CLINICAL CASE

"Optimization with laser in a case of Orofacial Rehabilitation after Trauma: Improvement of oral and facial volumes with laser"

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INTRODUCTION

Orofacial trauma cases pose a challenge for the dentistry of this century. Generally, the first intervention is not directly performed in our offices and for that we need to approach these cases, some time after trauma. Normally, the patients are treated by the Emergency Services first, and not always in the most appropriate way for a complex Oral rehabilitation. The management of soft and hard tissues and intraoral volumetry, as well as the projection of optimized oral tissues significantly improve facial aesthetics, reducing the need for more aggressive treatments and the amount of. The digital orofacial diagnostic systems, the evaluation of the occlusal plane and the cephalic postural axis, laser systems and the ultrasound studies allow us a more integrative approach, with very precise actions and a minimally invasive approach.

MATERIALS, METHODS AND TREATMENT PLAN

Diagnostic methods:

-Satelec 3D X-Mind Unit
-Intraoral periapical radiography sensor Fona CDRelite
- General Electrics ultrasound system Logiq F6
-Photo studio with Canon EOS 350D camera and ring flash
-Chinesport Global Postural System Posturometer
-Carestream intraoral camera model CS 3600, with updated software

Therapeutic methods:

2780 nm Erbium Chromium and 940nm diode lasers (BIOLASE, USA) were used for decontamination and removal of granulation tissue, with C3 and Mz6 tips, as well as the fractional dermatological piece for soft tissue sealing by photothermal and fractional effect , to promote tissue contraction and collagen stimulation and a biomodulation piece for the diode and 660 nm low level laser.

Treatment plan

Our action focused on repairing and regenerating all affected and lost tissues, with effective decontamination, eliminating biofilms and granulation tissue, strengthening the microbiota, improving local microcirculation and collagen metabolism. Our plan was based on the following sections:

1. Infection control with cleaning, clinical debridement of intra and extraoral wounds with various laser systems
2. Regeneration of intraoral tissues with bone grafting, plasma and techniques to increase tissue regeneration capacity, by means of photobiomodulation and micronutrients.
3. Fractional laser treatment in the perioral area for aesthetic improvement of the lip both outside and inside.
4. Implants in position 11-21 with temporary crowns following the BORG technique.
5. Digital design of the final oral rehabilitation.
6. Ultrasound control of the lip to assess the need for collagen fillers, hyaluronic acid ... etc.
7. Bruxism splint.
8. Hygiene and maintenance techniques. Micronutrients and microbiota regulators throughout the regeneration process.

CLINICAL CASE

We present the clinical case of a 50-year-old patient, non-smoker and in good health, who visited our clinic after an orofacial trauma, due to a fall with frontal trajectory, which caused immediate avulsion of the upper central incisors, in addition of open wounds in the nasal and labial area, with loss of tissue in the upper lip, with bad appearance. The patient came to our center with severe pain, infection in the alveoli, presence of granulation tissue, pus and inflammation. After exploration, we observed an evident deterioration of the alveoli and the lip, with significant loss of the vestibular wall, but without bone displacements; however, the lateral incisors showed slight mobility, with loss of the interproximal wall. There was moderate suborbital edema and submandibular nodes were slightly inflamed. In the clinical examination, no lesion was observed in the TMJ, the oral opening was not compromised and there was no deviation from the closing trajectory; although a contracture of the masseter and retraction in the neck of his teeth was detected, with mandibular exostosis and lines on her cheeks which indicated bruxist habit. The patient had some sensitivity to cold foods and her occlusal plane was correct with a good canine guide. (**Figure 1**)

(a) (b)

Figure 1. Extraoral (a) and intraoral (b) view before treatment

Clinical and imaging diagnosis

In radiological studies and computed tomography, we observed a complete loss of the roots of both central incisors, a very weakened and affected vestibular wall and, loss of interproximal bone of the lateral incisors (**Figure 2**).

Figure 2. Panoramic and Periapical Radiography images after avulsion

The conical beam computed tomography showed the loss of vestibular bone and the involvement of the lateral incisors. We also carried out studies of the sections in positions 11 and 21. (**Figure 3**).

