Carbon Dioxide Laser in the Treatment of Oral and Craniofacial Soft Tissue Lesions, Pros and Cons

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Abstract

Background and objectives: Whether to use a cold scalpel or laser surgery to remove a lesion in the skin of the craniofacial area is the main question the surgeon asks him- or herself to do. The study tried to extend the literature with data that may help the surgeons to choose the right method.

Methods: Thirty patients with intra- and extraoral craniofacial skin lesions managed by Carbone dioxide (CO2) laser surgery.

Results: The most common type of lesion treated was melanocytic nevi (15 patients; 50%).

Conclusion: The main complication of CO2 laser surgery is the remaining permanent hypopigmentation of the treated area; however, the CO2 laser has many advantages (especially at the time of surgery) making it a good choice for the management of these lesions.

Keywords: *CO_2 laser; skin resurfacing; melanocytic nevi; maxillofacial surgery.*

Introduction

When the patients have an intraoral lesion, they are afraid of the dental needle and the pain during the surgical procedure to remove that lesion, the laser here plays a role in decreasing these terrifying feeling for the patients. Not only the oral cavity lesions, the face is also the first site to take an impression upon anyone, if this area has a disfiguring lesion such as nevi, skin tags and other skin lesions, they should be removed.

The correct diagnosis of the lesion is essential before deciding which type of laser used. This is depending on surgical skills and experience to differentiate between benign and malignant lesions clinically or even by using dermoscopy [(1)].

In 1964, Patel published an article describing the first use of carbon dioxide (CO_2) laser [(2)]. Carbone dioxide laser has been used medically for different indications in oral and maxillofacial surgery like skin resurfacing in burns or any pathological skin lesions, management of oral mucosal lesions as in leukoplakia, pre-prosthetic surgery as in vestibuloplasty, facelift, intraoral vascular malformation and many other applications [(3-8)].

The wound resulted from a laser is different from that of burn, although it will vaporize the fluid inside the cells causing disintegration of the cell structures but without releasing of the inflammatory mediators in such a way that occurred in burns. Intraoral wounds after laser surgery usually healed without any scar; rapid healing without suturing or packing, likewise with some facial benign lesions like skin tags or commonly acquired moles [(9)].

In general, the energy exerted by the laser depends on the chosen power, time of laser application and the characteristics of the laser used. The laser can be used in two modes, a non- contact laser scalpel in which, the laser is focused on a small area (0.1-0.5mm), used for cutting, while the other mode is defocused laser, to be applied over a large surface area (1-5mm) which is

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usually useful in cases of lesions spread superficially; the lesion is removed by layers [10].

The aim of the study was to evaluate the CO_2 laser in the management of oral and craniofacial soft tissue lesions.

Methods

This study was conducted in accordance with the World Medical Association Declaration of Helsinki. All the procedures performed in the study were in accordance with institutional ethical standards.

Thirty patients presented with intraoral (Fig. 1) as well as extraoral craniofacial soft tissue lesions (Fig. 2-5) managed by ablation using CO_2 laser. The selected patients were otherwise healthy with no history of systemic disease that may alter the healing process after laser surgery.

