



Selection criteria and techniques for improved cosmesis and predictable outcomes in laser hair removal treatment of acne keloidalis nuchae

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Key words: acne keloidalis nuchae; hairline; laser hair removal; outcome; selection criteria.

INTRODUCTION

A common denominator for successful, long-term treatment of acne keloidalis nuchae (AKN) with low recurrence is elimination of hair in the lesions, which can be achieved by surgical means or laser hair removal.¹⁻⁸ Although laser hair removal typically improves AKN,⁵⁻⁸ not all lesions are equally responsive to treatment.⁵ Furthermore, although studies generally report favorable outcomes from laser hair removal in treating AKN, they have also described variability in outcomes⁵⁻⁷ and the need for a standardized scoring system.⁸

This report describes a methodology for selecting patients for laser AKN treatment based on height of individual folliculocentric lesions and a laser treatment classification system to maximize patient outcomes and expectations.

METHODS

Selection criteria

The author restricted laser treatments to patients with folliculocentric lesions that were either discrete follicular papules or nodules, or papules and nodules that coalesce to form follicular plaques. Plaques with smooth bald plaques were excluded. Lesions must also have a preferred vertical height (above the skin surface) of 2 to 3 mm, because the neodymium-doped yttrium aluminum garnet (Nd-YAG) laser penetrates 5 to 7 mm,⁹ and average scalp hair follicle length is 2 to 4 mm, with the coarsest averaging 5 mm.⁶ Keeping lesions to less than 3 mm also

Abbreviations used:

AKN:	acne keloidalis nuchae
Nd-YAG:	neodymium-doped yttrium aluminum garnet

ensured a higher likelihood of penetration depth equivalent to the entire length of the hair follicle (Fig 1).

Zone of laser treatment and classification

Treating lesions alone will result in the appearance of patchy areas of hair loss. Additionally, neighboring hair follicles are a potential source of new AKN lesions through which the disease propagates. By treating adjacent areas, the chance of disease spread is minimized. Additionally, the zone of treatment was chosen to deliberately result in an area of alopecia that caused shifting of the posterior hairline superiorly (Figs 2 and 3). The result was areas below the superior border of the treated area appearing as hairless skin contiguous with hairless neck skin. With this scenario, alopecia induced by the laser is camouflaged.

Next, because alopecia is an expected effect of laser hair removal in AKN, the author adopted a severity-based classification system for predicting esthetic outcome using recommended laser treatment protocols. The severity classification, which extends from level I to IV is based on the scope of AKN lesion spread relative to the occipital notch. A

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Funding sources: None.

Conflicts of interest: None disclosed.

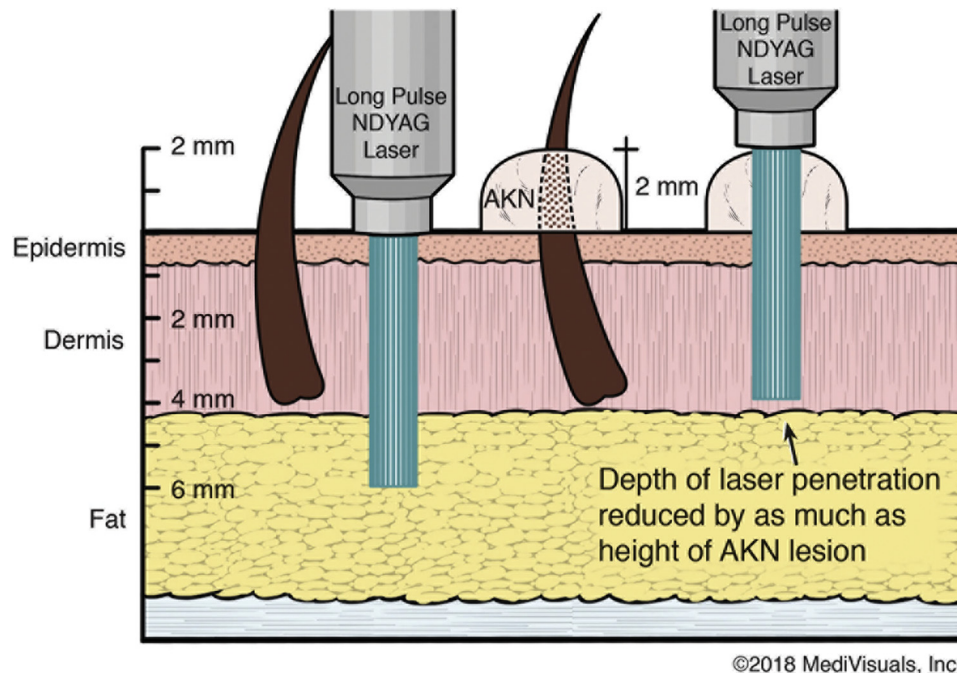
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JAAD Case Reports 2019;5:529-34.

