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CASE REPORT

Interrelationship Between Orthodontics and Implantology in Anterior Aesthetic Rehabilitation: A Case Report

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ABSTRACT

The rehabilitation of complex cases in the anterior region of the maxilla may require knowledge of several dental specialties. when dental involvement also causes bone and gingival involvement, management usually requires adjustment of gingival zeniths and bone graft to compensate for bone loss. **Objective:** to discuss a case of previous orthodontic treatment for implant-prosthetic rehabilitation in the anterior region. **Case report:** This case report describes a 40-year-old patient who came with the intention of extracting the tooth and installing a bridge. The implant-prosthetic treatment was performed after previous orthodontic treatment to adapt the gingiva and space. **Conclusion:** The interrelationship of specialists in oral rehabilitation improved the aesthetic and functional result of this complex case. Orthodontic mechanics and periodontics adapted the space and improved the periodontal condition before the implant was installed, resulting in a very satisfactory aesthetic, improving the patient's self-esteem.

Key words: orthodontic extrusion, dental implant, dental prosthesis, dental implantation, periodontics

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INTRODUCTION

The orthodontic extrusion is a procedure that has been widely used over the years to preserve and/or gain bone and gingival tissue, enabling a more appropriate aesthetic and functional rehabilitation. Several studies reported success in associating extrusion with implantation and immediate restoration, some with follow-up for years showing the effectiveness and stability of orthodontic traction to restore volumes of bone and gingival tissue for implant installation.¹⁻³

Some recommendations to optimize the clinical performance in the implementation of orthodontic extrusion to manage the tissues in the preparation for implantation are use of multiple connection device to execute the extrusion; use of low intensity and continuous forces varying between 15 and 70g; placing a reinforced anchorage on the teeth adjacent to the tooth planned to be extruded; control of the tooth extrusion

axis; extrusion ratio less than 2 mm maximum per month; regular monitoring of the patient with at least one visit per month; and placement of a post-extrusion and pre-surgical retention for a period of 2 months.⁴

Variations in the methodology can be observed recommending that at the beginning of the orthodontic step the applied force should be 0.2 to 0.5 N resulting in 1 mm in the first month of slowly forced eruption, then the activations follow weekly with a force between 1.0 and 1.5 N to improve the condition of gums and interdental papillae. Then a stabilization for 3 months for tissue reorganization and prevention of recurrences is indicated.⁵

When confirming the need for extraction of a dental element, especially in the anterior region of the maxilla, implantation immediately after extraction is a viable

alternative, providing high predictability, representing a valuable instrument for the implantology. It presents advantages such as the maintenance of gingival architecture and bone dimension, guidance for adequate tissue healing, immediate aesthetics, comfort for the patient and decrease in the time the patient is toothless and treatment time.⁶

The dental extraction must be performed with the understanding of the progressive resorption of the bone crest and procedures must be executed to compensate, considering that the replacement of the tooth by the implant is a viable alternative.⁷ The immediate rehabilitation in alveolus impaired with the possibility of success, despite the high complexity, has become increasingly predictable and routine in dental practice. This protocol can become a viable alternative, aiming at predictable functional and aesthetic results, as long as the diagnostic and clinical criteria obtained through strict reverse planning are maintained and preserved.⁸

The immediate implant has the purpose of simplifying the treatment, minimizing the healing time, reducing the cost and increasing the patient's comfort, with the immediate placement of the fixed prosthesis, after the implant insertion. In the immediate loading technique, new bone formation is stimulated around the implant, being faster than in the two-step procedure.⁹ This type of approach decreases the number of surgical interventions, as well as the time to install the final restoration, increasing the patient's aesthetic and functional satisfaction.¹⁰ In a case report, the authors¹⁰ realized that previous orthodontic treatment through the slow orthodontic extrusion of a fractured dental element (central incisor) restored the ideal conditions of the soft and hard tissues for the implant installation. This procedure both increased bone availability above the fractured root, and leveled the gum with neighboring teeth, improving the final result of rehabilitation, highlighting the importance of multidisciplinary in more complex cases, providing a more complete and effective treatment, with more satisfactory results.