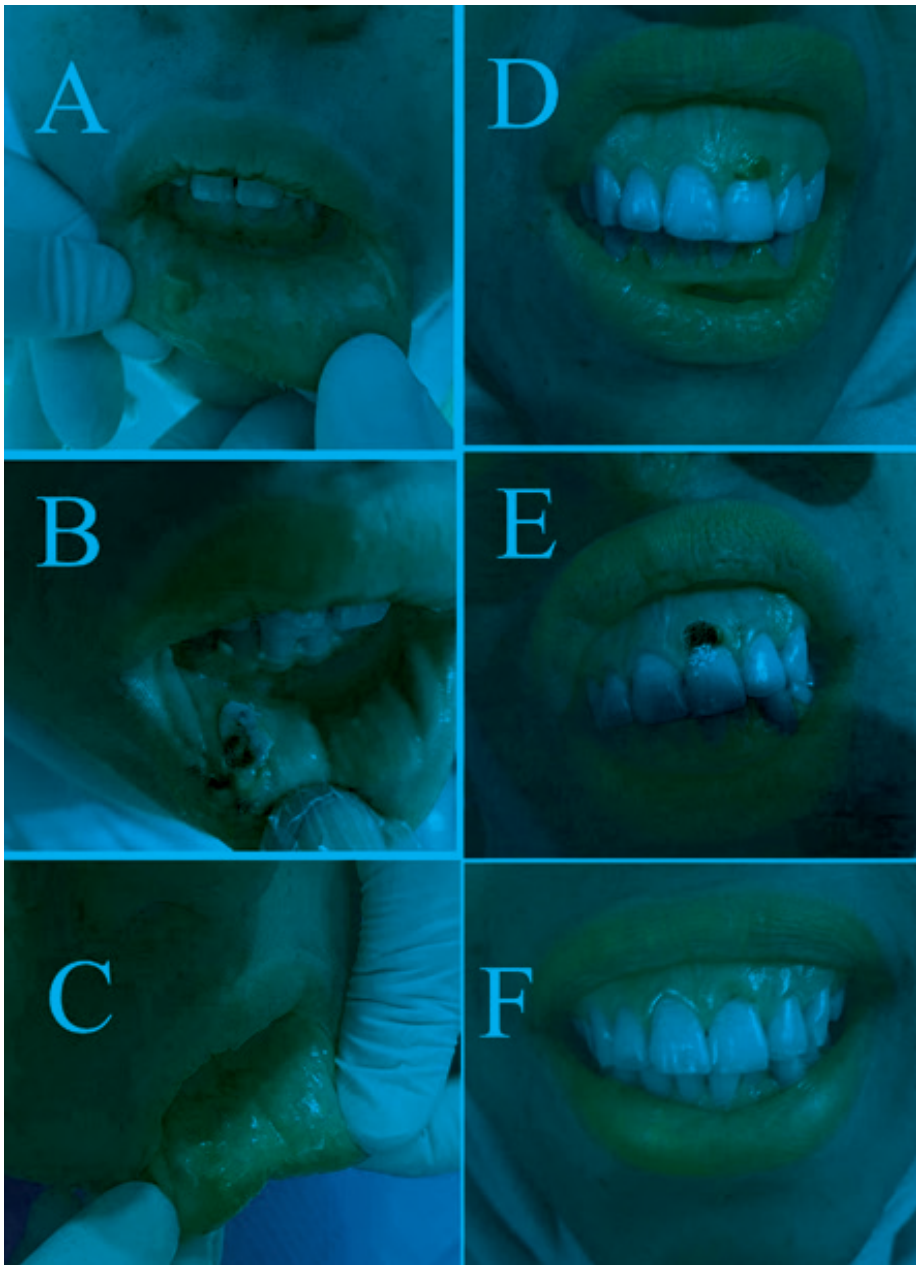

Figure 1 Intraoral lesions ablated by CO_2 laser (A,B,C; mucocele and D,E,F; pyogenic granuloma). (A) Mucocele on the lower lip. (B) Healing with coagulum. (C) Very well healing on follow-up. (D) Pyogenic granuloma on the upper alveolus. (E) Postoperative result. (F) Very well healing on follow-up.