2352-5126

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<https://doi.org/10.1016/j.jdc.2019.02.034>



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Fig 1. Schematic explaining why a ≤ 2 -mm vertical height limit for AKN lesions is preferred for optimal treatment response. The depth which laser waves must penetrate to kill hair should include the length of the hair follicle from the epidermal surface to the hair bulb plus the vertical height of the AKN lesion. © 2018 MediVisuals, Inc.

detailed description of the classification system and treatment zones is illustrated in Figs 2 and 3.

The process

The zone to be treated (level I-IV) was chosen according to the aforementioned classification system. Next, after clean shaving the designated zone, a topical anesthetic (benzocaine/lidocaine/tetracaine or lidocaine/prilocaine) was applied. Optionally, after a 30- to 45-minute interval, an epinephrine/lidocaine HCl 1% 1:1000,000 mix injection diluted with saline in 1:10 ratio was used to infiltrate the area.

After waiting about 15 minutes, lesions and nonlesion hair-bearing areas were treated with long-pulsed ND-YAG 1064 nm (GentleYAG by Candela; Syneron, Inc, Irvine, CA). Treatment conditions used pulse durations of 30 to 40 ms, spot size of 18 mm, an energy fluence of 18 to 22 mJ, as well as prepulse and postpulse dynamic epidermal cooling.

If the skin tone is found to be significantly dark either preoperatively or during the treatment sessions because of natural skin tone or AKN-induced postinflammatory hyperpigmentation, hydroquinone 4% twice daily is prescribed. This treatment lightens the skin so the laser is better able to discern and target darker hair shafts more effectively with less possibility of skin burns.

A minimum of four treatments at intervals of 6 to 8 weeks was prescribed and is acceptable for

good long-term results if no lesion recurrence is noted approximately 6 months after treatment in the absence of any ancillary treatments (eg, steroids).

CASE 1

A 52-year-old African-American man presented with follicular papules each of less than 3 mm vertical height spread in an area below the halfway line between the occipital notch and posterior hairline. His papules were determined to be level I (Fig 4, A) after not responding to topical and intralesional steroid treatments. Before the initiation of laser treatment, patients with level I lesions are given the option of having rounded or sharp patterns at the lateral end corners of their new posterior hairlines. He chose sharp lateral corners for his proposed new posterior hairline, which was made to blend with the periauricular hairline. Four ND:YAG laser treatments were administered at 6- to 8-week intervals using methods recommended for level 1 lesion spread (Fig 2, A). Permanent resolution of all AKN lesions occurred with excellent posterior hairline cosmesis (Fig 4, B).

CASE 2

A 40-year-old Asian-American man with AKN did not respond to topical and intralesional steroid treatments and presented with follicular papules,

