Fractionated Ablative Carbon Dioxide Laser for the Treatment of Rhinophyma

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Background: Rhinophyma is a progressive and disfiguring proliferative disorder of the nose, which is related to chronic rosacea. Many different treatment modalities have been utilized both alone and in combination including: loop cautery, CO2 laser, argon laser, dermabrasion, cryotherapy, radiotherapy, full-thickness excision, skin graft, flap reconstruction, and cold scalpel. CO2 resurfacing has been considered first line therapy but is often associated with a shiny, scarred appearance, with patulous pores, and with loss of pigmentation. We report a technique using aggressive parameters with the fractionated ablative CO2 laser, resulting in improvement of appearance with very few complications.

Materials and Methods: Five patients who presented with rhinophyma of varying degrees were treated with a series of fractional ablative CO2 laser treatments (Fraxel re:Pair, Solta Medical, Hayward, CA). These patients were treated with settings of up to 70 mJ, 70% density and 16–18 passes. All patients received HSV prophylaxis using either acyclovir 400 mg TID or valacyclovir 500 mg BID. Patients were rendered anesthetic by 1% lidocaine and epinephrine regional perinasal nerve block.

Results: All of the patients tolerated the procedure well with reepithelialization at days 4–7 and self-limited edema and erythema. Patients with relatively early to moderate signs of rhinophyma proved optimal candidates for this treatment. There were no adverse events. Patients and physicians noted significant improvement and reduction in the rhinophyma without the typical scarring noted with most other treatments.

Conclusion: Rhinophyma treated with fractionated ablative CO2 laser using relatively aggressive parameters achieved good cosmetic outcomes in this group of early to moderate cases of rhinophyma, while still retaining the benefits of a fractionated treatment such as faster healing times and fewer adverse events. Lasers Surg. Med. 46:8–12, 2014. © 2013 Wiley Periodicals, Inc.

Key words: Rhinophyma; fractionated therapy; fractional carbon dioxide laser

INTRODUCTION

Rhinophyma is a progressive and disfiguring proliferative disorder of the nose. It is most commonly seen in association with chronic rosacea, and historically has been considered the final end stage of rosacea, however, the exact mechanism is yet to be elucidated. Clinically, it is characterized by a painless hypertrophy of the sebaceous glands and connective tissue of the distal nose.

The first descriptions of this condition date back to the Middle Ages, but it was not clinically defined until 1845 when Hebra derived the term rhinophyma from the Greek words *rhis*, meaning nose, and *phyma*, meaning growth [1,2]. Factors implicated in the worsening of rosacea and ultimately in the formation of rhinophyma have included Demodex folliculorum, alcohol, caffeine, spicy foods, and other vasodilatory agents [2–5]. Androgenic influences have been implicated, as the incidence is greatly increased in males [6,7]. Although the causative association with alcohol has not been supported in the literature [8], the stigma arising from the presumed association of alcoholism and rhinophyma is still prevalent. In addition to stigmatization, severe rhinophyma can cause significant cosmetic disfigurement and impairment of function.

Rebora described four stages of rosacea with the evolution of rhinophyma marking the fourth and final stage [9]. As the sebaceous tissue hypertrophies, the nasal cosmetic subunits are obliterated. In severe cases patients may suffer from secondary airway obstruction [2,10]. Histologically, there is hyperplasia of the sebaceous

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glands, perifollicular fibrosis, thickening of the dermis, and epidermis, and dilation of the superficial vessels [11,12].

The first reported surgery for rhinophyma was attempted by Johann Friedrich Dieffenbach in 1845 by making elliptical excisions to remove the hypertrophied tissue and then closing primarily [13]. In 1851 and 1864 "decortication" was utilized and reported by von Langenbeck and by Stromeyer, respectively. Decortication describes the shaving off of the hypertrophic tissue while preserving the fundi of the sebaceous glands as loci for re-epithelization [14]. Further advances in treatment of rhinophyma throughout the early 1900s ranged cold steel surgery [15,16], cryosurgery [17,18], dermabrasion, [15,19] as well as combination therapies [20,21]. The major disadvantages of these early procedures were related to excessive blood loss, dispersion of blood, and poor visibility in the operative field. To improve visualization and to create a bloodless field, electrosurgery was utilized in the 1950s and is still regarded as a fast, cost effective method for treating rhinophyma [10,22,23]. Despite its ease of use, the intense heat that is generated during the procedure can result in damage to the underlying cartilage resulting in cartilaginous necrosis [24]. Additionally, there is an increased risk of post treatment scarring when compared to laser therapy [25].