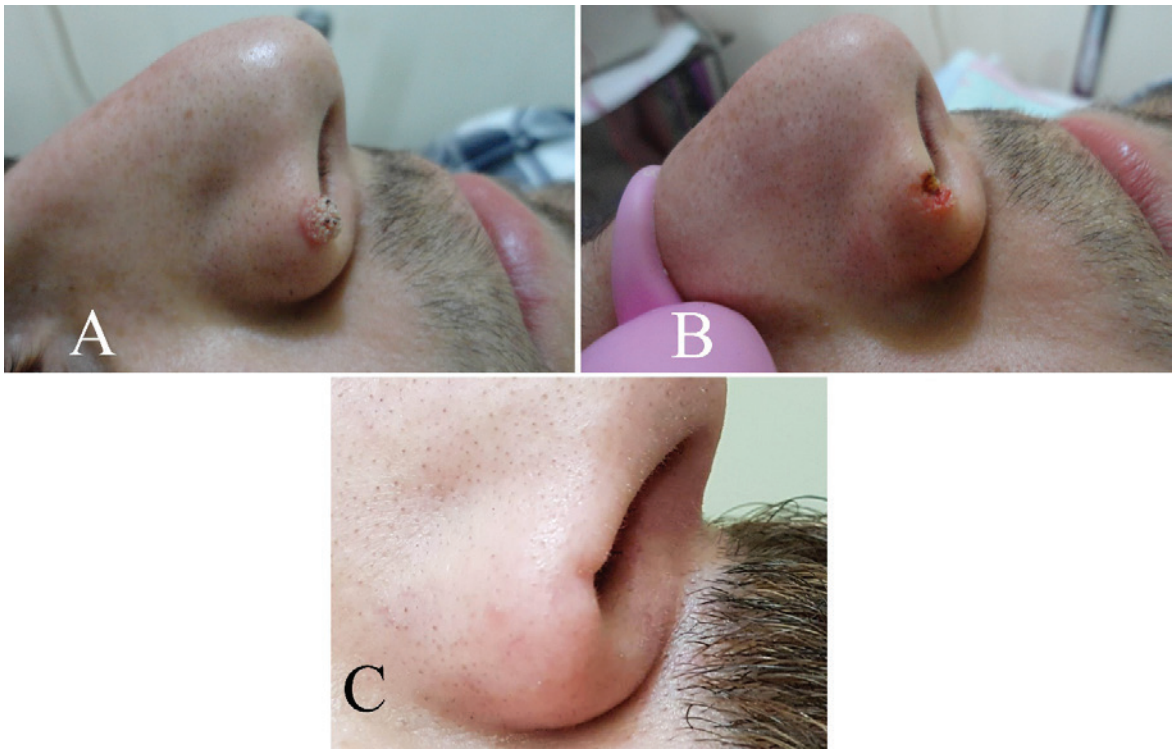

Figure 2 Seborrheic wart on the nose ablated by CO_2 laser. (A) Preoperative. (B) Postoperative result. (C) Pitting scar (two years follow-up).