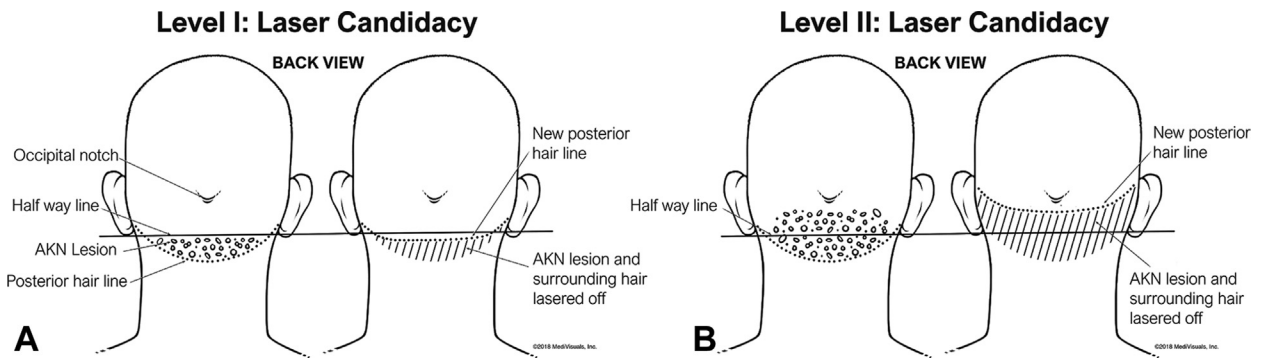


Fig 2. **A**, Level I candidacy. These are patients in whom the qualifying primary lesions are predominantly located in the lower half of the sagittal distance between the occipital notch (superiorly) and the posterior hairline (inferiorly). A new hairline would be created that is cosmetically indistinguishable from normal posterior hairlines. **B**, Level II candidacy. These are patients whose distribution of AKN lesions are predominantly in the upper half of the area described above but below the level of the occipital notch. Minor breaches in the line that do not exceed the level of the occipital notch can be tolerated. A new posterior hairline would be created that is higher than typical hairlines. © 2018 MediVisuals, Inc.

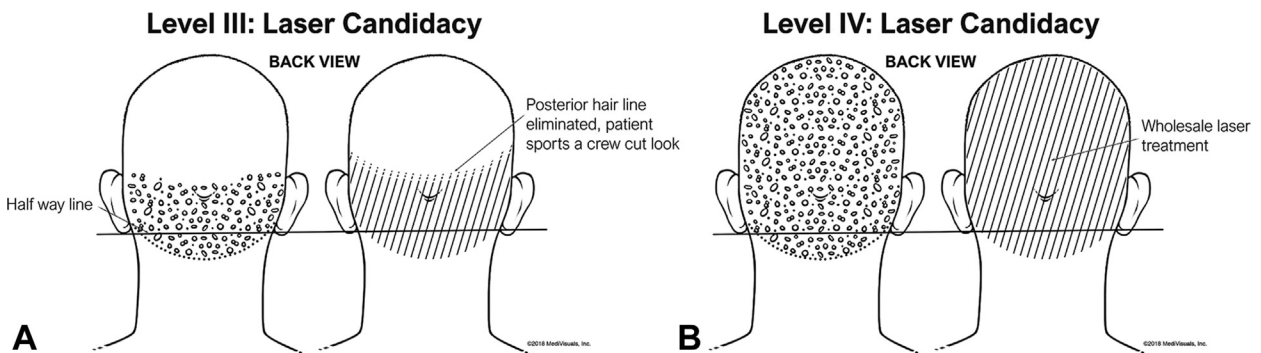


Fig 3. **A**, Level III candidacy. This classification describes a patient whose predominant lesions extend to the level of the occipital notch or slightly above it. Laser treatment is performed with the goal of creating a very high posterior hairline at the level of the occipital notch or complete elimination of the posterior hairline if lesions exceed the level of the occipital notch. Significantly thinned hair in the treated zone is accepted in lieu of complete baldness if lesion improvement is achieved. **B**, Level IV candidacy. There is widespread scalp involvement in these patients. The entire scalp is treated to eliminate AKN lesions and cause wholesale reduction or elimination of scalp hair. The patient is reconciled to being completely bald or severely thinned in the treated area. © 2018 MediVisuals, Inc.