With the limitations of surgical techniques, lasers gained popularity for treating rhinophyma. Ablative carbon dioxide lasers have proven to be an effective treatment for rhinophyma resulting in marked cosmetic improvement of shape, texture, and size of the nose. Ablative lasers work by creating homogenous thermal damage at a specified depth within the skin [26]. These lasers have generally fallen out of favor do to their high side effect profile including oozing, edema, crusting, and a burning discomfort. Complete healing often takes 3 to 4 weeks, and this time frame is often inconvenient for patients [27]. There is a high risk of scarring, delayed-onset permanent hypopigmentation, and demarcation lines can be significant. The significant risk for adverse events limit its usefulness, especially in patients with only mild disease. While non-ablative lasers have less risk for adverse events, their use is limited due to suboptimal energy penetration [28]. Fractional photothermolysis (FP) was introduced in an attempt to overcome the limitations posed by conventional ablative and non-ablative lasers [26]. Instead of heating the tissue in layers, the fractionated lasers heat the tissue in columns called microscopic treatment zones (MTZs). These surrounding areas of sparing act as reservoirs for healing, enabling the MTZs to resolve quickly with minimal discomfort by providing a foundation of structural and nutritional support and a reservoir for keratinocyte migration [26]. Thus these lasers were able to over come the homogenous destruction caused by the traditional ablative lasers. Since their advent these lasers have been shown to significantly improve skin texture and tightness with a significantly improved safety profile [29,30].

We discuss the use of ablative fractionated carbon dioxide lasers for the treatment of mild to moderate rhinophyma in five patients.

CASE REPORTS

Five patients with long standing history of mild to moderate rhinophyma were treated. On clinical exam, all five had mild to moderate rhinophyma. They all underwent one treatment with a fractionated ablative carbon dioxide laser to the affected area.

TECHNIQUE

All patients received herpes simplex virus prophylaxis prior to the procedure using either acyclovir 400 mg TID or valacyclovir 500 mg BID for 7 days. The nose was prepped with chlorhexidine solution. Patients were anesthetized with regional perinasal nerve blocks consisting of 1% lidocaine and epinephrine. All appropriate laser precautions were taken prior to starting treatment. Protective eyewear was worn by the patient and all present in the room throughout the treatment. The patients were treated with an ablative fractionated carbon dioxide laser (Fraxel re:Pair, Solta Medical, Hayward, CA). The panel was set to 70 mJ and 70% density at 8 passes. However, during the treatment approximately 16 to 18 passes were performed, effectively increasing the density delivered. An energy of 70 mJ was chosen as the fractionated ablative CO2 laser achieves a depth of ablation greater than 1.5 mm at this setting [29,31,32]. The less sebaceous areas of the nose were treated with fewer passes, and the treatment was feathered at the periphery. No forced air cooling was used. After the procedure, an occlusive dressing was applied. Patients were given wound care instructions, including frequent emollition with daily dressing changes for the first week after treatment. The patients did not require additional medications for pain management.

CLINICAL COURSE

All patients had an uneventful treatment course. Patients did not require any postoperative analgesia, and all were discharged directly home after the procedure. Follow up was 1 week (Fig. 1a and b), and 4 to 6 weeks postoperatively (Figs. 2a,b and 3a,b) at which time all had a good cosmetic result. At an additional follow up appointment at 4 months all patients maintained good cosmetic improvement (Figs. 4a,b and 5a,b). All of the patients tolerated the procedure well with re-epithelialization at days 4–7 and self-limited edema and erythema. There were no adverse events. None of the five patients had hypopigmentation, scarring appearance, or patulous pores. Patients and physicians all noted improvement in cosmetic appearance.