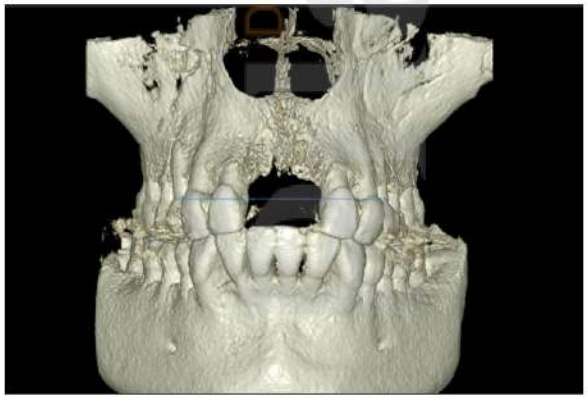


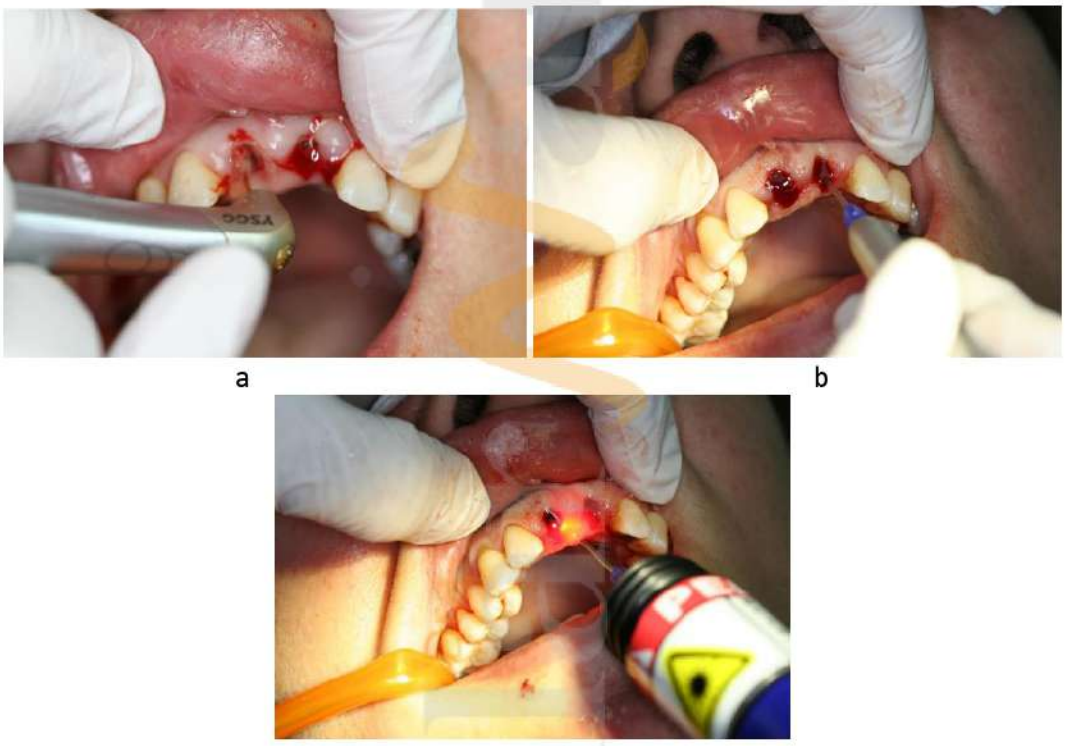
Figure 3. CT Scan of the clinical case

Initial phase of treatment

It was decided to apply high power diode and erbium laser, for decontamination and elimination of granulation tissue, in addition to sealing soft tissues through the photothermal effect, to promote tissue contraction and collagen stimulation. In the final phase of the intervention, a 660 nm low power diode laser was applied as a postoperative treatment (**Figure 4**).

With the application of the different lasers, we take advantage of the optical properties of the tissues and act on several chromophores present in the different affected tissues: water, phosphates, OH- ions, hydroxyapatite and hemoglobin-melanin.

