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Interdisciplinary Treatment of Patient with Maxillary Sinus Pneumatization: A Case Report.

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Abstract

An interdisciplinary dental treatment offers the patient optimal clinical results thanks to the interaction of specialists from different areas who can see the problems presented from different points of view, express opinions and complement each other to jointly establish an ideal treatment plan. The presented case involves the specialties of surgery, rehabilitation and endodontics, being the surgical part the one of greater weight. The patient visits for the replacement of a 4-unit bridge whose porcelain is fractured. Two of the dental organs that serve as pillars have insufficient coronary structure for restoration, so it is decided to remove them; the remaining pillar is decided to be restored with a unitary crown.

The orthopantomography and the CBCT reveal pneumatization of the maxillary sinus in this area, which needs to be lifted to rehabilitate with implants. Maxillary sinus lift surgery is performed and a delayed implant placement is chosen 6-12 months later. In this way, the integration of the graft into the receptor site is ensured, which results in an optimum space that allows a correct osseointegration of the implants.

Keywords: *Maxillary sinus lift; Zirconia; Irreversible pulpitis*

Abbreviations: CBCT: Cone Beam Computed Tomography

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Introduction

The interrelation of the different dentistry specialties is extremely important. In this way, an ideal treatment can be offered to the patient; a treatment where the problems that are presented can be seen from different points of view, this being a great benefit to obtain optimum results. The case that will be presented involves the specialties of surgery, rehabilitation and endodontics.

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The patient visits because of failure of a 4-unit bridge located in the left posterior region of the maxilla. Two of the pillars were not found in optimal conditions to restore so its extraction is indicated. Extensive coronal destruction is an indicator for the selection of restorative treatment to be performed. Destruction's etiology is diverse; in this case, it is attributed to the failure of the previous restoration [1].

Because of the above, the patient is offered the option of restoring the edentulous areas by placing implants. However, it is known that the posterior maxillary region has anatomical limitations that become important when restoring with implants. Usually, this zone presents reabsorption of the alveolar process, as well as pneumatization of the maxillary sinus, which makes surgical treatment difficult [2].

Today, these limitations are not an impediment for implant placement. Bone defects may be caused by trauma, disease, surgical complications, and extraction of dental organs or physiological reabsorption, a situation that occurs more frequently in elderly patients [3]. Maxillary sinus lift surgery is the choice treatment for these cases. Elevation of the maxillary sinus floor allows filling with autologous graft and with different types of synthetic biomaterials compatible with bone tissue [3] to increase the height volume of the alveolar bone crest, resulting in an optimal space that provides the primary stability required for implant placement [4].

Speaking of the prosthetic part, rehabilitation will be done with monolithic zirconia crowns on the remaining stump of the bridge, as well as in dental organ 1.7 because of a composite restoration that was found fractured. This fracture is attributed to the patient's traumatic occlusal forces.

Zirconium is a metal element with the following characteristics: it is greyish, shiny and resistant to corrosion. It is widely used in dentistry in its tetragonal zirconium oxide partially stabilized with yttrium form which, when oxidized, becomes an ideal ceramic for restoration [5].

Studies have now demonstrated the short and medium term success of zirconia crowns in posterior sectors subjected to high occlusal forces. The fracture possibility decreases in a high percentage, being this a great advantage for patients with traumatic occlusions [6]. Authors such as Larsson et al. claim that monolithic zirconia crowns have a success rate of 95.9% over a 5-year period. They also have a lower bacterial adhesion compared to other materials. This feature, united with the ones described above, makes monolithic zirconia crowns an excellent option for the restoration of posterior dental organs [7].

Finally, we refer to dental organ 1.7 with fractured composite restoration. Because of the previously mentioned characteristics, restoration with monolithic zirconia crown is chosen. It is common while preparing a stump that the dental organ presents a positive response to sensitivity towards a stimulus (reversible pulpitis), which usually disappears at the time of crown placement. When this pulpitis becomes irreversible, the best option for the dental organ is an endodontic treatment.

It is well known that endodontic treatment is indicated in dental organs that present infection by pulp communication. However, articles state that pulp conditions may have a non-infectious etiology. A traumatic occlusion is also a contributing factor to the development of an inflammatory process of the dental pulp [8]. Therefore, irreversible pulpitis may have a multifactorial etiology. An endodontic treatment in a tooth with a healthy pulp and without preoperative periapical lesion is generally successful. Also, good sealing and absence of lesions and postoperative symptoms are indicators of treatment success [9].

A high percentage of dental organs with healthy pulp treated with fixed partial dentures end up receiving endodontic treatment. In this way, the rehabilitator ensures the treatment's success, avoiding future pulp pathologies that can lead to crown failure [10].

Case Report

A 48-year-old male patient, with no apparent clinical findings, was referred to the Dental Prevention Clinic of University of Monterrey for the replacement of a 4-unit bridge. The bridge goes from dental organ 2.4 to 2.7. Intraoral examination reveals bridge porcelain fracture, presence of dent bacterial plaque and supra gingival calculus in lower incisors, restoration of dental organ 1.7 with fracture and presence of multiple degree 2 carious lesions (Figure 1).

Figure 1: *Upper and lower occlusal photographs.*

The bridge is removed to evaluate the condition of the stumps. Dental organs 2.4, 2.5 and 2.7 perform as pillars of the pontic, which corresponds to the area of dental organ 2.6. Coronal structure of dental organs 2.4 and 2.7 is insufficient for restoration so it is decided to remove them; 2.5 presents a good structure and root proportion so it is decided to keep it for restoration with a monolithic zirconia crown.

