

Tratamento da foliculite decalvante com laser de Erbium-YAG

Treatment of Folliculitis Decalvans with Erbium-YAG Laser

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ABSTRACT

Folliculitis decalvans (FD) is a neutrophilic cicatricial alopecia characterized by erythematous follicular papules and pustules associated with follicular hyperkeratosis and tufted folliculitis. Here, we report the case of a 35-year-old man with recalcitrant FD successfully treated with Erbium-Yag (Er:YAG) laser, showing a rapid response and no hair loss. The effects on fibroblasts, skin microbiota, immune cascade, and angiogenesis are mechanisms through which the Er:YAG may improve FD, promoting hair growth and reducing hyperkeratosis. Nonetheless, further clinical studies are needed to investigate and better define its benefits.

Keywords: Laser Therapy; Folliculitis; Solid-State Lasers.

RESUMO

A foliculite decalvante (FD) é uma alopecia cicatricial neutrofilica caracterizada por papulopústulas foliculares eritematosas associadas à hiperqueratose folicular e à foliculite em tufo. Nosso objetivo é apresentar o caso de um homem de 35 anos de idade com FD recalcitrante, tratada com sucesso com laser de Erbium-YAG (Er:YAG), com resposta rápida e sem perda capilar. As ações sobre fibroblastos, microbiota da pele, cascata imunológica e angiogênese são mecanismos pelos quais o Er:YAG pode melhorar a FD, favorecendo o crescimento capilar e reduzindo a hiperqueratose. Ainda assim, mais estudos clínicos são necessários para investigar e definir melhor seus benefícios.

Palavras-chave: Terapia a Laser; Foliculite; Lasers de Estado Sólido.

Case report

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INTRODUCTION

Folliculitis decalvans (FD) is a neutrophilic cicatricial alopecia characterized by erythematous follicular papules and pustules associated with follicular hyperkeratosis and tufted folliculitis.¹ There is primary involvement of the vertex and occipital scalp, but the beard area and nape may also be affected.¹ Its etiology involves bacterial infection, particularly *Staphylococcus aureus*, and a genetic predisposition has also been suggested. Biopsy should be taken from the active margin of alopecia, and early-stage findings typically include interfollicular acanthosis, loss of sebaceous glands, and fibrosis with follicular infundibula showing thickened interfollicular keloid-like areas. The initial infiltrate is characterized by intrafollicular and perifollicular neutrophils, later evolving into a mixed inflammatory infiltrate composed of neutrophils, lymphocytes, and plasma cells with inflammatory granulomas.² There is also significant loss of elastic tissue throughout the dermis and often the presence of *Staphylococcus aureus*.² Treatment mainly involves therapies with antibiotics, tacrolimus ointment, systemic isotretinoin, human immunoglobulin, radiotherapy, adalimumab, infliximab, and, among other less commonly used but reported therapies, photodynamic therapy (PDT), oral steroids, cyclosporine, methotrexate, and hydroxychloroquine.³ Regarding technologies, the use of long-pulsed Nd:YAG laser for hair removal has been described, as well as the use of PDT combined with carbon dioxide (CO₂) laser.⁴⁻⁷

Here, we report the case of a 35-year-old man with recalcitrant FD successfully treated with Er:YAG laser, demonstrating a rapid response with no hair loss.



FIGURE 1: Before treatment with Er:YAG laser: erythematous follicular papules and pustules, multiple fibrotic papules and nodules, and tufted hair in the vertex and occipital scalp



FIGURE 2: After treatment with Er:YAG laser: improvement in papules and pustules and scarce areas of fibrotic papules