DISCUSSION

Over the years a variety of treatments and surgical techniques have been used to improve the cosmetic appearance of rhinophyma. Medical treatments may be helpful in the early stages, but no oral or topical medication

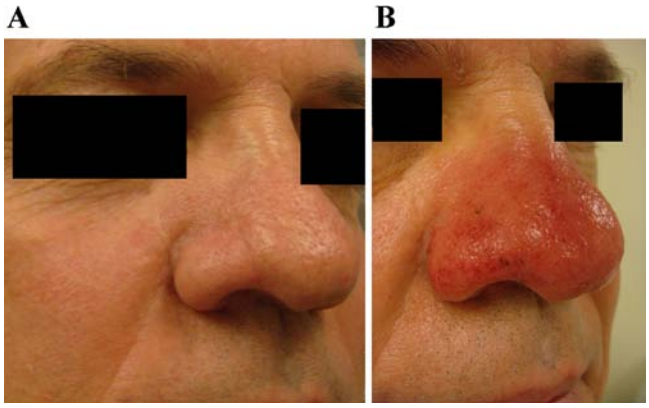

Fig. 1. One week after one treatment with fractional ablative carbon dioxide laser.

has been shown to result in regression of rhinophyma. It is generally accepted that late stage rhinophyma is only amenable to surgical removal of the hypertrophic tissue [13]. Severe cosmetic distortion and functional impairment such as nasal obstruction are indications for surgical treatment [2,4,33]. Fully ablative lasers such as carbon dioxide and Er:YAG, have become the favored method of treatment for the treatment of rhinophyma [27,34]. Despite their efficacy, they are associated with significant side effects including prolonged swelling, erythema, crusting, risk for permanent dyspigmentation, textural changes, and scarring [35–37]. Additionally, after the treatment of rhinophyma with the conventional ablative lasers, the nose can occasionally take on a shiny, scarred appearance with patulous pores.

Hantash et al. [29] first published results with an ablative fractional resurfacing device in 2007. The non-ablative fractionated lasers had already demonstrated an improved safety profile, but with much lower efficacy than ablative lasers. The new ablative fractional devices demonstrated similar efficacy as the previous generation of lasers with an improved safety profile. The delivery of

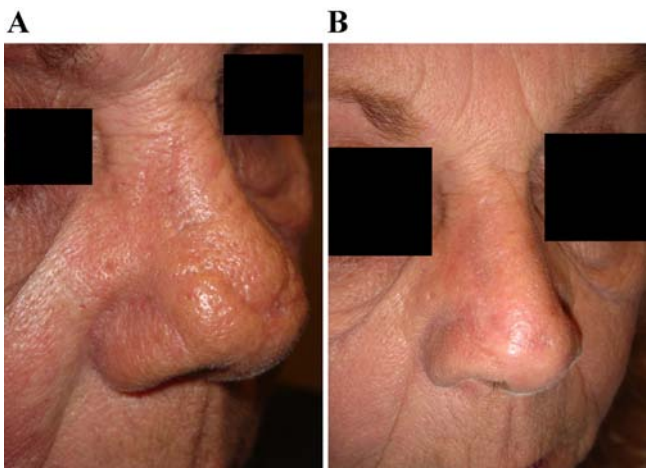

Fig. 2. Six weeks after one treatment with fractional ablative carbon dioxide laser.

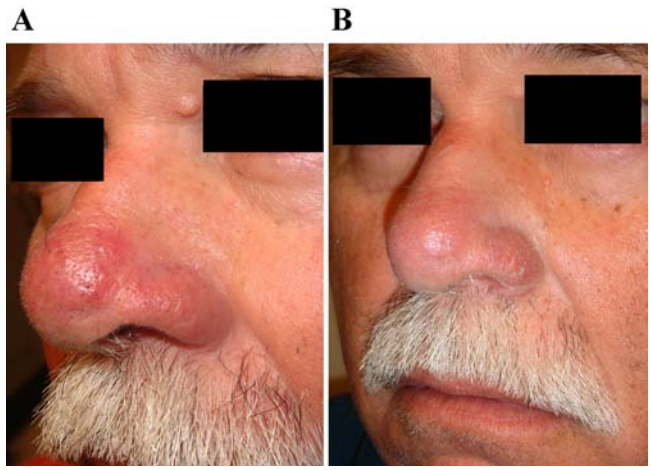

Fig. 3. Four weeks after one treatment with fractional ablative carbon dioxide laser.

energy in columns with surrounding zones of uninjured tissue promotes rapid wound healing and collagen induction resulting in contraction and tightening of the tissue [26,38]. There is decreased risk of scarring and shorter downtime than seen with traditional ablative treatments, as the uninjured skin allows for faster re-epithelialization with minimal to no risk of long-term postinflammatory change or scarring [26,38].

