
Treatment Of Mediastinoscopy- Induced Keloid With Pulsed Light And Heat Energy (LHE): A Case Report

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ABSTRACT:

Background: Non-ablative lasers such as pulsed dye and Nd:YAG have been shown to improve texture, thickness, pliability, and symptoms of keloids. Recently a non-laser, light and heat based, flash lamp device was introduced for the treatment of various skin lesions.

Objective: To clinically test the safety and efficacy of a light and heat based device in the treatment of a mediastinoscopy-induced keloid.

Methods: A fifty-six years old woman with an 18 months mediastinoscopy-induced keloid underwent 8 weekly treatments. Each treatment consisted of 6 pulses of light and heat energy (LHE). During the early sessions (1-4), a lower fluence of 5 J/cm² was used, whereas in subsequent treatments, an average of 9 J/cm² was used.

Results: A significant (>20%) structural shrinkage and softening of the keloid was observed as early as the 2nd treatment; pruritus sensation was completely resolved. After the 4th treatment, the keloid was less erythematous, flatter and softer. Following the 8th treatment, keloid length and width was reduced by as much as 30% and 60%, respectively, when compared to baseline. Patient's self-assessment after the 8th treatment was "excellent". There were no adverse side effects during or after treatments.

Conclusions: The LHE system is a safe and effective modality for the treatment of keloids. Further studies are warranted to optimize the number and frequency of treatments, the timing after keloid formation and best protocol parameters.

Introduction

A keloid is an overgrowth of dense fibrous tissue that usually develops after healing of a skin injury, as a result of an inherited metabolic alteration in collagen (1). The tissue extends beyond the borders of the original wound and usually does not regress spontaneously. Erythema, pruritus and dysesthesia are common sequelae. Although they occur in all skin types, keloids are most common in patients with darker skin.

As a primary treatment option, non-ablative laser therapy using 585nm pulsed dye (PDL) or 1064nm Nd:YAG has shown to improve texture, thickness, erythema, pliability, and symptoms of keloids with no long-term adverse effects (2-14). Multiple treatment sessions resulted in greater response.

Recently, a new broad-spectrum flash lamp device was introduced to treat selected photoaged skin lesions. This light and heat based system selectively targets blood capillaries and dermal collagen. Its safety and efficacy in the treatment of a mediastinoscopy- induced keloid was clinically tested.

Case description

Patient

A fifty-six year old woman (Fitzpatrick skin type II)

underwent mediastinoscopy 18 months ago. She was presented to the clinic with a 2cm x 0.5cm size keloid on the suprasternal notch. The keloid was raised (1-2mm), reddish, irritating and stiff (Figure 1). Before treatment, the patient complained of pruritus, and "pulling" sensation. She came to the clinic to seek cosmetic improvement. The patient refused any surgical intervention or intralesional corticosteroid injections.

Methodology & Treatment

The system used (SPR, Radiance, Orangeburg, NY) is a non-coherent, flash lamp device, operating at wavelengths between 400-1200-nm. Each pulse emits an energy density of between 5-10 J/cm² and a pulse width of 10 msec. The spot size is 35 x 12mm.

The patient underwent 8 weekly treatments. In each treatment, the affected area was exposed to 6 pulses, with 30% overlap. Each pulse was triggered by the practitioner at 30-second intervals. During the first sessions (1-4), lower fluence (average 5 J/cm²) was used, whereas in subsequent treatments (5-8), the fluence was increased to 9 J/cm². Pictures were taken before and immediately after each treatment (Nikon, Coolpix 885, Japan). The practitioner performed a

clinical assessment before each treatment. Patient self-assessment of the keloid was done at 12-24 hours post treatment and following the 8th treatment. Immediate treatment reactions and adverse side effects were observed and documented, as well as the presence or absence of symptoms such as pain and itching.

At the end of the 8th treatment, patient's self-assessment was graded according to the following scale: 0-25%=poor; 25-50%=fair; 50-75%=good; 75-100%=excellent. No local anesthesia or skin cooling means were used before, during or after the treatment. No topical steroidal cream or silicon creams were applied between treatments. Treatment was conducted as an office procedure. The patient was asked to avoid any cosmetic application over the treated area.

Results

Immediately after each treatment, the keloid became erythematous (resolved after 10-12 hours), softer and flatter. Patient reported no pain or discomfort.

As early as the 2nd treatment, there was significant (>20%) keloid shrinkage and softening and patient's pruritus sensation completely subsided. After the 5th treatment, the keloid was less erythematous, flatter and softer. Following the 8th treatment, keloid length and width was reduced by 30% and 60%, respectively, when compared to baseline (Figure 2). Patient's self-assessment was graded "excellent" following the 8th treatment.