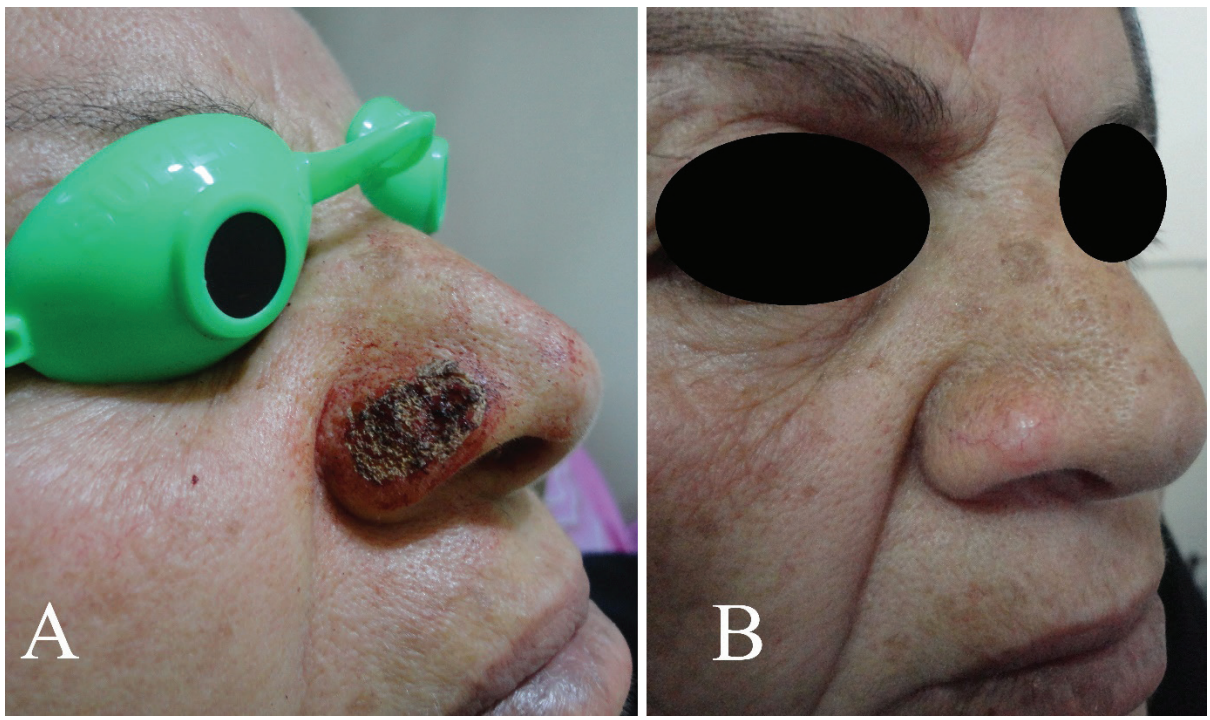

Figure 3 Basal cell carcinoma on the nose ablated by CO_2 laser. (A) Preoperative. (B) Very well healing on follow-up.

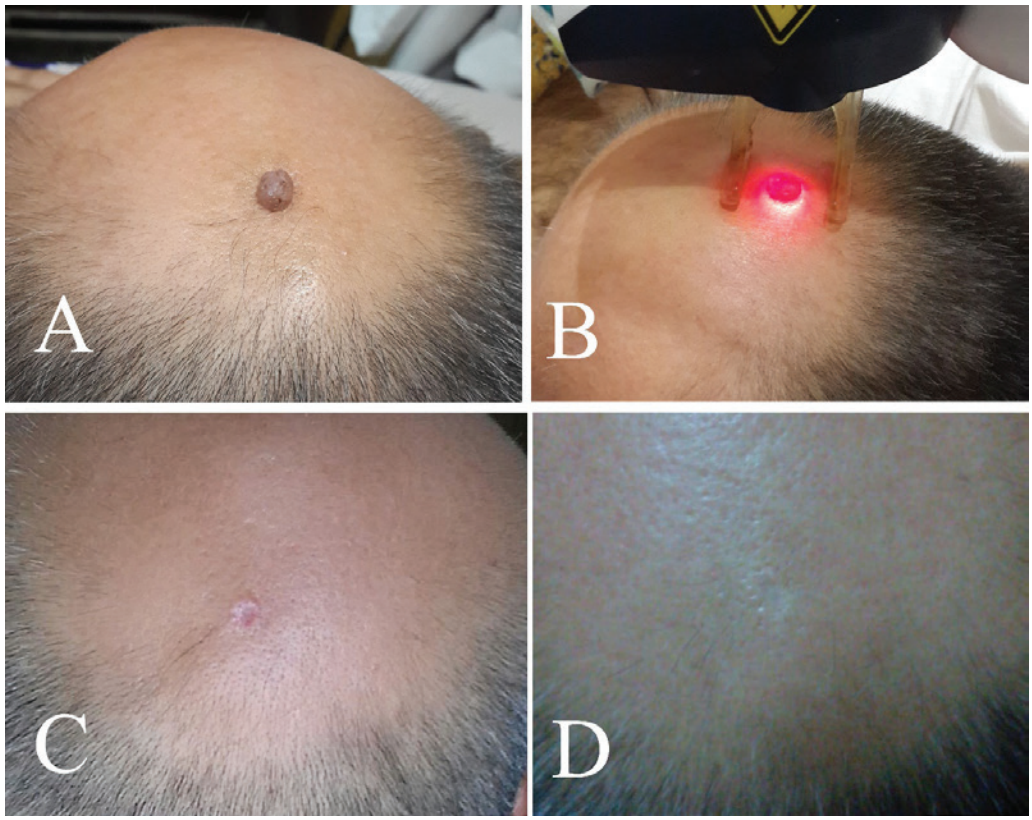

Figure 4. Nevus on the scalp ablated by CO_2 laser. (A) Preoperative. (B) Intraoperative. (C) One day postoperative. (D) Two years of follow-up (hypopigmentation).

