CASE REPORT

Successful Treatment of Laser Induced Hypopigmentation with Narrowband Ultraviolet B Targeted Phototherapy

Q-switched 1064 nm neodymium-doped yttrium aluminium garnet (Qs 1064 nm Nd: YAG) laser plays an important role in the treatment of pigmentary skin disorders, including tattoos. Although it has high efficacy and safety, adverse effect like hypopigmentation may occur causing anxiety to patients. We present a case report of Qs 1064 nm Nd: YAG laser induced hypopigmentation which was successfully treated with ultraviolet B targeted phototherapy, with rapid and satisfactory re-pigmentation.

KEYWORDS: Laser induced hypopigmentation, Q-switched 1064 nm neodymium-doped yttrium aluminium garnet laser, targeted ultraviolet B phototherapy

INTRODUCTION

Q-switched 1064 nm neodymium-doped yttrium aluminium garnet (Qs 1064 nm Nd: YAG) laser has gained much popularity in the treatment of pigmented skin lesions and tattoos. It works on the principle of selective photothermolysis, generating ultra-short pulses of high energy and peak power, with an additional photoacoustic effect. The 1064-nm wavelength is selectively absorbed by chromophores such as melanin and ink particles.[1]

The most frequently encountered adverse reactions with this laser are hypopigmentation and hyperpigmentation, and rarely textural changes and scarring.[2] These complications are more common in darker skin types. Hypopigmentation in a dark skin patient causes much anxiety and its treatment is challenging. Phototherapy has been reported to be helpful in such a scenario.[3] We are presenting a case report of successful reversal of Qs 1064 nm Nd: YAG laser-induced hypopigmentation with ultraviolet B (UVB) targeted phototherapy (TPT).

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CASE REPORT

A 29-year-old male patient of Fitzpatrick skin type V approached us for tattoo removal treatment. He had a 6-month-old black tattoo of size 3 × 7 cm on the dorsum of his left hand [Figure 1]. He was treated with Qs 1064 nm Nd: YAG () (Dual- pulsed Q-switched Nd: YAG SPECTRA Laser, Lutronic Corporation) laser machine. The parameters used were 3 mm spot size, 2 Hz pulse rate and 3J fluence in the first session. The subsequent sessions were scheduled at 1 month interval and the fluence was gradually increased to 8J. Patient had a very good response to the treatment with 85% clearance of the tattoo but reported to us with depigmentation at 4 weeks after the 6th session of laser treatment [Figure 2]. Patient was then subjected to targeted UVB phototherapy twice a week starting on the same day, using TPT device (Lumera: Targeted Phototherapy, Daavlin Company), which delivered UVB radiations at a dosage of 100 mJ/s, at a full lamp output of 100 mW/cm^2. The starting duration of therapy was 4 s and gradually increased by 1 s at every session, depending on the response to previous session. Patient started showing re-pigmentation after two sessions and a very good response was seen after six sessions at 9 s duration of phototherapy [Figure 3]. The energy delivered at 9 s with the Lumera system was 275 mJ/cm^2.

DISCUSSION

Pigmented lesions of skin respond to laser and light of wavelength ranging from 290 nm to 1200 nm, as

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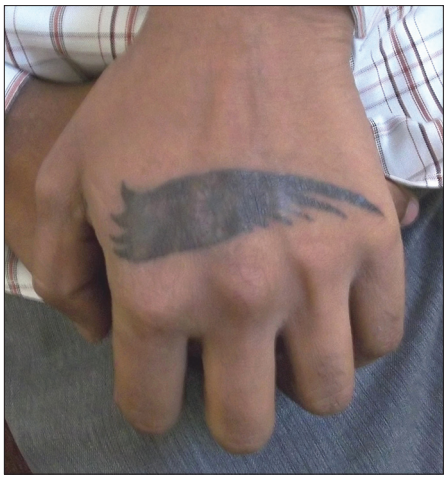

