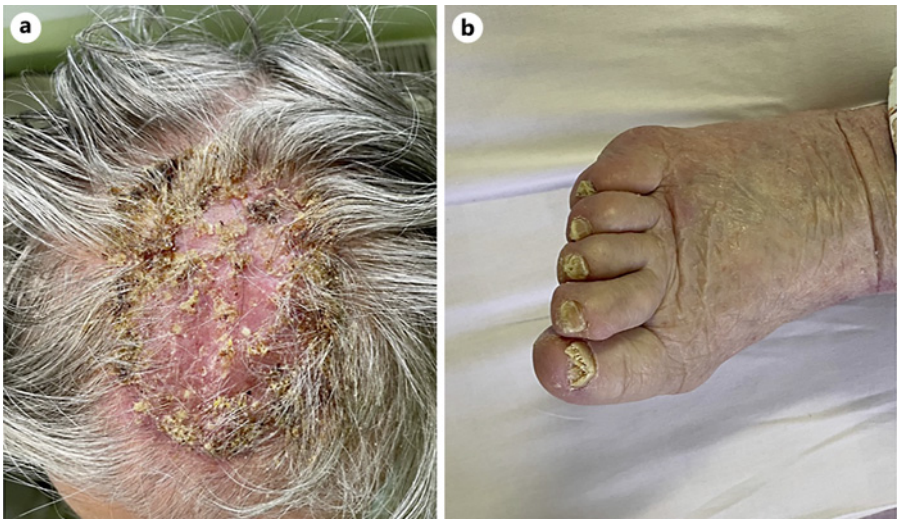

Fig. 1. a Scalp lesion at admission. **b** Toenail onychomycosis at admission.

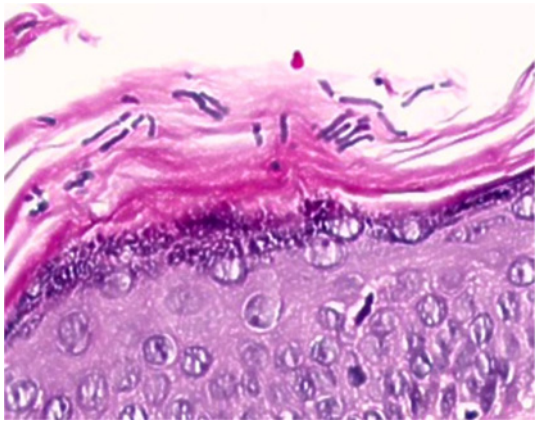

Fig. 2. Histopathological picture of kerion lesion presenting hyphae in the epidermis (H&E, ×400).

During hospitalization, all pustules and crusts resolved and kerion became less tender and erythematous (Fig. 3). We did not observe laboratory abnormalities during systemic treatment with terbinafine (complete blood count, urea, creatinine, and liver tests).

One month after discharge from the hospital, the patient returned for follow-up. On examination, skin no longer appeared infiltrated or tender, but erythema and alopecia still persisted. No pustules or crusts were present. Unfortunately, it became evident that the patient did not adhere consistently to the prescribed oral medication. She did not return for the next follow-up. Her relatives informed us that she refused further systemic treatment.

Discussion

Our case report presents an instance of a healthy elderly female patient who developed kerion celsi, caused by *T. rubrum*. Kerion celsi in adults has only rarely been reported in the literature. Since tinea capitis is most commonly observed in children, this infection may at first not be considered in the differential diagnosis in adults and elderly which can lead to significant diagnostic delay [13]. In our patient, the family doctor probably suspected

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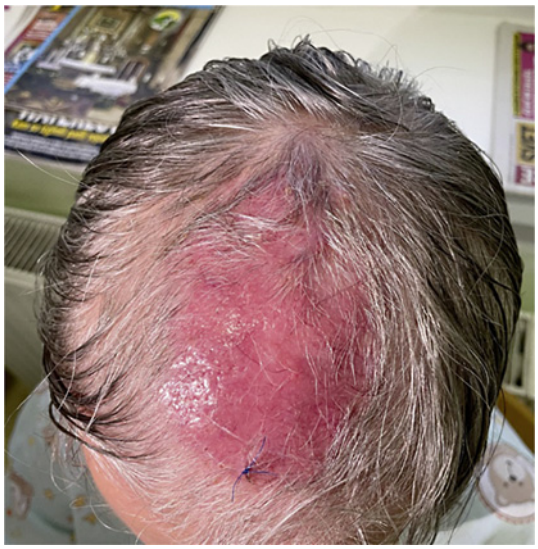

Fig. 3. Scalp lesion at discharge from hospital.

bacterial scalp infection and prescribed flucloxacillin. Due to suppurative skin lesions, we could not exclude the possibility of secondary staphylococcal infection; therefore, treatment with this antibiotic was continued upon admission until we received negative result of bacterial culture.