CASE REPORT

A 35-year-old man with a 14-year history of FD, who had been treated with 0.1% clobetasol scalp solution, 10% benzoyl peroxide gel, intralesional administration of betamethasone dipropionate, and multiple oral antibiotics, including sulfamethoxazole + trimethoprim and doxycycline, presented to us highly dissatisfied. He displayed erythematous follicular papules and pustules, multiple fibrous papules, nodules, and tufted hair in the vertex and occipital scalp, despite prolonged use of medications (Figure 1). Together with the patient, we decided to perform treatment with ablative fractional Er:YAG laser combined with drug delivery of triamcinolone hexacetonide 20 mg/mL over the entire folliculitis area and, in the same session, an infiltration of 1 mL of triamcinolone acetate 20 mg/mL in the keloids. The Solon® platform was used, and the Er:YAG laser parameters were set at 10 J/cm², 2 ms, and 2 Hz. In total, 3 sessions were performed with monthly intervals. After 3 months, the patient exhibited significant improvement and stability in his clinical condition (Figure 2), with no need for further treatment.

DISCUSSION

Treatment of recalcitrant FD with long-pulsed Nd:YAG laser aimed at hair removal has shown good responses.^{5,6} A recent case report also documented a positive response to the use of PDT combined with CO₂ laser.⁴ We proposed treatment with Er:YAG laser because, unlike other therapies, it does not result in permanent alopecia and has several mechanisms for improving FD: acts on the potentially involved bacterial microbio-

me; increases duration of the transition between the catagen and anagen phases; enhances permeation through the microchannels of drug delivery; and, finally, improves follicular hyperkeratosis, healing, and tissue regeneration.

The Er:YAG laser is known for promoting collagen production and dermal reconstruction.⁸ In vitro studies have shown that the laser increases fibroblast adhesion, with cells appearing more spindle-shaped and elongated on treated surfaces.⁹ Its use is well established in the treatment of acne scars due to its 2,940 nm wavelength, which has a high affinity for the water chromophore, allowing for the superficial ablation of the epidermis.⁸ Another mechanism by which the Er:YAG laser acts is its beneficial effect in skin microbiota regulation through the creation of acoustic waves strong enough to abruptly disintegrate the bacterial cell wall.⁹ Given that scarring fibrosis caused by activated fibroblasts and bacterial infection, primarily by *Staphylococcus aureus*, are the main pathophysiological mechanisms related to FD, the Er:YAG laser appears to be a potentially beneficial therapy in the therapeutic arsenal for this disease.^{9,10}

It is also known that the Er:YAG laser increases hair growth by upregulating β -catenin and Wnt 10b expression, promoting the transition of the hair cycle from the catagen and telogen phases to the anagen phase, which begins significantly earlier in treated patients.^{11,12} Moreover, the formation of small columns of thermal injury enhances the absorption of topical medications, with complete re-epithelialization occurring within 48 hours, as demonstrated in histology. Fractional photothermolysis also

induces micro-coagulative trauma on the papillary dermis, promoting healing factors that promote hair growth, such as vascular endothelial growth factor (VEGF) and fibroblast growth factor 7 (FGF7).^{13,14} Thus, it has already been shown to provide benefits in noncicatricial alopecia such as androgenetic alopecia and alopecia areata.¹⁴ The benefits of the microchannels can be extrapolated to our case, resulting in increased delivery of topical corticosteroid.

The application of Er:YAG laser for acne has also demonstrated good results due to its photothermal effect acting on follicular hyperkeratosis and skin microbiome modulation.^{15,16} Considering that hyperkeratosis is also present in FD, this may be an additional reason for the improvement of the disease. Furthermore, it has been demonstrated that Er:YAG laser therapy modulates the immune response as a stress defense process, particularly regarding the Cxcl-1 protein. This protein plays a role in the angiogenesis of human endothelial cells, enhancing tissue healing and regeneration, as seen in FD.¹⁷

CONCLUSION

The Er:YAG laser exhibits multiple mechanisms of action that can benefit the pathophysiology of FD, including effects on fibroblasts, skin microbiota, immune cascade, and angiogenesis, as well as hair growth and improvement of hyperkeratosis. We reported a case of FD with rapid improvement and no hair loss using Er:YAG laser. Further clinical studies are necessary to better define its benefits. ●

