Case Report

SURGICAL EXCISION OF A FIBROMATOUS EPULIS AND A PERIPHERAL GIANT CELL GRANULOMA: TWO CASE REPORTS

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ABSTRACT

"Epulis" is an umbrella term clinicians use to describe any localized subepithelial enlargement of the gingiva or alveolar mucosa. Under this generic definition, several types of lesions have peculiar macro- and microscopic characteristics. Hence, traditionally, epulides are categorized into different subtypes, but currently, the literature has identified three primary forms: granulomatous, fibrous, and giant-cell epulis. The purpose of this article is to present two cases of epulides: the first one is fibromatous (or fibrous) epulis, and the second one is giant cell epulis, also known as Peripheral Giant Cell Granuloma (PGCG). The treatment choice for these neoformations was surgical excision, performed in the Clinic of Odontostomatology of San Sebastiano Hospital, Frascati (Rome). The first lesion was removed in one appointment; the second one was removed in two surgical sessions due to its dimensions.

KEYWORDS: *gingiva, epilus, hypertrophy, mass*

INTRODUCTION

According to Slootweg's "*Dental and Oral Pathology*," an epulis is a collective term for oral mucosa lesions having an intimate relation with the periodontal membrane or the periosteum of the jaw. In practice, it is used for localized swellings of the gingiva (1).

The word "epulis," from the Greek ἐπουλίς "over the gingiva," indicates any localized, slow-growing, and asymptomatic gingival mass (2).

Three primary categories of epulides have been identified, differentiated based on their tissue origin: granulomatous epulis (also known as epulis haemangiomatosa), fibrous (or fibroid) epulis, and giant cell (or myeloid) epulis. However, numerous other conditions have been documented in the literature, including congenital epulis, epulis fissuratum, pregnancy tumor (3), pyogenic granuloma, fibrous hyperplasia, peripheral fibroma with calcification, and lympho-plasma-cellular variety (4, 5).

The aim of this report is to present two cases of epulides, specifically fibrous epulis and peripherical giant cell granuloma, with relative surgical excisions.

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CASE DESCRIPTIONS

First case – Fibromatous epulis

A 45-year-old man with no relevant medical history presented in the Clinic of Odontostomatology of San Sebastiano Hospital, Frascati (Rome), with a gingival swelling between the upper central incisors. The patient reported that the lump had been present for a few months and gradually increased in size, causing difficulties and discomfort in chewing.

The clinical examination revealed an asymptomatic gingival mass that was firm, sessile, and pink without any signs of inflammation, erosion, or ulceration (Fig. 1).

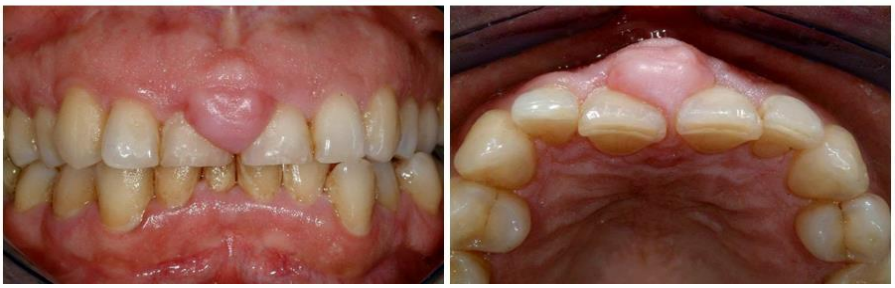

Fig. 1. *The macroscopical aspect of the lesion.*

It was prevalent on the buccal surface but extended on the palatal side. The general oral hygiene condition of the patient was not optimal. On the radiographic examination, it was possible to observe no erosion of underlying bone (Fig. 2).

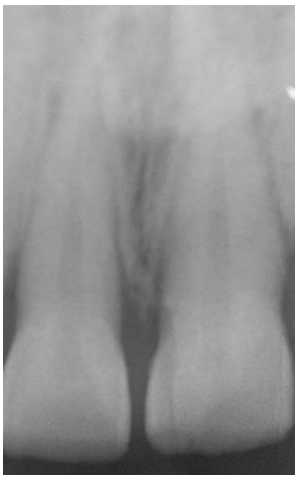

Fig. 2. *Radiographically, it is possible to observe that the interdental bone pick was intact*.

The therapeutic plan included a first appointment of professional oral hygiene and a second one in which the lesion was surgically removed. The patient took 2 g of amoxicillin with clavulanic acid 1 hour before surgery.

After a local anesthesia infiltration, the complete excision of the epulis was performed using a scalpel until the entire tissue of the epulis was separated from the surrounding healthy tissue (Fig. 3).

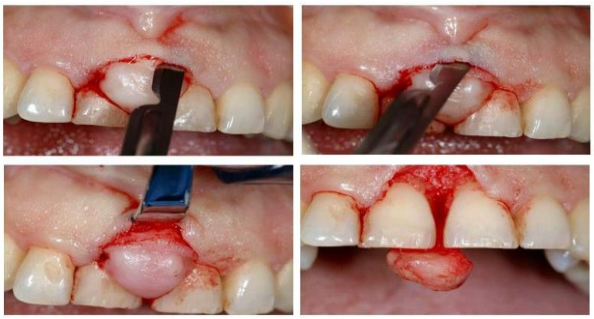

Fig. 3. *Surgical incision and removal of the lesion.*

Therefore, the surgical wound was irrigated with saline water and sutured with 4-0 silk. The extraoral aspect of this fibrous epulis showed a main rounded body of the lesion and a palatal peduncle (Fig. 4).

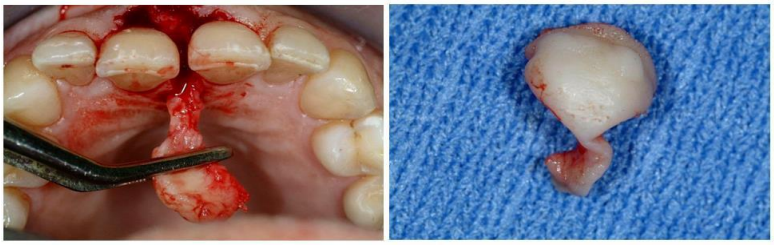

Fig. 4. *Removed lesion.*

Thus, the tissue was put inside 10% of formalin and sent to pathology. Post-surgical instructions were given, such as not chewing on the surgical area and not drinking or eating anything hot for the first 24 hours. Pharmacologic management consisted of amoxicillin with clavulanic acid at a dose of 1 mg every twelve hours for six days. The patient was also instructed to come back a week after surgery for the removal of the suture and after two weeks for control of the healing process (Fig. 5).

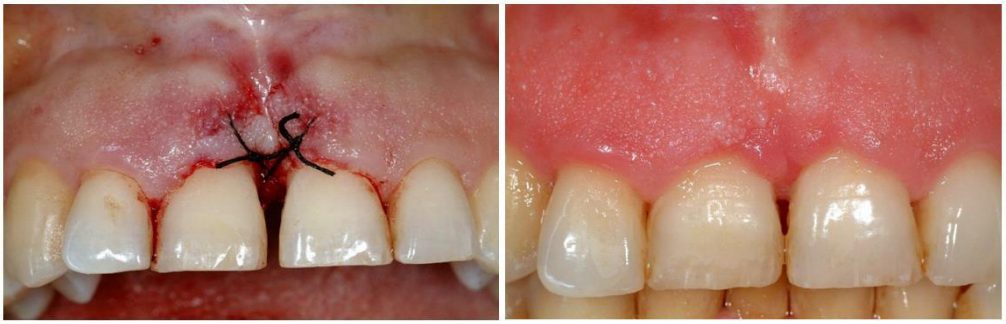

Fig. 5. *The healing of the surgical site.*

Second case - Peripheral Giant Cell Granuloma (PGCG)

A 58-year-old man with controlled hypertension presented in the Clinic of Odontostomatology of San Sebastiano Hospital, Frascati (Rome), with a dark red-colored mass on the anterior region of the upper maxilla. During the last year, the patient experienced little or no pain but felt persistent discomfort during chewing and speaking. The clinical examination showed a dark red swelling on the edentulous space (Fig. 6).

From a frontal point of view, the lesion appeared sessile. On the distal side, however, it seemed to have a large peduncle (Fig. 7). The radiograph examination shows focal resorption of the underlying alveolar bone (Fig. 8). The patient took 2 g of amoxicillin with clavulanic acid 1 hour before surgery.

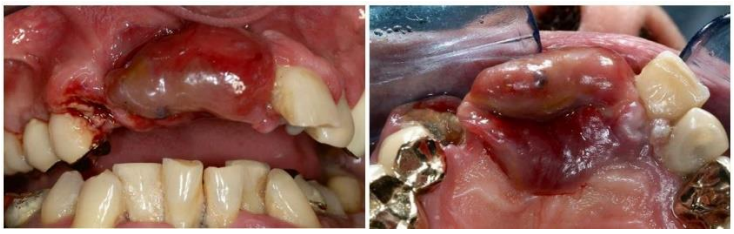

Fig. 6. *The macroscopical aspect of the lesion.*

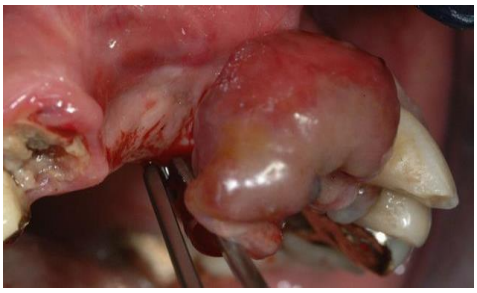

Fig. 7. *The base of the mass was between the sessile and the pedunculated.*

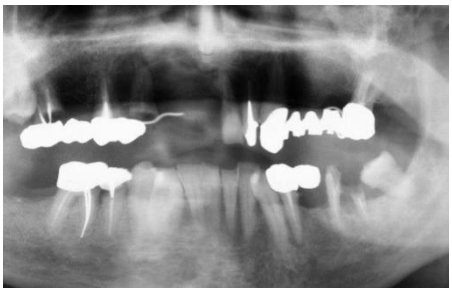

Fig. 8. *On the radiograph, the lesion is lightly radiopaque.*

Under local anesthesia, surgical excision was conducted using a No. 15 scalpel blade to completely remove the mass, along with further curettage of the cortical bone surface. After removing the lesion, the wound was primarily closed using a 4-0 suture with an interrupted vertical mattress suture and an interrupted single suture (Fig. 9).

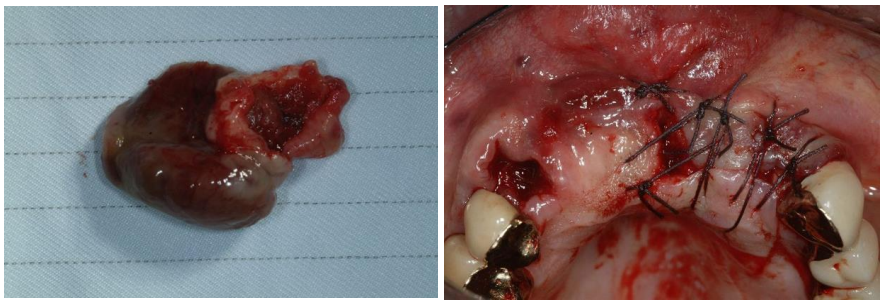

Fig. 9. *The first surgical removal of PGCG.*

Post-surgical instructions were given, such as not chewing on the surgical area and not drinking or eating anything hot for the first 24 hours. Pharmacologic management consisted of amoxicillin with clavulanic acid at a dose of 1 mg every twelve hours for six days. The patient was also instructed to come back a week after surgery for the removal of the suture.

At the 2-month follow-up, the surgical wound appeared to have healed perfectly; however, a residual lesion was observed on the mucogingival junction (Fig. 10).

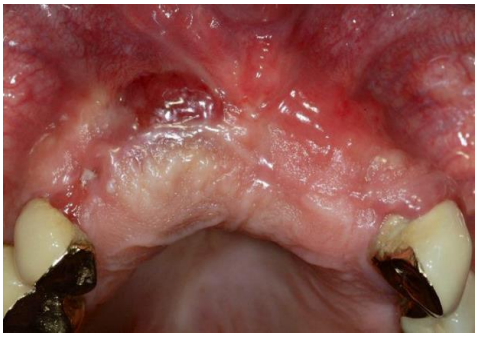

Fig. 10. *A part of the lesion residual.*

Then, it was decided to perform a second surgical removal. In this second surgical access, it was observed that the lesion, had eroded the underlying alveolar bone (Fig. 11-12).

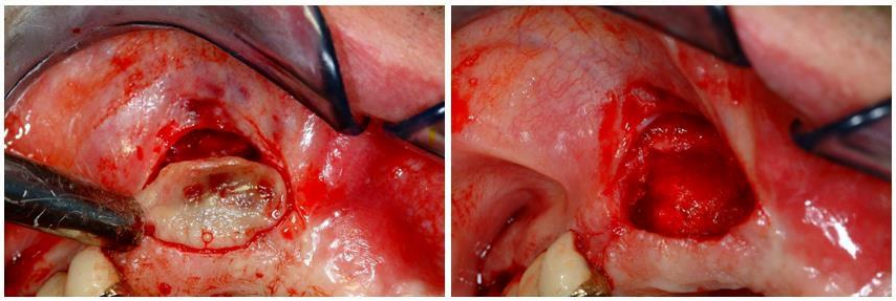

Fig. 11. *The second surgical access.*

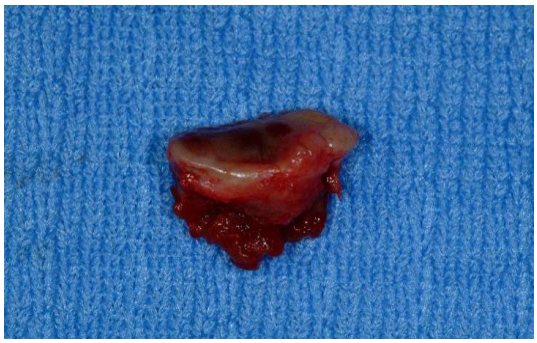

Fig. 12. *The residual lesion removed.*

After enucleating the lesion, curettage was performed on the underlying bone. The wound was primarily closed using a 4-0 suture with an interrupted single suture. The exact postoperative instructions for the first surgery were given during this appointment.

At the follow-up at 2 months, the surgical wound appeared to have healed without further residual lesions (Fig. 13).

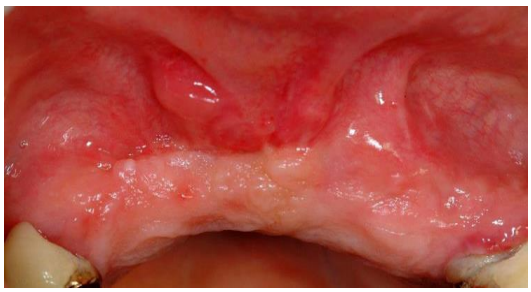

Fig. 13. *The healing of the surgical wound.*

DISCUSSION

"Epulis" is a nonspecific term used for tumors and tumorlike masses of the gingiva with mixed cell origin arising from periodontal squamous cell residues (5). The factors that influence their formation, rate of growth, and likelihood of recurrence remain unclear. However, various possibilities have been explored, including the type of injury or inflammation, oral hygiene, diet, alcohol consumption, smoking, medication, hormonal balance, and immune function (5, 6).

Fibrous epulis is a benign tumor of the gingiva that most often occurs in the interdental papilla area due to local irritation (inadequate restorative fillings, carious teeth, subgingival deposits, or the combination of them) (7). In other words, it is essentially a reactive fibrous hyperplasia (8). In the first case presented in this paper, the possible etiology of the lesion is unknown because there were no significant predisposing factors other than non-optimal oral hygiene. The surface texture and presentation reflect the previous history of the lesion, e.g., hyperkeratosis or occasional ulceration (8). This lesion represents the archetype and most common epulides with a female bias and predominantly adult distribution (8). This lesion is frequently represented as a firm, pink, un-inflammed mass. Most often, the lesion is painless. Pain may be associated with secondary trauma via brushing, flossing, or chewing. The swelling is sessile initially and then becomes pedunculated (9). All these clinical features can be found in the fibromatous epulis presented in this article. There is no erosion of underlying bone and no interdental spread unless there is a pre-existing diastema or pre-existing interdental bone loss due to chronic periodontitis. They may slowly increase in size, and some can reach impressive proportions and compromise the outcome of surgical removal, but this is an uncommon finding (8). The treatment of these lesions focuses specifically on understanding the derivation from the periodontal tissues, so a superficial gingivectomy-type procedure will frequently result in recurrence. Mucoperiosteal flaps are best raised so the lesion can be excised entirely, suprabony connective tissue curetted, and the adjacent tooth and root surfaces debrided of plaque and calculus or plaque-retaining factors to minimize recurrence. The cosmetic result depends on the site of the lesion, the periodontal bone support present, and the amount of attached gingiva (8). The first case presented reached a satisfactory aesthetic result due to the bone peak preservation and adequate availability of attached soft tissue.

Peripheral giant cell granuloma, or "giant cell epulis," is the most common oral giant cell lesion. The peripheral giant cell granuloma accounts for approximately 10% of epulides (10, 11). They occur over a wide age range with a lower age peak incidence for males than females and a female predilection. These lesions can occur in any part of the gingiva in dentate patients or on the alveolar ridge in edentulous patients, such as the second case presented. Still, most occur anterior to the molar region and are slightly more common in the mandible (10, 12). It typically appears as a purplish-red nodule in soft tissue comprising multinucleated giant cells within a backdrop of mononuclear stromal cells and leaked red blood cells. This condition likely isn't an actual tumor but is more likely a reactive response, thought to be triggered by local irritation or injury, although the exact cause remains uncertain (13). As in the second clinical case presented in this paper, PGCGs typically appear as deep red or purple sessile growths that can grow significantly in size. They might extend between teeth, resembling a dumbbell shape (10). Sometimes, the initial excision is not thorough, and the pathologist preparing the report should acknowledge this. To ensure a comprehensive evaluation, it is essential to comment on the necessity for additional investigations, such as radiological examinations (10, 14).

