

Combination Therapy of Fractional Laser and Subcision for Acne Facial Scarring

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Abstract: Acne vulgaris is a prevalent skin disease that predominantly afflicts adolescent populations. Permanent scarring from acne is an unfortunate complication of acne vulgaris. Atrophic acne scars are more common than hypertrophic or keloid scars and are generally classified as ice pick, boxcar, or rolling scars. Having acne scars can be emotionally and psychologically distressing to patients. In this case report, we presented a case of a 26-year-old lady with Fitzpatrick skin type IV and a combination of scars including rolling scars, box scars and ice pick scars over her face. She was treated with three sessions of treatments with 3-week interval between sessions. The first session was a combination treatment of subcision and Fractional CO₂ laser. The next two treatments were single treatments of only Fractional CO₂ laser. In this study, we intend to discuss the multimodal treatments for facial scarring.

Keywords: Atrophic acne scar, Subcision, Fractional CO₂ laser

Introduction

Acne vulgaris is a prevalent skin disease that predominantly afflicts adolescent populations [1]. It is caused and characterized by multiple factors including Propionibacterium acnes activity, increased sebum production, androgenic stimulation, follicular hypercornification, lymphocyte, macrophage and neutrophil inflammatory response, and cytokine activation [2]. Inflammatory acne lesions can result in

permanent scars, the severity of which may depend on delays in treating acne patients [3]. Permanent scarring from acne is an unfortunate complication of acne vulgaris. Acne scars can be classified into three different types- atrophic, hypertrophic, or keloidal [4]. Atrophic acne scars are more common than hypertrophic or keloid scars and are generally classified as ice pick, boxcar, or rolling scars [1]. Ice pick scars are usually narrow (< 2 mm), deep, sharply demarcated tracts that can extend into the deep

dermis or subcutaneous tissue. Rolling scars are wider (4 to 5 mm) and shallower than ice-pick scars, producing an undulating appearance. Boxcar scars are wider at the base than ice-pick scars, do not taper, and can be shallow (<0.5 mm) or deep (>0.5 mm). Hypertrophic acne scars and keloids are characterized by excess collagen deposition, resulting in a raised papule or plaque.

Scars appearing on the face due to multiple reasons, mainly being acneiform scarring, often cause psychological, emotional and cosmetic problems to many people especially women. The purpose of minimally invasive treatments in aesthetic dermatology is to obtain better effects with as much smaller thermal trauma to the skin as possible, while keeping the epidermis intact. There are several multimodal treatments available for facial scarring due to acne.

Subcision

Subcision, also known as subcutaneous incisionless surgery, is a phrase that Orentreich and Orentreich first used in 1995 [5] to refer to a small surgical treatment for correcting depressed scars and wrinkles that involves inserting a tri-beveled hypodermic needle through a puncture in the skin surface (thus, "incisionless" surgery) and manipulating the needle's sharp edges to generate subcuticular cuts or "cisions" underneath the defect. The goal of this surgery is to remove the fibrous threads holding the scar to the subcutaneous tissue beneath. The fibrotic attachments in the dermal-subcutaneous junction that pulls down the skin's surface are physically torn apart, making it more effective than other therapy procedures.

To maximise the outcomes of this procedure, numerous novel approaches have been created in recent years. Needles, cannulas, wires, and blunt-blade instruments are the four major types of subcision tools that are frequently used to treat atrophic acne scars. Use of these devices varies depending on scar depth, aesthetic preferences, and treatment combinations. However, each tool has its own advantages and

also some complications which might follow. Initially subcision was done using hypodermis needle of different gauge thickness depending on the scar's depth, the thickness of its fibrotic tether, and practitioner's personal choice [6]. Then, several modifications have been done to improve the outcome of this procedure, including using a different type of needle such as the triangular tip Nokor needle as was reported by Jacob et al [7]. Subsequently, other tools have been used primarily cannula. However, there are limitations as subcision might only puncture the fibrotic tethers rather than completely severing them, thus, combination treatments will yield higher efficacy in treating acne scars.

Fractional CO₂ Laser

Traditional ablative laser therapies have fallen out of favor in the treatment of atrophic acne scars despite their efficacy because of the higher incidence of side effects and longer downtime. Fractional laser treatments have become the gold standard of care. The carbon dioxide (CO₂) laser in ablative fractional resurfacing (AFR) is now the most popular aesthetic treatment for skin beauty [8]. **Figure 1** illustrates the modes of a CO₂ laser.

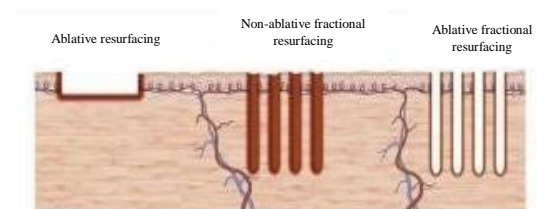


Figure 1 Modes of a CO₂ laser.

