Enhancement of Contour Using Laser Scar Treatment in the One-Stage Nasal Ala Reconstruction with Nasolabial Fold Flap

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Postoperative scarring around the nasolabial area and alar rim poses very high cosmetic concerns, leading to patient dissatisfaction. Several strategies, like laser therapy, have been developed to improve its clinical aspects. However, to date, little is known about when in the early wound healing phases laser exposure would have the most optimal results. This paper introduces a remarkable case of effectively treating a 32-year-old male patient with scarring on the alar rim and nasolabial fold using early active laser treatment. We started carbon dioxide (CO\textsubscript{2}) laser therapy early in the second month after surgery. In the course of laser treatment, we performed a combined treatment using an ablative fractional CO\textsubscript{2} laser device and the combination of pulsed-dye laser and neodymium: yttrium-aluminum-garnet laser. A total of 7 sessions of CO\textsubscript{2} laser therapy and 3 sessions of cynergy laser therapy were performed, and the patient was followed-up for evaluation. These early laser treatments resulted in both patient and clinical satisfaction. In this case, we confirmed that early treatment with CO\textsubscript{2} laser and cynergy laser can have a positive effect on scarring of the alar rim and nasolabial fold.

Key words
Nasal ala contour; Fractional carbon dioxide laser; Cynergy; Multiflex; Early laser therapy

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INTRODUCTION

The scars around the nasolabial area and the alar rim have very important cosmetic concerns. There are various studies reporting about the reconstruction of the alar defects caused by trauma or tumor. The reconstruction of the full-thickness defects involving the alar cartilage and mucosa may present difficulties because of the complex 3-dimensional structure of the alar region.1 After reconstructions performed using inappropriate methods, functional problems including the collapse of the external nasal valve and esthetic problems such as retraction in the alar wing or asymmetry may develop. Therefore, re-establishing the 3-dimensional structure of the nasal ala is of utmost importance in the reconstruction to be performed. One of the effective classic methods used in nasal alar reconstructions is the nasolabial flap. Thanks to the laxity of the cheek tissue, full-thickness alar reconstructions can be performed using nasolabial flaps. The flap donor area is primarily repaired, and the scar is aligned with the nasolabial fold.2

Especially after the surgery of the nose, the scar can make the patient suffer from cosmetic difficulties and reduce social confidence. Multiple strategies have been developed to prevent or improve postoperative surgical scarring, including silicone sheets, topical corticoids, dermabrasion, and laser therapy.3 Over the past decade, laser skin resurfacing with carbon dioxide (CO2) and erbium (Er):yttrium-aluminum-garnet (YAG) lasers has become popular for the treatment of scars. The ablative fractional CO2 laser combines the concept of fractional photothermolysis with an ablative 10,600 nm wavelength.4,5 However, little is known on when in the early wound healing phases laser exposure most optimally should be provided.

CASE REPORT

This case is a 30-year-old male patient with a skin defect of the alar rim caused by direct trauma. The patient underwent a subcutaneous pedicle nasolabial island flap to reconstruct the nasal defects. The flap to be elevated from the nasolabial fold was drawn with its width equaling the height of the defect and its height at least twice as long as the width of the defect. The flap donor area (nasolabial fold) is closed with primary suture (Fig. 1, 2).

Two months after the flap operation, the patient started an early laser treatment for scar treatment. We used two laser machines, an ablative fractional CO2 laser device (LineXel®; UTI Co. Ltd, Seoul, Korea) and the combination of pulsed-dye laser (PDL) and neodymium (Nd):YAG laser (Cynergy with MultiPlex; Cynosure, Westford, MA, USA) which allows the sequential emission of each wavelengths. Treatment was accomplished with a 10,600-nm fractional CO2 laser using laser parameters were set as a pulse duration of 280-400 milliseconds and a distance of 1.0 millimeters. During CO2 laser treatment, coagulative treatment was performed simultaneously. Cynergy was combination treated at 2, 4, and 6th session in CO2 laser treatment. We used multiflex mode among various modes of Cynergy. The 595 nm pulsed-dye laser was fired first with a pulse duration of 10 ms and fluence of 7 J/cm2. The long-pulsed 1,064 nm Nd:YAG laser was fired later at 15 ms pulse, 40 J/cm2 using a 7-mm spot size with a medium delay between the two pulses. The therapeutic endpoint was decided to immediate whitening following laser irradiation. Energy densities were reduced if tissue bleeding was prominent. Patients were treated up to 7 sessions, at intervals ranging from 4 weeks. A single physician performed all treatments. Topical lidocaine cream (EMLA; AstraZeneca Canada Inc., Ontario, Canada) was applied 60 minutes before treatment. After treatment, the patients were asked to apply topical fusidic acid 2% under occlusion until the superficial wound was closed to avoid sun exposure. We photographed the patient’s progress with each laser treatment. Clinical photos were obtained under standardized lighting conditions and body positioning using a digital camera (Fig. 3-5).

The patient showed a remarkable improvement of the surgical scar through laser treatment. Especially, it is meaningful that a good effect was obtained through the combination therapy of two lasers. After laser treatment, the patient had a good effect on the appearance of the alar rim as well as the treatment of the scar. The current case demonstrates clear clinical efficacy in the treatment of facial scars with fractional CO2 laser. Based on these results, we recommend early intervention in facial scars, to maximize the clinical benefit and to mitigate social stigmatization as early as possible.