CONCLUSIONS

This case report presents two peculiar oral epulides with different clinical and histological characteristics. The surgical removal was the treatment of choice of both neoformations, with various results depending on the size and complexity of the two epulides: in the fibromatous type, only one intervention was needed to complete the resolution of the lesion, whereas, in the giant cell type, a second surgical access was required to achieve total healing.

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Clinical Trial

CONSCIOUS SEDATION AND PAIN CONTROL IN DENTAL SURGERY WITH NITROUS OXIDE: CLINICAL PROTOCOL

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ABSTRACT

Usually, dental implant and oral surgical procedures are performed outside of the operating room. Conscious sedation is a method in which the use of one or more drugs produces a state of depression of the central system (CNS) and euphoria with little effect on the respiratory system; verbal contact with the patient is maintained throughout sedation. Conscious sedation does not require intubation of the patient to maintain airway patency independently. It is a drug-induced depression of consciousness induced by drugs, during which the patient intentionally responds to light tactile stimulation and verbal commands. The level of sedation must be such that the patient remains conscious, maintains protective reflexes, and can understand and respond to tactile or verbal commands. Anxiolytics in dentistry are very important to achieve absolute patient cooperation. Nitrous oxide/oxygen (N_2O/O_2) inhalation is used for analgesia/anxiolysis as a safe and effective technique to manage pain and anxiety in dentistry. Nitrous oxide (N_2O) is a colorless, soluble gas with a sweet odor. So, anxiolytics with nitrous oxide can be used for the management of the patient undergoing oral surgery.

KEYWORDS: *conscious sedation, analgesics, nitrous oxide, oral surgery*

INTRODUCTION

More patients must undergo invasive dental treatments with new surgical techniques and increasing average age (1). The increased focus on dental care and the recent evolution towards particularly demanding elective and emergency techniques identifies the need to recognize aspects of the patient's anamnestic profile and any other helpful information related to executing the chosen conscious sedation technique. Conscious sedation is a method in which the use of one or more drugs produces a state of depression of the central system (CNS) and euphoria with little effect on the respiratory system (2); verbal contact with the patient is maintained throughout sedation. CNS depression defines a continuum from preservation to loss of consciousness, where the latter draw stages of varying depth that are called “moderate sedation,” “deep sedation,” and “general anesthesia” up to irreversible depression of CNS functions if the necessary measures are

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not taken to maintain the patient in a state of vitality (tracheal intubation, automatic ventilation, support of cardiovascular functions, etc.). Conscious sedation does not require intubation of the patient to maintain airway patency independently (3). These drugs can cause increasingly deep levels of sedation concerning the doses, to the point of disruption of vital functions and signs of life, and cardiovascular function is usually maintained (4). It also retains protective reflexes and can understand and respond to verbal commands. Conscious sedation is a drug-induced depression of consciousness induced by drugs, during which the patient intentionally responds to light tactile stimulation and verbal commands. The level of sedation must be such that the patient remains conscious, maintains protective reflexes, and can understand and respond to tactile or verbal commands (4); it may be considered the first level in the sedation process (5, 6). Conscious sedation can use oral, intramuscular, intravenous, and inhalation drugs. Different drugs commonly used for procedural sedation and analgesia include the following: midazolam, fentanyl, ketamine, propofol, etomidate, dexmedetomidine, methohexital, and nitrous oxide. Of these methods, midazolam and nitrous oxide are the drugs considered to be the gold standard, given their popularity in the literature. In clinical practice, healthcare prefers conscious sedation over general anesthesia because it has less risk and low mortality. The reason for this is the reduction of the mortality risk and delirium, along with the improved recovery time and reduced reliance on anesthetic staff, as it can be performed even without the presence of an anesthesiologist (3). Another advanced conscious sedation is that it is cheaper by about a third compared with general anesthesia (7). The advantage of conscious sedation is that it reduces anxiety, not just limited to children but extends to adults, too.

The techniques of conscious sedation in dentistry and used in Italy are as follows:

1. the inhalation technique with nitrous oxide and oxygen (N_2O/O_2);
2. the enteral technique with benzodiazepines with anxiolytic activity;
3. the enteral technique using benzodiazepines with anxiolytic activity;
4. the intravenous technique using benzodiazepines with anxiolytic activity in the patient undergoing pre-sedation per os.

Nitrous oxide/oxygen (N_2O/O_2) inhalation is used for analgesia/anxiolysis as a safe and effective technique to manage pain and anxiety in dentistry. Nitrous oxide (N_2O) is a colorless gas with a sweet odor and soluble. It causes central nervous system depression and euphoria and has a low effect on the respiratory system through different mechanisms of action. The analgesic effect appears to be initiated by neuronal release of endogenous opioids (e.g., enkephalins) with impact on the central excitatory (n-methyl-d-aspartate) NMDA receptor (8). N_2O exerts inhibitory properties on this receptor, thus preventing its excitatory effects. The receptors recognize glutamic acid as a neuromediator. This receptor is released into the synaptic space of the excitatory cortico pathways and contributes to sustaining, maintaining, and preserving anxiogenic effects. The anxiolytic effect involves activation of GABA; this receptor is released into the synaptic space of the excitatory cortico-liberal pathways and contributes to sustaining, maintaining, and preserving anxiogenic effects.

Recommended concentrations of N_2O vary from 30 to 50%. For these reasons, N_2O can be considered a practically perfect drug, with both anxiolytic and analgesic activity. It has a low water/oil solubility coefficient, and it is a drug for high-perfusion organs such as the CNS due to the high diffusibility at the level of the pulmonary alveoli and the equally rapid availability to the CNS. Due to its poor solubility in plasma, N_2O is rapidly eliminated upon discontinuing its administration as the patient's neurological functions and alertness recover.

CLINICAL PROTOCOL

The technique requires machines that cannot deliver more than 70 percent N_2O and no less than 30 percent O_2.

Consequently, the inhalation mixture will, in any case, contain higher percentages of O_2 than atmospheric O_2, guaranteeing 'hyperoxygenated' breathing if one considers that the rate of atmospheric O_2 is 21%.

Machines releasing varying percentages of N_2O/O_2 can titrate N_2O until optimal subjective signs and symptoms of tranquillity and well-being are achieved. The effect can be traced back to action on the type A GABA receptor, where many other anxiolytic drugs, including benzodiazepines act.

The percentage that reaches these levels of effectiveness is called the Baseline and varies from individual to individual by the degree of anxiety; the empathy reached with the practitioner, the type of breathing, and previous experience.

The administration technique

The administration technique involves a series of steps, starting with the denitronisation process, which consists of decreasing the N_2 concentration in the blood by administering 100% O_2 through a face mask.

Breathing through a face mask with 100 percent O_2 should last no less than three minutes, at the end of which the N_2 content in the blood and alveoli is reduced from pressures of 570 mm Hg to values close to zero.

The primary purpose of denitronisation is to avoid a rapid drop in the alveolar O_2 concentration even if N_2O is initially used together with O_2 due to the greater diffusion of N_2O compared to O_2, which causes a balancing of the administered gas percentages in favor of N_2O. To correctly recognize the baseline value, the percentages of N_2O in O_2 must be increased, starting with minimum N_2O values of 5 or 10 percent and increasing the N_2O percentages by 5 or 10 percent every 5 minutes.

Baseline recognition must be achieved by maintaining verbal contact with the patient. At the same time, physical contact must be maintained (e.g., the operator's hand resting on the patient's shoulder).

At the end of each N_2O exposure time, the patient should be asked, using an analog numeric scale from 1 to 10, about the level of tranquillity the patient achieves. The N_2O rates will be increased until the patient indicates a maximum tranquillity score of 10. The dentist notes the percentage of Baseline that will 'almost always' be used in subsequent conscious inhalation sedation.

The technique of conscious sedation with N_2O causes an anesthetic effect on the mucous membranes of the oral cavity to such an extent that the tendency to vomit is inhibited or nullified, even in patients with a particularly lively gag reflex. This type of technique can be used in most patients, except those with severe chronic obstructive pulmonary disease (COPD), in which ventilatory function is sustained by the hypoxic stimulus exerted in the respiratory centers.

The American Society of Anesthesiology defines three levels of sedation based on the "responsiveness" of patients (9) (Fig. 1-3, Table I):

1. Minimal (or mild) sedation:
   the patient has a good level of anxiolysis but is perfectly responsive and cooperative and has perfect efficiency of respiratory activity and airway protection reflexes;
2. Moderate (conscious) sedation:
   the patient is more sedated and, therefore, has a reduced level of vigilance but responds adequately to tactile or verbal stimuli. Spontaneous ventilation is usually adequate, and protective airway reflexes are maintained; therefore, interventions are not required to preserve efficiency and patency;
3. Deep sedation:
   the patient is no longer alert, can respond adequately only to painful or repetitive stimuli, and may require some assistance to maintain adequate ventilation and/or airway patency.

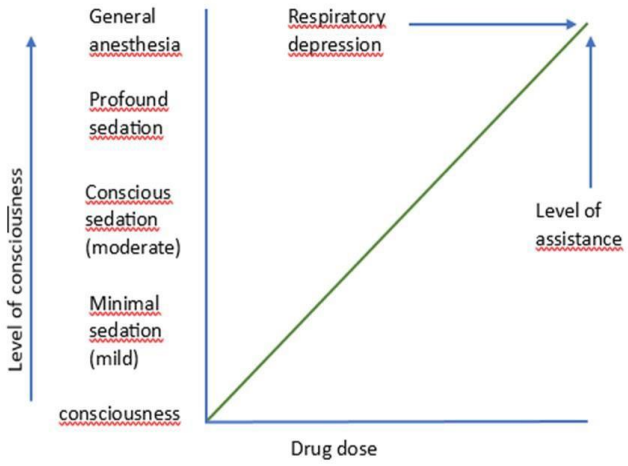

Fig. 1. *Effect of drug dosage and depth of sedation ansylosis.*

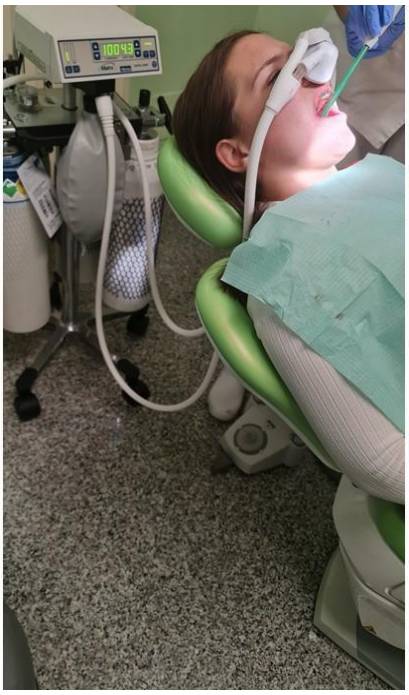

Fig. 2 *The patient with correct placement of nasal mask.*

Fig. 3 *Control panel that allows the flow rate of oxygen and nitrous oxide to be varied.*

Table I. *Continuum of depth of sedation: definition of general anesthesia and levels of sedation/analgesia.*

	Minimal Sedation Anxiolysis	**Moderate Sedation/ Analgesia ("Conscious Sedation")**	**Deep Sedation/ Analgesia**	**General Anesthesia**
Responsiveness	Normal response to verbal stimulation	Purposeful response to verbal or tactile stimulation	Purposeful response following repeated or painful stimulation	Unarousable even with painful stimulus
Airway	Unaffected	No intervention required	Intervention may be required	Intervention often required
Spontaneous Ventilation	Unaffected	Adequate	May be inadequate	Frequently inadequate
Cardiovascular Function	Unaffected	Usually maintained	Usually maintained	May be impaired

Contraindications

This technique has some contraindications that are worth mentioning, including patients suffering from psychosis, those suffering from claustrophobic panic attacks, patients recently operated on the auditory tract, those suffering from obstruction of the first airways in the first three months of pregnancy, hyperthermic children, and patients suffering from chronic bronchopneumonia. The symptoms of sedation can be subjective and objective. Subjective symptoms consist of a generalized sensation

of warmth due to the peripheral vasodilator effect, a tingling sensation in the upper limbs, a feeling of heaviness in the lower limbs, a sense of chest weight due to the muscle relaxant effect on the intercostal muscles, and muffling of sounds. At the same time, verbal contact, although always preserved, is slowly slowed down.

During surgery, respiratory and heart rate and O_2 saturation in the blood must be monitored. Thirty minutes after the start of the procedure, N_2O percentages must be reduced by 5% due to the progressive saturation of tissues with low blood perfusion. Once the procedure is over, N_2O administration must be discontinued and replaced with 100% O_2 percentages, thus ensuring the complete elimination of N_2O from the body and the full restoration of the patient's brain functions.

After removing the nasal mask, the patient is asked if he/she complains of residual N_2O symptoms (dizziness), and if this symptom is still persistent, 100% O_2 is continued for a few minutes.

CONCLUSIONS

Anxiety control during oral surgery is essential to promote patient cooperation between patient and dentist; this also ensures the security of the procedure (10, 11). Nitrous oxide has proven to be the most effective drug for performing conscious sedation in individuals with dental phobia.

Dental treatment under general anesthesia is not repeatable at close intervals and is not aimed at increasing patient cooperation (12). Conversely, with conscious sedation, the patient may cooperate during the treatment. Repeated sessions of conscious sedation have indeed been shown to improve the level of cooperation significantly (13, 14).

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Case report

ENVELOPE GRAFT TECHNIQUE FOR THE TREATMENT OF SINGLE GINGIVAL RECESSION: A 17-YEAR FOLLOW-UP CASE REPORT

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ABSTRACT

Gingival recession is one of the most common problems affecting the periodontium. About 50% of the population has at least 1 mm gingival recession, and 5-32% of adults have an advanced gingival recession. Recession is not only an aesthetic problem but can increase root sensitivity and hinder optimal oral hygiene. A deviation from the norm necessitates diagnosis, prognosis prediction, and treatment planning, all needing classification. These injuries pose a common clinical challenge in dentistry, demanding a targeted and advanced approach to ensure optimal aesthetic and functional outcomes. Among various proposed surgical methodologies, the "envelope graft technique" has garnered increasing attention and consideration for its effectiveness in treating individual gingival recessions. This article explores the "envelope" technique as a surgical approach. A case report is described, and the recent literature is discussed.

KEYWORDS: *gingival recession, envelope graft technique, periodontal stability, interdental papilla*

INTRODUCTION

Gingival recessions present significant clinical implications. Beyond aesthetic concerns, exposed roots increase the risk of dentin hypersensitivity, root caries, and compromise of periodontal stability (1). Understanding the causes and effects of gingival recessions is crucial for developing targeted therapeutic approaches.

Before planning a treatment, a proper diagnosis is paramount to selecting the right therapy. Published almost 40 years ago (2), Miller's original classification proposes a schematic and clear subdivision of the various types of gingival recessions commonly detectable in clinical practice. It classifies recessions into four main groups, and the clinical parameters that allow their subdivision is represented by the involvement or lack of involvement of the mucogingival line by the recession, the loss of periodontal attack, and the underlying bone loss. Due to these three parameters, it is possible to identify Class I as a gingival recession that does not extend beyond the mucogingival line, devoid of bone loss at the interdental level; this type of recession allows it to be, in the absence of complications of surgery, complete coverage of the injury site. Class II involves an extension of the lesion beyond the mucogingival line, but there is no loss of bone tissue in the interdental area; also, complete coverage of the recession can be performed with a high predictability index for this class. Class III recessions provide extension beyond the mucogingival line with the loss of interdental bone and

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periodontal attachment, which may or may not be associated with the extrusion of the dental element. In most cases, this type of recession does not allow surgery that may result in full root coverage. Class IV predicts that there is a recession extending beyond the mucogingival line, associated with severe bone loss and periodontal attack at the interdental level, as well as frank dental malposition. This type of recession does not foresee that there can be surgically full coverage of the tooth root.

In 1992, Tarnow identified (3) the physiological height of the interdental papilla: it must extend coronally to the bone crest for 5mm at the interdental level. Starting from this definition, in 1998, a system of classification of the recessions of the interdental papilla according to the cement-enamel junction (CEJ) was published (4). This classification divides the recessions of the papilla into three types, called Type A, Type B, and Type C, and in relation to the class of belonging, the kind of treatment and its possible outcomes vary. Type A includes all cases where the papilla extends 5 mm coronally to the bony crest, has a width greater than or equal to 3mm at the level of its base, and there is no loss of interdental bone tissue underneath. In these situations, it is predictable surgery that can fully cover the portion of the exposed root. Type B differs from the previous one only for the width of the base, which must be less than 3mm; in this case, the integral root cover cannot be predicted. Type C integrates cases where there is a substantial loss of bone tissue underneath the papilla and possibly a dental extrusion, such that the papilla may not 'cover' the interdental space. In these conditions, a complete root cover is hardly obtainable. At this point, going to combine the concepts contained by the classification of Miller and those of the classification of Tarnow and Nordland, it can be asserted that Miller classes I and II typically present recessions of the papilla type A or B, type C papillae recessions characterize Classes III and Classes IV are often devoid of interdental papillae.

The previously reported classifications have surgical implications. From the surgical point of view, a type A papilla guarantees a greater blood supply in cases of tissue grafting, with a consequent increase in the possibility of its survival. Type B papillae provide a lower nutritional intake that decreases proportionally to the decrease in the width of their base, reducing the predictability of a complete root cover. Another aspect to keep in mind is the thickness of the papilla, as this is crucial for the tissue graft's survival and the suture's tightness. In detail, the thickness of the papilla in the anterior sector varies according to the arch: in the upper jaw, unless there is a malocclusion, the thickness of type A papillae is greater than or equal to 3mm, and this guarantees a positive prognostic factor for the survival of the graft; differently, in the lower arch, especially in case of dental crowding, the thickness of the papilla is reduced, and this reduces the possibility of being able to obtain a complete root cover, especially in Miller Class III recessions (5).