In our patient, negative Wood's lamp examination was consistent with *T. rubrum* infection, as this fungus causes endothrix infection, which does not produce fluorescence observed with organisms causing ecto-endothrix infection, such as those in the *Microsporum* genus [3].

Potassium hydroxide scraping from kerion lesion yielded false-negative result, likely due to scraped site being the inflamed surface with crusts. Trichoscopy was not used as a diagnostic tool in our patient. Features of trichoscopy of kerion such as erythema, broken hairs, black dots, perifollicular scaling, pustules, and yellow crusts are described in literature but are not highly specific [14]. Trichoscopy should not be used as a substitute for standard mycological examination. We had the opportunity to perform PCR examination on a small biopsy sample from the scalp skin and toenail scrapings, which revealed *T. rubrum* from both the scalp and toenails at the day of performing the test, which is a big advantage compared to fungal cultures, which often take up to 4 weeks or even 6 weeks to show positive results. Additionally, microscopic examination and cultivation can be false-negative because the sampled area is obtained from the inflamed surface rather than actively infected deeper situated tissue. Negative cultivation results thus do not exclude kerion [3]. Faster isolation of causative pathogen enables clinicians to implement the most appropriate antifungal treatment. For example, terbinafine is not optimal for infections caused by *Microsporom* species [7] but is considered as the treatment of choice for *Trichophyton* species [3]. Some authors have proven oral prednisone to reduce the time needed for resolution of symptoms [8]. In our view, decision to use oral corticosteroids should be made on an individual basis. As our patient was elderly and not the most cooperative, we decided against the use of oral prednisone, to prevent possible complications.

Concerning hair care in tinea capitis, removal of crusts is important. We used 10% salicylic acid ointment and wet compresses. In addition, ketoconazole or selenium sulphide shampoo is recommended 2–3 times weekly for 4–6 weeks to reduce transmission of infection in households [3].

Tinea capitis is most commonly caused by zoophilic dermatophyte *M. canis* in Slovenia [15]. Our patient in this case is particularly challenging, because she lived alone in urban apartment, effectively eliminating the possibility of the zoophilic mode of transmission. A review of the literature revealed sporadic cases of autoinoculation of *T. rubrum* from the toenails to the scalp, causing kerion-like lesions and less frequently kerion on scalp [11, 12]. Preceding tinea pedis and toenail onychomycosis, caused by *T. rubrum,* was the most probable source of the scalp infection also in our patient.

We propose that autoinoculation of anthropophilic dermatophytes may be a more common route of transmission for tinea capitis, especially in elderly individuals, than generally thought. Recognizing this pathway could streamline diagnostic protocols and narrow the differential diagnosis of kerion in adults in the future. Moreover, this insight could underscore the importance of treating toenail onychomycosis and tinea pedis as a preventive measure against spreading of dermatophytes to other skin regions.

Additionally, our case demonstrates the utility of PCR as a rapid and definitive method for identifying the causative pathogen, which facilitates initiation of the most efficient antifungal therapy for the pathogen, likely reducing the chances of long-term complications.

Lastly, treatment of tinea capitis in elderly can be especially challenging in case of lower treatment compliance, as was observed in our patient. Cognitive disorders and social isolation in elderly can also contribute to diagnostic delay, lack of compliance, prolonged treatment period, or less successful treatment.

Conclusion

Our case highlights several challenging aspects of kerion in elderly, concerning the transmission pattern, diagnosis and treatment. It underlines the importance of careful evaluation of coexistence of dermatophyte infection at different skin sites and the possibility of autoinoculation transmission of anthropophilic dermatophytes. Misdiagnosis can occur, especially if clinicians are not familiar with full range of transmission modes and less common clinical presentations of tinea capitis. Early recognition and prompt treatment are crucial to prevent complications, such as secondary bacterial infection and scarring alopecia. The use of PCR method for diagnostics is valuable, as it is far quicker and has higher sensitivity than fungal cultures for identifying the causative pathogen, enabling to initiate the most efficient targeted therapy for the patient.

The CARE Checklist has been completed by the authors for this case report, attached as online supplementary material (for all online suppl. material, see https://doi.org/10.1159/000547156).

Statement of Ethics

Ethical approval is not required for this study in accordance with local or national guidelines. Written informed consent was obtained from the patient in attendance of her close relatives for publication of the details of their medical case and any accompanying images.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

Andraž Jahič, MD: helped with daily operations regarding the patient under supervision of the attending doctor, conceptualization of the article, and writing – original draft. Jan Stanič, MD: helped with daily operations regarding the patient under supervision of the attending doctor, and helped writing the article. Rok Tomazin, PhD: responsible for mycological diagnostics with cultivation and PCR testing. Mateja Dolenc-Voljč, MD: attending doctor, responsible for treatment of the patient, conceptualization of the article, writing – review and editing, recommended corrections, and supervision.

Data Availability Statement

All data generated or analyzed during this study are included in this article. Further inquiries can be directed to the corresponding author.

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