DISCUSSION

Laser treatments are established procedures to improve clinical appearance of mature scars.6 Within recent years, a preventative approach of minimizing scar formation by applying laser during the wound healing process has increasingly been adopted. Studies on early laser intervention indicate promising response in a range of scar characteristics, including improved pliability, smoother surface and reduced scar thickness.7 A variety of termina-
tion lasers can be used for scar treatment, ablative fractional lasers are an effective treatment modality for facial scars after reconstruction of skin cancer defects.8

Natural wound healing is divided into three overlapping phases, beginning with the inflammation phase (0–4 days), shifting towards the proliferation phase (4–21 days) and progressing to the remodeling or maturation phase (>21 days) lasting up to 24 months. Laser exposure specifically targeting the early phases of wound healing may be the key to scar minimization. Furthermore, as the acute inflammatory response induced by laser peaks after 24 hours, fractional laser-exposure 1 day prior to wounding could ensure the presence of stress protective cytokines in the skin at the time of wounding. As a result,

Fig. 1. Pre-operative photographic finding and flap design.

Fig. 2. Intra-operative flap elevation and immediately post-operative photographic finding.

Fig. 3. One-month postoperative photographs of 30-year-old male who underwent nasolabial flap operation.
more efficient scar prevention could be expected. Laser-
priming of the skin prior to elective surgical procedures
may thus limit scar formation.

The body of evidence on early laser intervention com-
prises less than 30 studies applying laser within 3 months
after injury. Thirteen of these studies were randomized
controlled trials. Sixteen studies applied laser in the
proliferation phase of wound healing (4–21 days post-
injury), generally performed at the point of suture removal
using PDL, fractional laser. Overall, these studies report
improved subsequent scar appearance. Only Hong et al.
investigated the appropriate timing of laser interven-
tion to reduce scarring. This study shows that the use
of early fractional CO₂ lasers 4 weeks after surgery or
trauma is an effective and safe method to minimize scar
formation, substantiating the concept of “the earlier the
treatment, the better.”

Similar to this study, clinical investigations of early laser
treatment to reduce scarring have previously used
single laser exposure of various types. Under these
conditions, slight laser-mediated improvement of treated
scars has been reported. In accordance with previous
results, subtle differences were visualized in this study.
Using multiple laser treatments, more prominent clinical
results have been reported in preceding studies. Thus,
applying laser over several treatment sessions may offer
a more pronounced reduction of scar formation.

Various reconstruction methods including local flaps,
forehead flaps, composite grafts, and free flaps have been
reported to be used in the repair of alar defects. The de-
fect size, symmetry, color harmony with the surrounding
tissues, skin texture, and donor area are important fac-
tors to be considered in nasal alar reconstructions. Be-
cause of its closeness to the nasal ala, the nasolabial re-

duction is among the most suitable donor areas in terms of

color and texture. One of the oldest classic methods used
in nasal alar reconstructions is the nasolabial flap. Since
its first use in nasal reconstructions, various modifica-
tions of this flap have been reported. The scar in the flap
donor area is much less visible compared with various
methods including forehead flaps. Thanks to cheek skin
mobility, full-thickness nasal alar defects can be closed

Fig. 4. Six months after started laser treatment photographic finding (postop, 8 months).

Fig. 5. After all laser treatments have been done follow-up photographs (postop, 1 year).
in 1 session in patients; no revision is needed around the flap pedicle, and donor area morbidity is reduced. Thus, the flap can be planned in the desired form and size, and a total alar reconstruction can be realized.

Different techniques are used to enhance wound healing, but, thanks to the rapid advances in laser technology, a new method has emerged with a promising future for modern wound healing lasers. These lasers have also been applied to improve the appearance of such scars. The first lasers utilized for this purpose were ablative, nonselective lasers: CO₂ or Er:YAG laser. The flashlamp-pumped PDL, which emits light at a wavelength of 585 nm, has become the gold standard in the treatment of port-wine stains and also an effective treatment modality for superficial vascular lesions, including those associated with photoaging, such as facial telangiectasias. The Nd:YAG laser emits light at a wavelength of 1,064 nm, which allows deep penetration into the dermis and vascular specificity due to a broad absorption peak of oxyhemoglobin above 800 nm. PDL and Nd:YAG lasers of different wavelengths have been incorporated in the novel dual laser device built into the same console. Laser and light source combinations are currently being examined for their complementary, additive, or sometimes synergistic action. The combined laser therapy additionally decreases the accumulation of fibroblast cells in the scar tissue and stimulates the production of reticular collagen fibers. Krisztina Vas et al, one half of each of the postoperative linear scars immediately after suture removal was treated three times at monthly intervals with the combined 585/1,064 nm laser and the cosmetic appearances of the treated and untreated scar halves were compared.

In this patient case, we combined the effects of the known CO₂ laser with the effect of the Synergy. It was also confirmed that early treatment with laser treatment could have a good effect on scar treatment. Therefore, selecting an appropriate laser and performing active scar treatment early may have a positive impact on the prognosis of the patient. It is common to reconstruct the entire subunit during reconstruction in plastic surgery. In this case, it is significant that the contour enhancement was achieved through the use of remaining natural alar grooves and the subsequent laser treatment.

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