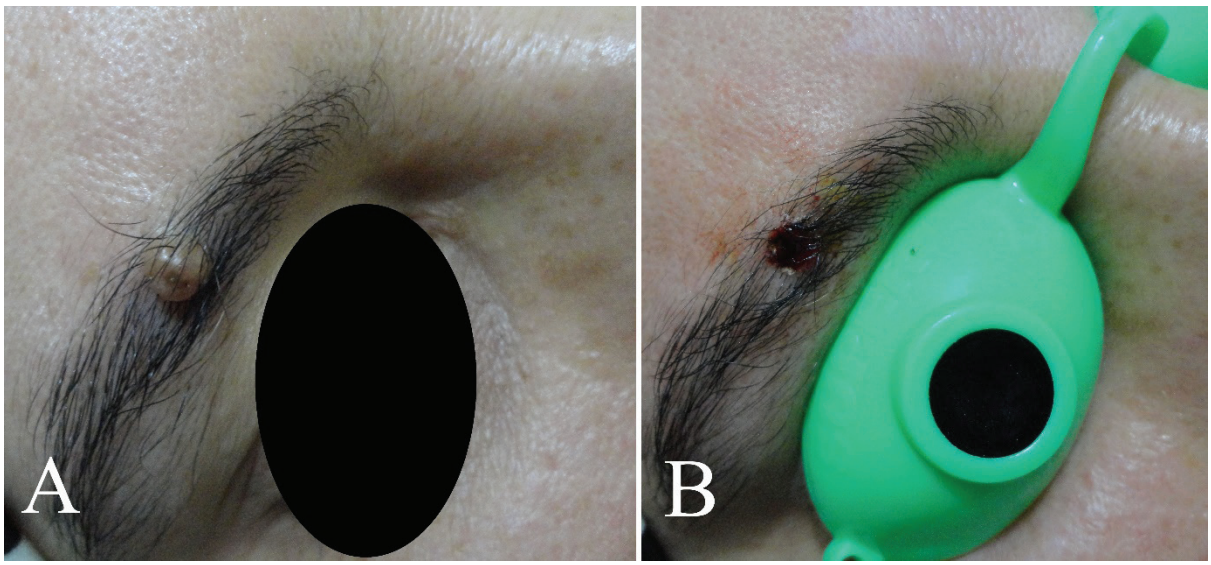

Figure 5 Nevus on the right eyebrow ablated by CO_2 laser. (A) Preoperative. (B) Postoperative result.

Either of two techniques of local anesthesia was used preoperatively; infiltration with the lidocaine 2% or topical anesthesia by eutectic mixture of local anesthetics (EMLA), depending on the nature, size and the site of the lesion.

CO_2 Laser

All the precautions regarding laser use were followed. The wavelength of the CO_2 laser was 10,600 nm, which is absorbed very well by water, with the power depends on the type and the site of the lesion.

Postoperative Care

For the extraoral lesions, a closed wound dressing was applied for the first 24 hours. As a protocol, no postoperative analgesia given to the patients unless needed (mefenamic acid tablets / 500mg).

Follow-up

The follow-ups were scheduled at ten days, one month, one year and as required after that or between these periods. The parameters to be assessed during follow-up were a pain, edema, scar formation, functional disturbance, aesthetic satisfaction as well as recurrence of the lesions or any other related complications.

Results

The study included 30 patients (20 females; 66.7%) and (10 males; 33.3%). The age range was 13-70 years; the mean age was 30.4 years. The most common lesion treated was extraoral melanocytic nevi (15 patients; 50%) (Fig. 4) (Table 1).

