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Post-Surgical Repair of Cleft Scar Using Fractional CO_2 Laser

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Abstract

BACKGROUND: Postoperative scarring is a common cause of patients dissatisfaction. Several modalities have been developed to overcome such a problem following surgical repair. Despite precise surgical technique, still, some scars would remain over the time, mostly due to the weak formation or inadequately replaced collagen fibres in the underneath dermis especially those following unilateral or bilateral cleft lip repair surgery.

AIM: of this study is to evaluate whether a 10,600 nm fractional ablative carbon dioxide (CO_2) used early during the healing period would result in better postoperative scars.

METHODS: In the present study six patients complained from cleft lip scars resulting from lip revision surgery. Each patient had six fractional ablative CO_2 laser sessions for treatment along six months to obtain a complete collagen cycle. Vancouver Scar Scale VSS was used as a method of evaluation of the scar using 4 points scale evaluating vascularity, pliability, thickness & colour of the skin and Visual Analogue Scale VAS from (0-10) was used to assess the severity of pain as well as a survey questionnaire for the rate of patient's satisfaction. Also, digital clinical photos assessment before&after were compared.

RESULTS: Patients expressed a significantly greater degree of satisfaction with the treatment using a subjective 4-point scale. All patients observed dramatic improvement in their lip scars after FCO_2 laser sessions following their surgeries with the better psychological state. The assessment was done by clinical observation according to VSS before (9.17 ± 2.2) while after (3.33 ± 1.9) with a highly significant P value <0.001 and VAS for the rate of pain & satisfaction that ranged from (8.0 ± 0.9) as well as series of photos taken before and after the procedure. No long-term complications were noted however patients complained of annoying pain during the session as well as crust formation that lasted up to 5 days after surgery. In the present study, we introduce the effectiveness of ablative fractional 10,600 nm CO_2 laser for treatment of postoperative cleft lip scar after secondary surgical cleft repair rather than ablative CO_2 due to its reported complications such as postoperative infection, erythema and pigmentary changes along with prolonged downtime healing. In the current study, we chose early laser treatment within the first six months before complete collagen organisation which will be easier to manage the older scars. Patients mostly complained about the pain during the session as well as dark-coloured crust formation post session that stayed from 3-5 days however they all observed a massive improvement of their scars following treatment protocol.

CONCLUSION: Facial wounds sutured in layers heal in a good manner. Patients prefer early treatment with a fractional CO_2 ablative laser for postoperative surgical scars. The use of a CO_2 fractional laser is safe and effective also causes high patients satisfaction.

Introduction

Postoperative scarring is a common cause of patients dissatisfaction. Several modalities have been developed to overcome such a problem following surgical repair. Despite precise surgical technique, still, some scars would remain over the time, mostly due to the weak formation or inadequately replaced collagen fibres in the underneath dermis especially those following unilateral or bilateral cleft lip repair surgery.

This study aims to evaluate whether a 10,600 nm fractional ablative carbon dioxide (CO_2) used early during the healing period would result in better postoperative scars [1] [2]. Carbon dioxide (CO_2) resurfacing ablative laser has been the main treatment of facial scar since its introduction in the mid-1990's. Recently, a new generation of fractional micro ablative CO_2 lasers has been introduced. According to the concept of fractional photothermolysis, theses layers ablate only a fraction of the epidermal and dermal layers of the skin in the target area instead of full ablation with less aggressive impact on the tissues. A microscopic array of thermal wounds is created within very tiny zones, adjacent to these areas; the epidermis and dermis are spared.

That procedure employs fractional thermolysis to occur, so healing becomes more rapid compared to fully ablative CO_2 laser and downtime healing is relatively reduced. This micro ablative process of laser skin resurfacing has been proven to be safe and effective with less damage to skin [3] [4]. Intralesional Corticosteroids also have long been used in the treatment of hypertrophic and restricted scars. Fractional ablative lasers create zones of ablation at variable depths of the skin with subsequent induction of wound healing and collagen remodelling. Recent studies suggest that ablative zones may also be used for in immediate postoperative period to enhance delivery of drugs and other substances such as platelet-rich plasma injection [5] [6].

Carbon dioxide CO_2 laser ablative fractional resurfacing produces skin damage with the removal of the epidermal layer and variable portions of the dermal layer as well as associated residual heating, resulting in new collagen formation and skin tightening. The non-resurfaced epidermis helps tissues to heal rapidly with short-term postoperative erythema [7] [8]. Despite the effectiveness of ablative CO_2 resurfacing laser for the face, its application has been limited due to its undesirable side effects as pigmentary changes and prolonged hyperemia.

New fractional CO_2 laser skin resurfacing technology is associated with shorter periods of hyperemia, resulting in shorter recovery time compared to older ablative technology. Also, the side-effects are minor and infrequent. This new technology of fractional photothermolysis (FP) provides significant clinical improvement resulting in higher patient's satisfaction [9] [10].