Periodontal plastic surgery techniques often involve the transplantation of epithelialized or non-epithelialized gum tissue, i.e., connective tissue, harvested from the palate. The two techniques used are the connective tissue, graft, and Envelope Techniques.

In particular, the Envelope Technique consists of a horizontal intrasulcular incision within the gingival margin of the recession and the subsequent placement of connective tissue taken from the palatal fibromucosa. This incision allows lifting a gingival flap without compromising the vascular supply due to the absence of release incisions. After lifting, the surgeon prepares the surgical bed, removing any damaged soft tissue and reducing the possibility of recurrence.

The Envelope Technique is, therefore, a surgical approach that stands out for its versatility and ability to treat single gingival recessions with precision. Here, we reported a case of single recession treated with the Envelop Graft Technique.

CASE REPORT

A 23-year-old man presented to Clinique with a sensitivity problem at level 1.3. An objective examination and endo-oral Rx were performed to assess the integrity of the interproximal periodontal support (bone and attachment), a fundamental factor in achieving complete root coverage.

On examination and intraoral inspection, two recessions in elements 1.3 and 2.3 with an extension in the apical coronal direction of 5 mm were easily visible. It was decided to treat the recession in 1.3 first. In addition, the radiological diagnosis showed the integrity of the osseous and periodontal support of element 1.3, which was a positive prognostic factor for complete root coverage (Fig. 1).

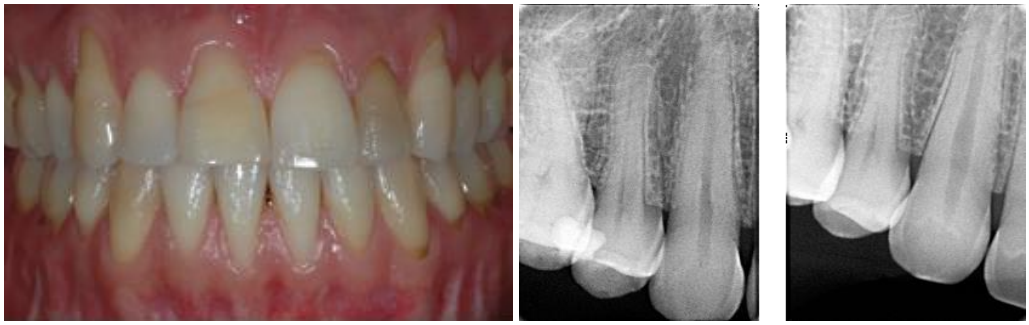

Fig. 1. *Initial intraoral photo (front view) and periapical x-rays of element 1.3.*

The treatment plan proposed to the patient to resolve the recession and associated tenderness in the tooth element (1.3) was root coverage with a subepithelial connective graft harvested from the palatal fibro-mucosa. The patient consented to the treatment, and the Envelope Surgical Technique was chosen. As a first step, the exposed root surface was smoothed and etched with tetracycline for decontamination (Fig. 2).

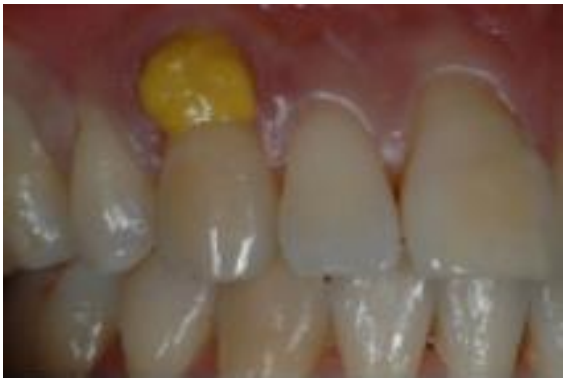

Fig. 2. *Decontamination of the root surface using tetracycline.*

Palatal connective sampling has certain advantages over epithelial-connective sampling: sampling can be extended more mesially, including the palatal crevicular sector. Haemostasis control is easier to achieve because the sampling site is closed by first intention, favoring a better postoperative course (Fig. 3).

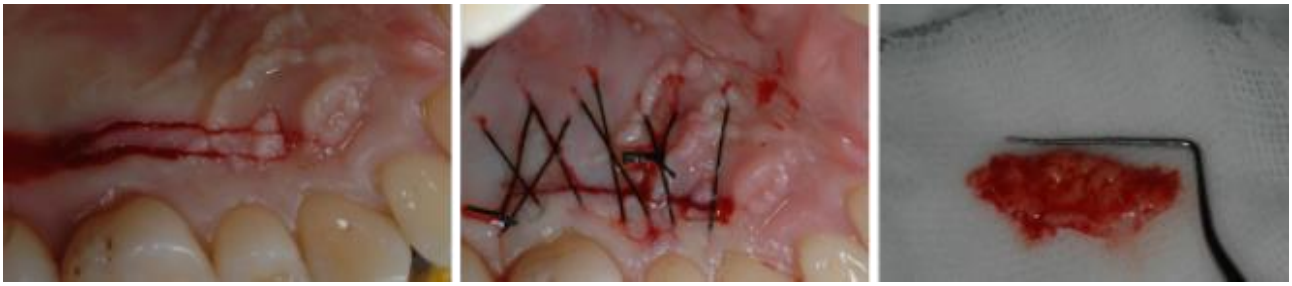

Fig. 3. *Intraoperative photos.*

However, there are some disadvantages: if the palatal fibro-mucosa is thin, the quantity and quality of tissue that can be harvested is reduced, and the technique requires good manual dexterity and experience from the surgeon.

The envelope harvesting technique uses a single incision line through which the subepithelial connective tissue was harvested (Fig. 3). This allowed the palatal creases to be included.

After achieving adequate anaesthesia with adrenaline 1:50,000, a horizontal incision was made from distal to the canine to mesial to the first molar, at least 1 mm from the sulcular depth of the adjacent teeth, staying above the periosteum. Using a periosteal cutter, the incision line was gently opened to allow the insertion of a 15c scalpel blade.

The blade was inserted parallel to the plane of the bone along its entire length, remaining superficial to separate the epithelium from the connective tissue. The blade was then inserted at a deeper level to separate the connective tissue from the periosteum. Two vertical incisions, one mesial and one distal, allowed the release of the connective tissue on all four sides, which was removed from the sheath using forceps. The incision line on the palate was sutured with simple detached stitches to facilitate healing by first intention. Fig. 3 shows the newly harvested piece of connective tissue with a length of 12 mm and a width of 5 mm.

The flap was then designed (Fig. 4), starting with an intra-sulcular incision with an internal bevel to remove the sulcus epithelium.

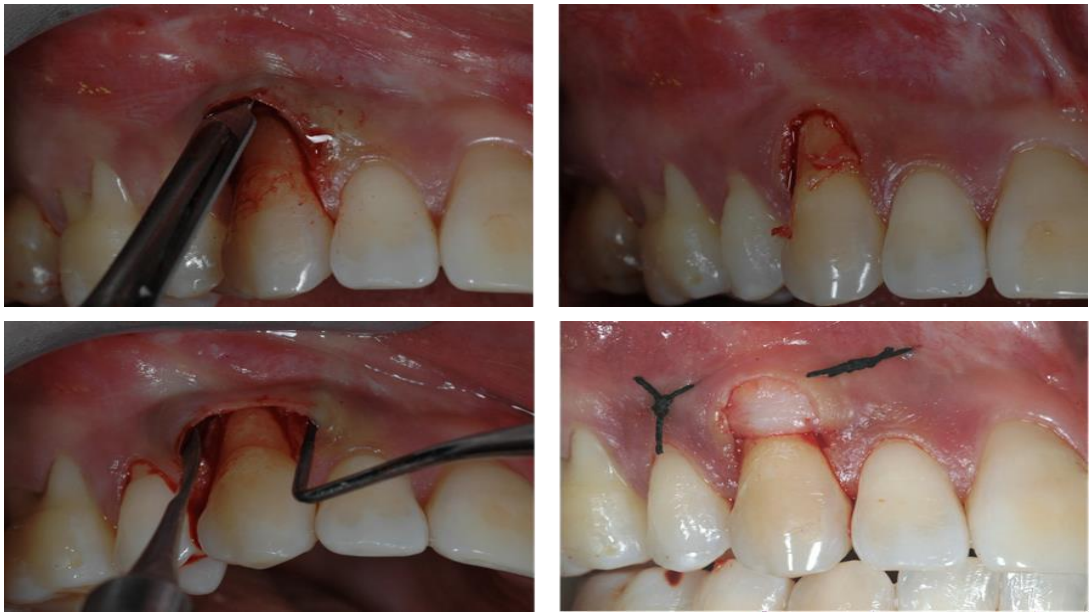

Fig. 4. *Intraoperative photos.*

Once this was done, a partial thickness incision was made to create an 'envelope' apically of the lesion, extending 3 to 5 mm beyond the muco-gingival joint, mesially and distally, to create the housing for the connective graft. The operator used a periodontal probe to ensure that there were no intact fibers within the incision margin that would compromise the passive fit of the graft.

The graft was then positioned, paying attention to positioning, passivity, and stability within the resulting envelope. Based on the stability of the graft, fixation with 2 simple sutures was chosen. One week later, the sutures were removed, and the graft was well anchored, with a pink mucosa showing some traces of inflammation (Fig. 5), which can be assimilated to the physiological postoperative healing phase.

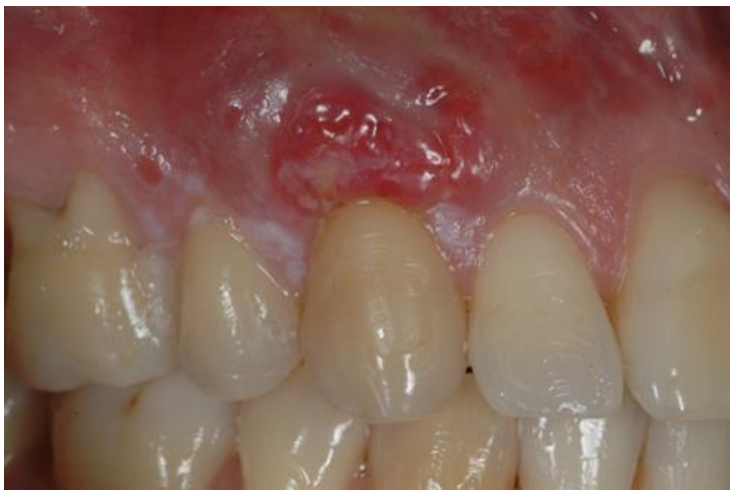

Fig. 5. *One week later after removing the suture. First healing*.

At the 17-year follow-up, complete root coverage, gingival margin at the level of the CEJ, and adequate support were observed. There was a clear recovery of the keratinized tissue, completely restoring the physiological aesthetics of the periodontium, and the patient reported the complete disappearance of the symptoms of algal hypersensitivity due to the root coverage (Fig. 6).

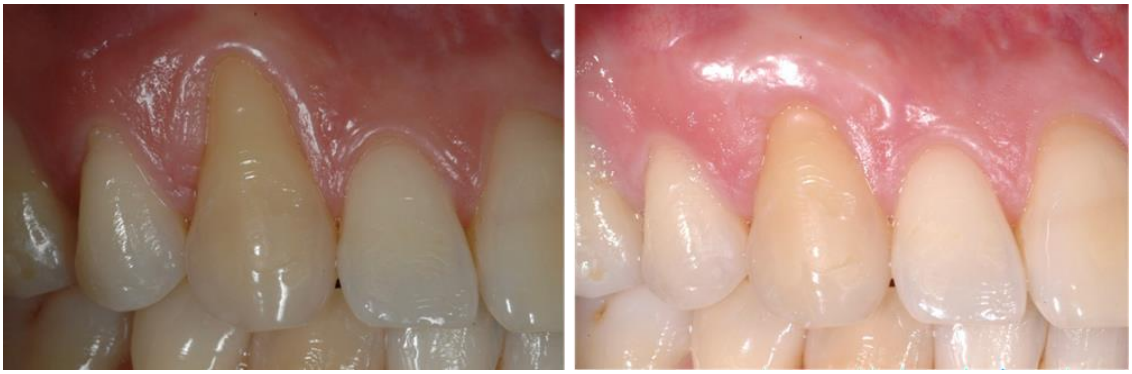

Fig. 6. *The first photo shows the initial situation with the exposure of the root surface of element 1.3. The second photo is a 17-year follow-up.*

DISCUSSION

The present case report aims to evaluate a case of coverage of a Miller Class II gingival recession on a 1.3. The technique used a partial-thickness papillary flap without release incisions, with an autologous connective tissue graft harvested from the palate and inserted to cover tooth recession.

The periodontal surgery technique used in the presented case includes the transplantation of a subepithelial connective tissue graft. This technique harvests a partial thickness graft of connective tissue without the epithelial component, which covers the palatal periosteum, excluding that there can be healing by the second intention of the donor site. The advantages are that it can be extended for several teeth, also affecting the area of palatine wrinkles and that the closure by first intention guarantees a post-operative course with less discomfort. On the other side, the use of this method of sampling is limited to cases in which the palatine fibro-mucosa is thick enough to be dissected. In addition, the thin superficial epithelial layer often undergoes necrosis, and the healing occurs by second intention if the palatal mucosa is too thin. A further disadvantage lies in the fact that this technique requires excellent manual skill and experience from the surgeon. Despite the abovementioned disadvantages, the subepithelial connective tissue harvesting technique is preferable to epithelial-connective tissue harvesting.

In recent years, synthetic connective tissue substitutes have been introduced to reduce post-operative problems related to the donor site and avoid needing a second surgical site to harvest connective tissue (6). These biomaterials consist of collagen and elastic fibers and mimic both the appearance and function of connective tissue grafts, making them a viable alternative in patients where harvesting connective tissue is impossible due to anatomical problems.

Using autologous connective tissue from a palatal harvest is considered the gold-standard treatment for gingival recessions. However, it is important to consider some negative aspects during the preoperative period. This approach requires the creation of a second surgical site, which can cause pain and post-operative bleeding for the patient.

Furthermore, making one or more incisions at the palatal level significantly prolongs the surgical procedure. Additionally, there is a risk of necrosis in the palatal epithelial layer, which may result in the lesion healing by second intention and causing further discomfort for the patient. Therefore, it is advisable to consider using a biomaterial graft to cover the gingival recession. According to the study conducted by Rampinelli et al. (7), these tissues are designed to overcome the disadvantages of autologous grafts. Allogenic grafts present several advantages over autologous grafts, including reduced morbidity and shorter surgery duration. Autologous grafts, on the other hand, have several unfavorable aspects, such as the need for a second surgical site, limited availability of material, difficulty in manipulation, longer operating times, high patient morbidity, and unsatisfactory aesthetic results. Additionally, allogenic grafts can significantly reduce intraoperative and postoperative discomfort. For these reasons, biomaterials may be a viable alternative to autologous harvesting. Regarding aesthetic performance, studies suggest that these materials provide effective camouflage, but further research is needed (8).

A different technique that can be used is the Bilaminar Technique (9) that consists of a coronal advancing flap with autologous grafting of connective tissue from the palate. This type of technique is particularly effective, especially

in cases where there is a loss of mesial and distal bone tissue and/or a loss of tooth substance due to collar caries (9). The bilaminar technique consists of an intrasulcular incision with partial thickness accompanied by two release incisions, one mesial and one distal to the defect, and also involves a de-epithelialization of the papillae. The resulting flap is surpassed to cover the grafted material and is sutured with two sling sutures at the papillary level and simple sutures on the release incisions (10). This guarantees root coverage and stability of results over time in most cases (9).

However, Bilaminar Technique has a series of disadvantages: first of all, the presence of release incisions, which have a higher biological cost - despite making surgery easier - which means longer healing times; less blood flow to the flap and greater risk of necrosis (11) to the detriment of predictability similar to the classic envelope method. In fact, the use of this technique in Miller's class II guarantees predictability of the result equal to 84% (10), a percentage that rises to 89.7% according to the retrospective study carried out by Cordioli et al. (12). Another main point in the choice of the surgical method is, certainly, to be able to guarantee the patient not only good predictability of the root coverage but also a good result from a chromatic point of view (13).

CONCLUSIONS

In conclusion, the Envelope Technique is a reliable surgical procedure to treat single recession in selected cases. Proper classification prior to surgery and appropriate surgical technique are essential to obtain good result over time. Envelope Technique guarantees less invasive surgery, a flap with excellent blood supply due to the absence of release incisions, highly predictable root coverage results, and the papillae preservation. In addition, it guarantees an excellent rendering both from a chromatic point of view and surface matching of keratinized gums.

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Case Report

PDH-MIX© PROTOCOL: CORRECT INSERTION OF IMMEDIATE IMPLANTS IN POST-EXTRACTION MOLAR SITES

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ABSTRACT

There is a widespread tendency in oral implantology that leads to consider the immediate post-extraction implant more frequently in the frontal region and, although less often, in posterior areas. Each of these sectors has its peculiarities, advantages, and risks. Although there are several shared protocols for the immediate post-extraction system in the front area, there are none for those in the rear sectors. The aim of this study is to propose, through the presentation of a case report, systematics that makes it as predictable to the clinician beforehand, in the diagnostic phase, to draw up a treatment plan as close as possible to the situation that will be found once the tooth has been extracted. That is, to give a technique, which in any case is always for experienced operators, for which the immediate insertion of the implant once the multi-rooted tooth has been extracted and its long-term success is more predictable.

KEYWORDS: *implant, fixture, protocol, bone, crest, alveolus*

INTRODUCTION

There is a widespread tendency in oral implantology that leads to consider the immediate post-extraction implant more frequently in the frontal region and, although less often, in posterior areas. Each of these sectors has its peculiarities, advantages, and risks. Patients and operators agree in favoring less inquisitive solutions possible, fewer sessions, and therefore greater speed to reach the end of treatment in the shortest possible time, where the conditions are met.