We work with the erbium laser at 4 watts, with 30-50 Hz, 50-75% water, 30-60% air, in S or H mode (variable pulse duration), depending on whether we work in hard or soft tissues . The diode laser was used in continuous wave mode at 2.5 watts, and finally the 660 nm low power laser, working at a fluence of 10 joules / cm^2 (**Figure 4**).



a b c

Figure 4. Erbium laser of 2780 nm, used to clean and decontaminate the alveoli (a). 940 nm diode laser for decontamination (b) and 660 nm low power diode laser for biomodulation and post-operative treatment (c). After 24 hours, tissue improvement was evident and the pain disappeared.

Figure 5. Improvement of the tissues is observed after 24 (left) and 72 hours (right) of the laser treatment, where a diverticulum that appeared after the trauma is observed.

The labial and perioral areas were treated with erbium laser using a fractional handpiece to improve and accelerate the regenerative process of the affected skin. The lip scar required three laser sessions to achieve a significant improvement. The affected Cupid's bow was also repaired (**Figure 6**).

Figure 6. Application of the fractional handpiece using a 2780 nm erbium laser to improve and optimize the lip contour, vermilion and perilabial area.

Diagnosis and planning of peri-implant treatment

After having achieved infection control, with the consequent stabilization of the clinical picture, a complete digital study was carried out, with preparation of the ideal design prior to surgery; and subsequently, surgical orientation was performed, given the difficult situation of the bone crest. To perform this procedure, the Carestream intraoral camera was used (**Figure 7**).

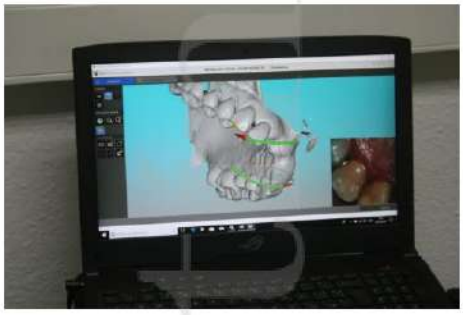


Figure 7. Digital study, calibration and evaluation of symmetry and postural axes with the occlusal plane.

Implant placement phase

A bone graft with synthetic bone and PRF with collagen was performed, following the technique of Dr. Ignazio Loi. Two Sweden Martina Premium implants of 11.5 mm and 3.3 mm diameter were placed. RECTA Premium implants were used, as they are suitable for intraforaminal sectors and, useful with fine ridges or to replace upper incisors. **(Figure 8).**

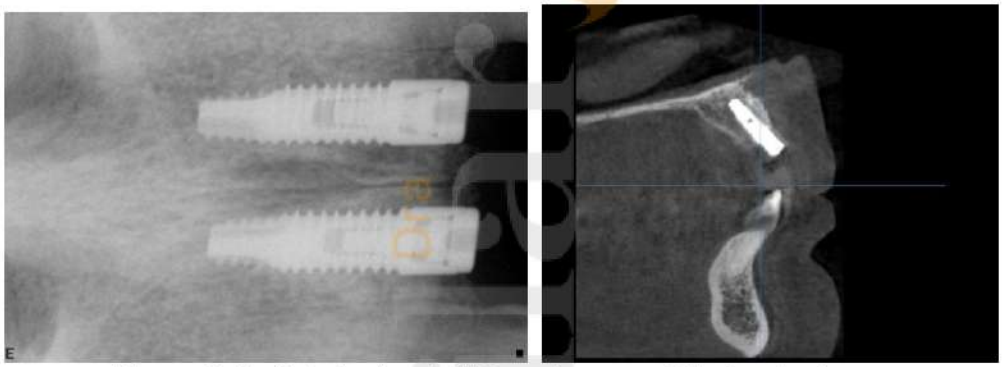


Figure 8. Radiological and CT Scan images of the implant area

Figure 9. Labial frenum near the implants and diverticulum that appeared after trauma.

Figure 10. Removal of the diverticulum and improvement of the insertion of the labial frenum, with an erbium laser of 2780 nm.