each less than 3 mm of vertical height spread in an area that extended above the halfway line between the occipital notch and posterior hairline (level II). A few satellite lesions extended to the occipital notch (Fig 5, A). Complete and permanent resolution was observed after 5 sessions of ND-YAG laser treatments at 6- to 8-week intervals using methods recommended for level II lesion spread (Fig 2, B). The patient was satisfied with a new posterior hairline comparable to an individual with naturally developed retrograde alopecia (Fig 5, B). Before treatment, the outcome was discussed and accepted

by the patient who was also given the option of patchily treating the affected area by laser⁵⁻⁸ or by surgical excision.¹⁻⁴

CASE 3

A 24-year-old African-American man with AKN did not respond to topical steroid treatment and presented with follicular papules and nodules, each of less than 3 mm vertical height spread in the entire back of the head extending from the posterior hairline to above the occipital notch line. His lesions were determined to be level III (Fig 6, A).

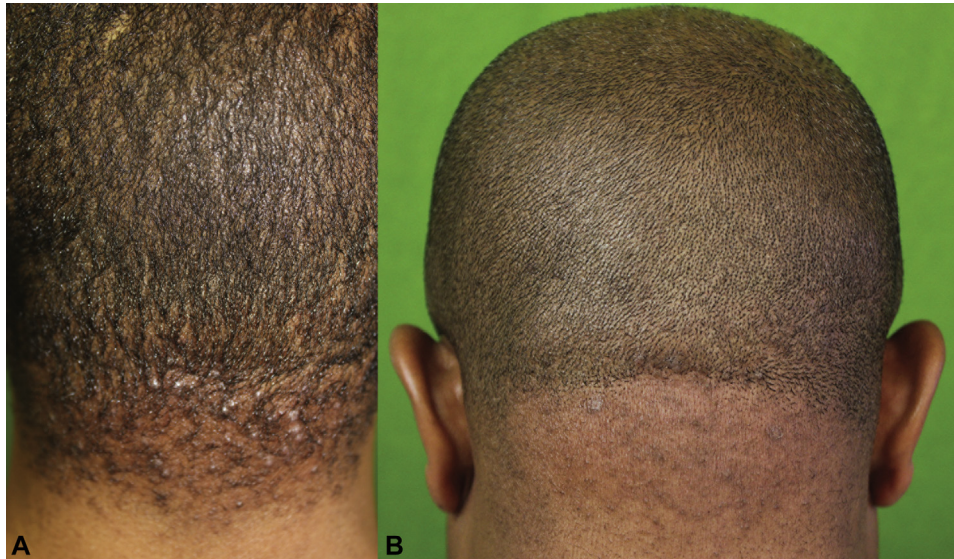


Fig 4. Case 1, before (A) and 6 months after (B) 4 sessions of ND-YAG laser treatments. Shows well camouflaged treated area the baldness of which blends with the bald neck. Minor hairline relocation with squared out lateral corners look very natural.

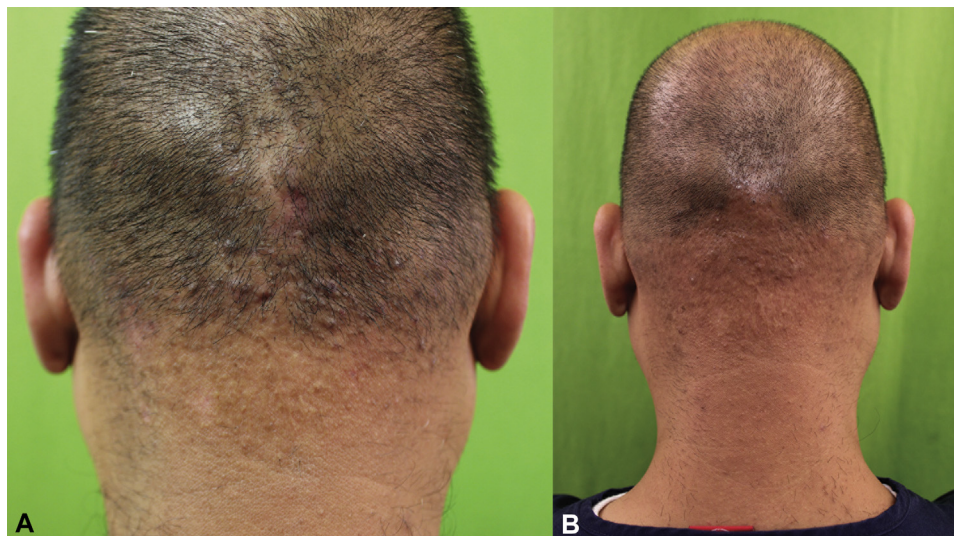


Fig 5. Case 2, before (A) and 1 year after (B) 5 sessions of ND-YAG laser treatments.