Although there are several shared protocols for the immediate post-extraction system in the front area (1), there are none for those in the rear sectors. If it is true that some studies speak of high success rates (2, 3), others instead report a high possibility of failure linked to the diameter of the fixtures (4). A recent prospective study of 15 consecutive patients, in which 4 of 15 immediate post-extraction implants on molars had to be removed before 1 year, demonstrated a relatively low survival rate (73.3%) (5).

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In any case, they are studies that exclude infected alveoli or cases in which fixtures "cannot" be inserted (due to poor quantity or quality of residual bone found in the surgical phase and not predictable by x-ray examination or pre-operative planning); therefore, these researches do not inform us about the predictability of the possibility of successfully inserting an immediate post-extraction implant into molar sites.

The studies of the reviews above mainly investigate the success rate, or survival, of those implants that have been able to be inserted because the anatomical situations of the post-extraction alveolus have been considered reliable. The problem of the clinician is, instead, being in front of the patient and not having yet extracted the tooth - therefore not knowing if and what anatomical conditions the post-extraction alveolus will present - predict in advance if in that case an implant can be inserted with the appropriate conditions of stability, correct positioning and asepsis, or an ARP (Alveolar Ridge Preservation) will have to be performed (6) and the insertion of the fixture will have to be postponed or postponed.

First, the patient must always be warned, not intraoperatively, to avoid uncomfortable situations, disappointments, or false expectations (7). In fact, the option of a second surgical phase should always be proposed in the first visit, possibly also giving the patient an idea of its greater or lesser percentage predictability. Even in the relationship of communication with the patient, these are relevant aspects (8).

In fact, it must be considered that several of these post-extraction sites could present (radiographically or clinically) infections or bacterial contamination due to infiltrations, fractures, and endo-periodontal lesions. These, when present, in addition to having to be naturally resolved and decontaminated, indirectly affect the quality and quantity of the residual alveolar bone and, therefore, the presence or absence of minimum conditions required to obtain the primary stability of the fixture, the correct positioning from the point of view and the possibility of safe healing of the site (9). It is, therefore, very difficult to predict whether the residual inter-radicular bone will be of adequate quality and quantity to accommodate the fixture in multi-rooted teeth in the immediate post-extraction phase. That said, it is up to the operator to use all available means to increase the chances of concluding the implant insertion in a single surgical phase (avulsion and immediate insertion of the fixture in the post-extraction alveolus)

In summary, the challenges that in this type of intervention we must face are:

a) the preservation of bone, both of the buccal wall and the interradicular septum, that can be lost or compromised as a consequence of an inquiring avulsion, particularly in the frequent ankylosed elements;
b) the correct management of the residual infection (from the odontogenic lesion, granuloma, or cyst), which is not an obstacle because it can and must be neutralized (10), but which certainly can increase the risk of contamination, and therefore of lack of osseointegration, of part or all of the implant surface (11). Systemic antibiotic therapy is not always sufficient to do this (12);
c) the reliable closure by the second intention of the gap, almost always > 2 mm (13), which hesitates between fixtures and residual alveolar walls;
d) stabilization of the clot, including adequate protection of the (14) flapless post-surgical site;
e) the induction of healing by the second intention, aiming to maintain or increase the peri-implant keratinized gingiva band (15).

The aim of this study is to propose, through the presentation of a case report, systematics that makes it as predictable to the clinician beforehand, in the diagnostic phase, to draw up a treatment plan as close as possible to the situation that will be found once the tooth has been extracted. That is, to give a technique, which in any case is always for experienced operators, for which the immediate insertion of the implant once the multi-rooted tooth has been extracted and its long-term success is more predictable.

CLINICAL CASE REPORT

Patient evaluation and case planning

Female patient, 46 years old, non-smoker, good oral hygiene, general negative history. Radiographic examination revealed an encapsulated, fractured, asymptomatic 1.6 (Fig. 1, 2).

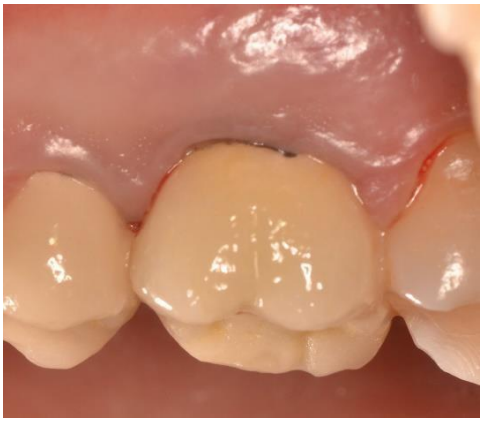

Fig. 1. E*ncapsulated, fractured, asymptomatic 1.6 pre op.*

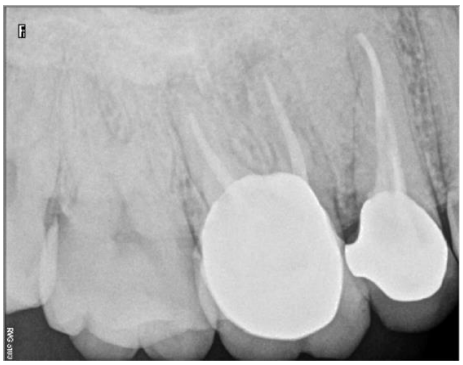

Fig. 2. *Encapsulated, fractured, asymptomatic 1.6 rvg T=0.*

The CBCT confirmed the presence of periapical odontogenic lesions organized on the two mesial and distal-vestibular roots (Fig. 3, 4) and helped analyze residual bone thicknesses and anatomical relationships with the maxillary sinus floor and surrounding tissues. Also, the thickness and conditions of soft tissue were evaluated and found stable.

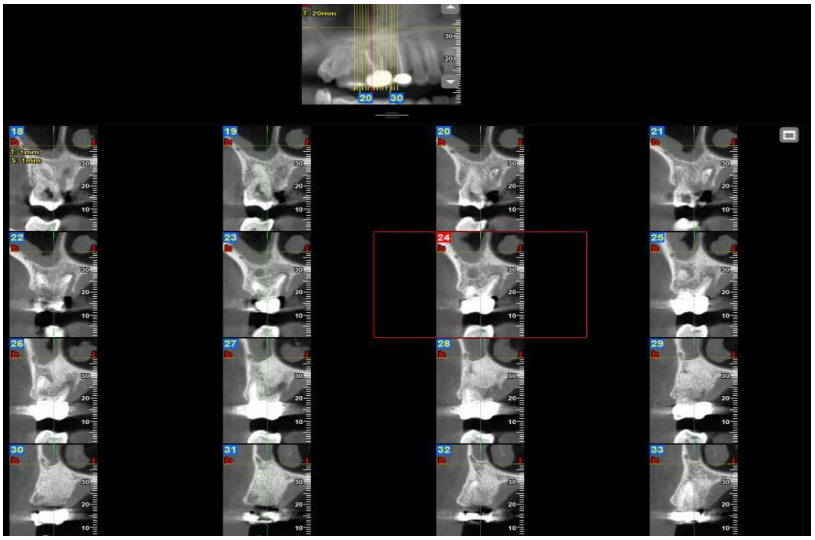

Fig. 3. *CBCT T=0.*

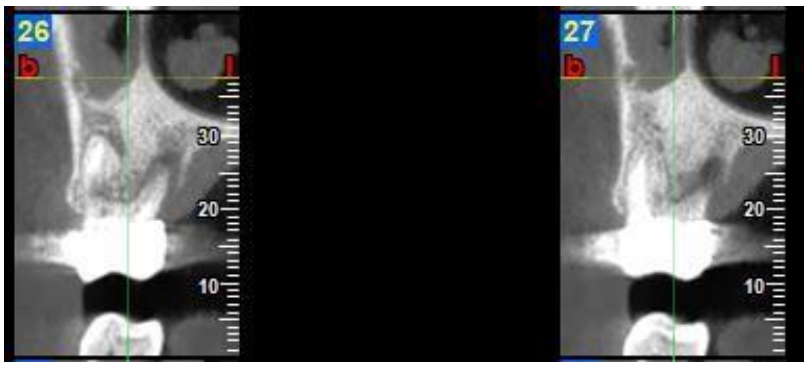

Fig. 4. *CBCT confirmed the presence of periapical odontogenic lesions organized on the two mesial and disto-vestibular roots.*

Surgical procedure

According to a known protocol, the patient was prepared for surgery and received complete mouth disinfection by the dental hygienist one week before surgery (16). She also received pharmacological protocol: Azitromicine 500 mg, 1 every 24 hours for three days, beginning the day before the surgery; paracetamol 1000 mg, 2 hours before surgery; chlorhexidine 0,20% rinse, 3 per day, from 3 days before surgery.

Two anesthetic cartridges (Mepi Mynol 20 mg/ml, mepivacaina cloridrato, 1:100.000) were injected locally from the beginning till the end of the surgery (50 min). These were the phases of surgery, as shown in the pictures:

1. Atraumatic avulsion. The alloy-porcelain crown, present in this case, is removed, and the rest of the clinical crown is separated (Fig. 5) following the root anatomy, with the normal tungsten carbide cutter separating the roots up to the floor of the pulp chamber.

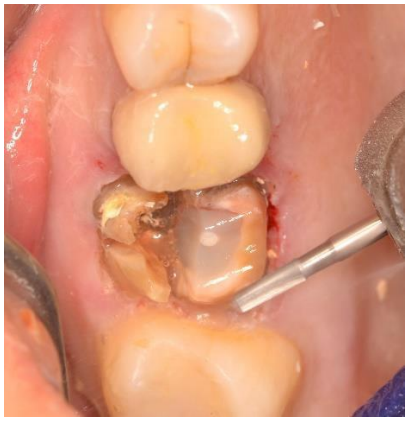

Fig. 5. *The alloy-porcelain crown is removed, and the rest of the clinical crown is separated.*

2. With a special piezoelectric insert (ES009NT, Esacrom®), the separation of the roots was completed with a conservative technique and in safety for the surrounding noble structures (floor of the maxillary sinus, bundle bone, palatine artery), reducing surgical times and post-operative morbidity for the patient (Fig. 6) (17).

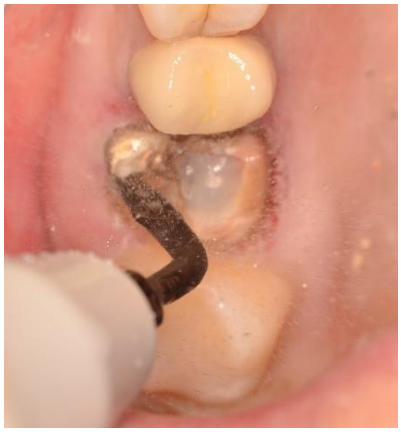

Fig. 6. *Completed separation of the roots with a special piezoelectric insert (ES009NT, Esacrom®).*

3. The avulsion was particularly inquiring since the roots are ankylosed. Eight fragments were gently extracted with the utmost respect for the residual anatomy, preserving the maximum hard tissues that will provide primary stability to the fixture (Fig. 7).

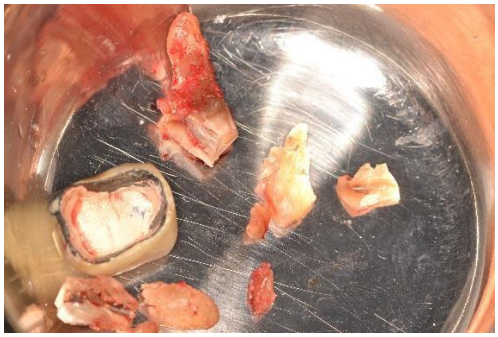

Fig. 7. *Extracted fragments.*

4. *Decontamination and inspection of the post-extraction site*. The cavitation effect (18) is now adopted in its appearance as a powerful tissue decontaminator. It is exploited, even after removing the apexes and the granulation tissue present, leaving the insert (the same used for avulsion) to vibrate for 30-40 seconds inside the post-extraction alveolus filled with physiological saline solution (Fig. 8). The insert can be of any type; the important thing is that it does not come into contact with the alveolar bone tissue but is immersed and surrounded by saline solution (the recommended parameters for this procedure with this insert are U = 60; V=90; P=100). The conservative technique used guarantees an excellent field visibility (due to the hemostatic effect of cavitation), and the maintenance of the most significant amount of alveolar bone possible, thanks to piezoelectric surgery (Fig. 9) (18).

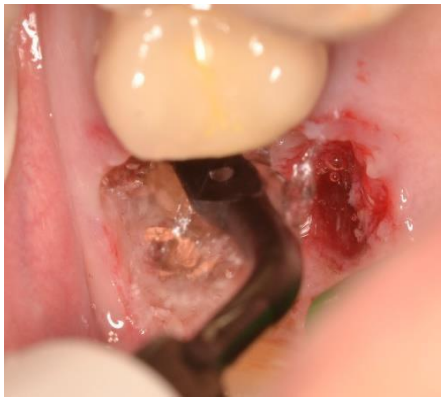

Fig. 8. *Post-extraction alveolus filled with physiologica.*

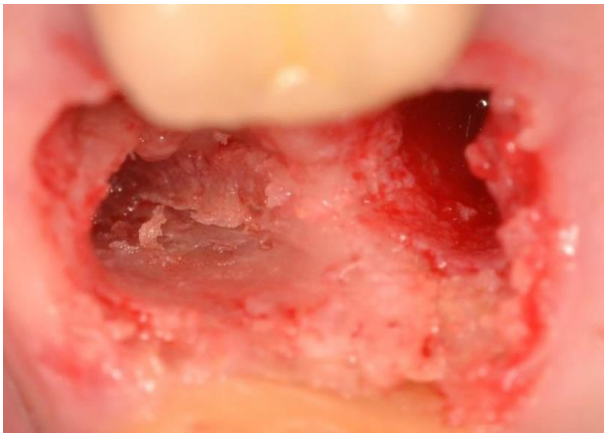

Fig. 9. R*esult of the conservative technique.*

5. *Implant insertion.* Once the site for the placement of the implant has been identified with the piezoelectric handpiece (insert ES052XGT, Esacrom®) or similar, depending on the thickness of residual bone, the first invitation to osteotomy is gently practiced in the center of the interradicular septum bone (Fig. 10).

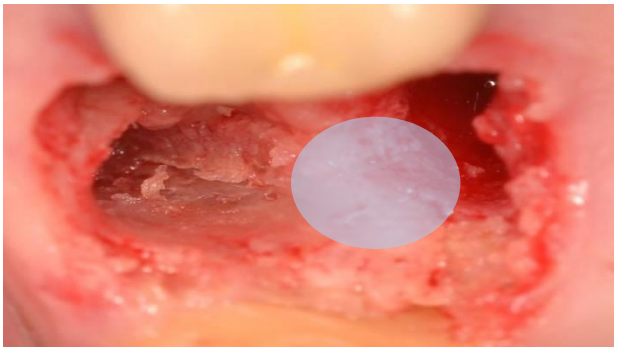

Fig. 10. *Osteotomy area (with Piezo).*

This is the most important cut, and the *Piezo* is the only tool capable of maintaining such thin thicknesses but also sufficiently resistant to accommodate the implant. This portion of the bundle bone will guarantee the necessary primary stability, Torque, and ISQ to the fixture that will be placed.

6. When this is done, it is easier to continue the osteotomy at low speed (250-300 rpm) with the implant kit's progressive cutters according to the different manufacturers' protocols (Fig. 11).

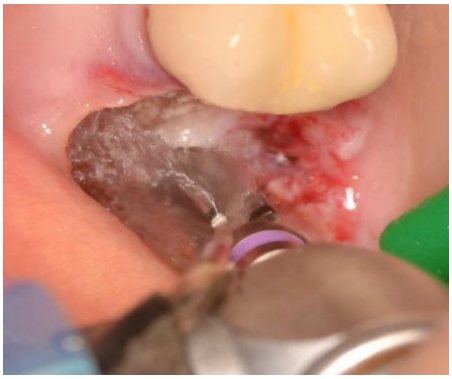

Fig. 11. *After the initial drilling with Piezo, the osteotomy ends with the cutters of each implant kit.*

7. After the osteotomy, the site is prepared or underprepared (in this case, a cutter Ø 3.5 mm), according to the quantity and quality of bone D1-D4 the fixture is inserted, in this case of Ø 4.1mm, with an insertion Tq 35 Nmc, and ISQ (Osstell©) 80-50 (Fig. 12).

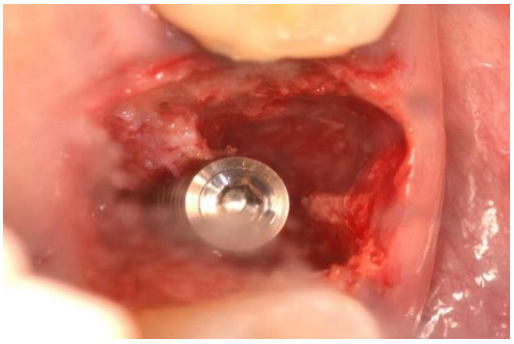

Fig. 12. *Implant correctly inserted in the residual bone.*

8. *Hyaluronic Acid (H-mix).* xHYA Regedent®, a cross-linked stabilized Hyaluronic Acid gel, fills the gap in the alveolar bone. Everything is then stabilized by a collagen tablet (Collaplug; Zimmer®) placed coronally to protect

the site previously soaked with xHYA gel (Fig. 13). Although it has been shown that xHYA, both with collagen and without, still has a bone regeneration effect (19), it is preferable to use it for *space-making*, given the large crater formed after these teeth' extraction.

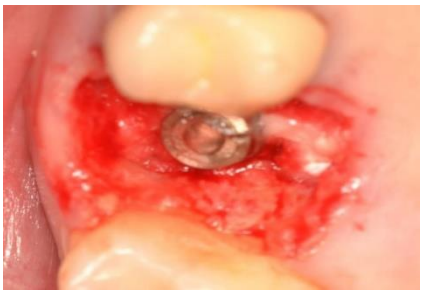

Fig. 13. *Collagen tablet (Collaplug; Zimmer®) placed coronally to protect the site.*

The procedure of mixing xHYA and Collagen aims to maintain its "space-making" effect for as long as possible, slowing down its reabsorption and lysis by salivary proteases (20), thus allowing a better stabilization of the clot and, at the same time, ensuring good healing for second intention.

