Treatment of hidradenitis suppurativa with 755-nm alexandrite laser hair removal: A randomized controlled trial

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Background: Hidradenitis supprativa is a chronic inflammatory skin disease that can respond to treatment with laser hair removal.

Objective: To assess alexandrite laser hair removal laser as a treatment for hidradenitis suppurativa as measured by the Hidradenitis Supprativa Clinical Response.

Materials and methods: We conducted a prospective, randomized, controlled study in adult patients with hidradenitis supprativa. Participants underwent a series of 4 monthly laser treatments to 1 side of the body, with the contralateral side serving as a control. The primary outcome was Hidradenitis Supprativa Clinical Response at week 24, 8 weeks after the final laser treatment.

Results: The percent improvement across treated sites after 4 treatments was 72.73% axillary, 70% inguinal, and 100% inframammary. Across all body regions, Hidradenitis Supprativa Clinical Response was significantly higher for the sites treated with the alexandrite laser compared to the contralateral controls: 75% vs 33.33% (P = .0046, 95% CI: [0.16, 1]).

Limitations: The limitations of this study include a small sample size from which the data was collected.

Conclusions: The 775-nm alexandrite laser is a safe and effective treatment for hidradenitis supprativa at various anatomic sites in both resolving preexisting lesions and preventing new eruptions. (JAAD Int 2024;16:239-43.)

Key words: clinical research; general dermatology; laser; medical dermatology; surgery; treatment response.

INTRODUCTION

Hidradenitis suppurativa (HS) is a chronic, relapsing, painful skin disorder with a global prevalence ranging from 1% to 4%.[1] Treatment is challenging and typically consists of a combination and medical and surgical therapies, based on disease severity and lesion morphology.[2] While the exact pathogenesis of HS is unknown, it has been accepted that it involves occlusion of the hair follicle, which drives an inflammatory immune response.

Laser hair removal can be an effective therapy for patients suffering from HS as it targets the follicular origin of the disease. The neodymium: yttrium-aluminum-garnet laser has the strongest evidence supporting its utility. Case reports and series demonstrate the efficacy of the alexandrite laser, and a

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recent trial demonstrated efficacy in combination with oral zinc.[3,4] This trial studied the efficacy of the alexandrite laser in treating HS after 4 monthly sessions and to assess if the effect was maintained during 2 months of follow-up. Previous studies have demonstrated that long-pulsed alexandrite laser results in less pain and more efficiency than the Nd:YAG laser in cosmetic laser hair removal.[5] The shorter wavelength of the alexandrite laser, makes it more effective for hair removal on lighter skin tones because it is more readily absorbed by melanin in the hair follicles. Additionally, the alexandrite laser has a larger spot size than the neodymium: yttrium-aluminum-garnet laser, which allows for faster treatment times.[6]

CAPSULE SUMMARY

- This article introduces a new laser type and wavelength in the treatment of hidradenitis suppurativa which has been previously treated with the neodymium: yttrium-aluminum-garnet laser.
- As a result of reading this article, dermatologists may be able to consider alternative treatment options for this chronic condition.

METHODS

We conducted a prospective randomized controlled trial of the 755-nm alexandrite hair removal laser (Gentlelase) in the treatment of HS. Adult patients with a diagnosis of HS with bilateral and symmetric involvement were recruited from a single center. Topical clindamycin 1% and benzoyl peroxide wash were the only allowed concomitant therapies. The axillae, inframammary, and groin regions were eligible for inclusion, and patients with involvement of multiple sites were eligible for treatment of each, so long as they had bilateral involvement of that site. One side was randomly selected as the treatment side, the other as an intrinsic control. Each participant completed a total of 4 treatments with the laser at 4-week intervals. During each treatment, the entire hair-bearing region was treated with a single pulse of the laser, with a 30% overlap. Active HS lesions were treated with an additional pulse. Assessment of Hidradenitis Suppurativa Clinical Response (HiSCR) was performed at baseline, each of the 4 treatments, and the final assessment at week 24, 8 weeks after the final laser treatment. The primary endpoint was HiSCR response at week 24. A spot size of 12 mm and a cryogen spray setting of 50/50 was utilized for all treatments. The laser fluence was based on Fitzpatrick skin type as follows:

Skin type I to II: 30 J/cm^2
Skin type III: 25 J/cm^2
Skin type IV: 18 J/cm^2
Skin type V: 16 J/cm^2
Skin type VI: 14 J/cm^2

Secondary assessments included pain (scored 0-3) and discharge (scored 0-3). A 1-tail 2-sample proportion test was used to evaluate the change in HiSCR from baseline to week 24 between treatment and control sides, as well to compare the response between axillary, inframammary, and inguinal regions.