The patient is informed about his dental condition and rehabilitation with implants is proposed for dental organs 2.4, 2.6 and 2.7. Orthopantomography (Figure 2) and CBCT are requested. Pneumatization of the maxillary sinus is observed on the side to restore. Elevation is indicated for the future placement of implants.

Figure 2: *Orthopantomography.*

Sanitation is carried out in first instance; dental scaling is made and cavities are filled with composite. For dental organ 1.7 it is decided to restore with a monolithic zirconia crown because of the patient's traumatic occlusion. Once the crown preparation has been made the patient refers sensitivity; thermal vitality test is made and irreversible pulpitis is diagnosed. Endodontic treatment is performed and once it is done (Figure 3), the crowns of dental organs 1.7 and 2.5 are placed.

Finally, removal of dental organs 2.4 and 2.7 and maxillary sinus lift surgery is scheduled. Once both extractions are performed (Figure 4), a triangular flap with discharge between dental organs 2.3 and 2.4 is designed. The lateral access window is made (Figure 5) and Schneider's membrane perforation is observed. A collagen membrane is placed in the perforation place, as well as a mixture of

autologous and particulate graft derived from human bone tissue (Figure 6) to raise the maxillary sinus of the entire left posterior area. The alveolus corresponding to dental organ 2.7 is grafted as well for its preservation. The flap is repositioned and sutured with 4-0 nylon (Figure 7). Subsequent control appointments are given and implant placement in scheduled 6 months after maxillary sinus lift surgery (Figure 8).

Figure 3: *Endodontic treatment of dental organ 1.7.*

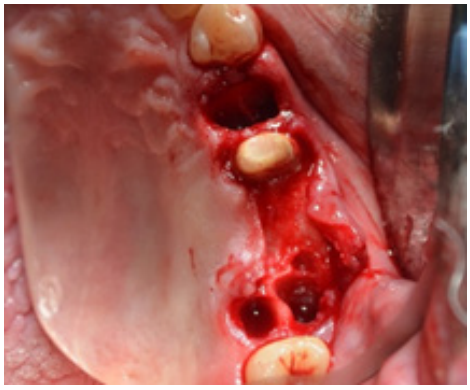

Figure 4: *2.4 and 2.7 post-extraction alveoli.*

Figure 5: *Side access window.*

Figure 6: *Placement of particulate bone graft.*

Figure 7: *Flap reposition and suture.*

Figure 8: *Upper and lower occlusal photographs (10 days post-surgery).*

Discussion

According to Castro Aguilar., *et al*. the occlusal reduction of tooth structure for monolithic zirconia crowns is 0.5-0.7 mm and the axial reduction is 0.5 mm to form the stump on which the crown will be placed [6]. A minimal reduction makes this type of restorations fulfill at least one of the factors that make up the first category described by Osorio to consider a tooth as a pillar for restoration [1]. A sufficient dental structure is maintained which provides good support and resistance to fractures thanks to the splint effect, specifically in endodontically treated molars.

Evidently, metal-free restorations have greater biocompatibility than porcelain-metal restorations. González Ramírez., *et al*. conclude in their literature systematic review that zirconia crowns have a better clinical and functional performance than ceramic coated

crowns [7]. Also, Castro Aguilar., *et al*. state that the use of monolithic zirconia crowns show optimal results according to studies performed *in vitro* [6].

Regarding maxillary sinus elevation, several types of heterogeneous and alloplastic grafts are described in the literature, which are good options because of their properties: biocompatibility, hemostasis, scarring, and cell proliferation, among others. However, De Almeida., *et al*. affirm that autologous graft will always be the gold standard for atrophic alveolar processes reconstruction due to its resistance to infections, to the absence of reaction to a foreign body and because it maintains osteogenesis and osteoinductive capacities, assisting revascularization and integration with the receptor site [3].

Implant placement can be done simultaneously or deferred to the maxillary sinus lift. Although both are safe techniques, as any surgical procedure, they are not exempt from complications. Jiménez Guerra., *et al.* mention that among the most frequent surgical complications are Schneider's membrane perforation (17.1%) and sinusitis (2.8%) [2]. In the surgery performed, Schneider's membrane perforation was reported.

Jiménez Guerra et al. emphasize that the survival of a graft ensures the success of the implants to be placed in a second surgical act 6-12 months later [2]. This is the reason why we opted for a deferred placement. Studies have confirmed that the incidence of failure of a graft is up to 18%, which is why it is recommended to first ensure the integration of this graft into the recipient site.

Conclusion

Interdisciplinary treatment in dentistry offers patients optimal clinical results thanks to the interaction of specialists from different areas. The first step consists on a precise diagnosis to develop a successful treatment plan.

It is of vital importance to consider all aspects that may influence treatment such as the pulp state of the dental organs, the amount of remnant dental structure, and the occlusion type of the patient. All these will be decisive elements that will help the dental surgeon determine the type of restorations to place.

Undoubtedly implant placement is nowadays the most innovative option for the rehabilitation of patients with absence of dental organs. Elevation of the maxillary sinus is a clinical procedure that allows implant rehabilitation in patients with morphological limitations and insufficient bone structure, allowing a correct osseointegration of the implants.

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