

CASE REPORT



Long-term outcome of a patient with paradoxical hypertrichosis after laser epilation

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ABSTRACT

One underreported, rare side effect of laser hair removal is paradoxical hypertrichosis. It is largely unknown what the long-term outcomes are of patients who develop this complication. We report a 21-year-old, Fitzpatrick II, male patient, who had patchy areas of dark hair affecting various body areas. An Alexandrite 755 nm laser was used to address the desired areas at energies between 20 and 22 J/cm² at 10–12-week intervals over a course of seven treatments. After three treatments, the patient noted a significant increase in the density and length of hairs involving the back, shoulders, neck, and upper arms. The patient was followed on a biannual basis, without further epilatory intervention. After 10 years, the areas of paradoxical hair growth were sparser compared to immediate post-treatment but remained denser compared to pre-treatment. This case illustrates improvement in the condition over time without intervention. Further studies are needed to determine the etiopathogenesis of this phenomenon.

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Introduction

Unwanted body hair is a significant aesthetic issue for many, resulting in individuals feeling physically and emotionally unappealing. Laser hair removal (LHR) is largely a safe and effective method of treatment of unwanted body hair offering permanent hair reduction for the right candidates (1–6). Potential side effects such as burns, folliculitis, pigmentation changes, scarring, and eye injury are well reported in the literature (7,8). One notable side effect that appears to be underreported is the paradoxical growth of hair in areas previously treated, or adjacent to areas treated, with laser epilation. In this study, we report the long-term outcome of a patient who developed laser-induced paradoxical hypertrichosis who was followed over a 10-year period without further epilatory intervention.

Materials and methods

A case of an individual patient was reviewed. Institutional review board approval (Pro00067960) and patient consent was obtained prior to accessing medical records. A 21-year-old male, with Fitzpatrick type II skin, presented in July 2005 to a med-spa and was assessed by a registered nurse as having patchy areas of dark hair on the upper and lower legs, buttocks, shoulders, upper and lower back, posterior neck, chest, and arms. He was healthy and denied having any known hormonal conditions. He did not report taking any medications throughout the study period, including steroids, and he had not previously undergone any form of prior depilatory treatment. Unfortunately, no pre-treatment photographs were taken and a test spot was not performed.

The patient received treatments to the above-mentioned areas with a long-pulsed Alexandrite 755 nm laser at energies between 20 and 22 J/cm². Treatments were performed at 10–12-week intervals over a course of seven treatments. During the treatment period, each treatment provided temporary hair clearance. After three treatments, the patient noted a significant increase in the density and length of hairs particularly affecting the upper back, neck, and upper arms. The patient reported satisfactory results with permanent hair reduction of the legs, buttocks, and no change in chest hair density. After seven treatments with the Alexandrite laser, the same practitioner transitioned to an intense pulsed light (IPL) system but temporary hair clearance was not achieved with one treatment.

Results

Frustrated with these results, the patient first presented to our facility in December 2006 and was offered laser therapy to the affected areas at higher fluences. Endocrine workup was performed and revealed no evidence of hormonal abnormalities. The patient desired no further treatment due to financial constraint, but agreed to follow up on a biannual basis and interval photo documentation was performed to track changes over time. He did not undertake further epilatory treatments of any kind but did he shave his anterior and posterior neck frequently.

Without pre-treatment photos, it was hard to determine the extent of laser-induced hypertrichosis. Per the patient's description, prior to commencing treatments, he had a few fine vellus hairs of the upper back and shoulders and sparse vellus hairs of the upper arms. Figure 1 shows dense hair



Figure 1. Six-month post-treatment photographs show dense hair growth involving the upper arms and upper back.



Figure 2. Three-year post-treatment photographs show mild regression of the upper back and shoulder hair.



Figure 3. Five-year post-treatment photographs show mild reduction of the upper arm hair density and length and reduction of upper back hair density.

growth involving the upper arms and upper back 6 months after completing seven treatments with the Alexandrite 755 nm laser and one treatment with an IPL system. At 3 years post treatment, there was minimal change in the upper arm hair density and length but some regression of the upper back and shoulder hair (Figure 2). The patient did not note any changes in hair density of the upper arms and back at this stage. After 5 years, continued regression of the upper back and shoulder hair was noted with some mild reduction of the

upper arm hair density and length (Figure 3). At 7 years post treatment, the patient believed the upper back and shoulder hair was near back to his baseline before undertaking LHR treatments. We noted continued reduction in the density and length of hairs involving the upper arms (Figure 4). After 10 years, the patient had a few fine upper back hairs and felt the appearance of his back had returned to his pre-treatment baseline. The upper arm hair had also significantly improved over time but the hair remained denser and longer compared



Figure 4. Seven-year post-treatment photographs show continued reduction in the density and length of hairs involving the upper arms and upper back hair close to the patient's pre-treatment baseline.



Figure 5. Ten-year post-treatment photographs show a few fine hairs involving the upper back and shoulders and marked improvement in the density and length of upper arm hair.

to pre-treatment (Figure 5). Due to financial constraints, the patient did not wish to pursue re-treatment of the affected areas at higher fluences.

Discussion

This is the first reported case documenting the natural progression of a patient with paradoxical laser-induced hypertrichosis over a significant length of time. This patient had near complete body LHR and reported an 80% clearance of lower body hair, no change in chest hair reduction and paradoxical growth of hair involving the upper arms, shoulders, and neck. We found the areas where patient had vellus hairs, mainly the upper arms and neck, were most affected.