The fractional carbon dioxide laser has a wavelength of 10,600 nm which has a strong absorption of water in human body. The concept of fractionated photothermolysis served as the foundation for the mechanism of the carbon dioxide laser. This method thermally ablates columns of the skin, leaving behind areas of healthy skin that quickly repopulate the columns of tissue that were removed. It is a laser emission mode that creates countless micro-heat treatment zones (MTZs) by emitting minute focal spots (50

to 80 μm) through highly focused mirrors. They are columns of repeated thermal injury that are divided by healthy skin tissue [9,10].

This is further supported by histologic evidence of wound repair, in which the retained keratinocytes accelerate the healing process of collagen synthesis, allowing for reepithelialization in less than 48 hours without compromising the epidermal barrier function. It is widely recognized that fractional carbon dioxide laser treatment is associated with a significantly lower incidence of adverse effects and better safety profiles than typical ablative laser treatment. However, post-inflammatory hyperpigmentation (PIH) following fractional carbon dioxide laser resurfacing has frequently been a problem, particularly in individuals with darker skin [11].

Dermabrasion/Microdermabrasion

Dermabrasion and microdermabrasion are facial resurfacing techniques that mechanically ablate damaged skin in order to promote reepithelialization. Dermabrasion completely removes the epidermis and penetrates to the level of the papillary or reticular dermis, inducing remodeling of the skin's structural proteins. Microdermabrasion, a more superficial variation of dermabrasion, only removes the outer layer of the epidermis, accelerating the natural process of exfoliation. Unlike dermabrasion, microdermabrasion can be repeated at short intervals. However, dermabrasion will not improve atrophic acne scars optimally [12].

Punch Excision for Ice Pick Scars

Another popular method of treating acne scars is punch excision. Deeply depressed acne scars with steep vertical walls, like ice pick and boxcar scars, can benefit from punch excision procedures. Since these scars reach the deep reticular dermis, resurfacing methods alone cannot be used to effectively treat them [13]. Punch instruments are circular blades that have a variety of diagnostic and therapeutic uses in several fields of medicine

and surgery. This multifunctional punch blade is used during punch surgery (or biopsy) while the patient is under local anaesthesia [14]. There are different sizes of the instrument ideally in between 1.5 to 3.5 mm used according to the size of the acne scar. Using the concept of scar manipulation, in a punch excision, a large circular scar is removed and the skin is then sutured along the lines of reduced skin tension. This method effectively transforms a recessed scar or hole into a linear scar that is flat. The appearance of these flat linear scars can subsequently be minimized using laser resurfacing, which will be considerably more aesthetically pleasing. The modified scar that resulted would be flat and simple to cover up with a thin coat of foundation or cosmetics, thus will yield the best outcome for the patient.

Trichloroacetic Acid Cross

Another treatment for acne scar available is the CROSS technique (Chemical Reconstruction of Skin Scars). It is ideally suited to treat ice pick or small boxcar scars by using a high strength of the peeling agent, Trichloroacetic acid (TCA). The CROSS technique involves stretching the skin and using a small wooden toothpick to administer 50 to 100 percent TCA to the bottom of the ice pick scar, resulting in epithelial tract breakdown. This is followed by collagenization and filling of the depressed ice pick scar throughout the healing phase. Collagen synthesis can take two to three weeks and can last up to six weeks. This technique can be performed two or three times at an interval of two to four weeks [15].

Chemical Peeling

Chemical peeling is the process of applying chemicals to the skin to destroy the outer damaged layers, thus accelerating the normal process of exfoliation. There are multiple types of peeling agents that may vary in the depth of penetration. The classification of peeling agents is listed in **Table 1**.

Table 1 Classification of peeling agents [16].

Depth Of Penetration	Histologic Level	Peeling Agents
Very superficial	Destruction of the stratum corneum without creating a wound below the stratum granulosum.	<ul style="list-style-type: none"> • Glycolic acid, 30% to 50% applied briefly (1 to 2 minutes) • Jessner solution, applied in 1 to 3 coats • TCA 10%, applied in 1 coat
Superficial	Destruction of part or all of the epidermis, anywhere from the stratum granulosum to the basal cell layer.	<ul style="list-style-type: none"> • Glycolic acid, 50% to 70%, applied for a variable time (2 to 20 minutes) • Jessner solution, applied in 4 to 10 coats • TCA, 10% to 30%
Medium depth	Destruction of the epidermis and part or all of the papillary dermis.	<ul style="list-style-type: none"> • Glycolic acid 70%, applied for a variable time (3 to 30 minutes) • TCA, 35% to 50% • Augmented TCA (CO₂ + TCA 35%; Jessner solution + TCA 35%; glycolic acid 70% + TCA 35%)
Deep	Destruction of the epidermis and papillary dermis, extending into the reticular dermis.	<ul style="list-style-type: none"> • Phenol 88% • Baker-Gordon phenol formula

