Kerion Celsi Caused by *Trichophyton verrucosum* Probably Transmitted from Cattle

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= Abstract =

Kerion celsi is a severe inflammatory type of tinea capitis that presents as an inflammatory, boggy mass with broken hairs and hair loss. It is usually occurred in children between the age of 4 and 14 years that caused by zoophilic or geophilic pathogens such as *Microsporum(M.) canis*, *Trichophyton(T.) mentagrophytes*, *T. verrucosum*, *M. gypseum*, *T. verrucosum* was chiefly found from cattle which infect the human through direct contact. We report a case of kerion celsi caused by *T. verrucosum* probably transmitted from cattle in a 3-year-old boy. The patient had a solitary, tender, 6.0 × 5.5 cm sized, erythematous boggy plaque and pustules with hair loss on the right side of occipital scalp for 2 weeks. Chains of chlamydoconidia were observed in KOH mount and slide culture by light microscopy. The nucleotide sequence of internal transcribed spacer (ITS) region for clinical isolate was identical to that of *T. verrucosum* strain IFM 57570. He was treated with 125 mg of terbinafine daily for 12 weeks and short term therapy of low dose of prednisolone. Skin lesion was cured without recurrence.

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Key Words: Cattle, Kerion celsi, *Trichophyton verrucosum*

INTRODUCTION

Kerion celsi is a severe inflammatory type of tinea capitis which is the result of a hypersensitivity reaction to the infection. Clinically, kerion celsi presents boggy inflammatory mass studded with broken hairs and follicular orifices oozing with pus. Most cases of kerion celsi develop in school-age children and delayed treatment usually results in scarring alopecia[1]. The causative pathogens are zoophilic or geophilic dermatophytes such as *Microsporum(M.) canis*, *Trichophyton(T.) mentagrophytes*, *M. gypseum*, *T. verrucosum*, of which *T. verrucosum* is transmitted to humans through contact with cattle and rarely causes kerion celsi. Since Kim et al[2] reported a first case of kerion celsi in Korea in 1986, 8 cases of kerion celsi have been reported so far[3~8]. Although diagnoses of dermatophytosis, including kerion celsi, depends

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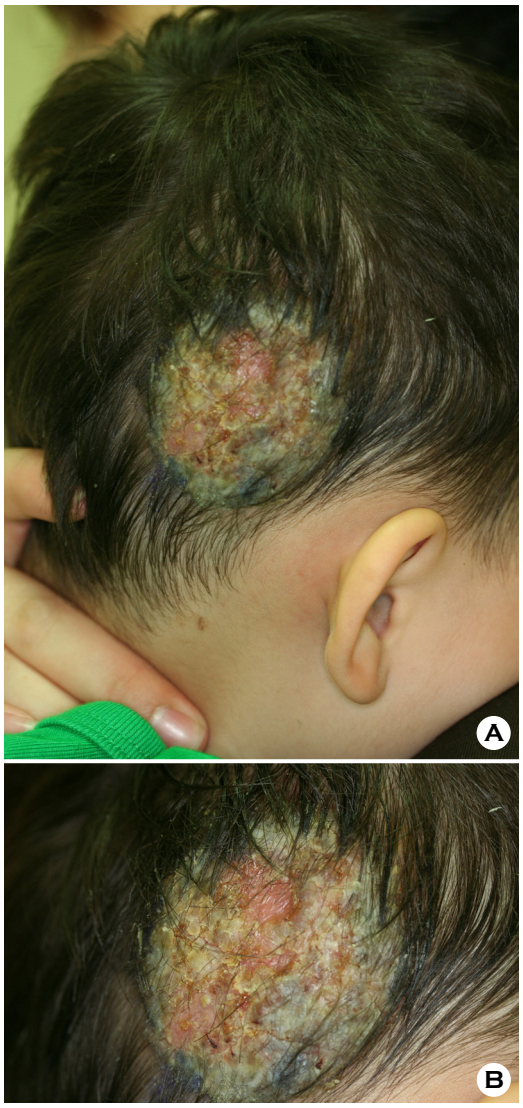

Fig. 1. (A) A solitary, tender, 6.0 × 5.5 cm sized, erythematous boggy plaque and pustules with hair loss on the right side of occipital scalp. **(B)** Close-up view of the scalp lesion.

primarily on KOH mount and fungal cultures, causative pathogens have recently been complementarily identified by molecular biologic analysis[8].