Figure 1: Black coloured tattoo on the dorsum of left hand

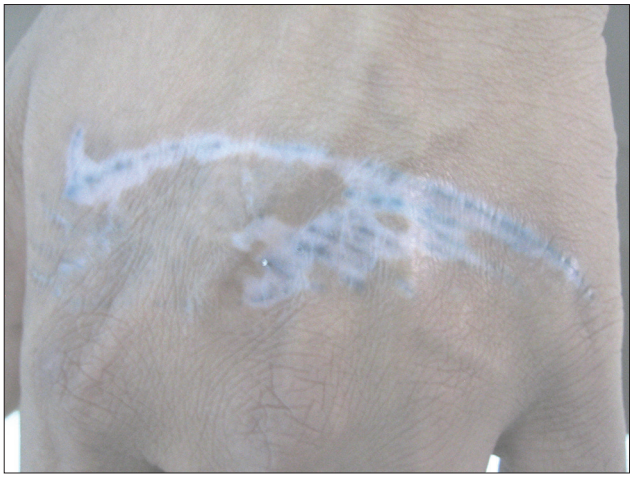

Figure 2: Depigmentation following treatment with Qs 1064 nm neodymium-doped yttrium aluminum garnet laser

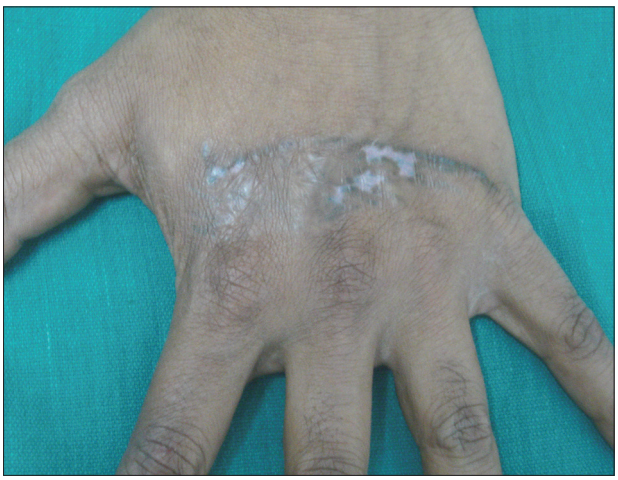

Figure 3: Repigmentation following targeted ultraviolet B phototherapy

melanin absorbs light of this wavelength. The Qs laser has a special property of generating ultra-short (nanosec) range of pulses with high peak power.[1] The Qs lasers such as Nd: YAG, Ruby and Alexandrite are preferred to treat pigmentary lesions, although long pulsed laser such as diode is also useful. These lasers function on the principle of selective photothermolysis and also produce photoacoustic effect by generating shock waves that cause explosion of the targets such as melanin and ink particles, which are later gradually removed from the site through circulation.[2] The resultant effects include dermal and epidermal melanosome rupture, melanosome rupture in melanocytes and destruction of dermal melanophages.[4,5]

As in any aesthetic treatment, side effects can occur in this laser treatment also. The most commonly occurring side effects are hypo and hyperpigmentation, the risk being higher in darker skin types. Hypopigmentation occur as small white macules matching the laser spot size and shape, within weeks of treatment.[3] These may last for few months and may rarely become permanent. The risk of hypopigmentation appears to be directly proportional to the number of treatment sessions and fluence.[6] However, these side effects can be avoided by using the right fluence tailored to individual patient. A test patch in the covered area may be helpful to decide the appropriate fluence. Only a slight sensation of warmth in the treated area is enough to produce the effect and avoid side effect at the same time. Petechiae or crusting as the end point should be avoided in Qs laser treatment. Histological features of laser induced hypopigmentation include marked decrease in melanin with only slight decrease in basal epidermal melanocytes.[7] Thus, the hypopigmentation is likely to be temporary.

Treatment of hypopigmentation in a dark skinned patient can cause much psychological distress and is challenging. Different treatment options previously reported to be effective include topical medication such as Psoralen with ultraviolet A phototherapy PUVA and Narrow band ultraviolet B NB-UVB phototherapy, 308 nm Excimer laser and Fractional resurfacing.[6,8-10] Phototherapy helps in re-pigmentation by stimulation of melanocyte-stimulating hormone (MSH), increased melanocyte proliferation, and melanogenesis. UVB radiation causes increased MSH receptor activity by redistributing MSH receptors from internal pools to the external surface, with a resultant increase in cellular responsiveness to MSH.[11-13] TPT induces all these effects in a more aggressive way, because of delivery of super-erythemogenic doses of radiation.[14] Hence this treatment is reported to be effective in fewer treatment sessions. Furthermore, since it specifically targets the affected skin, it avoids many of the side effects of conventional phototherapy. It is, therefore, particularly suitable for management of laser induced, which is a localized form of hypopigmentation.