RESULTS

Fifteen patients were enrolled in the study with a total of 24 distinct sites (Table I). The mean age was 37.6 with 80% (n = 12) female participants. The anatomic sites were 11 axillae, 10 inguinal, and 3 inframammary.

When all anatomic sites were combined, a statistically significant proportion of sites treated with the laser (75%) achieved HiSCR response on the treated sites (75%) compared to control sites (33.33%) (P = .0046 | 95% CI: [0.16, 1]) at week 24. The HiSCR response rate on the treated side of each region was: 72.73% axillary (8/11), 71.43% inguinal (5/7), and 100% inframammary (3/3). Sites were treated and all 3 responded (100%) and 3 pubic regions were evaluated and 2 of these responded (66.67%). Overall of 18 anatomic treated sites, 18 showed a response (75%), and 8 of the control sites did not (33.33%).

Between treatment sites, there were no statistically significant differences in HiSCR response. Our study was not powered to detect these changes because of the limited sample size. The response rates in patients with axillary disease and inguinal disease were comparable. Patients with inframammary disease had the highest response rate in our study (n = 3, 100%).

Additionally, patient sites that were treated with the alexandrite laser demonstrated a reduction in pain (Table II). Patients reported mild pain in keeping with the known discomfort during laser hair removal. No patients discontinued treatment due to any side effects.

DISCUSSION

HS is a debilitating inflammatory skin disease with pathogenesis centered on the folliculosebaceous unit. Treatment modalities target various aspects in the pathogenesis of the disease, including bacterial colonization, inflammatory pathways, hormonal regulation, and occlusion of the hair follicle. Through destruction of the hair follicle and

Abbreviations used:

HS: hidradenitis suppurativa
HiSCR: Hidradenitis Suppurativia Clinical Response

regression of the folliculosebaceous unit, laser hair removal has demonstrated efficacy in treating HS.[6,7] In theory, any light-based treatment capable of hair follicle destruction would be beneficial, and this is supported by trials, case reports, and case series for the Nd:YAG, alexandrite, diode, and intense pulsed light.[1,8-10]

Currently, Nd:YAG laser hair removal has the most robust evidence supporting efficacy in HS. Across 4 randomized controlled trials with a total of 99 patients, 31.6% to 72% improvement has been demonstrated, with remission lasting at least 2 months after a course of 2 to 4 monthly treatments.[1,8,11,12] Nd:YAG laser hair removal also demonstrated efficacy in early (Hurley stage I) disease, with decreased self-reported decreases in number of flares and severity, in a case series of 27 patients after a mean of 9.8 treatments at 4 to 6 week intervals.[11]

Until recently, the evidence supporting the alexandrite laser for HS was based on 3 case reports.[4,13] None of the cases utilized validated outcome measures, with one reporting discontinuation of oral antibiotics and the others simply reporting disease improvement.[4] More recently, a prospective study of the efficacy of the alexandrite laser in combination with oral zinc supplementation (zinc gluconate 90 mg per day) was compared to oral zinc therapy alone in patients with Hurley stage I to II HS. Patients were treated with 5 sessions at 6-week intervals and evaluated at baseline, 15, and 30 weeks. At 30 weeks, 70% of patients in the alexandrite group achieved HiSCR, compared to 20% in the zinc group. Scores for pain and Dermatology Life Quality Index also demonstrated significant improvements in the group treated with laser. Disease-free survival was significantly longer in the laser treatment group as well (26.4 ± 6.6 weeks vs 12.3 ± 2.1 weeks, $P = .001$).[5]

Our study provides high-level evidence that treatment with 755-nm alexandrite laser is effective and well-tolerated in the treatment of HS. Our HiSCR response rate of 70% is similar to that seen in trials of alexandrite and Nd:YAG laser hair removal, supporting the hypothesis that any light-based method of hair removal can benefit patients with HS. While this response rate appears impressive in comparison to HiSCR responses seen with biologic medications studied for HS, it is important to note the differences in baseline characteristics, with our trial including

Table I. Subject demographics

Patient	Age	Hurley stage	Gender	Skin type
1	41	2	F	5
2	39	3	M	2
3	35	2	M	4
4	43	1	F	2
5	28	2	F	2
6	33	2	F	3
7	45	2	F	5
8	45	2	F	4
9	50	3	F	5
10	30	2	F	5
11	31	2	F	5
12	29	2	M	5
13	46	2	F	2
14	22	2	F	3
15	47	2	F	4