Case Presentation

This is a case of a 26-year-old lady, with no known medical illness and no known drug allergy presented to an aesthetic clinic with a combination of post acne and chicken pox scars from 10 years ago. Her acne condition worsened during her late adolescence days as she was in college under a lot of stress coping with her studies and exams. Besides that, she is also very active in sports and usually spends more time outdoors exposed to the sun. Her daily skincare routine consists of cleanser, toner, moisturizer and sunscreen. She rarely uses serum and sheet masks. Her menstrual cycle was normal, all investigation was done and there was no evidence of autoimmune disease such as Polycystic Ovary Syndrome (PCOS). She was previously treated for her acne vulgaris condition with topical anti acne, adapalene gel, Cerave gel cleanser and completed two courses of systemic antibiotic treatment namely tablet doxycycline 100 mg once daily under a

dermatology clinic follow up. Subsequently, her acne improved however she developed multiple acne scars all over her face.

As she entered adulthood and started working, she had an inferior complex regarding her facial scarring condition which she was unable to conceal with cosmetic products (e.g. concealer and foundation). This is when she decided to seek aesthetic treatments. On physical examination, her skin type was Fitzpatrick IV and there was a combination of scars predominantly ice picks scars and rolling acne scars over her face with hyperpigmentation (**Figure 2**) especially over the bilateral cheek.



Figure 2 Before treatment.

Management and Outcome

The recommended procedure suggested by the doctor was combination treatment sessions of subcision over cheek and jaw area followed by fractional CO2 laser for her acne scarring. The patient underwent three sessions of treatments within 3-week intervals. The first session was a combination treatment of subcision and Fractional CO2 laser. Numbing cream was applied all over face for 30 minutes before beginning the subcision procedure. Cannula was used and was inserted at the right cheek adjacent to the scar parallel to the skin surface into deep dermis and moved back and forth in a fan like motion to release fibrous bands at dermal plane. The same procedure was repeated at the left cheek. After the subcision, laser procedure was started. Fractional CO2 laser (More Xel bison) was used, energy was set up to 5.0 mJ, density at 0.5. At the end of the treatment, a face mask was put on and a 3 days course of doxycycline antibiotics was prescribed to cover for bacterial infection. However, due to cost, the next two treatments were only single treatment which is the fractional CO2 laser. As for the setting, the energy was increased up to 5.2 mJ for the second session and 5.4 mJ for the third session. The density was also increased up to 1.0 for both sessions

The patient had a follow up after completing three sessions of treatments, claiming that the acne scars over the cheek areas are much improved however prominent ice pick scars are seen (**Figure 3, Figure 4, Figure 5**). Further treatments such as combination of laser and TCA CROSS were suggested. The patient agreed to do it later as the downtime usually takes 3 to 7 days.

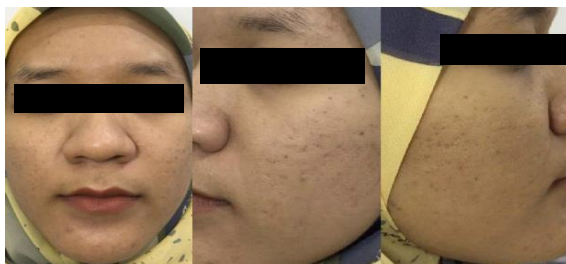


Figure 3 After first session (combination treatment of subcision and fractional CO2 laser).

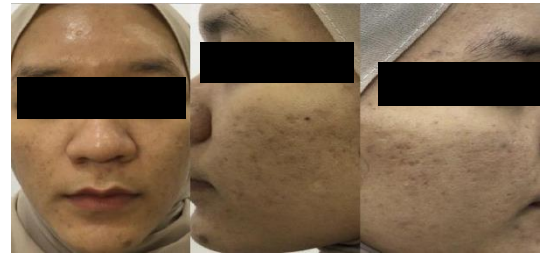


Figure 4 Last session (fractional CO2 laser only).



Figure 5 After last session.

Discussion

In this study, we combined two types of scar treatment which is subcision and ablative fractional laser [17,18]. The subcision procedure was conducted using cannula instead of needle as there were multiple studies done and proven that the outcome was both effective and economic, but cannula method offers less side effect and complications such as ecchymoses, hypertrophic scar, hyperpigmentation, redness and nodule formation. However, there's limitation as shown in the result that the acne scars that show improvement are mostly the rolling type as subcision and fractional laser was the main treatment done in this patient. She still has the ice pick scars which are yet to be resolved. Thus, there are many other options of treatment that can be added for this patient to combat the ice pick scar subsequently providing the best outcome for the patient.