9. *The suture.* A cross-stitch in pseudo-monofilament polyamide (*Supramid* n. 4/0) is given, with care to involve sufficient portions of healthy and thick tissues (Fig. 14). Healing by second intention creates the conditions for the increase of keratinized gingiva, fundamental for the success and long-term maintenance of peri-implant soft and hard tissues.

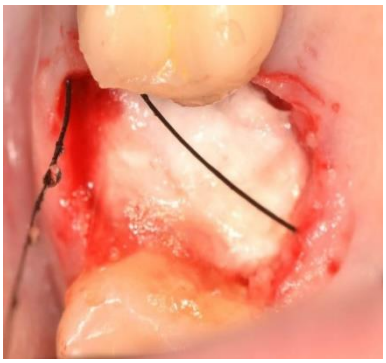

Fig. 14. *The suture.*

10. An additional application of xHYA is directed to cover the entire area (Fig. 15). It is necessary not to swallow the patient for 3-4 minutes to let the gel solidify and instruct him so that for the 2 hours following the operation he does not drink, eat or throw his mouth.

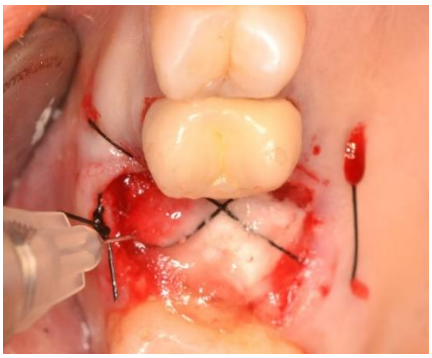

Fig. 15. *Additional xHYA is inserted all over the graft.*

11. Final RVG (Fig. 16).

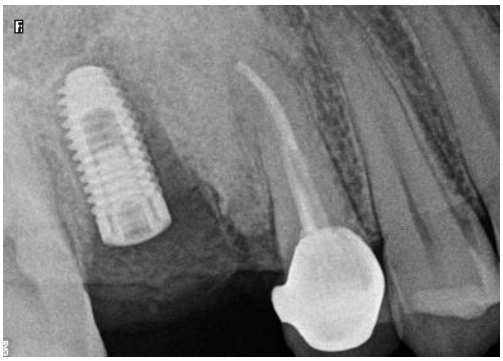

Fig. 16. *Final RVG*

12. The following controls evidence the effectiveness of healing (Fig. 17-20).

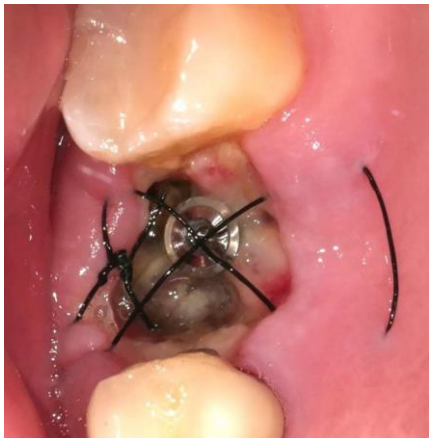

Fig. 17. *Control at 7 days.*

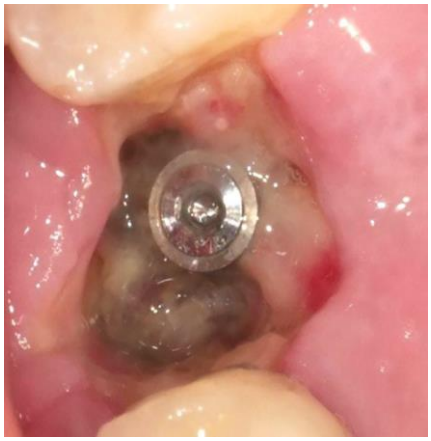

Fig. 18. *Removal of the suture.*

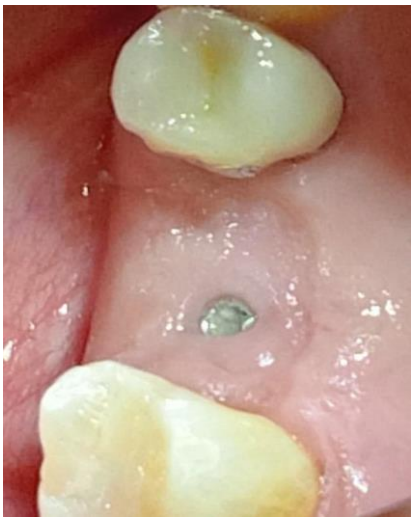

Fig. 19. *Effectiveness of healing T=4m.*

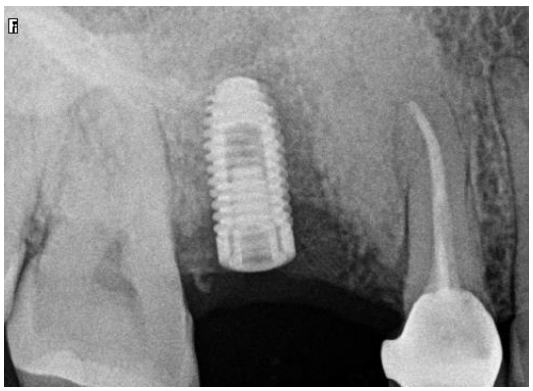

Fig. 20. *Effectiveness of healing T=4m RVG.*

13. Delivery of the final work at 5 months (Fig. 21-24).

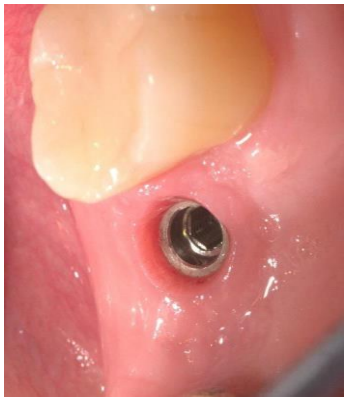

Fig. 21. *Note the healed soft tissue around the implant.*

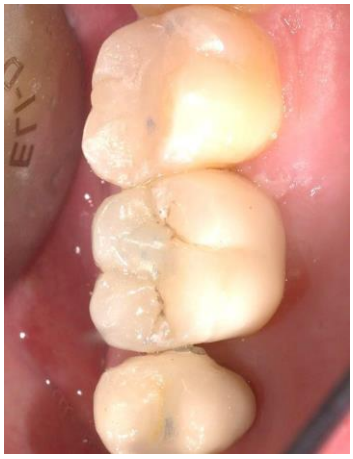

Fig. 22. *Final delivery of the ceramic.*

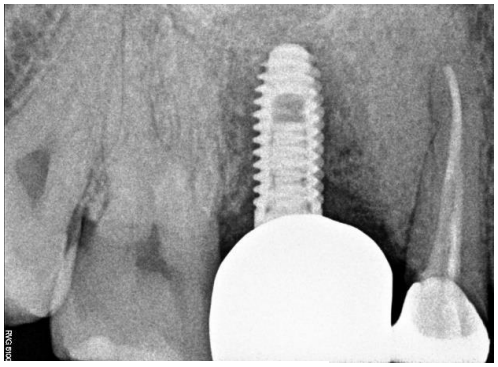

Fig. 23. *Final RVG T=5months.*

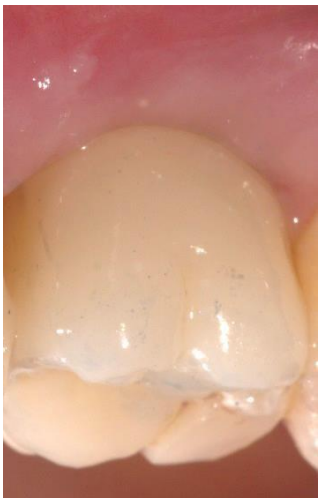

Fig. 24. *T=5 months; note the maintenance of a large band of KG.*

DISCUSSION

Piezoelectric surgery is an excellent tool to handle delicate or compromised hard- and soft-tissue conditions with less risk for the patient. Minimal accidental damage to adjacent soft-tissue structures allows for a safe and gentle surgical approach, particularly to thin and fragile bony structures (18, 21). Piezoelectric instruments reduce the risk of nerve damage when used for lower molar tooth extraction. When it is used in the upper posterior sites, it is safer when, as often happens, the clinician is working close to the maxillary sinus area or near the vase and nerves.

The reduction of overheating, frequent in extraction with classic instrumentation, bone surgery, or implantology, is explained by the generation of a *cavitation* effect in the irrigation solution due to the mechanical micromovements at a frequency of approximately 25–30 kHz. This also accounts for the local sterilization effect and reduced bleeding, which means better surgical visibility and increased safety (22, 23).

A mechanical shock wave that vibrates linearly produces the sonic and ultrasonic frequency (25-30 kHz). The cutting tip works with a reduced vibration amplitude (horizontal 20-200 µm, vertical 20-60 µm). This allows for the main advantages of this device, which are precise and selective cutting, the avoidance of thermal damage, and safety for the patient (22). The selective cutting is the result of the limited amplitude. Only mineralized tissue will be cut at this amplitude because soft tissue requires frequencies greater than 50 kHz (24).

Resonance-frequency analysis was applied to evaluate the implant-stability quotient (ISQ) in sites prepared by conventional drilling or piezoelectric tips. It showed significant increases in ISQ values for the piezo-surgery group. Therefore, the ISQ of the fixtures placed using the piezoelectric device was greater than that obtained when the implants were placed using the conventional technique (25).

Several clinical studies have evaluated the degree of contamination of the autogenous bone particles that can be obtained with bone collectors during implant osteotomy. The result demonstrated that collected bone particles contain oral microorganisms that may cause infectious complications. Owned to the effectiveness of different decontamination methods, stringent aspiration protocol, preoperative oral chlorhexidine rinse, and antibiotic prophylaxis (26, 27) were important precautions that have been tried to implement when collected bone particles are to be implanted. Despite reducing contamination of collected bone particles, none of the methods described in the literature can completely decontaminate collected bone particles or prevent the risk of infectious complications. Further research is needed to identify more effective decontamination methods (28). The presented PDH-mix protocol is a proposal in that sense.

Hyaluronic Acid (HyA) is well known as a non-sulfated glycosaminoglycan structured biomolecule and a major natural component of the extracellular matrix in many tissues, including the skin (29), joints, eyes, and periodontium (30). The rationale for using it in PDH-mix protocol is because, physiochemically and biologically, HyA has been demonstrated to have huge effects: bacteriostatic (31, 32), antibacterial (33), anti-inflammatory (34) and anti-oedematous (30, 31). Moreover, extensive in vitro studies have demonstrated that HyA significantly stimulates clot formation (29, 35), induces angiogenesis (36), and increases osteogenesis (29, 37); all factors we strongly need to make more predictable the post-extractive immediate implant in the posterior area. Moreover, the piezoelectric device stimulated peri-implant osteogenesis and reduced proinflammatory cytokines (38).

All these factors, synergistically gathered in PDH-mix protocol, can provide a more reliable and predictable surgical placement of the implant in a fresh extraction socket, healthy and/or ankylosed or not, after molar extraction.

CONCLUSIONS

Atraumatic extraction and immediate implant placement in the molar area is a challenging procedure for the clinic, and it's, in any case, for expert operators.

The PHD-mix protocol may improve the possibilities to insert the fixture and improve the prognosis relative to the final esthetic and functional results, facing the different local anatomical and biological situations and decreasing the complications, reducing the number of surgical procedures required to end the case successfully.

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Case Report

IMPLANT INSERTION, BONE REGENERATION AND PALATAL CONNECTIVE TISSUE GRAFTING IN MAXILLARY AESTHETIC AREA: A CASE REPORT WITH A 9-YEAR FOLLOW-UP

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ABSTRACT

The restoration of tooth loss in the frontal area is challenging. Patients demand immediate restoration for aesthetic reasons. In addition, tooth loss determines alveolar bone remodeling with consequent reduction in height and thickness of the alveolar bone. Several frontal area rehabilitation techniques exist, ranging from prosthetic solutions to immediately loaded implant solutions. In this case, there is often the need to do soft and hard tissue regeneration. These techniques can be performed at the same or different times of implant insertion. A single intervention to insert the implant, regenerate bone, and increase soft tissue in a single surgical session is more complex but highly appreciated by the patient. The present work describes a case report of a patient who benefited from implant placement, guided bone regeneration, and grafting of connective tissue collected from the palate to restore an upper central incisor.

KEYWORDS: *bone, regeneration, maxilla, jaw, crest, alveolus, graft, fixture*

INTRODUCTION

Immediate post-extractive rehabilitation of loss of frontal teeth is challenging due to soft and hard tissue loss and the request for a high aesthetic solution. The therapeutic choice is guided by several factors, such as the possibility of obtaining an implant's primary stability, gingival biotype, presence/absence of vestibular bone thickness/dehiscence, and marginal bone level.

Ridge bone reabsorption after tooth extraction in the frontal area is a common situation that can compromise a proper gingival tissue level around the implant emerging profile. From this point of view, the literature shows how vestibular bone is essential to maintain the vestibular soft tissue stability of the teeth to be treated (1). In addition, it has been identified that different gingival thicknesses are strictly related to the periodontal probing depth, gingival width, and type of teeth (2). Moreover, a correlation between gingival clinical thickness and alveolar bone thickness on the labial side has been demonstrated using CBCT measurements (3); both variables are essential for proper rehabilitation. Some surgical techniques can be used to maintain or restore alveolar bone ridges, such as socket preservation (4), guided bone

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regeneration, and the tent pole technique (5). Since patients ask for an urgent solution, combining some surgical procedures (i.e., implant insertion, bone regeneration, and soft tissue grafting) in a single surgical time is possible. In these cases, patient selection is paramount since the risk of failure is higher in cases where each surgical procedure is performed at different times.

Palatal tissue graft is the most used technique for soft tissue augmentation. The connective tissue graft procedure requires harvesting soft tissue from the palate (i.e., donor site), freeing the graft from the epithelium, and applying the connective tissue in a recipient site. The choice of the donor site is guided by the quantitative requirements of the site that received the graft (6). Indeed, connective tissue graft increases the width and thickness of keratinized tissue and improves the therapy's aesthetic results (7).

The present work reports a case treated with post-extractive implant insertion, guided bone regeneration using heterologous material, and palatal harvest connective tissue grafting treated by a single surgeon (Dr. Elias El Haddad). Furthermore, pertinent literature is discussed.

CASE REPORT

At the first visit, a 53-year-old man complained about a purulent swelling at the level of the left upper central incisor (Fig. 1).

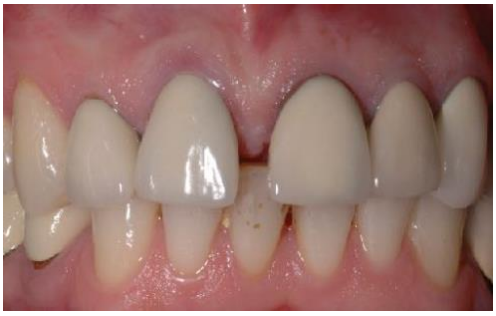

Fig. 1. *Initial stage, frontal view*

A radiographic examination revealed the development of an apical lesion with probable apicectomy performed in the past (Fig. 2). Dental probing showed no periodontal lesions around the central incisor or adjacent teeth.

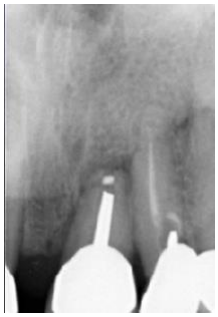

Fig. 2. *Radiographic examination with the development of an apical lesion*

The clinician explained different treatment options to the patient. The choice selected by the surgeon and the patient was to extract the tooth and immediately insert an implant 4.3 x 18 mm, replace tapered with a TiUnite surface, Nobel Biocare®, perform a bone regeneration using heterologous material, and graft connective tissue harvest from the palate. After taking a pre-extraction impression, the tooth element was provisionally restored with a temporary resin crown prepared in advance by the dental laboratory.

From a surgical point of view, after performing local anesthesia with adrenaline, the tooth was extracted, and a flap from the upper right central incisor to the upper left cuspid was lifted without a vertical incision. Then, a dehiscence in the vestibular bone plate was visible (Fig. 3).

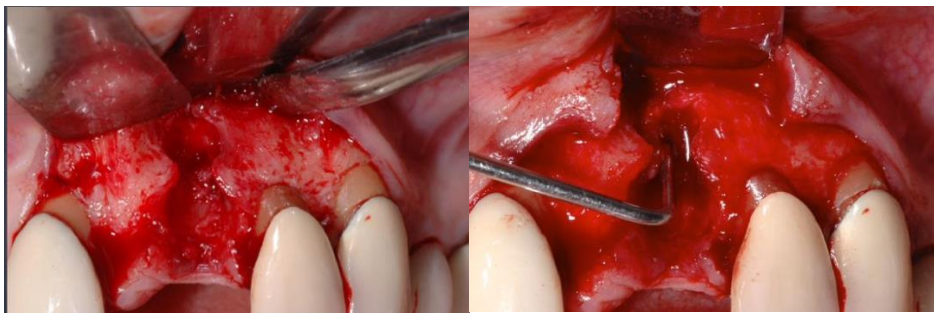

Fig. 3. *In the first photo, we can see the flap's realization and the vestibular bone's dehiscence in the following photo.*

The alveolus was cleaned by granulation tissue, and the implant was inserted. The implant surface was out of bone in the vestibular area for about 8 mm (Fig. 4).

