

Successful Treatment of Granuloma Annulare with Thin-Layered CO₂ Laser Ablation

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Abstract

Two clinical cases of successful thin-layered CO₂ laser ablation of localized form of granuloma annulare, are presented. Granuloma annulare is a rare dermatosis whose etiology is still unclear. Relation to various systemic diseases is assumed. Non-aesthetic lesions create discomfort, and may impede affected individuals' social confidence, physical, and psycho-social functioning. In most cases lesions regress spontaneously, and therefore therapeutic minimalism is to be applied. Therapeutic modalities include laser therapy. Reports in literature of GA treatment with PDL, Fractional Thermolysis, as well as excimer laser indicate attempts at treatment of GA are being made not knowing the mechanisms behind etiology of GA. Presented bellow successfully treated cases with thin-layered CO₂ laser ablation demonstrate treatment of GA with thin-layered laser ablation as therapeutically effective. The procedure is bloodless, relatively painless and completely aseptic, no postoperative pain. Possible impetiginization is easily avoided.

Keywords: Granuloma Annulare; CO₂ Laser; Thin-Layered Laser Ablation

Abbreviations

(CO₂ laser) Carbon Dioxide Laser

(GA) Granuloma Annulare

(PDL) Pulsed Dye Laser

(FT) Fractional Thermolysis

Introduction

Granuloma annulare is a rare dermatosis whose etiology has not so far been elucidated. Systemic associations have been proposed yet, not proven (such as diabetes mellitus, malignancy, rheumatism, and dyslipidemia, etc.) [1,2]. A probable cause is insect bites. It could also be drug induced. Besides to its localized form, there are other variants including generalized GA, disseminated papular GA, atypical generalized GA, subcutaneous, and perforating GA [2]. Even without treatment, the condition will improve; in more of half of the patients lesions regress spontaneously, and therefore therapeutic minimalism is the general approach [3,4]. In some cases however, the disease persists for years. It is not successfully being affected neither by topically applied corticosteroid therapy, nor cosmetics. Lesions create discomfort, and may impede social confidence, physical, and psycho-social functioning of those, affected. Furthermore, patients often suspect that this benign condition has not been properly diagnosed due to the fact that it is not amenable to therapy, and that impairs physician's credibility. Patients resort to self-treatment, which can lead to cicatrization, and anxiety escalation.

Treatments of GA include medications, biologic agents, surgical interventions, phototherapy, and laser treatments [3]. Published in literature cases of treatment of GA with PDL (Pulsed Dye Laser), FT (Fractional Thermolysis), and excimer laser indicate that treatment attempts are made sort of going it blind, not knowing the mechanisms behind its etiology. Histologically granuloma annulare is identified with focal collagen degeneration, inflammation with interstitial histiocytes and mucin deposition, with four different histopathological patterns observed such as interstitial, palisaded, sarcoidal, and mixed, as a patient may present with more than one of the histopathologic subtypes [5]. Since histological changes indicate altered collagen structure with focal immune responses [1,2] we decided not knowing the mechanisms of this reaction to remove the pathological locus destructively. For the purpose, a thin-layered CO₂ laser ablation which we have successfully applied in treatment of other superficial dermatoses, was put in use. Trying not to replace one defect with another (a lesion with a rough cicatrix) the lesion was superficially ablated, without striving to remove it entirely in one treatment session.

Cases

Here we present 2 of a total of 9 typical clinical cases of GA successfully treated with thin-layer CO₂ laser ablation. A common treatment of GA is an intralesional steroid injection, in order to decrease the inflammation in the spot area, topical steroids might also be prescribed [3]. Both patients, in presented below cases, have already undergone such therapy with variable or no results, which has led to distrust of treatment and motivation to seek other treatment alternatives. First typical case presented is of a 60 years old female patient with GA for 10 years (Figure 1a). The patient reported she has previously been treated with injection and topical cream corticotherapy. The lesion remained unaffected. It has grown even bigger, according to patient's own words. We decided to comply with patient's wish: "to treat the lesions with a laser," informing her in advance of a possible cicatrization. Since GA lesions were located on both hands, one hand was first test-treated. Comparison between the hands demonstrated an effective therapeutic answer. Results exceeded patient's expectations (Figure 1b). The other hand was then subjected to the same CO₂ laser treatment approach (Figure 2c), and small correction of the right hand' residual lesion spot was made (Figure 2d). The second case presented is of a 63 year old female patient with a 5 year old GA lesions on the right hand (Figure 3a). She reported, she has previously been unsuccessfully treated with topical steroid therapy. She was subjected to CO₂ laser therapy (Figure 3b). Results are seen on Figure 4 as (c) demonstrates results 1 month post treatment, and (d) six months post treatment.