Assess safety and efficacy of post-surgical cleft scar with **an** ablative fractional CO_2 laser**.**

Material and Methods

This study included six patients (3 males & 3 females) age ranging from 15 to 20 years old that had post-surgical secondary repair of cleft lip scar. Patients were being treated with fractional Carbon dioxide laser 10,600 nm. Patients were being selected randomly from the outpatient clinic of Al Azhar University, Faculty or Oral & Dental Medicine, Oral & Maxillofacial Surgery Clinic and National Research Center Cairo, Orodental Genetics Clinic. Patients started the laser sessions one month after the secondary cleft revision surgery took place. Protocol of sessions: Six sessions every four weeks for six months to have a complete collagen cycle. Laser parameters: Power 22.5 mJ, pulse width 500 microsecond, stack 3 and density 0.8. Using Bison Medical Fire-xel* laser device. Vancouver Scar Scale VSS was used as a method of evaluation of the scar using 4 points scale evaluating vascularity, pliability, thickness and colour of the skin and Visual Analogue Scale VAS from (0-10) was used to assess the severity of pain as well as a survey questionnaire for the rate of patient's satisfaction. Also, digital clinical photos assessment before&after were compared. The patients agreed to their enrollment in the study by signing a written informed consent. Patients were aware of the nature of the laser treatment and understood that this phenomenon did not influence their systemic or oral health. Safety measures were being considered as wearing protective eye shields for patients&all operating staff in the room.

Results

In the present study, six patients complained from cleft lip scars resulting from lip revision surgery. Each patient had six fractional CO_2 laser sessions for treatment along six months to obtain a complete collagen cycle. A greater decrease in VSS score was noted in the treated scars, especially regarding texture and thickness. Patients also expressed a significantly greater degree of satisfaction with the treatment as assessed using a subjective 4-point scale.

All patients observed dramatic improvement in their lip scars after FCO_2 laser sessions following their surgeries with the better psychological state. Assessment was done by clinical observation according to Vancouver scar scales VSS before (9.17 ± 2.2) while after (3.33 ± 1.9) with highly significant P value < 0.001 and Visual Analogue Scale VAS for rate of pain and satisfaction that ranged from (8.0 ± 0.9), Table 1 as well as series of photos taken before and after the procedure (Figure 1).

No long-term complications were noted however patients complained from annoying pain during the session as well as crust formation that lasted up to 5 days after surgery.

Table 1: Showing VAS and VSS before and after treatment

Variable		MEAN ± SD	RANGE (MIN-MAX)
Sex (no. (%))	Male	3 (50.0%)	
	Female	3 (50.0%)	
Age (years)		17.8 ± 2.7	7 (15-22)
Visual analogue scale (vas)		8.0 ± 0.9	2 (7-9)
Vancouver scar scale (vss) before			
	Vascularity	1.83 ± 0.4	1 (1-2)
	Pigmentation	1.83 ± 0.4	1 (1-2)
	Pliability	3.83 ± 1.3	3 (2-5)
	Height	1.67 ± 0.5	1 (1-2)
	Total VSS Score	9.17 ± 2.2	6 (5-11)
Vancouver scar scale (vss) after			
	Vascularity	0.67 ± 0.5	1 (0-1)
	Pigmentation	0.67 ± 0.5	1 (0-1)
	Pliability	1.33 ± 0.5	1 (1-2)
	Height	0.67 ± 0.5	1 (0-1)
	Total VSS Score	3.33 ± 1.9	4 (1-5)

Figure 1: Cases 1-4 before and after laser

Discussion

Cleft lip scars following lip revision surgeries are the most annoying to the appearance of most patients especially with a bilateral cleft lip. In the present study, we introduce the effectiveness of ablative fractional 10,600 nm CO_2 laser for treatment of postoperative cleft lip scar after secondary surgical cleft repair. This study included only six patients according to a few numbers of patients who have agreed to go for the second revision of their lip surgery followed by such a painful procedure using laser treatment. Postoperative scarring occurs because of the impaired resolution or healing. In the current study, we chose early laser treatment within the first six months before complete collagen organisation which will be easier to manage the older scars. Laser therapy is still considered a challenge. The ablative resurfacing CO_2 laser is effective in the treatment of postoperative surgical scars; however, it has many complications such as postoperative infection, erythema and pigmentary changes along with prolonged downtime healing.

On the other hand, non-ablative CO_2 lasers (e.g. the 1064 Nd: YAG laser, and the 1,450 nm diode laser) are known to improve scar appearance by stimulating collagen production and remodelling [10] [11]. Choi JE et al., [12] compared treatment of hypertrophic scars between Er: YAG fractional laser EYFL and CO_2 fractional lasers CO_2FL using Vancouver scar scale VSS&5 point grading scale. Patients were questioned about their rate of satisfaction and treatment outcomes.

After the final treatment, average percentage changes of VSS were 28.2% for EYFL and 49.8% for CO_2FL. The improvement was evident regarding pliability, while insignificant regarding vascularity and pigmentation. Based on physician's global assessment, mean grade of 1.8 for EYFL and 2.7 for CO_2FL was achieved. Eiler RE et al., [13] compared using different modalities in postoperative scar treatment including ablative fractional CO_2, non-ablative micro needling fractional radiofrequency&intralesional corticosteroids and observed different outcomes as regard healing and suggested a combination therapy with such modalities. In the current study, we chose fractional CO_2 laser rather than ablative CO_2 or intralesional injection. Patient's subjective satisfaction scores matched the physician's objective evaluation. Patients mostly complained about the pain during the session as well as dark-coloured crust formation post session that stayed from 3-5 days however they all observed a massive improvement of their scars following treatment protocol. No scar ointments were used after surgery or laser sessions, just soothing post laser creams to lessen the burning sensation felt by patients.

In conclusion, facial wounds sutured in layers heal in a good manner. Patients prefer early treatment with a fractional CO_2 ablative laser for postoperative surgical scars. The use of a fractional CO_2 laser is safe and effective also causes high patients satisfaction.

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