Herein, we report the case of a 3-year-old boy with kerion celsi caused by *T. verrucosum* possibly transmitted through contact with cattle on the authority of KOH mount, fungal culture, and molecular biologic analysis.

CASE REPORT

A 3-year-old boy presented with tender erythematous boggy plaque and pustules with hair loss. Three weeks prior to this presentation, he visited his grandfather's house where 30 cattle were being raised. A week later, scaly erythematous patch developed on the right occipital scalp, and he was treated at a private clinic for 1 week. However, the lesion gradually increased in size, and eventually several tender pustules and hair loss developed. At the clinical examination, a solitary, tender, 6.0 × 5.5 cm sized, erythematous boggy plaque with pustules and yellowish brown exudates were observed (Fig. 1A and B). The hair was easily depilated and alopecia also was observed at the lesion. His family history was unremarkable and general physical condition was well. There was no specific finding except skin lesion.

On the visit, laboratory studies including a complete blood cell count with differentials, peripheral blood smear, liver and renal function test, VDRL, urinalysis, stool examination, hepatitis viral test, HIV test, chest X-ray, ECG were all within normal limits or negative. The lesion did not fluoresce under Wood lamp and direct microscopic examination of the infected hair showed the presence of chains of chlamydoconidia (Fig. 2A). Cultures were performed in Sabouraud's dextrose agar slants and incubated at 25℃ for six weeks. As a result, slow growing, folded, heaped and glabrous white colonies were observed in two slants. The reverse surface of the slants was whitish (Fig. 2B). According to microscopic examination with lactophenol cotton blue staining, chains of chlamydoconidia were observed (Fig. 2C). Histopathologically, dense infiltration of mixed inflammatory cells in the dermis and pronounced inflammatory infiltration surrounding hair follicle were observed in H & E

Fig. 2. (A) Chains of chlamydoconidia around the hair shaft (KOH mount, ×400). **(B)** Slow growing, folded, heaped, glabrous, white colonies on Sabouraud's dextrose agar slant at 25℃ for 6 weeks. The reverse of colonies is white. **(C)** Chains of chlamydoconidia were shown in slide culture of *T. verrucosum* (Lactophenol cotton blue, ×400).

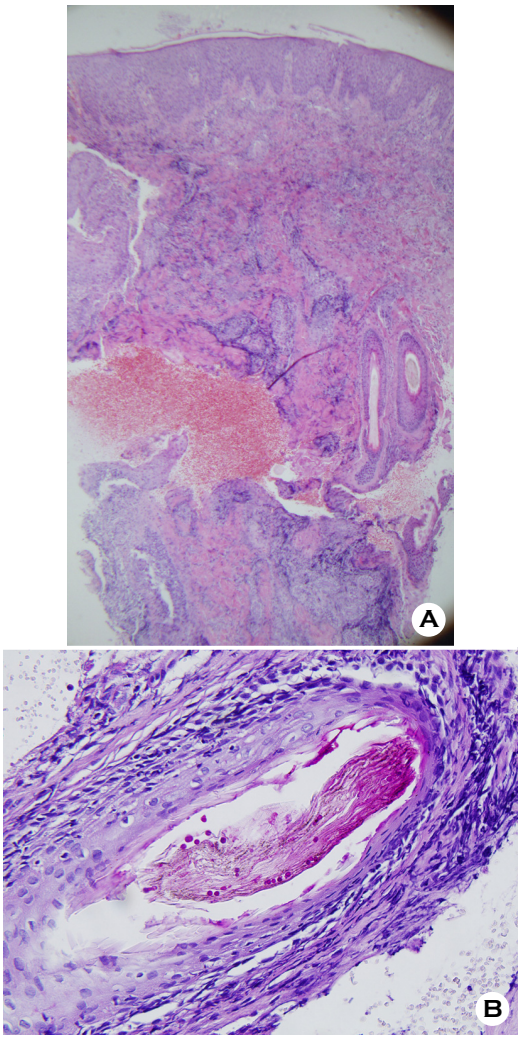

Fig. 3. (A) Dense infiltration of mixed inflammatory cells in the dermis and pronounced inflammatory infiltration surrounding hair follicle (H & E, ×40). **(B)** Many hyphae and conidia are found around the hair shaft (PAS stain, ×400).