Hurley stage I patients and only 2 patients with Hurley stage III disease. As disease progresses with tunnel and scar formation, the drivers of disease activity shift, with epithelialized tunnels serving as a source of inflammation.[9] The combination of scar tissue impeding laser penetrance and the nidus of inflammation evolving from the folliculosebaceous unit to epithelialized tunnels may explain the decreased efficacy of laser hair removal in advanced HS. While our study was not powered to assess differences in treatment response for different body regions, the inframammary region demonstrated the greatest response rate, higher than prior studies of laser hair removal. This can be explained by the low number of inframammary regions treated ($n = 3$), and the fact that 1 patient was male, with more terminal hairs in the area. While patients experienced predictable discomfort during laser treatment sessions, none experienced other adverse events associated with treatment, demonstrating the known safety profile of laser hair removal applies to the treatment of active, inflamed lesions in HS.

This randomized controlled trial demonstrated the safety and efficacy of 755-nm alexandrite laser hair removal in HS, particularly in mild to moderate disease. The findings represent a significant advancement to our treatment armamentarium for the complex and challenging management of HS. Currently, the North American Treatment Guidelines reflect the existing level III evidence supporting alexandrite laser hair removal with a level C strength of recommendation.[2] The level II evidence provided by this randomized controlled trial provides support to dermatologists and patients in utilizing shared decision-making to optimize care of HS, while also providing opportunities to advocate for coverage of

Table II. Baseline and treatment counts across all subject sites including pain

		Treatment						Control					
		Abscess nodule count		Fistula count		Pain score (0-3)		Abscess nodule count		Fistula count		Pain score (0-3)	
Patient	Site	Baseline	Week 24	Baseline	Week 24	Baseline	Week 24	Baseline	Week 24	Baseline	Week 24	Baseline	Week 24
1	**Axilla**	**3**	**0**	**1**	**1**	**1**	**0**	**6**	**2**	**1**	**1**	**1**	**1**
1	**Groin**	**2**	**1**	**1**	**1**	**2**	**1**	**4**	**2**	**1**	**1**	**2**	**1**
2	Axilla	4	3	1	1	2	2	4	2	0	1	2	1
2	Groin	4	9	0	0	3	2	4	3	0	0	3	0
3	**Axilla**	**13**	**2**	**0**	**0**	**0**	**0**	**10**	**4**	**0**	**0**	**0**	**0**
3	**Groin**	**10**	**0**	**1**	**0**	**0**	**0**	**9**	**2**	**0**	**0**	**0**	**0**
3	**Pannus**	**12**	**1**	**0**	**0**	**0**	**0**	**7**	**0**	**1**	**1**	**0**	**0**
4	**Axilla**	**4**	**0**	**0**	**0**	**1**	**1**	**5**	**1**	**0**	**0**	**1**	**0**
5	Axilla	4	3	2	1	2	1	4	2	2	0	2	0
5	**Groin**	**4**	**1**	**0**	**0**	**0**	**0**	**6**	**6**	**0**	**1**	**0**	**3**
6	**Groin**	**4**	**1**	**0**	**0**	**1**	**3**	**5**	**2**	**0**	**0**	**1**	**0**
7	**Axilla**	**4**	**1**	**2**	**0**	**3**	**0**	**3**	**3**	**1**	**1**	**3**	**1**
8	**Axilla**	**7**	**1**	**3**	**0**	**3**	**0**	**8**	**9**	**3**	**1**	**3**	**2**
9	**Axilla**	**4**	**0**	**0**	**0**	**0**	**0**	**3**	**3**	**0**	**0**	**0**	**0**
10	**Axilla**	**5**	**0**	**0**	**0**	**1**	**0**	**5**	**7**	**0**	**0**	**1**	**3**
11	**Groin**	**3**	**1**	**0**	**0**	**3**	**0**	**4**	**6**	**0**	**0**	**3**	**3**
12	**Inframammary**	**4**	**0**	**0**	**0**	**0**	**0**	**2**	**3**	**0**	**0**	**0**	**3**
13	**Inframammary**	**4**	**0**	**0**	**0**	**1**	**0**	**4**	**4**	**0**	**0**	**1**	**1**
13	**Supragroin**	**3**	**0**	**0**	**0**	**3**	**0**	**4**	**2**	**1**	**0**	**3**	**2**
14	**Axilla**	**4**	**2**	**0**	**0**	**0**	**1**	**3**	**1**	**0**	**0**	**0**	**1**
14	**Groin**	**2**	**0**	**0**	**0**	**0**	**0**	**1**	**3**	**0**	**0**	**0**	**0**
15	**Axilla**	**7**	**2**	**0**	**0**	**0**	**1**	**9**	**6**	**0**	**0**	**0**	**1**
15	**Inframammary**	**4**	**0**	**0**	**0**	**1**	**0**	**6**	**1**	**0**	**0**	**1**	**0**
15	Supragroin	4	3	0	0	2	3	6	4	0	0	2	0

Hidradenitis Suppurativa Clinical Response Score responders in bold.

laser hair removal as a safe and effective therapy in early HS.