In both cases, a free hand laser thin-layered ablation technique was used, with a beam diameter of 1mm, power density of up to 600W/cm², in superpulse mode. In this operational mode lesion's lower layers are thermally coagulated by the thermal relaxation effect of the ablated top layer; there is neither carbonation, nor bleeding. The procedure is completely bloodless. Ablated sections are coated with a surgical cyano-acrylate adhesive, to avoid possible impetiginization. Impetiginization is common as hands are very difficult to keep dry for a long time. Skin atrophy of the dorsal side of the hand is a cause of delayed epithelialization processes in older age.

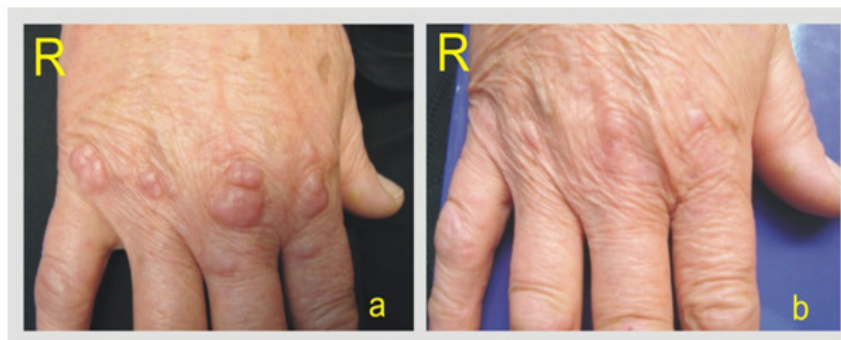


Figure 1: A 60 year old female patient with GA before (a) and after first session of laser ablation (b). Only minimal corrections are needed in treatment of this hand



Figure 2: Comparison between patient's treated and untreated hand, demonstrating a single treatment session' therapeutic efficiency. Right photo illustrates a view of both hands after second treatment session of laser ablation

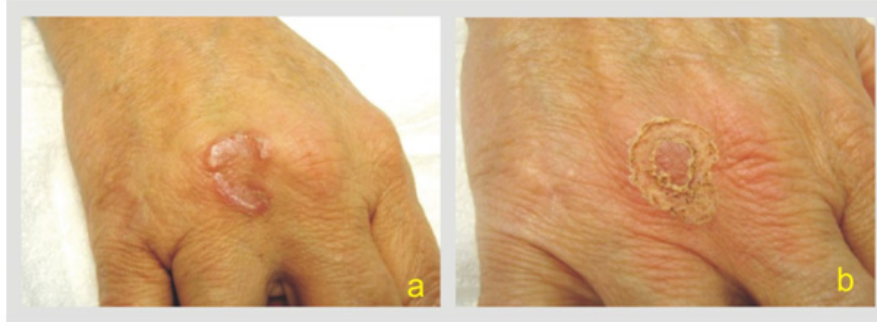


Figure 3: GA on the right hand of a 63 year old female patient, persisting for years, previously treated unsuccessfully with topical steroids (a). View immediately after laser ablation of active rim of the lesion (b)



Figure 4: View of the lesion one month post treatment (c), and final results 6 months after treatment. A slightly visible scarring is observed (d)