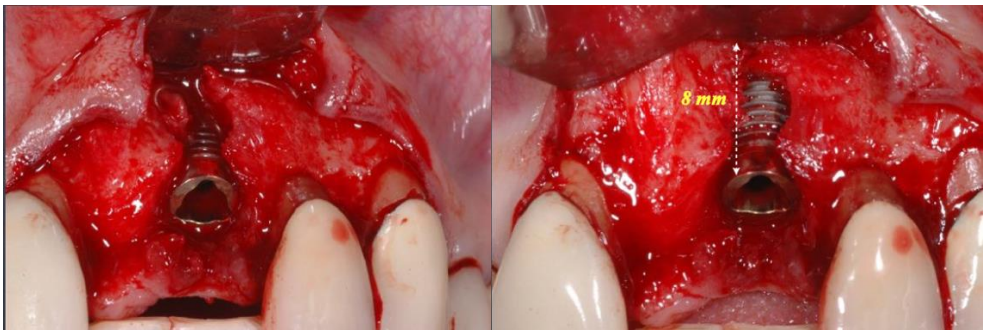

Fig. 4. *Implant positioning and vestibular dehiscence.*

Notably, the implant's surface was under the vestibular bone profile, a condition that makes bone regeneration ideal. A temporary crown was placed before proceeding with the reconstruction of hard and soft tissues. A cemented temporary crown was chosen to manage the restoration's aesthetics better.

A standard abutment was connected to the implant, leaving a space of 2 mm between it and the lower teeth to have the space for to create a correct occlusal crown. Afterward, our temporary crown was checked for occlusion in a nonfunctional way and finished to prevent over-contours and excess resin. It was polished and then cemented with a layer of temporary cement (Fig. 5).

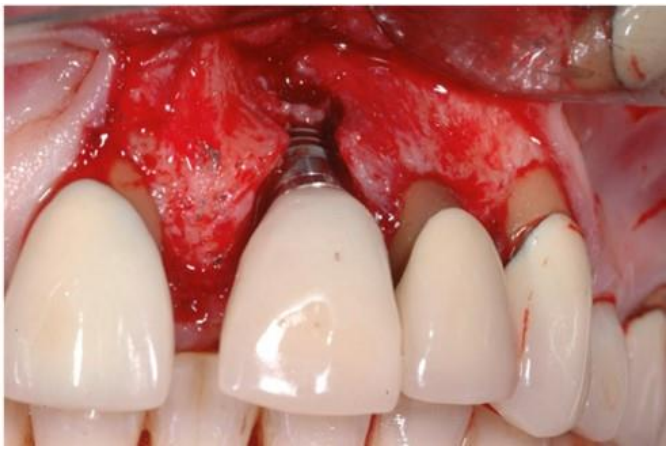

Fig. 5. *Placement of a cemented temporary crown on the implant.*

Once this phase was completed and the excellent stability of our implant was verified (by tightening and loosening the abutment screw), the surgeon proceeded with the reconstruction of hard and soft tissues. A connective tissue graft was taken from the palate side of the same surgical field. It was unnecessary to reach the molar area to collect the palatine connective tissue, which was preserved in physiological saline solution (Fig. 6).

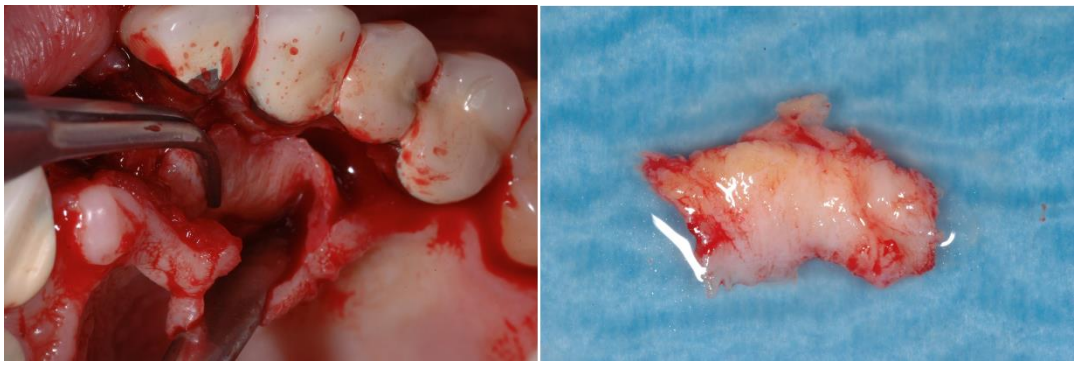

Fig. 6. *Connective tissue graft taken from the palate*

The vestibular bone defect was filled with a granular graft material of bovine origin, which was then covered with platelet-derived membranes (Fig. 7).

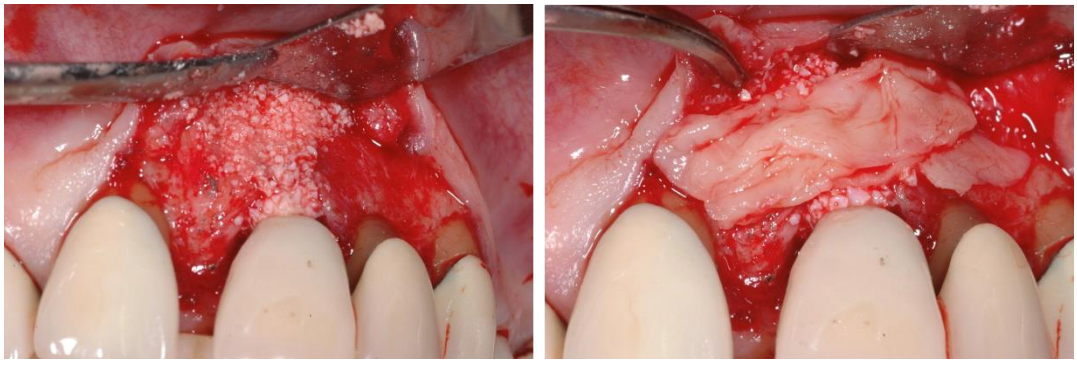

Fig. 7. *Granular graft material of bovine origin and platelet-derived membranes*

Above the bovine-derived granular graft material, the connective graft was positioned and sutured with the primary flap (Fig. 8).

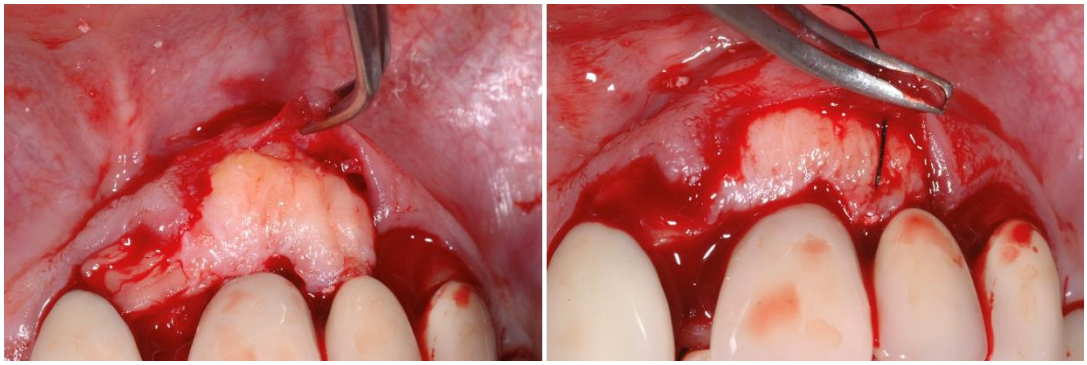

Fig. 8. *Positioning of the connective graft and suture with primary flap.*

An X-ray was performed to check implant positioning and prosthetic rehabilitation, and the patient was discharged with antibiotic therapy (i.e., amoxicillin and clavulanic acid), a chlorhexidine-based mouthwash, and a pain reliever (Fig. 9). One week later, the sutures were removed (Fig. 10).

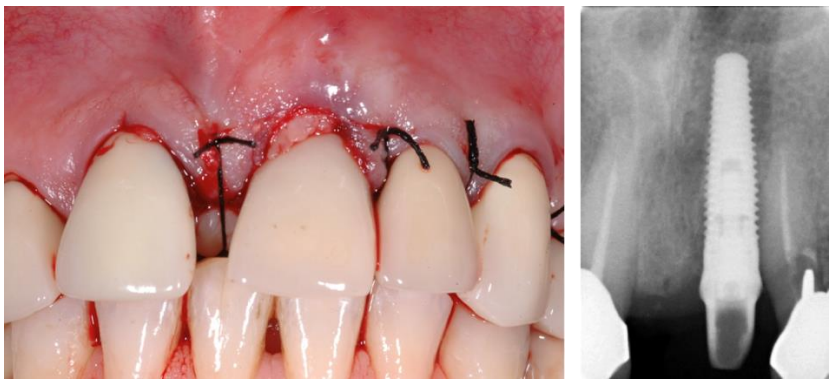

Fig. 9. Clinical and *X-ray control*

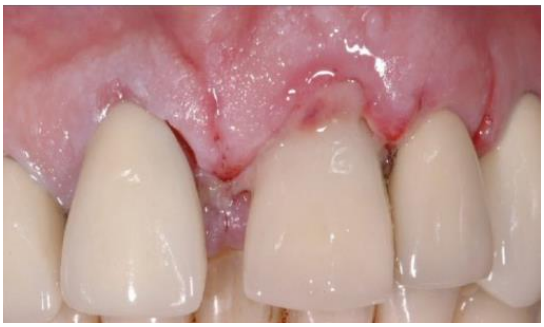

Fig. 10. *Suture removal after one week.*

After three months, the provisional restoration was finalized with a ceramic crown (Fig.11). Fig. 12 shows the clinical and radiological checks before and after the treatment.

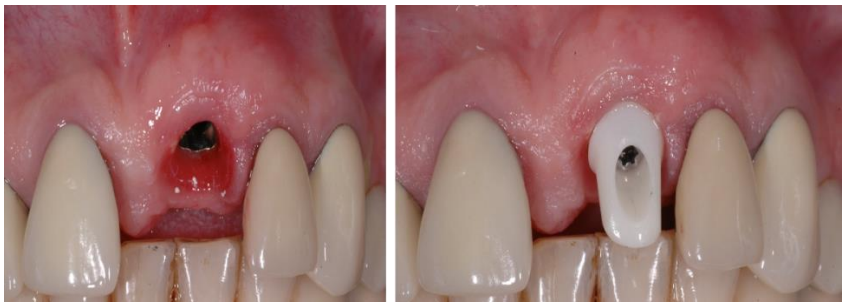

Fig. 11. *Ceramic prosthesis.*

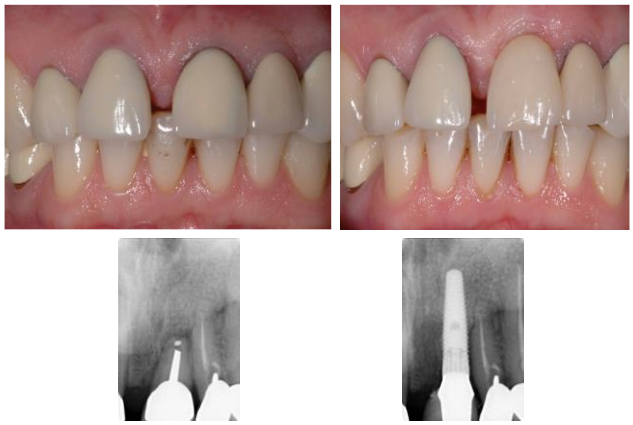

Fig. 12. *Clinical and radiological check before and after the treatment.*

A 9-year follow-up CBCT control was performed to better evaluate the vestibular bone regeneration outcome (Fig. 13).

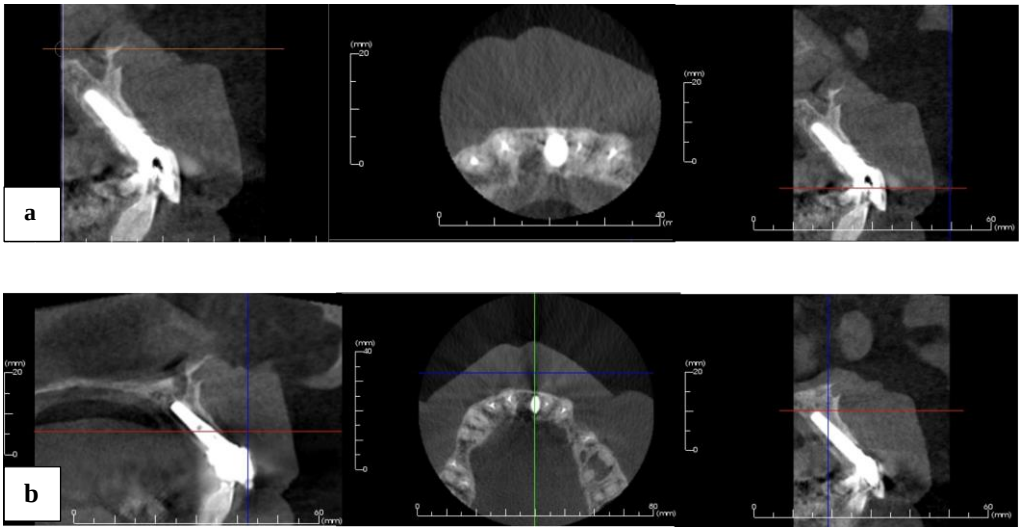

Fig.13. *9-year follow-up with CBCT investigation. A): Immediately after surgery; B): Nine years after surgery.*

DISCUSSION

For a long time, research in the implant field focused on peri-implant bone, as it claimed that quality and quantity of hard tissue were the main criteria for success (8). Therefore, before placing an implant, it was essential to have adequate bone volume, and this could be achieved through various conservation and ridge augmentation procedures (9).

The critical factors for implant success have always been crestal bone loss (10) and primary implant stability (11), while the importance of peri-implant soft tissue has often been overlooked. Recently, scientific evidence has shown that peri-implant soft tissue is critical to maintaining peri-implant health (12). Several publications evaluated the importance of soft tissues at dental implant sites from both a biological (13-15) and esthetic perspective (16, 17).

The anatomy of peri-implant mucosa and gingiva are different according to several factors. First, there is a difference in the connective tissue fibers that do not attach to the implant (18). In addition, the implant site has reduced vascular supply (19), and the junctional epithelium around implants is more permeable (20). Maintaining an adequate quantity and quality of mucosa around peri-implant bone is essential to promote peri-implant health (21).

Connective tissue grafts have become an essential part of periodontal reconstructive surgery, and several techniques are available to harvest a suitable connective tissue graft (22). For immediately loaded implants, strong evidence suggests that their placement and simultaneous bone grafting should be combined with soft tissue grafting to counteract postoperative remodeling processes. Adding a connective tissue graft has been shown to improve aesthetics and reduce the formation of peri-implant soft tissue recessions (23-25).

The reported case with a 9-year follow-up strengthens the importance of connective grafting in conjunction with bone regeneration at the time of implant insertion.

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Case Report

PTERYGOID IMPLANTS: TWO CASE REPORTS

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ABSTRACT

Pterygoid dental implants (PDI) are used in cases where traditional implants may not be feasible due to insufficient bone volume in the jaw. Unlike conventional implants placed in the frontal portion of the jawbone, PDI utilize the posterior region, taking advantage of the available bone structure. This can be particularly beneficial for individuals who have experienced significant bone loss in the frontal jaw area or have sinus issues that limit the placement of traditional implants. Placing PDI is a complex procedure requiring careful planning and consideration of anatomical structures. Advanced imaging techniques, such as cone beam computed tomography (CBCT), are used to assess bone density and determine the optimal placement for the implants. PDI can provide a viable solution for individuals with challenging anatomical conditions, offering stability and support for dental restorations. Here, a case series is reported, and pertinent literature is discussed.

KEYWORDS: *implant, fixture, pterygoid, sphenoid, prosthesis*

INTRODUCTION

Traditional dental implants, while highly successful in many cases, face limitations, mainly when dealing with patients who have experienced significant bone loss in the jaw (1-6). The anterior jawbone, a common implant site, may lack sufficient volume or density due to periodontal disease or prolonged tooth absence. Additionally, sinus issues can complicate implant placement in the upper jaw. These challenges spurred the exploration of alternative approaches, leading to the development of pterygoid dental implants.

The pterygoid region in the posterior aspect of the upper jaw emerged as a promising alternative for implant placement. At the core of the pterygoid region is the pterygoid bone, a butterfly-shaped structure comprising the lateral and medial pterygoid plates. Anatomical exploration of these plates reveals their connection to the sphenoid bone and their crucial involvement in forming the lateral wall of the nasal cavity. Adjacent structures, such as the greater wing of the sphenoid bone and the posterior wall of the maxillary sinus, further contribute to the complexity of this region. Anatomically, the lateral and medial pterygoid plates provide a robust foundation for implant anchorage.

The advancement of imaging technologies, particularly cone beam computed tomography (CBCT), played a pivotal role in visualizing the pterygoid region in three dimensions. This breakthrough allowed for precise implant placement planning, mitigating risks, and optimizing outcomes (7-10). Real-world applications demonstrate the efficacy of pterygoid implants in restoring oral function and aesthetics for patients who may have been deemed challenging cases with traditional approaches (1-6). Here, a case series is reported, and pertinent literature is discussed.

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CASE REPORT

Case 1

The patient presented to our clinic complaining about her smile in 2019. She was 65 years old and was a nonsmoker. At the clinical and radiological evaluation, she had a far-advanced periodontal disease and bone defects following endo-perio failure (Fig. 1).

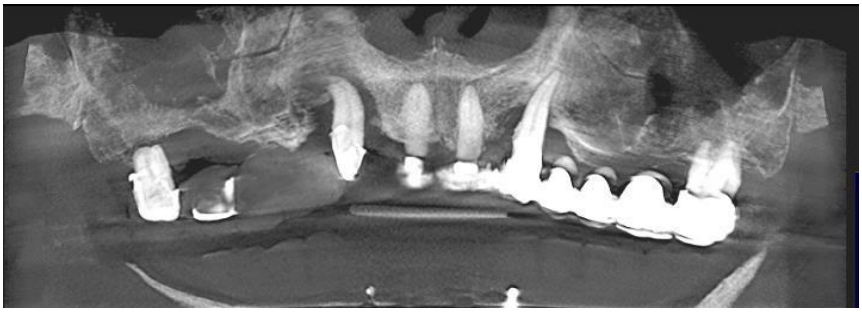

Fig. 1. *Pre-operative X-ray.*

The patient's main concern was not remaining without teeth, and she asked for immediate and permanent rehabilitation.