Some of the other treatments that will work wonders on the ice pick scar includes chemical peels primarily TCA CROSS, microdermabrasion and also something more invasive which is punch excision. In addition to better outcomes, performing treatments together provides advantage to the patients. Combination

scar treatment can help to decrease total sessions needed, reduce the overall cost and provide more comfort during the process.

Conclusion

The proper choice of treatment modalities for acne scar remains a great challenge. According to our study, it has been proven that significant improvement can be achieved with combination treatment sessions that utilize a minimum of two or more of different types of atrophic scar treatments, either the same day or over a series of time.

References

1. Vempati A, Zhou C, Tam C, Khong J, Rubanowitz A, Tam K, Hazany S, Vasilev R, Hazany S. Subcision for atrophic acne scarring: a comprehensive review of surgical instruments and combinatorial treatments. *Clinical, Cosmetic and Investigational Dermatology*. 2023;125-134.
2. Gozali MV, Zhou B. Effective treatments of atrophic acne scars. *The Journal of Clinical and Aesthetic Dermatology*. 2015;8(5):33.
3. Fabbrocini G, Annunziata MC, D'arco V, De Vita V, Lodi G, Mauriello MC, Pastore F, Monfrecola G. Acne scars: pathogenesis, classification and treatment. *Dermatology Research and Practice*. 2010 ;893080.
4. Fife D. Practical evaluation and management of atrophic acne scars: tips for the general dermatologist. *The Journal of Clinical and Aesthetic Dermatology*. 2011;4(8): 50-57.
5. Orentreich DS, Orentreich N. Subcutaneous incisionless (subcision) surgery for the correction of depressed scars and wrinkles. *Dermatologic Surgery*. 1995;21(6):543-549.
6. Ebrahim HM, Artima AY, Elardi A, Mohamed Morsi H. Clinical and histopathological evaluation of different tools for the subcision of atrophic acne scars. *Journal of Cosmetic Dermatology*. 2022;21(3):1127-1134.
7. Jacob CI, Dover JS, Kaminer MS. Acne scarring: a classification system and review of treatment options. *Journal of the American Academy of Dermatology*. 2001;45(1):109-117.
8. Petrov A, Pljakovska V. Fractional carbon dioxide laser in treatment of acne scars. *Open Access Macedonian Journal of Medical Sciences*. 2016;4(1): 38-42.
9. Ochi H, Tan L, Tan WP, Goh CL. Treatment of facial acne scarring with fractional carbon dioxide laser in Asians, a retrospective analysis of efficacy and complications. *Dermatologic Surgery*. 2017;43(9):1137-1143.
10. Alexiades-Armenakas MR, Dover JS, Arndt KA. Fractional laser skin resurfacing. *Journal of Drugs in Dermatology*. 2012;11(11):1274-1287.
11. Chapas AM, Brightman L, Sukal S, Hale E, Daniel D, Bernstein LJ, Geronemus RG. Successful treatment of acneiform scarring with CO2 ablative fractional resurfacing. *Lasers in Surgery and Medicine*. 2008;40(6):381-6.
12. Thiboutot D, Gollnick H, Bettoli V, Dréno B, Kang S, Leyden JJ, Shalita AR, Lozada VT, Berson D, Finlay A, Goh CL. New insights into the management of acne: an update from the Global Alliance to Improve Outcomes in Acne group. *Journal of the American Academy of Dermatology*. 2009;60(5):S1-50.
13. Gupta A, Kaur M, Patra S, Khunger N, Gupta S. Evidence-based surgical management of post-acne scarring in skin of color. *Journal of Cutaneous and Aesthetic Surgery*. 2020;13(2):124-141.
14. AlGhamdi KM, AlEnazi MM. Versatile punch surgery. *Journal of Cutaneous Medicine and Surgery*. 2011;15(2):87-96.
15. Lee JB, Chung WG, Kwahck H, Lee KH. Focal treatment of acne scars with trichloroacetic acid: chemical reconstruction of skin scars method. *Dermatologic Surgery*. 2002;28(11):1017-1021.

16. Monheit GD, Chastain MA. Chemical Peels. Facial Plastic Surgery Clinics of North America. 2001;9(2):239-255.
17. Anupama YG, Wahab AJ. Effectiveness of CO2 laser with subcision in patients with acne scars. Journal of Cosmetic and Laser Therapy. 2016;18(7):367-371.
18. Sardana K, Garg VK, Arora P, Khurana N. Histological validity and clinical evidence for use of fractional lasers for acne scars. Journal of Cutaneous and Aesthetic Surgery. 2012;5(2):75-90.