staining (Fig. 3A). Also, many hyphae and conidia were found around the hair shaft in PAS staining (Fig. 3B). For molecular biologic analysis, DNA was extracted from the cultured colonies and the sequence of internal transcribed spacer (ITS) region was identified. Subsequently, it was compared to the sequence of *T. verrucosum* strain IFM 57570 (GenBank accession number AB491473.1) which

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ATCATTAACGCGCAGGCCGGAGGCTGGCCCCCCACGATAGGGATCAGCGTTCCATCAGGGGTGTGCAGATGTGCGCCGGC [80]
CTTACGCCCCATTCTTGTCTACCTTACTCGGTTGCCTCGGCGGGCCGCGCTCTCCCCGGAGAGTCGTCCGGCGAGCCTCT [160]
TCGGGGGCTTTAGCTGGATCGCGCCCGCCGGAGGACAGACATCAAAAAATCTTGAAGAGCTGTCAGTCTGAGCGTTAGCA [240]
AGCAAAATCAGTTAAAACTTTCAACAACGGATCTCTTGGTTCCGGCATCGATGAAGAACGCAGCGAAATGCGATAAGTAA [320]
TGTGAATTGCAGAATTCCGTGAATCATCGAATCTTTGAACGCACATTGCGCCCTCTGGTATTCCGGGGGGCATGCCTGTT [400]
CGAGCGTCATTTCAACCCCTCAAGCTCGGCTTGTGTGATGGACGACCGTCCGGCCCCCTCTTTCGGGGGCGGGACGCGCC [480]
CGAAAAGCAGTGGCCAGGCCGCGATTCCGGCTTCCTGGGCGAATGGGCAATCAAACCAGCGCCCTCAGGACCGGCCGCTC [560]
TGGCCTTCCCCCAAATCTCTCTGAGATTTTTTTCAGGTTGACC [603]
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Fig. 4. Alignment of ITS sequences of the sample from patient and *T. verrucosum* strain IFM57570 (GenBank accession number AB491473.1). The sequences of ITS of clinical sample was 100% match to that of *T. verrucosum* strain IFM57570 (GenBank accession number AB491473.1).

Table 1. Summary of the reported cases of kerion celsi caused by *Trichophyton verrucosum* in Korea

Author (year)	Sex/ Age	Suspected animal	Site	Skin lesion	Treatment
Kim et al[2] (1986)	F/9	Cattle	Frontal scalp	Boggy mass	Ketoconazole, ampicilline
Kim et al[3] (1989)	M/4	Cattle	Vertex	Boggy masses	Griseofulvin, prednisolone
Suh et al[4] (1994)	M/15	Cattle	Frontal scalp	Boggy mass	Itraconazole, prednisolone, cephadroxil
Ro et al[5] (1997)	F/7	Cattle	Left temporal scalp	Boggy patch	Griseofulvin, prednisolone
Youn et al[6] (2000)	F/52	Cattle	Vertex	Indurated masses	Terbinafine, prednisolone
	F/50	Cattle	Occipital scalp	Purulent plaque	Terbinafine, prednisolone
Kim et al[7] (2000)	F/67	Cattle	Right parietal	Boggy mass	Terbinafine, prednisolone
Kim et al[8] (2010)	F/19	(−)	Frontal scalp	Boggy mass	Itraconazole, methylprednisolone, cephradine
Present case (2012)	M/3	Cattle	Occipital scalp	Boggy plaque	Terbinafine, prednisolone

stored in GenBank, using Blast program. The result was 100% matched (Fig. 4).