Prosthetic phase

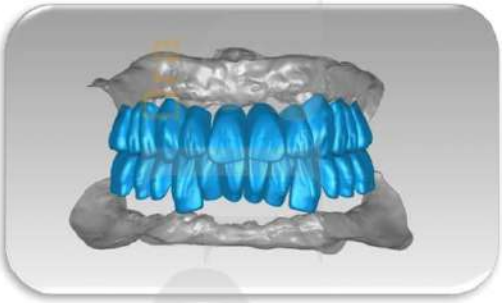


Figure 11. Crowns design, with study of the occlusal plane and gingival design

Digital scanning was taken, and 1200 MP zirconia abutments and ZI-F ceramic zirconia crowns were prepared in the laboratory, with a zirconium dioxide ceramic suitable for coating structures of zirconium oxide of any type.

Figure 12. Zirconium abutments were placed at 35 Nw of torque and the crowns were cemented. Pilar Martín and Alfredo Salvi

The crowns were adjusted in occlusion and with good contact points to facilitate the hygiene of the area and were cemented with Gradiacore. The aesthetic result, both intraoral and extraoral, was quite optimal, with a very positive evolution, without complications, with good osseointegration of the implants and a correct occlusal and articular balance (**Figure 12).**

Figure 13. Several fibrotic nodes were destroyed during the final phase of the treatment with the MZ5 tip and fractional handpiece.

Figure 14. Perioral area retouched with the fractional piece.

Figure 15. Evolution after 4 months after starting treatment

Figure 16. Ultrasound study to evaluate the labial volume and the state of internal fibrosis, assessing the need to use some type of filling

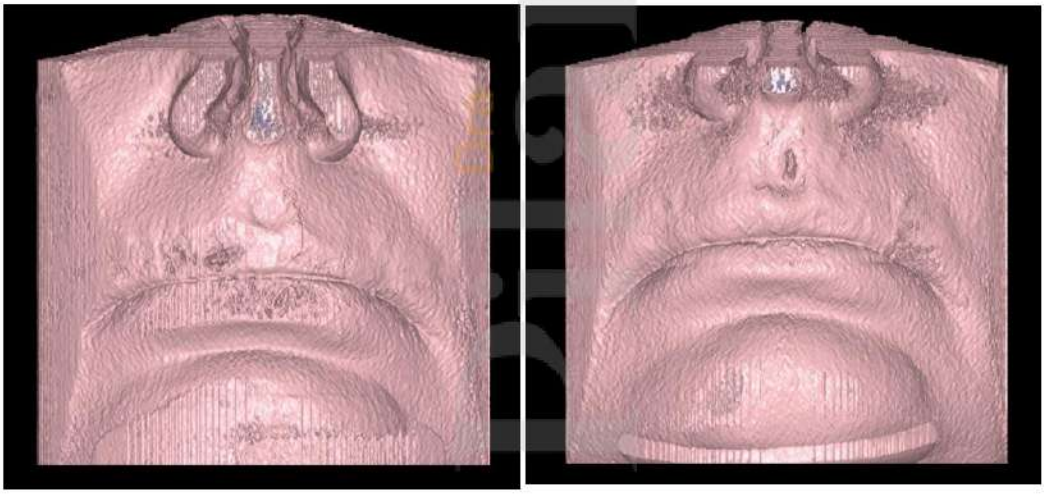


Figure 17. Ultrasound of the lip before and after laser treatment with an improvement in lip echogenicity and final volumetry

Discussion and Conclusions

There is little available literature on this subject and all the authors emphasize the need for early intervention and a correct diagnosis to avoid sequelae or complications [1-3].

We should reinforce the idea that emergency services need to have an action protocol in these cases. Regenerative techniques and lasers are an important option to address these complex clinical cases[6,7].

In the literature consulted, we have found many references about oral and facial treatments by themselves, but not in combination or using fractional technology together with erbium laser and ultrasound control. However, we have coincidences in some aspects with the works of Dr. Trelles and Dr. Martínez-Carpio. The use of laser systems allow us to optimize our aesthetic results, improving the quality of all tissues: bone, mucosa, connective tissue, dermis and epidermis. By using this technology, we can also control the parameters; perform our procedures in a less invasive way, as well as with their controls, where we use ultrasound images with high frequency sound waves to produce dynamic visual images of the tissues treated in this case. With the previous results, we can assess whether we will need to use fillers and, if so, doing it more accurately and avoiding excess of materials, causing a more artificial appearance.

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