The orthodontic extrusion can be considered an alternative treatment to improve the bone and gingival tissue before implant placement. Although the current literature does not provide clear guidelines, decision making for a specific approach to orthodontic extrusion appears to be based on the clinician's preferences.^{11,12, 13}

CASE REPORT

A 40-year-old female patient sought care at the outpatient clinic of the professional master's degree in dentistry at the University of Fortaleza - UNIFOR with the intention of extracting the upper right central



Figure 1. Tomographic images: tooth 11 with great bone loss



Figure 2. Initial space between 21 and 11

incisor for reasons of "tooth with mobility". On clinical examination, it was observed that it was a tooth with very advanced periodontal commitment, according to periodontal evaluation and tomographic analysis, which showed bone loss in this region and an unfavorable prognosis for immediate rehabilitation without adequate bone level and prosthetic space, with gingival inflammation and displacement of tooth 11 and increased space, which would compromise prosthetic rehabilitation due to the discrepancy in the width between tooth 21 and the space that would remain from tooth extraction 11. A cone beam computed tomography (TCFC) was requested for a better evaluation of the dental condition and supporting tissues of the anterior teeth and other dental elements of the upper arch. In the analysis of the TCFC, it was observed that the tooth was compromised and that it presented only bone insertion in the apical third, which added to the clinical picture of the gingiva suggested its extraction, however, the space and the gingival zenith were inadequate (as seen in Figure 1). The treatment plan aimed to provide adequate space for anterior rehabilitation and orthodontic extrusion that tooth to level the gingival zenith and gain apical bone. The other upper teeth were in good periodontal condition.

At that moment, the patient was offered an orthodontic treatment to adapt the space for later tooth extraction and prosthetic rehabilitation. With the patient according to the treatment plan, the Roth Max 9° 022 orthodontic appliance (Ortodontia Morelli) (as seen in Figure 2) was installed.



Figure 3. Final orthodontic treatment showing adequacy of the space and improvement of gingival health

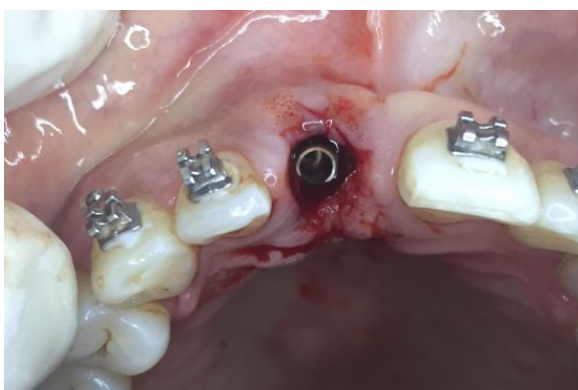


Figure 4. Implant installed in an ideal three-dimensional position

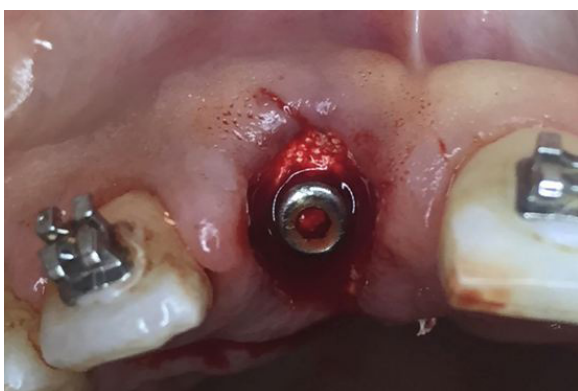


Figure 5. Particulate biomaterial filling the gap's

With the advancement of orthodontic treatment, and under strict plaque control, there was a substantial improvement in the gingival health of the referred element and the adequacy of the space “as shown in Figure 3”, which led us to consider implant-prosthetic rehabilitation as a possibility real. The orthodontic extrusion was performed with activations every 15 days so that there was no damage to the adjacent teeth and the gum of tooth 11 followed the slow extrusive movement.