The patient was treated with daily doses of terbinafine 125 mg and predisolone 10 mg for the first week. After than he was treated with 125 mg oral terbinafine daily alone. Two weeks after starting treatment, the inflammation and pustules were remarkably improved. We performed repeated KOH mount and fungal cultures for 2 times with 2 weeks interval and all were negative. Eight weeks after starting medication, all skin lesions, including alopecia, were improved.

DISCUSSION

Kerion celsi is a severe type of tinea capitis caused by zoophilic or geophilic dermatophytes. The distribution of causative pathogens varies among regions and times[1]. Most cases of kerion celsi reported in Korea are known to be caused by *M. canis*[9~11]. Since kerion celsi caused by *T. verrucosum* was first reported by Kim et al[2] in 1986. Eight cases of kerion celsi have been reported in Korea[3~8] (Table 1). Of these 8 cases, 2 occurred in males and 6 in females; 3 in children

and 5 in adults; 7 were transmitted through contact with cattle, while the transmission route of 1 case was not identified. *T. verrucosum* is known to be the most common causative pathogen of dermatophytosis caused by cattle which is usually transmitted to other cattle through hay or bull pens contaminated by the rubbing of infected skin against surfaces and is sometimes transmitted to humans by direct contact with infected cattle's skin[12~14]. In this case, kerion celsi developed after a 3-year-old boy visited his grandfather's house where cattle were being raised, which suggests that these cattles were the source of infection

A thorough history of contact with infected patients, domestic animals or pets as well as the long-term use of steroids or immunosuppressants is neccessary in the diagnosis of kerion celsi. Wood lamp, KOH mount and fungal cultures should be performed in suspected cases. Since fungal elements are relatively scarce in scales or crusts, the infected hair in the lesion should be obtained and examined whenever possible[15,16]. Although Wood lamp is usually positive for *T. verrucosum* in cattle, it is often negative in humans, except for at the early stage of infection[2,13]. *T. verrucosum* grows very slowly for at least 4 weeks at 37℃. Because of this long cultivation time, it cannot be isolated if culture media are contaminated with other microorganisms[5,7]. Since *T. verrucosum* is an ectothrix that involves the external surface of hair shaft, it causes more severe infection than an endothrix, and arthroconidia are not observed in hair shaft of infected patients[8]. In severe cases, kerion celsi should be discriminated from furuncle, impetigo, folliculitis decalvans and chronic pyoderma of the scalp. In cases with resultant scars, kerion celsi should be differentiated from discoid lupus erythematosus, lichen planopilaris, pseudopelade and radiation dermatitis[1]. Our case was negative for wood lamp but positive for KOH mount as well as 6-week fungal cultures. The biopsy of the tissue obtained from the lesion revealed numerous hyphae and spores around the hair shaft. The patient was diagnosed with kerion celsi based on these results. Although dermatophytosis is usually diagnosed based on the morphologic feature of cultured colonies, various molecular biologic analysis have recently been used in the isolation of causative pathogens. In this case, DNA was extracted from the cultured colonies and the sequence of ITS region was identified. Subsequently, it was compared to the sequence of *T. verrucosum* strain IFM 57570 (GenBank accession number AB491473.1) which stored in GenBank, using Blast program. The result was 100% matched which suggests that the causative pathogen was *T. verrucosum*.

Kerion celsi caused by zoophilic dermatophytes responds well to medical treatment; however, effective drugs must be carefully selected because their susceptibility differs between pathogens[17~19]. At first, causative pathogens should be treated by oral and topical antifungal agents. In cases of secondary infections, also antibiotics should be administered. Combination therapy with antifungal agents and corticosteroids is useful for the prevention of permanent scarring alopecia. In addition, terbinafine and itraconazole have recently been used effectively, where griseofulvin was widely used in the past[5,7,8,15,16].

Also the patient in this case was treated with daily doses of terbinafine 125 mg and predisolone 10 mg for the first week. After than he was treated with 125 mg oral terbinafine daily alone for 7 weeks. Eight weeks after starting medication, all skin lesions, including alopecia, were improved.

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