After 2 sessions of ND-YAG laser treatments using methods described for level III candidate (Fig 3, B) at 6- to 8-week intervals, the AKN lesions largely resolved with significant hair thinning in the entire treated zone. This patient preferred a thinning zone to complete baldness to have the option of grooming to mimic a tight crew-shaved appearance (Fig 6, B).

DISCUSSION

Currently, the only treatments with curative possibility for AKN are surgical and laser hair removal.¹⁻⁸ A common feature of both treatments is

the elimination of hair follicles at the center of the lesion. However, recurrent surgical removals may be necessary if the excisions are not carried to depths exceeding levels of the hair follicles. Although cure by radiation treatment has been used, in the single reported case, all lesional tufted hair was permanently lost at 20 months after therapy.¹⁰ The success of laser hair removal underscores the folliculocentric nature of the disease.⁵⁻⁸

Histologic studies have shown that hair follicles play a central role in both triggering the disease and perpetuating it into papules, indurated plaques, and masses.¹¹ It follows that hair follicle killing should



Fig 6. Case 3, before (A) and 3 months after (B) 2 sessions of ND-YAG laser treatments.

occur for laser hair removal to be effective in AKN lesion treatment.⁷

Generally, long-pulse, long-wave lasers are favored, including the long-pulsed Alexandrite 755 nm,⁷ the long-pulsed Diode 800 nm,⁶ and the long-pulsed Nd-YAG 1064 nm.^{5,8} These lasers can penetrate deeply enough to target the entire dermal expanse of the average follicular length of 2 to 4 mm (Fig 1) because of their longer wavelengths.

Of these lasers, Nd-YAG is favored by the author because it penetrates the deepest of the 3 lasers (5-7 mm)⁹ and is the least absorbed by melanin, resulting in lesser skin damage for the most affected demographic (men of color). The safety profile is additionally enhanced by contact or the dynamic cooling of the epidermis.

The advantage of the laser hair removal approach, especially in level I and II patients, is that the reward is immense—patients are rid of their disease permanently and with a very natural cosmetic outcome. Even level III patients have shown immense satisfaction and good outcomes. Furthermore, no wound is created in the process, so issues related to wound care and complications such as scarring are avoided. The drawback is that for some level II and III patients, the higher posterior hairline is not as natural looking. Patients whose lesions are more widespread (level III and IV) are typically unwilling to completely sacrifice their hair on a permanent basis. For this reason, they are first given the option to have fewer laser treatment sessions so that improvement or clearance of AKN lesions in the background of significant hair thinning rather than

complete hair elimination in the treated zone is considered a satisfactory outcome. These patients have often preferred having significant hair thinning instead of complete baldness in the treated zones (Fig 5, B). Patients still have the option of getting more laser treatment sessions to eliminate hair permanently should new lesions develop after a waiting period of 6 months.

Laser hair removal also carries all the known risks of laser hair treatment, such as first- and second-degree burns. These latter complications are generally self-limiting and easily treatable. Because the treated area is often already inflamed from AKN diseased tissue, it is especially susceptible to developing burns. For this reason, cautionary measures should be taken, including use of melanin-sparing laser hair removal wavelengths (Nd-YAG), lower energy settings, longer pulse durations, skin precooling, and avoiding double pulsing. Finally, multiple office visits over a period of at least 24 weeks are required.

CONCLUSION

Using the above methodology and selection criteria, laser hair removal can be an effective cure for AKN with good cosmesis.

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