Efficacy of Ablative Laser Treatment in Galli-Galli Disease

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Background: Galli-Galli disease (GGD) represents a rare genodermatosis that is clinically characterized by progressive reticulate hyperpigmentation of the flexures accompanied by itching and pain. To date, no convincing treatment options are known for GGD. We sought to examine the therapeutic potential of ablative laser treatment in a patient with genetically confirmed GGD.

Observations: We describe a 68-year-old man with refractory bilateral axillary GGD accompanied by severe itching and pain. His clinical picture and histologic findings were consistent with GGD. Direct sequencing analysis of the KRT5 gene identified the causative mutation, c.418dupA, and confirmed the clinical diagnosis. The patient was treated with the erbium:YAG laser in 2 consecutive sessions for each side and was followed up for 12 months. Ablative laser treatment led to complete resolution of clinical symptoms and a good clinical result with only minimal scarring and dyspigmentation.

Conclusions: This article demonstrates the efficacy of ablative laser treatment in a patient with genetically confirmed refractory GGD. However, further studies with longer follow-up are required to confirm these results.

Arch Dermatol. 2011;147(3):317-320

GALLI-GALLI DISEASE (GGD) is a rare autosomal dominant genodermatosis in the clinical spectrum of reticulate pigmentary disorders characterized by progressive pigmented lesions primarily involving large body folds and flexural areas, small follicular hyperkeratotic papules, and pitted scars. Galli-Galli disease is regarded as an acantholytic variant of Dowling-Degos disease (DDD; OMIM 179850). Characteristic histopathologic features of DDD include filiform epithelial downgrowths of the rete ridges typically involving the follicular infundibulum, basilar hyperpigmentation, and dermal melanosis. Galli-Galli disease shows the characteristic clinical findings of DDD while presenting histopathologically with club-shaped rete ridges and focal acantholysis. Two mutations (c.418dupA and c.14C>A) in the keratin 5 gene (KRT5; OMIM 148040), encoding 1 of the 2 major basal epidermal keratin intermediate filaments, were reported to underlie DDD in several European cases. Recently, 2 novel mutations of the KRT5 gene were identified in single patients with clinical and histopathologic features typical of DDD and GGD, respectively. To date, only a few patients with GGD have been described in the literature, and despite the thorough clinical, histopathologic, and genetic analyses of these cases, no convincing treatment options have been proposed for this rare disease.

REPORT OF A CASE

A 68-year-old man was referred with a chronic pruritic papular rash mainly involving both axillary folds. The skin condition had appeared approximately 5 years earlier, with steady progression over time. The family history regarding similar skin eruptions was negative. The patient experienced persistent and severe itching and burning in the axillary folds and underwent various conservative treatment modalities with topical corticosteroids, topical antibiotics, and oral antihistamines in an outpatient setting without any improvement in his condition. Physical examination revealed superinfected erythematous hyperkeratotic papular eruptions and plaques involving both axillary folds and to a lesser extent, the neck, trunk, and groin (Figure 1). A punch biopsy specimen obtained from lesional skin of the left axilla revealed acanthosis with thin elongated rete ridges with basal branching and widening involving the follicular infundibulum and focal suprabasal acantholysis. Small intraepidermal keratin cysts, hy-
perpigmentation of the rete tips, and a perivascular lymphohistiocytic infiltration were observed (Figure 2). The clinical and histologic findings suggest the diagnosis of GGD. To confirm a genetic cause of the disorder, DNA from the patient was analyzed for the presence of a mutation in the KRT5 gene. A mutation consisting of a single adenine base insertion in the KRT5 gene (c.418dupA) was identified that has previously been shown to be characteristic of DDD (Figure 3).2

**METHODS**

**HISTOLOGIC ANALYSIS**

Histologic sections were prepared from formalin-fixed, paraffin-embedded skin biopsy specimens. Standard hematoxylin-eosin staining was performed for diagnostic purposes.