Table 1 Distribution of the lesions treated by Co_2 laser

Site	Lesion	N	Percentage
Extraoral	Acquired Melanocytic Nevi	15	50%
	Sebaceous Hyperplasia	2	6.7%
	Seborrheic Warts	1	3.3%
	Basal Cell Carcinoma	1	3.3%
Intraoral	Pyogenic Granuloma	5	16.7%
	Tongue Papilloma	3	10%
	Mucocele in the Lower Lip	3	10%
Total		30	

N: Number of cases

There was no pain during procedures; however, there was a minimal postoperative pain in all the patients at the site of operation. There was no functional disturbance, edema or recurrence of the lesions. Two of the lesions healed by a scar (Fig. 2C). Twenty-four patients (80%) were satisfied esthetically, while the other six patients (20%) were not satisfied.

Discussion

Carbon dioxide laser has been proved effective in the excision of soft tissue lesions with less morbidity and excellent pain control. It is characterized by being an effective photo-thermal ablation device with efficient coagulation capabilities [11, 12].

Although the laser works with minimal pain, local anesthesia is required to finish the work, however, the amount of local anesthesia used with the surgical laser is usually less than that required with the cold scalpel [13]. In our study, we used two techniques of local anesthesia; eutectic mixture of local anesthetics (EMLA) as topical anesthesia and the traditional lidocaine infiltration.

There were difficulties in the diagnosis of a solitary basal cell carcinoma (BCC) (Fig. 3) on the face because it could have the same clinical features of seborrheic keratosis (Fig. 2), malignant melanoma, melanocytic nevi or even hypertrophic scar. Carbone dioxide laser ablation of BCC gives superior results than the traditional invasive surgical excision. Of all the types of BCC, superficial and nodular types are the most types responsive to CO_2 laser therapy. However, in this study, a pigmented BCC has been treated by CO_2 laser with very well healing and with no recurrence [14-17].

Wound care after laser therapy is essential for better healing. The moist dressing is superior to the dry dressing by gauze alone. Some authors prefer the open dressing by applying ointment alone, others, prefer the moist closed dressing, which is associated with a low infection rate. In our study, a moist closed dressing was used for the first 24 hours after extraoral laser surgery, no more than that (keeping the dressing for a long time may increase the risk of infection) [18-21].

The effect of laser on tissue depends on the wavelength of the light-emitting which could be reflected absorbed or scattered. Carbon dioxide laser is absorbed by water (vaporization) with minimal penetration. A thin layer of denatured proteins (coagulum) (Fig. 1B) cover the wound after the excision of the lesions by the laser acting as a natural wound dressing, protecting the wound from irritation especially in the oral cavity [9].

The common consequences of using CO_2 laser are erythema due to vascular reaction to the healing process and hypopigmentation (Fig. 4D), which is occurred due to the effect of laser on the melanocytes in the treatment area; it is either replaced by peripheral melanocyte or remain deficient permanently. Textural alteration occurred due to deep vaporization and destruction of the deep skin layers [16,17]. In this study, six of the patients (20%) were not satisfied esthetically because of the visible permanent hypopigmentation of the area treated by laser.

Carbone dioxide lasers worked in a continuous mode affecting also the adjacent surrounding healthy tissues causing more scar possibilities. Recent CO_2 lasers have short-pulsed high energy mode making them more precise to target the lesion only, sparing the healthy tissue [22].

Conclusion

While the cold scalpel is still convenient for use by many surgeons, the laser is increasingly replacing it. The advantages of CO_2 laser are being safe, provide bloodless surgical field, less operative time, no need for suturing, deferred acute inflammatory reaction, cause less damage to the surrounding tissues and less scarring (inhibit myofibroblast activity). While the disadvantages of CO_2 laser can be summarised as expensive to buy and expensive to maintain, need high power consumption and need very well training.

Conflict of Interest: Nil

Source of Funding: Nil

Ethical Clearance: This research has exemption as it a routine treatment (no new materials were used).

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