Discussion

The disease often persists for years. It has a slow tendency for either progression or regression. Apparently, a problem with repair mechanisms of tissue structures exists, alike a bug in a software program. Proposed therapy concept for laser treatment of GA may be metaphorically illustrated with a popular anecdote about Mr. Bill Gates: on his way to the airport, his car went off for idiopathic reasons. After series of unsuccessful attempts to start the engine the driver asked: "Mr. Gates, do you have any idea what to do?" Gates answered (given the issues with Windows bugging): "I suggest we get out of the car, and get in again." Removal of GA skin bug happens with the ablation of the lesion, relying on epithelialization processes reboot. During last 10 years, 9 patients were successfully treated with this CO₂ approach. No recurrence was observed in any of them, at the follow-ups. Remnants of treated lesions, if any were eliminated by repeated ablation. Patients were followed-up for 3 to 5 years. Clinical experience demonstrates treating GA with thin-layered laser ablation is therapeutically effective.

Due to the lack of understanding the pathogenic mechanisms of GA, effective treatment is limited. Research evidence suggests attempts in treating GA with PDL, Er: Glass, Fractionated Thermolysis, and excimer laser are being made [3,6-9]. In our opinion, PDL is not a very successful method of treating GA, for this particular laser is pulsed and may lead to vessel coagulation

which would delay epithelialization processes. It is possible some areas of the lesion to remain unaffected. In addition, this laser technology is not prevalent. It is much more practical to use the CO₂ surgical laser.

Treatment with excimer laser is not justified in affecting GA since ultraviolet radiation is absorbed by the upper epidermal layers only, and its effect is a result of a poorly controlled dose due to the non-specific thermal damage of underlying dermis. A priori such therapy is not applicable for patients with dark and suntanned skin. Our opinion is that Fractional Thermolysis is not suitable for the treatment of GA, as it is highly unlikely pathological structures to get fully affected due to the fractional thermolysis, and it is possible some zones to remain intact. As overall, usage of lasers designed for selective thermolysis and fractional lasers for treatment of GA is unnecessary, and unjustified. Fractional impact with Er: Glass, 1535nm is particularly suitable for treating generalized form of GA yet, several procedures are likely to be required to permanently affect the lesion.

Conclusion

GA is a rare dermatosis. Successful therapeutic response in all 9 patients during the last ten years indicate treatment of GA with thin-layered CO₂ laser ablation is therapeutically effective, and justified. The procedure is also bloodless, relatively painless, and completely aseptic. There is no postoperative pain. Possible

impetiginization is easily avoided with a cyanoacrylate coating, applied on the laser-sterilized ablated surface. CO₂ surgical lasers are widely used in clinical practice, and are available in both dermatological, and surgical environments.

References

1. Dabski K, Winkelmann RK. Generalized granuloma annulare: clinical and laboratory findings in 100 patients. *J Am Dermatol.* 1989;20(1):39-47.
2. Thornsberry LA, English JC III. Etiology, diagnosis, and therapeutic management of granuloma annulare: An update. *Am J Clin Dermatol.* 2013;14:279-290.
3. Piete EV, Rosenbach M, Granuloma Annulare. *JAMA Dermatol.* 2015;151(6):692.
4. Verne SH, Kennedy J, Aizpurua LA, Nouri K. Laser treatment of granuloma annulare: A review. *International journal of dermatology.* 2015;55(4).
5. Wang J, Khachemoune A. Granuloma Annulare: A Focused Review of Therapeutic Options. *Am J Clin Dermatol.* 2018;19(3):333-344.
6. Bronfenbrener R, Ragi J, Milgraum S. Granuloma annulare treated with eximer laser. *J Clin Aesthet Dermatol.* 2012;5:43-45
7. Karsai S, Hammes S, Rutten A, Raulin C. Fractional Photothermolysis for the treatment of granuloma annulare: a case report. *Lasers Surg Med.* 2008;40(5):319-322. doi:10.1002/lsm20640
8. Manstein D, Laubac HJ, Iglesia S, Dormishian A, Estarabadi A, Nouri K. Fractional Photothermolysis. *Lasers in Dermatology and Medicine.* 2018:165-196.
9. Passeron T, Fusade T, Vabres P, Rouaud R, Vilette AM, Dahan S, et al. Treatment of granuloma annulare with the 595-nm pulsed dye laser; a multicentre retrospective study with long term follow-up. *J Eur Acad Dermatol Venereol.* 2013;7(6):785-788.