

## Pitted Keratolysis: Primarily a Clinical Diagnosis

MARTÍNEZ-HERRERA, Erick\*†, TEJADA-GARCÍA, Diana'', GARCÍA-REMENTERÍA, Carlos''' and ARENAS-GUZMÁN, Roberto''''

''Universidad Nacional Autónoma de México, Departamento de Microbiología y Parasitología, Facultad de Medicina, Ciudad de México.

''Dermatology Institute and Skin Surgery "Prof. Dr. Fernando A. Cordero C", Guatemala.

'''Dawson Medical Group. 4805 S. Western Ave Oklahoma City, Oklahoma, USA (405) 636-1506.

''''General Hospital "Dr. Manuel Gea González". Chief, Section of Mycology, México City, DF.

Received March 20, 2015; Accepted November 12, 2015

### Abstract

Pitted keratolysis, is a bacterial skin infection that commonly affects the weight-bearing surfaces of the feet. The most frequent etiological agents are various species of Gram-positive bacteria including *Dermatophilus congolensis*, *Micrococcus sedentarius*, *Corynebacterium* spp. We report a case of pitted keratolysis in a 25-year-old male blacksmith from Guatemala. A Gram stain was performed of the lesions and showed grouped Gram positive cocci. The subsequent culture grew *Staphylococcus auricularis*

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**Citation:** MARTÍNEZ-HERRERA, Erick, TEJADA-GARCÍA, Diana, GARCÍA-REMENTERÍA, Carlos and ARENAS-GUZMÁN, Roberto. Pitted Keratolysis: Primarily a Clinical Diagnosis. Ecorfan Journal-Republic of Guatemala 2015, 1-1: 27-30

\* Correspondence to Author (email: martinezerickh@gmail.com)

† Researcher contributing first author.

Pitted keratolysis is a bacterial skin infection that commonly affects the weight-bearing surfaces of the feet. It is caused by various species of Gram-positive bacteria including *Dermatophilus congolensis*, *Micrococcus sedentarius*, *Corynebacterium* spp., and others. It is characterized by crateriform depressions in the affected area and is often associated with hyperhidrosis, malodor, and sliminess of the area. We report a case of a 25-year-old blacksmith with pitted keratolysis who was successfully treated with aluminum sulfate soaks and Clindamycin 0.6% lotion BID. Pitted keratolysis (PK) is a bacterial skin infection primarily affecting the weight-bearing surfaces of the feet, including the ventral aspect of the toe, the ball of the foot, and the heel. Occasionally non-weight-bearing areas, such as the palmar surfaces of the hands may be affected, although this is rare. The disease is characterized by many circular or longitudinal, crateriform depressions in the skin surface [1]. Hyperhidrosis is the most frequently observed symptom, but malodor and sliminess of the skin are common features as well [2]. Although most cases are asymptomatic, painful plaque-like lesions can be seen. This is a disease that is most frequently observed in young men wearing protective shoes for occupational reasons which do not allow for ventilation of the feet, and thus promote a moist and warm environment for the growth of organisms [3]. We report a case of pitted keratolysis in a 25-year-old male blacksmith from Guatemala.

### Case Report

A 25-year-old male blacksmith from Guatemala presented to our clinic with an 18-month history of excessive wrinkling, itching, and fetid sweating of bilateral feet. On physical exam, his feet were mal odorous and multiple punctiform depressions forming geographic plaques were appreciated on the soles of his feet.

**In Figure 1** superficial erosions forming geographic plaques can be seen on the plantar surface of the foot. **In Figure 2** confluent depressed plaques with minimal scales can be seen on the plantar surface of the foot.

A Gram stain was performed of the lesions and showed grouped Gram positive cocci. The subsequent culture grew *Staphylococcus auricularis*, which was identified by the innovative microbial identification system VITEK® 60 (bioMérieux, France). A diagnosis of pitted keratolysis was established according to the clinical triad (bromhidrosis, skin maceration and plantar keratolytic lesions) characteristics of the same and the patient received topical treatment with aluminum sulfate soaks and Clindamycin lotion 0.6% BID. The plantar lesions improved markedly after just one week of the prescribed treatment.

### Comment

Pitted keratolysis was first described by Castellani in 1910 and was termed “keratoma plantaresulcatum” at the time [4]. It was later renamed “keratolysis plantare sulcatum” by Acton and Maguire in 1930 [5] as keratolysis was a more appropriate term than keratoma as keratoma implies a hypertrophic growth which is not the case with PK. It is now most commonly referred to as pitted keratolysis.

A variety of gram-positive species, including *Dermatophilus congolensis*, *Micrococcus sedentarius* and *Corynebacterium* spp. [3], and others have been implicated as the causative agent of pitted keratolysis. These bacteria share a feature of producing proteinases that allow them to degrade keratin and destroy the stratum corneum thus producing the characteristic pits of PK. *D. congolensis* produces a keratinase and *M. sedentarius* produces proteinases [6].

The malodor associated with PK is thought to be due to the production of sulfur-compound by-products, such as thiols, sulfides and thioesters [7]. Pitted keratolysis eruptions are limited to the stratum corneum layer of the skin, therefore no inflammation is observed.

The treatment of PK includes both educating the patient on preventative measures as well as various medications that have proven effective. "Various preventive measures recommended are, avoiding use of occlusive footwear, reduction of foot friction with properly fitting footwear, using absorbent cotton socks, wearing open toed sandals whenever possible, washing feet with soap or antibacterial cleanser twice a day, and avoiding sharing of footwear or towels" [8]. Topical clindamycin has also been shown to be an effective treatment for PK and is very commonly used for its bactericidal effect on *Corynebacterium* [9]. It also appears to be effective on other causative agents of PK, as is evidenced by our case. Aluminum sulfate or aluminum chloride soaks are used to treat the hyperhidrosis that is commonly associated with PK [1]. Other common treatments include acne medications such as topical erythromycin, oral erythromycin, and alcohol-based benzoyl peroxide applied twice a day. Mupirocin has also shown to be effective [10]. Vlahovic et. al. demonstrated the efficacy of clindamycin 1%-benzoyl peroxide 5% topical gel in the treatment of PK in their 2009 study.

This was the first known use of this combination treatment and it proved effective [11]. Botulinum toxin has also proven effective in treatment-refractory cases of PK associated with hyperhidrosis [12]. There is not a universal consensus on the treatment of PK, but in general a combination of the various treatments is often employed.

## Conclusion

We report a case of a patient with pitted keratolysis who responded well to aluminum sulfate soaks and Clindamycin lotion 0.6% BID. This case should serve as a reminder to keep a clinical suspicion for pitted keratolysis and know the distinguishing characteristics as it is primarily a clinical diagnosis and which could be confused with other skin lesions as *tinea pedis*, hyperhidrosis, chronic arsenic and erythrasma.

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**Figure 2** Forming shallow erosions geographically defects in foot and toes



**Figure 1** Forming shallow erosions geographically defects in heel