Figure 6. Plastic cylinder positioned

In the 8-month recall appointment from the beginning of orthodontic treatment, a good spatial adaptation and leveling of the gingival zenith was observed, so the patient was offered implant-prosthetic rehabilitation explaining to the patient the risks and benefits resulting from his clinical condition. Using mepivacaine 2% with epinephrine 1: 100,000 Mepiadre (Nova DFL), infiltrative terminal anesthesia at the bottom of the groove and palatal anesthesia were performed. The surgical procedure started with an incision around the tooth followed by the use of a flexible instrument and subsequent minimally traumatic extraction, facilitated by the periodontal condition of the tooth itself. Then, curettage was performed with a curette associated with vigorous washing of the alveolus with saline, performing mechanical decontamination and removal of periodontal fiber remains. The implant was installed anchored in the bone beyond the apex of the root and with a palatal approach (as seen in Figure 4).

For this case, a 3.5 X 11.5 mm Morse Cone Drive (Neodent) implant with 32 N / cm torque was installed. The gaps around the implant were filled with a Genox Org (Baumer) bone graft to compensate for the loss of vestibular support and avoid gingival recession (as seen in Figure 5).

Screwed on a 2.5 X 4.8 mm GT (Neodent) abutment, a plastic cylinder was used to make a temporary crown “as seen in Figure 6”. The finishing of the temporary

crown was finished outside the mouth, with the same attached to an analog and then the component was screwed into the implant “as seen in Figure 7”. After one week, the patient returned for recall radiographic and evaluation of the implant / graft adaptation (as shown in Figure 8).

The 60-day recall appointment showed good gingival health and satisfactory aesthetic harmony with neighboring teeth. One month later (90 days after the surgery), the bone and gingival architecture were satisfactory (as seen in Figure 9). A Hawley plate was used for retention.

After 8 months of the surgical procedure and with the implant properly consolidated, the final crown was made and re-anatomization contiguous teeth (as seen in Figures 10 and 11).

DISCUSSION

In this case report, the patient required anterior rehabilitation to replace a periodontal compromised tooth. The maxillary central incisor with gingival inflammation, tooth mobility and change in tooth space and position made it derailed for the tooth to remain. Initial radiography and tomography showed great bone loss indicating tooth extraction and replacement. The space was not adequate for the placement of the prosthesis. In cases of unfavorable prognosis such as advanced periodontal disease, root fracture, extensive caries below the gingival margin or failure of endodontic treatment, the treatment chosen will be the removal of the tooth and installation of the immediate implant, however, the indication for extraction must be careful and analyzed.^{1,9}



Figure 7. Immediate postoperative.



Figure 8. Radiographic evaluation



Figure 10. Final restoration and re-anatomization contiguous teeth (21)

Figure 9. Clinical aspect 3 months after surgery



Figure 11. Final smile

Some oral rehabilitations demand different dental specialties. Orthodontics and periodontics complementing each other and optimizing the final result.¹⁴ The orthodontic treatment previous to rehabilitation with implants is able to adjust the spaces and improve the esthetic conditions before the installation of the implant(s) that optimize the final result, and still influence the psychological state of patients.¹⁵ In this case, previous orthodontic treatment was indicated, improving the conditions for placing an implant and tooth, however, rehabilitation in aesthetic areas with alveolar defects is a challenge in the use of dental implants.⁸