Discussion

The textural and structural changes in the patient's keloid is in agreement with Alster and Williams (12) and Manuskiatti et. al. (4,5) who reported significant improvement in scar pliability after 2-4 treatments with PDL. In the current case, during each treatment session the patient received on average 6 pulses of light and heat energy (LHE™) (average fluence = 7.5J/cm²). Manuskiatti et. al. concluded that the clinical improvement of scars after PDL treatment demonstrated no significant fluence dependence with a trend to better response at lower fluence (3 J/cm²). In addition, the authors suggested that multiple (>2) treatment sessions provide greater percentage of scar resolution. Alster observed improvement rate ranging from 57-83% following 1-2 treatments with PDL, respectively. However, overall 2-6 treatments should be more effective.



The pulsed LHE system induces a micro-thermal trauma to the tissue via two distinct energy pathways: light-induced and heat radiation, both originating from the light unit assembly (LUA) of the system. The broad spectrum light has peaks at the optimal hemoglobin absorption range of 400-600 nm and thus is thought to effect the vasculature supply to the area in a similar way to that of the pulsed dye laser. Simultaneously with the light, the heat pulse stimulates neo-collagenesis as a result of a mild thermal insult to dermal collagen.

The definitive mechanism whereby keloid scars are improved after laser or LHE irradiation is not fully understood. It has been suggested that increased levels of collagenase (hypoxia induced by coagulation of capillary plexus) promote lysis of collagen, causing the keloid to flatten. Alternatively, collagen fiber heating with dissociation of disulfide bonds and subsequent collagen fiber realignment, and mast cell factors (including histamine) could affect collagen metabolism.

Although scars may spontaneously show improvement over 6-12 months after injury, some propose that laser treatment should begin within the first few weeks after injury, to abate scar proliferation. In our case, the patient's keloid was 18 months old, during which time the patient avoided any therapy. Interestingly, better clinical response was reported with PDL in scars less than 1 year old (84%) as compared with those more than 1 year old (68%). It is therefore conceivable that the textural changes seen in our case are of collagen remodeling and are similar to the improvement seen with treatment of photoaged skin.

In conclusion, the LHE system seems to be a safe and effective modality for the treatment of keloids. Larger clinical studies are warranted to determine treatment parameters, frequency and number of treatments for optimal clinical results.

References

1. Tredget EE, Nedelec B, Scott OG, Ghahary A. Hypertrophic scars, keloids, and contractures. The cellular and modular basis for therapy. *Surg Clin N Am* 1997;77(3) 701-730.
2. Alster T, Tanzi E. Hypertrophic scars and keloids: etiology and management. *Am J Clin Dermatol* 2003;4(4):235-43.
3. Lupton JR, Alster TS. Laser scar revision. *Dermatol Clin* 2002; 20(1): 55-65.
4. Manuskiatti W, Fitzpatrick RE. Treatment response of keloidal and hypertrophic sternotomy scars: comparison among intralesional corticosteroid, 5-fluorouracil, and 585-nm flashlamp pumped pulsed dye laser treatments. *Arch Dermatol* 2002 Sept;138(9):1149-55.
5. Manuskiatti W, Fitzpatrick RE, Goldman MP. Energy density and numbers of treatment affect response of keloidal and hypertrophic sternotomy scars to the 585-nm flashlamp-pumped pulsed-dye laser. *J Am Acad Dermatol*; 2001;45(4):557-65.
6. Paquet P, Hermanns JF, Pierard GF. Effect of the 585 nm flashlamp-pumped pulsed dye laser for the treatment of keloids. *Dermatol Surg* 2001;27(2):171-174.
7. Alster TS, Groover IJ. Laser revision of scars. www.emedicine.com/derm/topic519.htm. 2001.
8. Alster TS, Handrick C. Laser treatment of hypertrophic scars, keloids and striae. *Semin Cutan Med Surg* 2000 Dec;19(4):287-92.
9. Connell PG, Harland CC. Treatment of keloid scars with pulsed dye laser and intralesional steroid. *J Cutan Laser Ther* 2000 Sept;2(3):147-50.
10. Kumar K, et al. In-situ irradiation of keloid scars with NdYAG laser. *J Wound Care* 2000 May;9(5):213-5.
11. Alster TA, Bettencourt MS. Review of cutaneous lasers and their applications. *Southern Med J*; 1998;91(9):806-813.

12. Alster TS, Williams C. Treatment of keloid sternotomy scars with 585 nm flashlamp-pumped pulsed-dye laser. *Lancet* 1995; 345: 1198-200.
13. Dierickx C, Goldman MP, Fitzpatrick RE: Laser treatment of erythematous/hypertrophic and pigmented scars in 26 patients. *Plast Reconstr Surg* 1995 Jan; 95(1): 84-90.
14. Alster TS. Improvement of erythematous and hypertrophic scars by the 585-nm flashlamp-pumped pulsed dye laser. *Ann Plast Surg* 1994 Feb; 32(2): 186-90.

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