Conflicts of interest

None disclosed.

REFERENCES

1. Miller IM, McAndrew RJ, Hamzavi I. Prevalence, risk factors, and comorbidities of hidradenitis suppurativa. *Dermatol Clin*. 2016;34:7-16.
2. Alikhan A, Sayed C, Alavi A, et al. North American clinical management guidelines for hidradenitis suppurativa: a publication from the United States and Canadian Hidradenitis Suppurativa Foundations: part I: diagnosis, evaluation, and the use of complementary and procedural management. *J Am Acad Dermatol*. 2019;81(1):76-90. https://doi.org/10.1016/j.jaad.2019.02.067
3. Chan J. Long-pulsed alexandrite laser for treatment of hidradenitis suppurativa. *J Am Acad Dermatol*. 2013;68:AB224. https://doi.org/10.1016/j.jaad.2012.12.927
4. Koch D, Pratsou P, Szczecinska W, Lanigan S, Abdullah A. The diverse application of laser hair removal therapy: a tertiary laser unit's experience with less common indications and a literature overview. *Lasers Med Sci*. 2015;30:453-467.
5. Rao J, Goldman MP. Prospective, comparative evaluation of three laser systems used individually and in combination for axillary hair removal. *Dermatol Surg*. 2005;31:1671-1676. discussion 1677.
6. Mahmoud BH, Tierney E, Hexsel CL, Pui J, Ozog DM, Hamzavi IH. Prospective controlled clinical and histopathologic study of hidradenitis suppurativa treated with the long-pulsed neodymium:yttrium-aluminium-garnet laser. *J Am Acad Dermatol*. 2010;62(4):637-645. https://doi.org/10.1016/j.jaad.2009.07.048
7. Tierney E, Mahmoud BH, Hexsel C, Ozog D, Hamzavi I. Randomized control trial for the treatment of hidradenitis suppurativa with a neodymium-doped yttrium aluminium garnet laser. *Dermatol Surg*. 2009;35(8):1188-1198. https://doi.org/10.1111/j.1524-4725.2009.01214.x
8. Naouri M, Maruani A, Lagrange S, et al. Treatment of hidradenitis suppurativa using a long-pulsed hair removal neodymium:yttrium-aluminium-garnet laser: a multicenter, prospective, randomized, intraindividual, comparative trial. *J Am Acad Dermatol*. 2021;84(1):203-205. https://doi.org/10.1016/j.jaad.2020.04.117
9. Navrazhina K, Frew JW, Gilleaudeau P, Sullivan-Whalen M, Garcet S, Krueger JG. Epithelialized tunnels are a source of inflammation in hidradenitis suppurativa. *J Allergy Clin Immunol*. 2021;147(6):2213-2224. https://doi.org/10.1016/j.jaci.2020.12.651
10. Piccolo D, Di Marcantonio D, Crisman G, et al. Unconventional use of intense pulsed light. *BioMed Res Int*. 2014;2014:618206. https://doi.org/10.1155/2014/618206

11. Vossen ARJV, van der Zee HH, Terian M, van Doorn MBA, Prens EP. Laser hair removal alters the disease course in mild hidradenitis suppurativa. *J Dtsch Dermatol Ges*. 2018;16(7):901-903. https://doi.org/10.1111/ddg.13563
12. Xu LY, Wright DR, Mahmoud BH, Ozog DM, Mehregan DA, Hamzavi IH. Histopathologic study of hidradenitis suppurativa following long-pulsed 1064-nm Nd:YAG laser treatment. *Arch Dermatol*. 2011;147(1):21-28. https://doi.org/10.1001/archdermatol.2010.245
13. Tsai YC, Wang SH, Lu PH, Tsai TH. Hidradenitis suppurativa treated with a long-pulsed Alexandrite laser. *Dermatol Sin*. 2014;32:115-117. https://doi.org/10.1016/j.dsi.2013.04.00