The Qs 1064 nm Nd: YAG laser treatment was used in our patient for pigmentary skin condition like tattoo. Though, good clinical response was seen, it led to hypopigmentation as side effect. TPT was chosen to treat the hypopigmentation because of the above advantages of this treatment modality. Targeted UVB phototherapy produced rapid re-pigmentation response in our patient. Narrow band UVB, excimer laser and fractional lasers have been reported to be effective in treating post laser hypopigmentation. However, to the best of our knowledge, only one case of TPT in Qs laser induced hypopigmentation has been reported before.[3] This case report, therefore, represents the second documented use of TPT in Qs Nd: YAG laser induced hypopigmentation.

TPT appears to be a suitable alternative in the treatment of laser induced hypopigmentation, because of its effectiveness and rapid response needing fewer treatment sessions with minimal side effects. The success of TPT suggests that the melanocyte damage caused by Qs Nd: YAG laser is reversible and temporary.

REFERENCES

1. Aurangabadkar S, Mysore V. Standard guidelines of care: Lasers for tattoos and pigmented lesions. Indian J Dermatol Venereol Leprol 2009;75:111-26.
2. Aurangabadkar S. Lasers for pigmented lesions and tattoos. In: Venkataram M, editor. ACS (I) Textbook on Cutaneous and Aesthetic Surgery. New Delhi: Jaypee; 2012. p. 797-813.
3. Reszko A, Sukal SA, Geronemus RG. Reversal of laser-induced hypopigmentation with a narrow-band UV-B light source in a patient with skin type VI. Dermatol Surg 2008;34:1423-6.
4. Anderson RR. Laser-tissue interactions in dermatology. In: Arndt KA, Dover JS, Olbricht SM, editors. Lasers in Cutaneous and Aesthetic Surgery. Philadelphia: Lippincott-Raven; 1997. pp. 25-32.
5. Anderson RR, Margolis RJ, Watenabe S, Flotte T, Hruza GJ, Dover JS. Selective photothermolysis of cutaneous pigmentation by Q-switched Nd: YAG laser pulses at 1064, 532, and 355 nm. J Invest Dermatol 1989;93:28-32.
6. Kono T, Manstein D, Chan HH, Nozaki M, Anderson RR. Q-switched ruby versus long-pulsed dye laser delivered with compression for treatment of facial lentigines in Asians. Lasers Surg Med 2006;38:94-7.
7. Grimes PE, Bhawan J, Kim J, Chiu M, Lask G. Laser resurfacing-induced hypopigmentation: Histologic alterations and repigmentation with topical photochemotherapy. Dermatol Surg 2001;27:515-20.
8. Glaich AS, Rahman Z, Goldberg LH, Friedman PM. Fractional resurfacing for the treatment of hypopigmented scars: A pilot study. Dermatol Surg 2007;33:289-94.
9. Tierney EP, Hanke CW. Treatment of CO2 laser induced hypopigmentation with ablative fractionated laser resurfacing: Case report and review of the literature. J Drugs Dermatol 2010;9:1420-6.
10. Gundogan C, Greve B, Hausser I, Raulin C. Repigmentation of persistent laser-induced hypopigmentation after tattoo ablation with the excimer laser. Hautarzt 2004;55:549-52.
11. Grimes PE. Advances in the treatment of vitiligo: Targeted phototherapy. Cosm Dermatol 2003;16:18-22.
12. Chakraborty AK, Funasaka Y, Slominski A, Bolognia J, Sodi S, Ichihashi M, *et al*. UV light and MSH receptors. Ann N Y Acad Sci 1999;885:100-16.
13. Chakraborty A, Slominski A, Ermak G, Hwang J, Pawelek J. Ultraviolet B and melanocyte-stimulating hormone (MSH) stimulate mRNA production for alpha MSH receptors and proopiomelanocortin-derived peptides in mouse melanoma cells and transformed keratinocytes. J Invest Dermatol 1995;105:655-9.
14. Mysore V. Targeted phototherapy. Indian J Dermatol Venereol Leprol 2009;75:119-25.

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