



Retrospective Analysis of the Efficacy of 10,600nm Carbon Dioxide Laser Ablation for Small Congenital Melanocytic Nevi in Adults

ABSTRACT

Carbon dioxide (CO₂) laser ablation treatment generating 10,600nm of infrared radiation has shown promising results in patients with small-sized congenital melanocytic nevi (CMN). In this retrospective study, we evaluated the efficacy (Investigator's Global Assessment [IGA] score) and patient satisfaction for CO₂ laser ablation for the treatment of small CMN in 17 adults. Of those treated with CO₂ laser ablation, our findings indicate the average IGA and patient satisfaction scores were 6.41 and 3.76, respectively. Apart from these, 47.1 percent of cases obtained an IGA score of 7 and 76.5 percent of cases achieved a patient satisfaction score of 4. These results support the efficacy of CO₂ laser ablation treatment and might help the clinician to guide treatment selection in patients who wish to avoid more invasive surgical options.

KEYWORDS: Congenital melanocytic nevi, CO₂ laser ablation, IGA score

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Congenital melanocytic nevi (CMN) are benign proliferations of cutaneous melanocytes that form as a result of abnormal growth, development, or migration of melanoblasts. They form between 5 and 24 weeks *in utero* and are either present at birth or become apparent within the first year of life, with approximately one percent of newborns being affected.¹

The appearance of CMN can diverge considerably based on morphology, texture, location, and size. The nevi can be round or oval with smooth, well-defined borders, and the surface texture can be papular, rugose, verrucous, or cerebriform.² Initially, nevi are light in color, flat, and hairless; however, over time, they can become more pigmented, raised, and acquire long, coarse hairs.³ They can appear anywhere on the body, with the most common locations being the face and trunk.⁴

Clinically, CMN are classified according to size. Krengel et al⁵ categorize small nevi as less than 1.5cm in diameter, medium nevi as between 1.5 and 20cm, and large CMN as 20cm or more.

Apfelberg et al⁶ first described the use of lasers in treating benign skin lesions in 1976.

Ablative laser devices are chiefly used for the external ablation of tissue without damaging the surrounding structures.⁶ The ablation depth of the laser depends on four parameters: wavelength, fluence, pulse duration, and pulse repetition. The wavelength of 10,600nm is absorbed by the extracellular fluid of biologic structures, promoting nonspecific vaporization and coagulation of tissue.⁸ Lack of bleeding and ease of use have made the carbon dioxide (CO₂) laser a popular treatment method for skin lesions.⁷

According to Ozaki et al,⁹ melanocytic nevi smaller than 3mm in diameter are best suited for CO₂ laser treatment, from a cosmetic standpoint. During treatment, the deep ablation mode is usually used, resulting in the immediate formation of a fresh ulcer in the dermis. Within 1 to 2 weeks, the wound healing process leads to granulation and reepithelialization of the lesion in almost all cases. The final appearance is fairly flat compared with the surrounding healthy skin.⁹

Before treating CMN with a CO₂ laser, the clinician must first rule out malignancy through

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FIGURE 1. Small congenital melanocytic nevus treated with CO₂ laser ablation on the face: A) Before treatment and B) After treatment

detailed observation and historical inquiry, including the time of occurrence and growth of the lesion.¹⁰ For lesions larger than 3mm, some clinicians favor surgical resection over CO₂ laser excision therapy due to the potential formation of a conspicuous dimple when the laser is used on larger lesions.⁹ However, in small CMN, the postsurgical scar is usually more elevated than the small nevus. Considering this, we adopted the CO₂ laser ablation technique for treating CMN measuring 0.5 to 7mm in diameter. The purpose of this study was to investigate the efficacy and level of patient satisfaction with CO₂ laser ablation for the treatment of CMN.

METHODS

A retrospective chart review was conducted of all adult patients registered at our private clinic for the assessment of suspicious skin lesions from April 2012 through March 2016.

RESULTS

Seventeen patients met the inclusion criteria which included adult age and diagnosis of CMN as determined by clinical examination by a qualified dermatologist. Exclusion criteria included presence of autoimmune disease, secondary infection, or photosensitivity; treatment with antiplatelet drug; or pregnancy.