Surgically, a vertical GBR with resorbable membranes and a combined 50/50 heterologous/homologous bone graft was done in the canine area. Membranes were fixed with titanium pins, and the emergence profile of implants was adapted with a multi-unit abutment surrounded by bio-guides (Fig. 2).

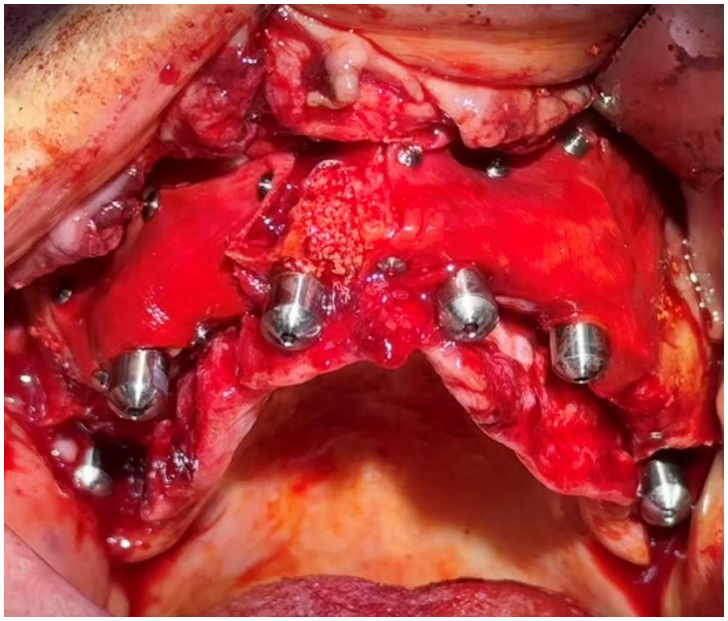

Fig. 2. *Horizontal-gbr-with-titanium-pins.*

The fixtures were anchored to the canine recesses and the nasal bone in the premaxilla, elevating the sinus membrane in the two distal sites and grafting the sub-sinus area. In the molar area, two pterygoid implants were inserted, which anchor the region between the pterygoid plates and the pyramidal process of the palatine bone. The positioning of implants in this way allows excellent stability even if the tuberal bone is soft (i.e., bone quality D3-D4).

Both bone primary stability and insertion torque are related to bone quality at the implant's apex. In this area, bone quality is of basal type (i.e., D1) surrounded by the insertions of pterygoid muscles. Here, pterygoid implants must be inclined 7-10 degrees towards the palate and 20-25 degrees towards the mesial side, thus emerging in the tuberal area. (Fig. 3).

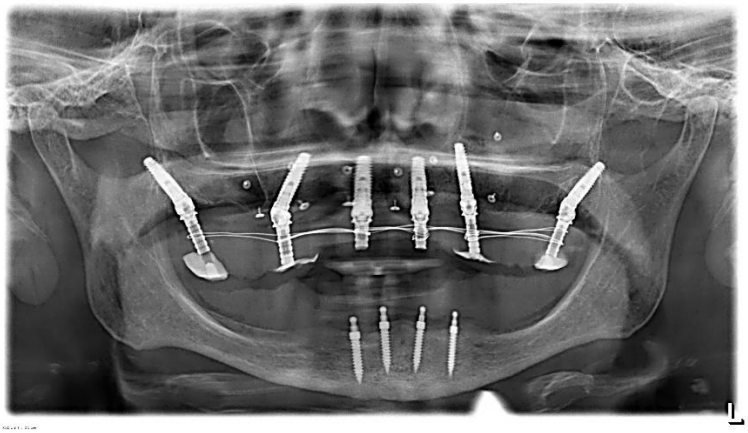

Fig. 3. *Post operative X-Ray.*

It should be noted that soft tissue in this area is very dense, making it a suitable site for free gingival graft sampling and optimal for sealing the collar transmucosal devices. Thus, the characteristic of soft tissue makes pterygoid implants well-maintainable over time. The patient then carried out immediate loading at the end of the surgery and the definitive rehabilitation in composite metal after 6 months. The follow-up was uneventful; after 45 months, the patient had no complications (Fig. 4, 5).

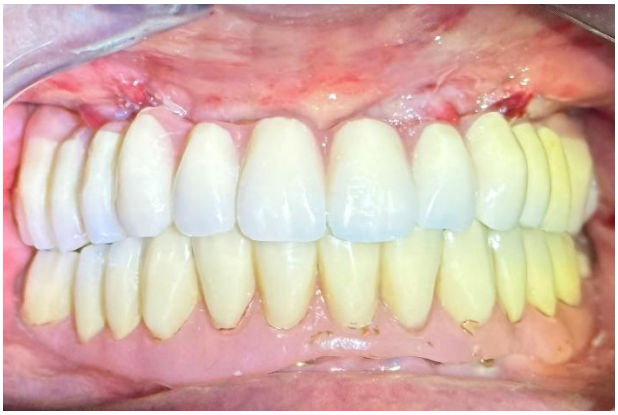

Fig. 4. *Fixed-temporary-full-arch.*

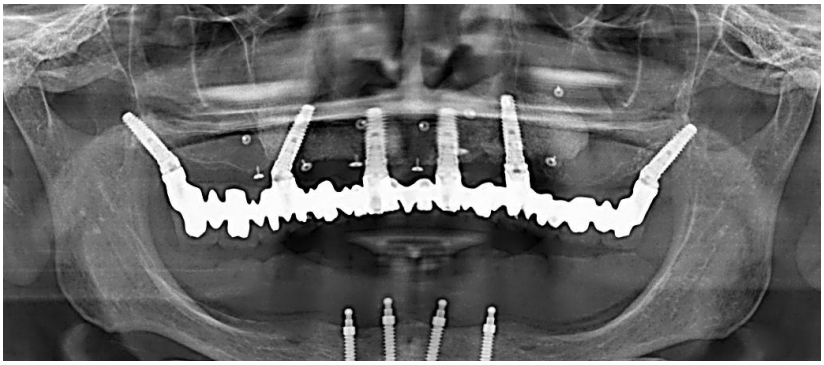

Fig. 5. *Final X Ray*.

Case 2

The patient presented to our clinic complaining about his chewing in 2019. He was 60 years old and was a nonsmoker. At the clinical and radiological evaluation, he has oro-antral communication in the right sinus due to infection affecting the implants in the 1st quadrant, bone defects extending to the entire arch, and non-recoverable anterior dental elements (Fig. 6).

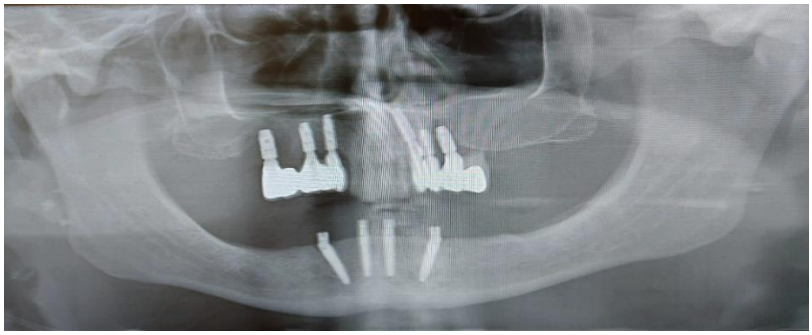

Fig. 6. *Pre-operative X-ray.*

The patient's chief concern was not to be left without teeth and asked for immediate and permanent rehabilitation. The program was to remove compromised teeth and implants and to perform a Toronto bridge.

Surgically, after extraction, the Schneiderian membrane was turned inside and sutured with 5.0 resorbable stitches to repair it and restore the anatomical separation between the antrum and the oral cavity. It should be done before grafting the area of oral communication with xenograft.

A resorbable membrane was placed over the Schneiderian membrane to prevent possible lacerations due to implant pressure or the patient's respiratory movements in the postoperative period. No sinus lift was performed in this patient since sutures were sufficient to prevent sinus complications. Subsequently, four implants were inserted in the premaxilla. The GBR was done using resorbable membranes stabilized by periosteal sutures. GBR of the residual alveolar crest was done by using bovine bone mixed with autologous bone collected from the zygomatic processes with a bone scraper. This procedure was necessary since the alveolar ridge was thick (Cawood class IV). It should be noted that pure autologous bone must be placed to cover the implant surface, whereas the remaining reconstruction can be made 50/50 autologous/xenograft mix. Then, a covering membrane was placed stably. To stabilize membrane pins, screws, and sutures fixed to the periosteum can be used. Fixing the membrane is the key point to having a successful surgical procedure. Finally, two pterygoid implants were inserted to stabilize chewing and reduce distal cantilever stress (Fig. 7-10).

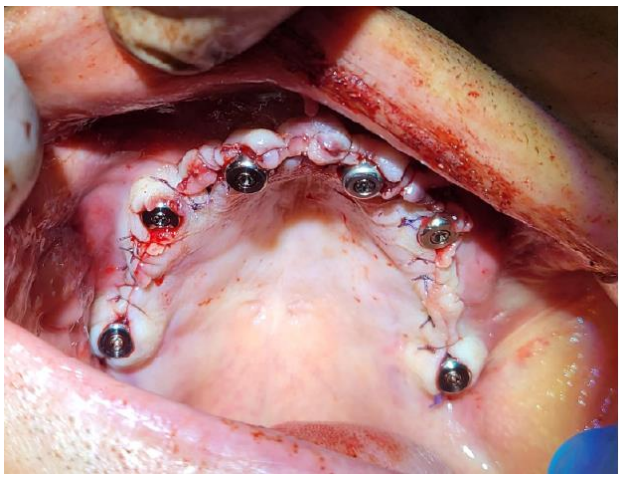

Fig. 7. *Suture.*

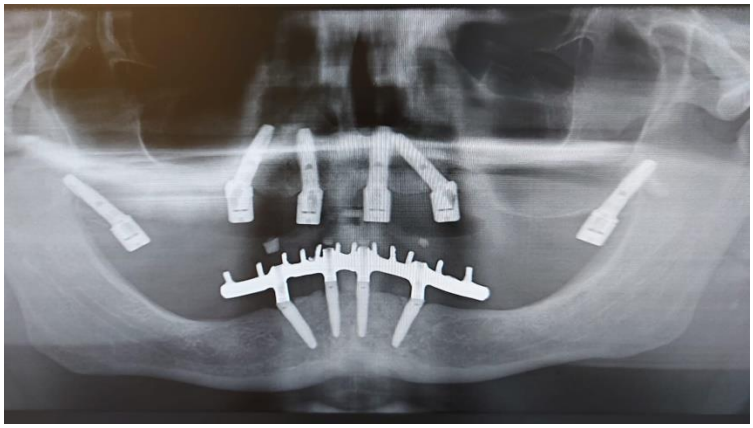

Fig. 8. *Post-operative X-ray.*

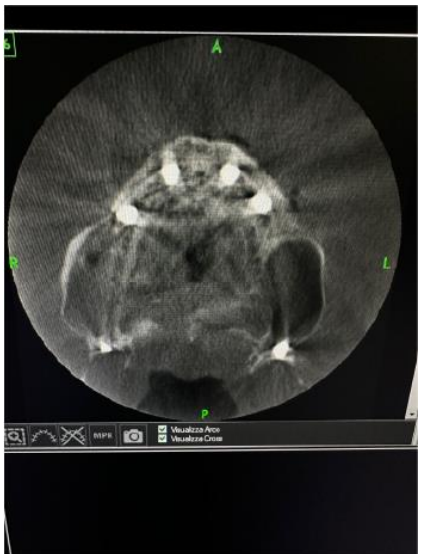

Fig. 9. *Post operative CBCT pterigoid check.*

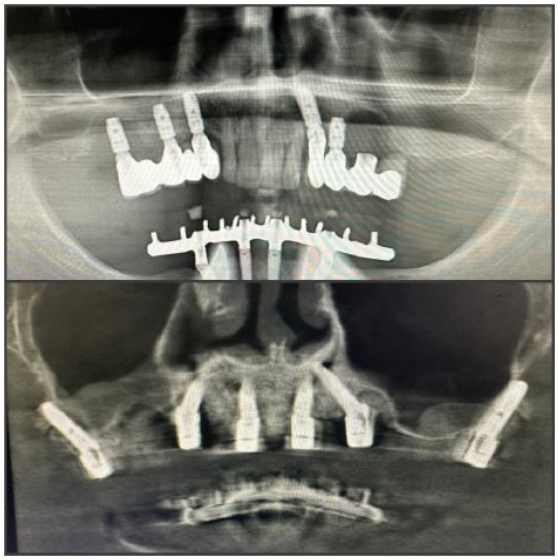

Fig. 10. *X-Ray comparison.*

Finally, an immediate prosthesis was delivered (Fig. 11). The follow-up was uneventful; after 51 months, the patient had no complications (Fig. 12).

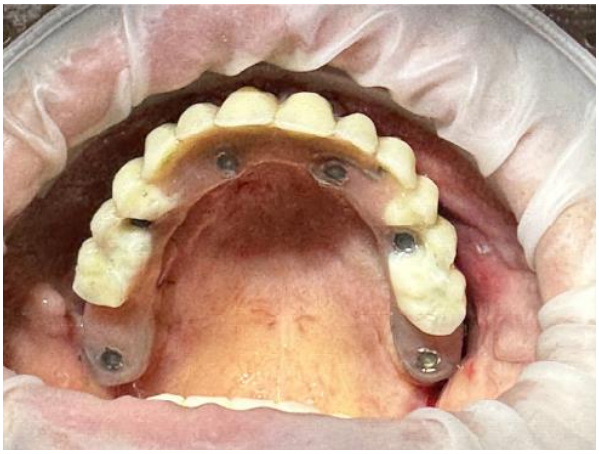

Fig. 11. *Fixed temporary.*

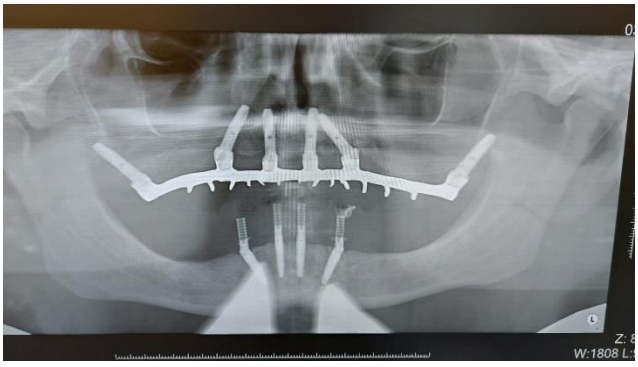

Fig. 12. *Three-year follow up X-ray.*

DISCUSSION

Traditional dental implants are typically placed in the anterior region of the jawbone, relying on adequate bone volume and density. In contrast, pterygoid dental implants (PDI) utilize the posterior pterygoid region, specifically the lateral and medial pterygoid plates (1-6). This distinction is crucial for patients with insufficient bone in the anterior jaw or anatomical challenges that complicate traditional implant placement. The surgical techniques for (PDI) involve accessing the posterior pterygoid region, which demands high precision due to its proximity to critical structures such as the maxillary sinus and major blood vessels. The increased complexity of pterygoid implant surgery requires specialized training for practitioners.

Vrielinck et al. (1) validate a planning system based on preoperative CT imaging on 12 patients for implant insertion. It allows the surgeon to determine the desired position of different kinds of implants. Candel et al. (2) reviewed the published literature to assess the success of treating patients with atrophic posterior maxilla with PDI. Studies from 1992 to 2009 on patients with atrophic posterior maxilla rehabilitated with PDI were reviewed. Thirteen articles were included, reporting 1053 pterygoid implants in 676 patients. The weighted average success of PDI was 90.7%; bone loss evaluated radiographically ranged between 0 and 4.5 mm. No additional complications compared with conventional implants were found, and patient satisfaction level with the prosthesis was high. Curi et al. (3) evaluated success rates of PDI and prostheses in patients treated in the atrophic posterior maxilla. A total of 66 PDI were placed. The mean bone loss around PDI after 3 years of loading was 1.21 mm (range 0.31 to 1.75). Araujo et al. (4) included 6 studies in their systematic review. Six hundred thirty-four patients received 1.893 PDI, with a mean implant survival rate of 94.87%. Ren et al. (5) described the clinical management and good short-term success in treating severe maxillary atrophy with a novel "VIV" design, using a combination of 3 anterior and 2 PDI. Sun et al. (6) studied CBCT to define the virtual valid length of PDI in maxillary atrophic patients from the prosthetic prioritized driven position and measure the implant length engaged in the pterygoid process according to the HU difference of the pterygoid maxillary junction. The authors concluded that PDI achieve adequate bone anchorage length beyond the pterygoid maxillary junction from a prosthetic prioritized driven position with fixed entry and angulation.

While traditional dental implants have a well-established track record of success, PDI have shown promising results in clinical applications. Success rates for PDI are influenced by factors such as patient selection, surgical technique, and anatomical considerations. Complications associated with each type of implant, such as peri-implantitis or implant malposition, need to be considered in the decision-making process (1-6). The choice between PDI and traditional dental implants depends on various factors, including the patient's oral health, anatomical considerations, and treatment goals. PDI are often considered for patients with severe bone loss in the anterior jaw, while traditional implants remain a reliable option for a broad range of cases.