REFERENCES:

- Cummins DM, Chaudhry IH, Harries M. Scarring alopecias: pathology and an update on digital developments. *Biomedicines*. 2021;9:1755.
- Uchiyama M, Harada K, Tobita R, Irisawa R, Tsuboi R. Histopathologic and dermoscopic features of 42 cases of folliculitis decalvans: a case series. *J Am Acad Dermatol*. 2021;85(5):1185-1193.
- Rambhia PH, Conic RRZ, Murad A, Atanaskova-Mesinkovska N, Piliang M, Bergfeld W. Updates in therapeutics for folliculitis decalvans: a systematic review with evidence-based analysis. *J Am Acad Dermatol*. 2019;80(3):794-801.
- Rózsa P, Varga E, Gyulai R, Kemény L. Carbon-dioxide laser-associated PDT treatment of folliculitis decalvans. *Int J Dermatol*. 2024;63(9):1256-1257.
- Meesters AA, Van der Veen JW, Wolkerstorfer A. Long-term remission of folliculitis decalvans after treatment with the long-pulsed Nd:YAG laser. *J Dermatolog Treat*. 2013;25(2):167-168.
- Horowitz MR, França ER, Cavalcanti SMM. Treatment of folliculitis decalvans with Nd:YAG laser. *Surg Cosmet Dermatol*. 2013;5(2):1702.
- Parlette EC, Kroeger N, Ross EV. Nd:YAG laser treatment of recalcitrant folliculitis decalvans. *Dermatol Surg*. 2004;30(8):1152-1154.
- Cenk H, Hulya S, Sarac G. Effectiveness and safety of 2940nm multifractional Er:YAG laser on acne scars. *Dermatol Ther*. 2020.
- Pham CM, Chen CY, Kim DM. The effects of using erbium, chromium-doped: yttrium-scandium-gallium-garnet laser on the surface modification, bacterial decontamination, and cell adhesion on zirconia discs: an in vitro study. *Lasers Med Sci*. 2021;36(8):1701-1708.
- Chiarini C, Torchia D, Bianchi B, Volpi W, Caproni M, Fabbri P. Immunopathogenesis of folliculitis decalvans. *Am J Clin Pathol*. 2008;130(4):526-534.
- Perper M, Aldahan AS, Fayne RA, Emerson CP, Nouri K. Efficacy of fractional lasers in treating alopecia: a literature review. *Lasers Med Sci*. 2017;32(8):1919-1925.
- Ke J, Guan H, Li S, Xu L, Zhang L, Yan Y. Erbium: YAG laser (2,940 nm) treatment stimulates hair growth through upregulating Wnt 10b and β -catenin expression in C57BL/6 mice. *Int J Clin Exp Med*. 2015;8(11):20883-20889.
- Jean-Pierre P, Pulumati A, Kashari E, Hirsch M, Nouri K. Lasers in the management of alopecia: a review of established therapies and advances in treatment. *Lasers Med Sci*. 2024;39(1).14.
- Tanakol A, Oba MC, Uzuncakmak TK, Askin O, Kutlubay Z. Treatment of alopecia areata with 2940-nm fractional erbium: yttrium-aluminum-garnet laser. *Dermatol Ther*. 2020;33(6).
- Guida S, Lippolis N, Giovani M, Pedroni G, Urtis GG, Pellacani G, et al. Ablative fractional erbium: YAG laser resurfacing: a treatment option for acne. *Dermatol Pract Concept*. 2022;12(1):e2022024.
- Cenk H, Sarac G. Effectiveness and safety of 2940-nm multifractional Er:YAG laser on acne scars. *Dermatol Ther*. 2020;33(6).
- Ansari M, Rezaei-Tavirani M, Hamzeloo-Moghadam M, Vafae R, Razzaghi M, Nikzamir M, et al. Assessment of immunological effects of low-level ER: YAG Laser Radiation. *J Lasers Med Sci*. 2022;13:e25.

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