All 17 patients were treated with CO₂ laser ablation set at a wavelength of 10,600nm (Airjet, power 2–15 W, continuous mode; Union Medical Co., Ltd., Osaka, Japan) by the same surgeon. A scanner with 150-micron spot size was used with a 100- to 500-micrometer pulse duration and frequency of 10 to 150Hz. We used the same treatment protocol in all patients. Clinical photographs were taken before and after the procedure with a digital camera (Figure 1) and were retrospectively reviewed by two board-certified dermatologists. To explore the efficacy of the treatment, we used the Investigator's Global Assessment (IGA) score as a seven-point scale to measure improvement in clinical outcomes, as follows: 1=worsened; 2=no change; 3=minor improvement; 4=moderate improvement; 5=marked improvement; 6=near-total improvement; and 7=total improvement.⁵ Patient satisfaction was evaluated subjectively by the physician on a five-point scale, as follows: 0=no change; 1=minor improvement; 2=moderate improvement; 3=marked improvement; 4=near-total or total improvement.

Of the 17 patients enrolled in the study, 15 (88.2%) were women and two (11.8%) were men. Mean patient age was 31.7±10.9 years (range: 22–52 years). Seventeen (100%) patients were Asian and had Fitzpatrick Skin Types III or IV. All treated lesions were located on the face.

Thirteen (76.5%) of the patients had single lesions, of which nine (52.9%) covered less than 10mm² body surface area (BSA) and four (23.5%) covered greater than 10mm² BSA. Three (17.6%) patients had two nevi each, with each nevus covering less than 10mm² BSA, and one (5.9%) patient had three nevi, with each nevus covering less than 10mm² BSA. The median number of treatment sessions was two (range: 1–5) and the median time of lesion presence was 26 years (range: 22–52 years).

The efficacy of CO₂ laser ablation was measured using the IGA score. The average IGA score was 6.41, and 5.9, 47.1, and 47.1 percent

of cases obtained scores of 5, 6, and 7 points, respectively. Patient satisfaction scores for the 17 patients were also recorded. The average patient satisfaction score was 3.76 after CO₂ laser ablation, with 76.5 and 23.5 percent of cases having satisfaction scores of 4 or 3 points, respectively.

DISCUSSION

Although moderately rare, congenital nevi require multidisciplinary monitoring for an extended period of time to prevent psychological sequelae or complications inherent to their pathology. The majority of patients in the present study were women, although no consensus has been found in the literature regarding prevalence by sex. The face region was the most common area of CMN in our study, which supports prior results reported by Turkmen et al.⁴ However, our results are limited by the exclusion of other body regions.

CO₂ laser ablation appears to be an effective treatment for patients with smaller CMN and CMN that are on the face. Based on the IGA and patient satisfaction scores, successful outcomes were achieved. Of the facial nevi treated with CO₂ laser ablation, overall, treatment of small CMN showed the highest IGA score. Hence, our findings suggest a cosmetically superior outcome of CO₂ laser ablation for the treatment of small CMN, despite the known disadvantage of multiple treatment sessions and the possibility of recurrence. The patient satisfaction scores in our study also suggest that CO₂ laser ablation is beneficial for the treatment of small CMNs on the face.

Facial melanocytic nevi, whether acquired or congenital, can represent an aesthetic problem for many patients. In regular practice, the removal of several melanocytic nevi is demanding from a cosmetic point of view, and, currently, the treatment options available for CMN include dermabrasion, chemical peel, laser ablation, and complete ablation, each with its own benefits and drawbacks. The primary goal of treatment management is to remove the risk of malignant transformation as well as lessening functional deformity and improving cosmesis.¹¹

The final appearance is an important consideration for patients when treating nevi smaller than 3mm. Ideally, the result should be a flat surface equivalent to the surrounding skin. Surgical resection should be avoided from a cosmetic standpoint if the surgical scar will

exceed the area of the primary nevus. For this reason, laser treatment is preferable for smaller lesions.

Many authors have reported advantages of treatment with the CO₂ laser, including less damage to the surrounding healthy tissue, shorter treatment time, simplification of the operative process time, elimination of the suturing process, less postoperative pain, and reduction in postoperative edema.¹² Considering these advantages over surgical ablation, we prefer this treatment, which provides cosmetic improvement and patient satisfaction.

Limitations. Our study was limited by the retrospective nature of data collection, which was restricted to medical records within our institutional network. In our institution, only adults received treatment for CMN, and there was a lack of diversity in skin type and reported race. Therefore, treatment efficacy in other ages, ethnicities, and skin types is uncertain and unpredictable. One drawback of our method is that the CO₂ laser ablation technique is used for the resection of lesions larger than 0.5mm but smaller than 7mm. We excluded lesions larger than 7mm to avoid significant scars and hyperpigmentation; for medium or large nevi that are not suitable for surgical treatment, treatment with CO₂ laser ablation remains controversial. A randomized,

controlled study that includes more patients and dermatoscopy evaluation to rule out malignancy in melanocytic nevi is necessary before firm conclusions can be drawn.

CONCLUSION

Our results suggest CO₂ laser ablation is an effective modality for the treatment of small CMN.

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