In this case, the phenomenon was observed in the treated areas, not adjacent to the treated areas as is reported in other studies (9,10). This may have been due to the use of suboptimal fluences to treat the affected areas. Many consider 27.5 J/cm² the lower effective standard treatment energy threshold to provide permanent hair reduction results (11–16). For this patient, energies between 20 and 22 J/cm² were used to treat the affected areas and paradoxical hair growth was noted after three treatments. As our patient was followed over a 10-year period and the areas with paradoxical hair growth were slow to regress, the theory of hair cycle synchronization was less plausible in this case. As Bernstein and other authors suggest,

LHR relies on a complex set of biological events involving an inflammatory response to laser treatment and a subsequent urticarial reaction develops surrounding each hair shaft (10,12). Unfortunately, we do not currently fully understand this inflammatory response but it appears to play an important role in the development of paradoxical hair growth.

As Marayiannis and colleagues also found, hair induction occurred several months after commencing LHR treatments and at least three treatments were performed before the patient noted increased hair growth (17). This does indicate paradoxical hypertrichosis is a phenomenon that occurs over time and patients should be carefully re-evaluated after 2–3 treatments to ensure paradoxical hair growth has not occurred. Although the current literature suggests those with a darker skin type (Fitzpatrick III–IV) are most commonly affected (11,18,19), our patient had a lighter skin tone (Fitzpatrick II) with dark hair, suggesting this phenomenon can also effect individuals with lighter skin types as well. An endocrine workup should always be performed in patients who develop paradoxical hair growth.

From our observation over a 10-year period, there was apparent regression of terminal hairs in the areas only where paradoxical hair growth was present, despite no further epilatory intervention. This is contradictory to our current understanding of how hair follicles behave as we age. As we know, the total number of hair follicles is fixed before birth and the ratio of terminal hair to vellus hair increases with age,

Table 1. Richards–Meharg hair growth table.

	Percentage of resting hairs in telogen	Percentage of growing hairs in anagen	Percentage of transition hairs in catagen	Percentage of uncertain growth stage	Duration of growth time in telogen	Duration of growth time in anagen	Number of follicles per square cm	Daily hair rate of growth (mm)	Total number of follicles in the area	Approximate depth of the terminal anagen follicle (mm)
<i>Head</i>										
Scalp	13	85	1–2	1–2	3–4 months	2–6 years	350	0.35	1 million follicles total for all of the head and scalp	3–5
Eyebrows	90	10			3 months	4–8 weeks		0.16		2–2.5
Ear	85	15			3 months	4–8 weeks				
Cheeks	30–50	50–70					880	0.32		2–4
Beard-chin	30	70			10 weeks	1 year	500	0.38		2–4
Moustache, upper lip	35	65			6 weeks	16 weeks	500			1–2.5
<i>Body</i>										
Axillae	70	30			3 months	4 months	65	0.3		3.5–4.5
Trunk	NA	NA					70	0.3	425,000	2–4.5
Pubic area	70	30			3 months	4 months	70			3.5–5
Arms	80	20			18 weeks	13 weeks	80	0.3	220,000	
Legs/Thighs	80	20			24 weeks	16 weeks	60	0.21	370,000	2.5–4
Breasts	70	30					65	0.35		3–4.5

especially in men (20). When paradoxical hypertrichosis occurs, it appears an aberrant inflammatory reaction, secondary to laser treatment, results in vellus hairs undergoing transformation into terminal hairs, which then slowly regress back to vellus hairs over many years. Furthermore, there is less regression of paradoxical hair growth from terminal to vellus hair over time in body areas where vellus hairs are found, such as the neck and upper arms, compared to body areas where more terminal hair is present, such as the upper back in men.

Another factor that has not been well explored in relation to paradoxical hair growth is treatment interval length. Hair growth models suggest the follicle germinative epidermal cells reside in the so-called bulge area of the follicle. These cells form the new hair matrix to initiate the growth, anagen, phase during the conclusion of the telogen phase. Theoretically, it is during this rapidly dividing period that the hair follicle is most sensitive to the thermal effects imparted from a laser or other light source (20). Therefore, the ideal treatment interval seems to be as soon as hair regrowth occurs, which varies by anatomic location (Table 1) (21). However, this theory has never been confirmed, and hence the reason for considerable variation between practitioners when recommending intervals between treatment sessions. Schroeter and colleagues determined that most cases of terminal hair growth in their study occurred when treatment intervals were more than 8 weeks apart. As a result, they advise that the interval between treatments be between 4 and 6 weeks (22). In 2000, Lloyd et al. performed a study of 11 patients who received five treatments at 3-week intervals to the right groin using an Alexandrite laser and reported “excellent” results with 78% clearance of hair noted at 1 year (23). These findings suggest that the treatment interval of 10–12 weeks in our case may have been a predisposing factor for the development of paradoxical hypertrichosis and decreasing the amount of time between treatments may reduce the risk of this complication.

Our study is mainly limited by the lack of a control for comparison of body hair changes over time. Although vellus hair increases with age, especially in men, we cannot be

certain how the subjects’ hair growth patterns would have changed over time. Also, a lack of standardized pre-treatment photos and photos of other body areas is a further limitation of this study. However, over time it does appear that there is slow regression of terminal hairs in the areas of paradoxical hair growth.

Conclusion

Practitioners offering LHR should be aware of this rare complication and be cautious when treating body areas with vellus hair. Although the phenomenon appears to affect darker-skinned individuals, it can also affect those with lighter skin. Using suboptimal laser fluences and prolonged treatment intervals may predispose individuals to the development of this unwanted side effect. On a practical level, paradoxical hypertrichosis should be listed on the informed consent and pre-treatment photographs of all patients are paramount. Further studies are needed to elucidate the pathogenesis of this entity and understand factors that lead to its occurrence.

Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the article.

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