Before embarking on PDI, meticulous preoperative planning is essential. Advanced imaging modalities, such as cone beam computed tomography (CBCT), enable a three-dimensional assessment of the pterygoid region (7-10). Surgeons can analyze bone density, evaluate anatomical structures, and identify potential complications. This thorough assessment forms the foundation for creating a customized surgical plan tailored to each patient's unique anatomy. Salinas-Goodier et al. (7) analyzed three-dimensionally the morphological characteristics of the pterygomaxillary region related to PDI. The authors concluded that due to the significant variation in the morphological characteristics of the pterygomaxillary region among subjects, personalized pre-surgical radiological assessment should always be performed. Zhang et al. (8) conducted a study to identify effective landmarks and establish valid guidelines to determine the ideal PDI placement. Rodríguez et al. (9) investigated the three-dimensional angulation of the pterygomaxillary corridor where PDI should ideally be placed. Based on the results of this study, an implant of at least 15mm long should be used to take advantage of the quantity and quality of the bone in this region. Motiwala et al. (10) analyzed the three-dimensional angulation of PDI using the hamulus as an intraoral guide, showing that when implants are placed along the hamular line, they are more likely to engage the center of the pterygomaxillary junction, resulting in an excellent prognosis of PDI. The surgical procedure begins with the administration of anesthesia, typically a combination of local anesthesia and sedation. Once the patient is adequately anesthetized, the surgeon gains access to the pterygoid region through a carefully planned incision. The core of the surgical process involves the precise placement of implants into the pterygoid bone. This step demands a deep understanding of the anatomical structures, particularly the lateral and medial pterygoid plates.

Surgeons navigate the region's complexities, utilizing specialized instruments and techniques to ensure the implants achieve stable anchorage. Using surgical guides based on preoperative CBCT data enhances accuracy and minimizes the margin for error (11-13). Grecchi et al. (11) performed a human cadaver study to assess the accuracy of zygomatic/pterygoid implant placement using custom-made bone-supported laser-sintered titanium templates. The authors concluded that the surgical guide system allowed acceptable and accurate implant placement regardless of the

case complexity. Wilkerson et al. (12) compared the stress and strain distributions in the PDI and surrounding bone using finite element analysis, concluding that PDI decreased the stress and strain level in the surrounding bone for all cases studied. Stefanelli et al. (13) showed that PDI surgery can be a predictable and successful modality for prosthetically directed implant rehabilitation in the atrophic posterior maxilla, is more accurate than free-hand surgery, and takes less time when using dynamic navigation.

Decisions regarding immediate or delayed loading of PDI are critical considerations in the surgical technique. Signorini et al. (14) investigated the 1-year survival and success rates of PDI and prostheses in participants affected by severe atrophy of the posterior maxilla requiring a complete-arch immediate fixed prosthesis. During the 1-year follow-up, high prosthesis stability and no implant loss were observed for all participants. In addition, participants did not report any pain or paresthesia. No peri-implant radiolucency was detected in the panoramic radiographs. Survival and success rates in the follow-up period were 100%. Immediate loading requires careful stability assessment, where prosthetic restorations are attached soon after implant placement. Alternatively, delayed loading allows for osseointegration before attaching the final prosthesis. The choice between these protocols depends on the strength of the implant's primary stability and the surgeon's judgment.

Despite meticulous planning, complications may arise during PDI placement (2-4). These can include vascular injuries, nerve damage, or malpositioning of implants. Surgeons must be equipped with strategies to address these challenges promptly. Preoperative imaging, a thorough understanding of the region, and adherence to a meticulous surgical technique contribute to minimizing the risk of complications. Successful PDI placement extends beyond the operating room. Regular follow-up appointments allow the surgeon to assess the patient's progress, address any concerns, and make necessary adjustments to the treatment plan.

CONCLUSIONS

Pterygoid implant placement has emerged as a sophisticated surgical technique, offering a viable alternative for individuals facing challenges with traditional implant options. The surgical technique of PDI placement requires a careful evaluation of anatomical structures and has to be performed by an expert surgeon. Our case series strengthens the usefulness of PDI in patients with extreme maxillary atrophies.

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Case Report

PERI AND POST-OPERATIVE MANAGEMENT OF A PATIENT WITH BRUGADA SYNDROME UNDERGOING MANDIBLE CYST REMOVAL: A CASE REPORT

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ABSTRACT

Brugada syndrome (BS) is an inherited cardiac disease that can lead to SCA (sudden cardiac arrest) in healthy young patients with structurally healthy hearts. Several treatments in common dental practice may be involved in the genesis of life-threatening arrhythmias, and local anesthetics themselves can have a potential role in eliciting the disease. Since surgical procedures can trigger the genesis of ominous arrhythmias, the setting -- of proper peri and post-operative protocols is mandatory when treating this type of patient. Anesthesiologic and cardiovascular risk must be conducted with particular care, and some procedures, such as placement of an external defibrillator along with continuous blood pressure and ECG monitoring, are needed to prevent the potential onset of arrhythmias. BS is a life-threatening condition, and despite its relatively low incidence, dentists should be aware of related risks since even simple local anesthesia may trigger a fatal arrhythmia. The aim of this case report is to describe the peri and post-operative management of a patient with BS undergoing mandible cyst removal.

KEYWORDS: *Brugada syndrome, oral surgery, cyst, dental extraction*

INTRODUCTION

Brugada syndrome (BS) was described in 1992 (1) as an inherited arrhythmic channelopathy characterized by the presence of specific ECG alterations at rest and by the occurrence of life-threatening malignant tachyarrhythmias.

Brugada syndrome (BS), also known as Nava-Martini-Thiene syndrome, was named after three Italian researchers who first described a condition that causes sudden cardiac death or ventricular tachyarrhythmias (2). Clinical

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manifestations can vary from syncopal episodes or palpitations to ventricular tachycardia/fibrillation and cardiac arrest. Still, most patients with BS are asymptomatic, and SCA may be the first manifestation. BS is an endemic disease in southeast Asia, which is often referred to as SUNDS (sudden unexplained nocturnal death syndrome), and it is considered the prevalent cause of sudden death among young people without structural cardiac anomalies. BS is thought to be responsible for 4-12 % of all SCAs and 20% of those in a structurally normal heart (3).

True incidence, due to its variable clinical manifestation, is challenging to estimate, and symptoms can occur spontaneously or be triggered by various factors such as fever, electrolyte imbalance, increased vagal stimulation, or even emotional stress. The mean age at presentation of symptoms is approximately at the fourth decade (4), and it has a tendency to affect males (5) (male-to-female ratio of 8:1). In rare cases, it can occur in childhood. It may play a potential role in sudden infant death syndrome (SIDS) (6).

The syndrome takes its name from Josep and Pedro Brugada, who, in 1992, presented several cases of patients reporting aborted sudden cardiac arrest without structural cardiac anomalies (1). However, since 1953 (7), reports of ECG patterns resembling BS are present in literature, remarking on the elusiveness and the difficulty of defining this pathology. BS is considered an autosomal-dominant transmission disease with incomplete penetrance (8). Mutations of specific genes linked to subunits of ion channels brought to an alteration of the sodium, calcium, or potassium currents in cardiac cells, producing characteristic ECG patterns and related clinical manifestations.

Loss-of-function mutation in SCN5A (a sequence related to a subunit of a sodium cardiac sodium channel) is found in up to 28% of BS patients, with more than 300 alterations reported. The mechanisms underlying arrhythmia in BS depend on the genesis of ionic disorders generated by transmural dispersion of repolarization or abnormal conduction pathway (repolarization and conduction hypothesis) occurring in the right ventricular outflow tract (RVOT). The spreading of these ionic currents through the epicardium can trigger arrhythmias and elicit the pathology (9). Diagnosis relies on identifying specific patterns in at least one of the suitable precordial leads (V1, V2, V3). There are three types of patterns, but only one (type 1) is considered diagnostic for BS; the other two (type 2 and type 3) suggest the pathology.

Even if not diagnostic, they can evolve in pattern 1 using certain classes of medications, such as sodium channel blockers (ajmaline and flecainide). Pattern type 1 is characterized by a “coved type” ST-elevation over 2 mm from the isopotential line and negative T-wave.

Type 2 and 3 (“saddleback”) show a high initial augmentation of ST-elevation over 0,5 mm followed by a convex ST segment and a positive T-wave in V2. In patients with patterns 2 and 3, provocation tests can unmask the pathology and induct a type 1 pathognomonic ECG pattern (4).

ECGs of BS patients can vary greatly, and the pathognomonic trace (pattern type1) may even disappear (10). Furthermore, different factors could act to mask the syndrome (11), highlighting its extreme variability over time. Despite numerous attempts to find a practical pharmacological approach, there is currently no available treatment that significantly reduces the number and severity of clinical manifestations, and risk stratification is an essential part of managing these patients.

Nowadays, implantable cardioverter-defibrillator (ICD) seems to be the most effective solution to reduce mortality in BS patients. However, new solutions, such as catheter ablation, in certain conditions, showed significant efficacy in reducing the arrhythmic risk (12) actively (conversely by ICD). Screening of all BS patients’ families is indicated and should involve ECG and flecainide or ajmaline test. EPS’s role in risk stratification is disputable. Some studies reported a high incidence of false positives and negatives (13), and reproducibility of results seems to be another critical issue (14, 15).

Due to the high rate of complications, ICD implantation should be avoided in asymptomatic patients (16). According to the latest consensus in 2015 on the management of BS in these patients, the presence of spontaneous or induced type 1 Brugada pattern, familiar history of SCA, and/or the inducibility of VT or VF during an EPS are factors to be considered in the decision to place an ICD (17).

Many drugs have been documented to trigger the type 1-ECG pattern; patients should be informed and aware of these “Brugada drugs” (18) to avoid the rising of arrhythmic storms. Certain medications, such as beta-blockers or calcium antagonists, should be preferably avoided in BS patients due to their action on the ST segment (19, 20).

Regarding dental practice, local anesthetics with slow dissociation properties, such as bupivacaine, levobupivacaine, and ropivacaine, should be avoided. Faster dissociation anesthetics, such as lidocaine, must be preferred (22). Furthermore, the use of epinephrine is a debated topic. Even if it is categorized as “Brugada drugs” (18), its role can be crucial for reducing the systemic administration of local anesthetics, and its use in combination with lidocaine is safe in clinical practice (23). The purpose of this article is to describe a case of cyst removal in a patient with BS a patient with BS.

CASE REPORT

A 43-year-old male patient with a radiolucent lesion in the symphysis area was referred by his general dentist to our Department of Oral Surgery, University of Chieti, Italy. The patient's familiar anamnesis was negative for SCA, and he was known to have an ECG compatible with a Brugada type 1 pattern on a flenicaide test in 2021. Since the absence of symptoms and the presence of specific ECG alterations, cardiologists decided to follow up with the patient without therapy. He underwent several surgical procedures in the past without complications. According to the American Society of Anesthesiologists (ASA), the patient was classified as an "ASA4" since a high risk of developing malignant arrhythmias was found. The treatment plan consisted of cyst removal under local anesthesia. The patient had already taken amoxicillin 1 gr of the tablets twice daily in the 3 days before surgery. Panoramic radiogram and TAC Cone Beam 3D showed radiolucency in the anterior mandible (Fig. 1-2).

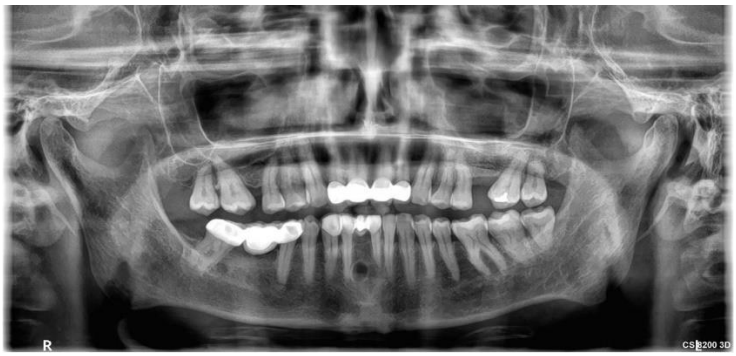

Fig. 1. *Panoramic radiogram showed radiolucency in anterior mandible*.

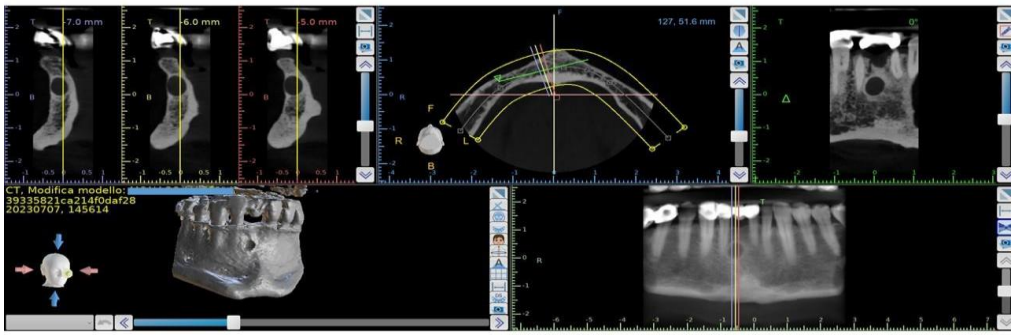

Fig. 2. *TAC Cone Beam 3D showed radiolucency in anterior mandible*.

Intraoral examination displayed swellings (in the anterior mandibular vestibule about teeth 31 and 41) that were tender to palpation. On clinical examination, teeth 31 and 32 showed good stability and were painless on horizontal and vertical percussion. The pads of an external biphasic defibrillator, 12-lead continuous ECG monitoring, and an automatic sphygmomanometer programmed to measure the patient's blood pressure every 5 minutes were placed. Isoproterenol was ready for emergency intravenous infusion (24). Block analgesia of the left and right mental nerve was implemented with block 2% mepivacaine with adrenaline (3M ESPE, Seefeld, Germany). A triangular flap (25, 26) (Fig.3) was performed, then an osteotomy was performed, and the cyst was removed (Fig. 4).

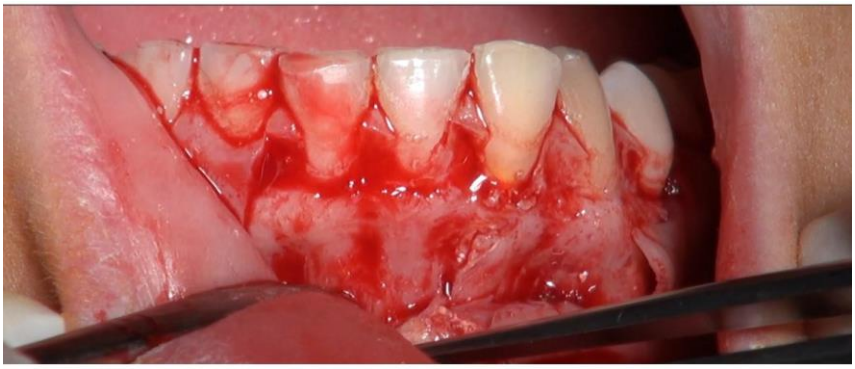

Fig. 3. *A triangular flap was performed, then an osteotomy was performed, and the cyst was removed*.

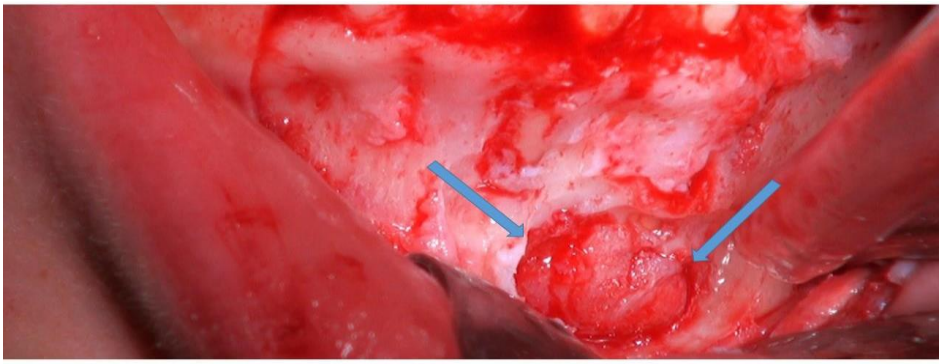

Fig. 4 *Clinical aspect of lesion*

ECG did not show any significant change. After the procedure, the patient was accompanied to a separate room where ECG monitoring continued for 2 hours; ECG did not show any significant change.

DISCUSSION

Cardiovascular arrest risk in BS patients is well described in the literature (27), and management of that risk is a fundamental part of these patients. Several articles highlight the need to avoid certain drugs commonly used in oral surgery. Regarding dental practice, local anesthetics with slow dissociation properties, such as bupivacaine, levobupivacaine, and ropivacaine, should be avoided. Bupivacaine, for instance, was shown to induce the Brugada-like electrocardiographic pattern in silent carriers of SCN5A mutations (28).

Lidocaine was shown to be safe in clinical practice (23); however, Barajas-Martinez et al. (29) reported, in rare cases of double mutation of cardiac sodium channels, a specific and pathognomonic ECG type-1 pattern even with its use. Local regional anesthesia must be performed with caution in BS patients; doses should be minimized, and active control of the patient's vital parameters should be conducted. Assisted local anesthesia, as well as the use of epinephrine, can be an excellent choice to reduce doses and risk of systemic administration of the local anesthetics. Since every increase in vagal tone can raise ST elevation, anxiety and pain must be avoided by a conscious sedation protocol. Benzodiazepines didn't seem to be associated with ECG changes (30), and their use could be crucial for stabilizing the vagal tone.

Placement of an external defibrillator, blood pressure, and ECG monitoring must be carried out throughout the treatment, and, in the absence of arrhythmias, isoproterenol (a beta-receptor agonist) can be used to reduce ST-segment elevation (30). In patients with ICD, according to the cardiologist, the device should be switched off to prevent inappropriate shocks due to monopolar surgical diathermy (22). ECG monitoring should be maintained during the first 24 hours after surgery (22).

BS is a life-threatening condition and requires special measures. Communication between the dentist and cardiologist is necessary to assist those patients properly. Particular attention must be given to anesthetic management. The cardiologist and anesthesiologist must accurately choose the type of anesthesia based on the patient's general assessment and risk. The dentist must analyze the patient's medical history to detect a family history of sudden death or ischemic disease so that further investigations can be performed before treatment.

Due to the lack of large trials, there are no clear recommendations for general or regional anesthesia in BS patients. In conclusion, managing BS requires special vigilance, avoiding factors and situations that potentially trigger arrhythmias, and setting up proper peri and post-operative protocols.

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