**GENETIC ANALYSIS**

The patient provided written informed consent to participate in the genetic analysis. DNA was extracted from peripheral blood leukocytes according to standard procedures. Exons 1 and 9 of the KRT5 gene were amplified by polymerase chain reaction. The polymerase chain reaction products were purified using the innuPREP DOUBLE Pure Kit (Analytik Jena AG, Jena, Germany) and were directly sequenced using the BigDye Terminator v1.1 Cycle Sequencing Kit (Applied Biosystems, Foster City, California) on a genetic analyzer (model ABI 3100; Applied Biosystems) as described elsewhere.2

**LASER TREATMENT**

Both axillae were treated with the erbium:YAG laser in 2 consecutive sessions. The left axilla was treated first. The axillary skin was anesthetized with tumescent local anesthesia using
At 3-month follow-up, the patient showed significant improvement, with complete resolution of clinical symptoms. Slight atrophic scar formation and partial hyperpigmentation and depigmentation of the treated skin were noted. A punch biopsy specimen obtained from the laser-treated area revealed normal epithelium with only slight fibrosis of the upper dermis and no residual histologic signs of GGD (Figure 4). At the same time, the right axilla was treated with the erbium:YAG laser using identical variables. At 12-month follow-up, the patient was very satisfied with the complete resolution of itching and burning and the good cosmetic result of the axillary skin (Figure 5). No new lesions were observed in the following clinical observation period.

We reported on the efficacy of erbium:YAG laser ablation in a patient with genetically confirmed GGD. Galli-Galli disease is regarded as a rare variant of DDD with the unique hallmark of suprabasal acantholysis. Whether GGD truly represents an independent histopathologic entity among the spectrum of reticulate pigmentary disorders is controversially debated, particularly because of the significant clinical and pathologic overlap between DDD and GGD. Besides the apparently indistinguishable clinical manifestation of GGD and DDD, identical mutations of KRT5 have been reported for both diseases. Because acantholysis is regarded as the unique feature distinguishing GGD from DDD, it remains to be determined whether the exact pathomechanisms causing acantholysis in GGD will be identified. It was suggested that polymorphic nucleotide heterozygous changes in addition to the causative KRT5 mutation may be responsible for acantholysis. Some researchers postulate that the KRT5 mutation itself might be responsible for acantholysis due to abnormal functions of the desmosomal plaque. Therefore, acantholysis might also be common, but underreported, in DDD. It has recently been suggested to subsume the diagnosis of GGD under the diagnosis of DDD with a facultative histopathologic feature of acantholysis.

Irrespective of the pathogenic distinction between GGD and DDD, treatment modalities for both diseases as found in the literature are few and largely disappointing. Therapeutic options include topical corticosteroids, topical retinoids, topical adapalene, depigmenting agents, and UV-B phototherapy, and they have been reported to be unsuccessful. In recent years, dermabrasion and ablative lasers have been shown to be effective in the treatment of focal genodermatoses, such as Hailey-Hailey disease, Darier disease, and 1 case of DDD. The removal of abnormal tissue followed by the formation of new epidermal tissue starting from the unaffected follicular epithelium is regarded as the mechanism underlying the effectiveness of dermabrasive procedures. Among ablative treatments, erbium:YAG laser therapy is known to provide more rapid wound healing and fewer adverse effects, such as scarring and pigmentedary changes, than is dermabrasion or carbon dioxide laser treatment.

The patient described herein showed complete resolution of clinical symptoms and significant overall improvement after erbium:YAG laser ablation. Clinically, there was slight atrophic scar formation and hyperpigmentation and depigmentation of the treated skin that spontaneously decreased during the following months. This case demonstrates the efficacy and safety of ablative laser therapy for the treatment of GGD.

Accepted for Publication: June 1, 2010.

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Author Contributions: All authors had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.
Study concept and design: Voth, Reinhard, Bieber, and Wenzel. Acquisition of data: Voth, Landsberg, Betz, and Wenzel. Analysis and interpretation of data: Voth, Refke, Betz, and Wenzel. Drafting of the manuscript: Voth and Wenzel. Critical revision of the manuscript for important intellectual content: Landsberg, Reinhard, Refke, Betz, and Bieber. Administrative, technical, and material support: Voth, Landsberg, Refke, and Betz. Study supervision: Voth, Reinhard, Betz, Bieber, and Wenzel.

Financial Disclosure: None reported.

Funding/Support: This study was supported by an Emmy Noether grant from the German Research Foundation (Dr Betz).

Role of the Sponsor: The sponsor had no role in the design and conduct of the study; in the collection, analysis, and interpretation of data; or in the preparation, review, or approval of the manuscript.

REFERENCES


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