Our patients demonstrated good improvement in the shape, size, and texture of their nose after one treatment with the fractional ablative carbon dioxide laser. All patients had complete re-epithelization within 4–7 days. Patients were treated with anywhere from 16 to 18 passes. Given that the maximum treatment density was set at 70% at 8 passes, 16 to 18 passes is expected to increase the density in a non-linear fashion. This increase causes the density to approach 100%; however, because of

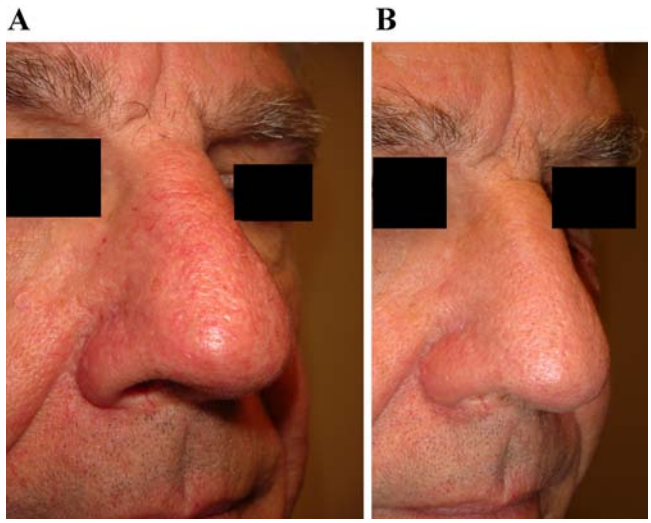

Fig. 4. Four months after one treatment with fractional ablative carbon dioxide laser.

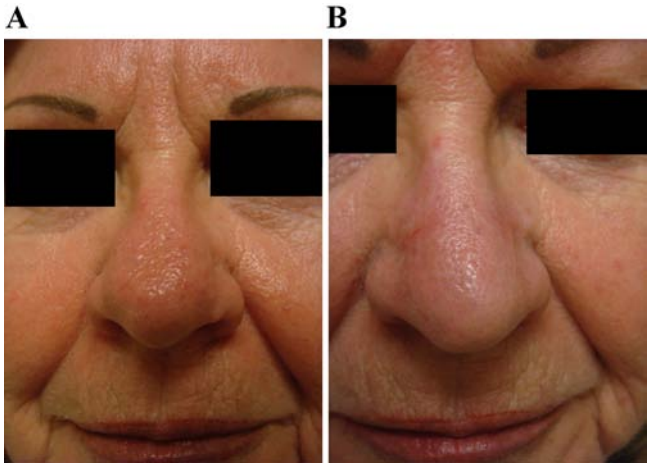

Fig. 5. Four months after one treatment with fractional ablative carbon dioxide laser.

the non-linear nature of the curve, 100% is not attainable with a fractionated device, and the estimated the density approaches approximately 92%. No patients had dyspigmentation or scarring after 4 months. At this time, it is too early to evaluate the potential for delayed onset, permanent hypopigmentation, as this condition usually occurs at least 6 months after traditional ablative laser therapy; however, we feel the risk remains low as it has never previously been reported after fractionated laser treatment for other indications. Higher densities allow for more total ablated tissue, allowing for the efficacy of the fractionated treatment to approach that of a fully ablative laser. However, because the fractionated treatment will never be able to ablate to 100% density, the amount of ablated tissue, and therefore, the amount of debulking will ultimately be less than a fully ablative treatment. For this reason, treatment is best suited to those patients with mild to moderate rhinophyma. For resculpting severely misshapen rhinophymas, traditional ablative lasers remain first line, and it is important to emphasize to patients that results of fractionated therapy may be modest. Additionally, an experienced physician may choose to employ the traditional high-energy, short-pulse ablative CO2 laser in the more florid areas, to optimize results.

Fractionated ablative CO2 laser treatment is indicated in patients who wish to halt progression of their rhinophyma in the early stages, possibly delaying for many years the progression to severe rhinophyma. Patients, especially those with mild rhinophyma and minimal disfigurement find this treatment appealing because there is less risk for side effects and a shorter downtime.

CONCLUSIONS

We were able to demonstrate good improvement in texture, color, and size of mild to moderate rhinophyma treated with ablative fractionated carbon dioxide laser. High densities improve treatment results with little risk for scarring or dyspigmentation. When compared to fully ablative treatments, there is more flexibility to vary the density for different aspects of the nose. This creates a more natural result that can be feathered at the edges of the treatment resulting in a blended natural appearance. Aggressive treatment parameters allow for good cosmetic outcomes while retaining the benefits of a fractionated treatment such as faster healing times and few adverse events.

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