Slow orthodontic extrusion can be considered an alternative treatment to improve the bone and especially the gingiva before implant placement when indicated, especially in the esthetic zone (the anterior maxillary) can be essential in optimizing the final result.^{12,13} In a systematic review on orthodontic extrusion for implant site development in patients with periodontal or endodontically compromised teeth with severe bone defects and negative prognosis, the studies showed that the protocol employed by the studied authors included: slow orthodontic extrusion, periodic controls making selective rectification of the tooth crown if necessary and stabilization of the extruded element allowing the mineralization of the new trabecular bone.¹ In this dental implant case report we had the collaboration of orthodontics adapting the prosthetic space and the height of the gingival zenith, the periodontics to control the gingival condition during orthodontic treatment and the fixed prosthesis restoring the function and aesthetics lost in the initial situation. Although there is still no common evidence of guidelines for this technique, personal experience and/or previous studies show the efficacy of orthodontic extrusion in pre-implant therapy that uses the biological mechanism of the periodontal ligament to increase hard tissue in the apical area. This method is also effective in conditioning gingival tissues that are coronally displaced, eliminating or reducing periodontal pockets and improving gingival tissue health.^{16,3}

In cases of unfavorable prognosis such as advanced periodontal disease, root fracture or endodontics treatment failure, the indicated treatment will be the removal of the tooth and the installation of the immediate implant¹⁸, in the case reported, after leveling the gingiva by orthodontic extrusion and adequate space for adequate rehabilitation Implant and Immediate restoration were installed after tooth extraction.

Several techniques have the potential to minimize the degree of unavoidable changes, such as minimally

traumatic extraction, alveolar crest conservation, alveolar filling and immediate implant installation minimizing the loss of bone and gingival size.⁷ In cases of immediate extraction and implantation, the implant is inserted only at its apex and much of the support on its buccal side only by the bone graft (xenogenic and/or autologous), as well as in the aforementioned case. The gaps between the implant's oral bone were filled with unique xenogenic biomaterial and provisional crown was installed immediately after implant surgery to maintain the gingival shape. The use of immediate crown helps to maintain this health condition achieved through the orthodontic mechanics of bone and gingival conditioning. As the shows prospective study of 18 months of follow-up with 12 patients who received implants in the maxillary central incisor after extraction and with immediate extraction, the authors¹⁶ found that there were no changes in the clinical dimensions of the teeth and papillae, immediate implants with Immediate crown represent an excellent option to replace teeth in the anterior maxillary, providing stability to the tissues around the implant. According to the scientific literature¹⁷, the survival of implants after tooth extraction with immediate crown reaches 96.9%, providing a high level of satisfaction for patients who opt for this rehabilitation, probably due to the immediate esthetics. The choice of the immediate implantation technique must be based on the correct diagnosis of the commitment of the dental element. The possibilities of maintaining the tooth must be exhausted and then an extraction indicated. For this analysis, three-dimensional imaging tests, such as cone beam computed tomography, allow a better understanding of the relationship between the roots and the vestibular bone, being an excellent tool or confirm the commitment of a tooth. In this case, the dental element was compromised, but adjustments were needed to install the implant and prosthesis. Infection control, gingival height and space adjustments were needed. In teeth with active infections, a strict antibiotic medication protocol must be followed. The need for soft tissue graft associated with bone graft will depend on the degree of bone loss associated with the presence of gingival recession and also on the gingival profile.^{15,13,6}

The use of a plastic cylinder for immediate crown is indicated, making the tooth fragile in order to protect the implant from possible traumatic forces, especially the horizontal and oblique forces to which the anterior teeth are constantly subjected.^{12,3} The final porcelain dental crown was made eight months after implant placement, when the implant and graft were already consolidated, to improve aesthetics, re-anatomization of the neighboring tooth was performed.

CONCLUSION

It was concluded that the interrelationship of specialties in oral rehabilitation increases the aesthetic and functional results of complex cases, especially in the anterior region of the maxilla. Orthodontic mechanics is fundamental for the adequacy of the space before implant placement, it can increase the hard tissues of the apical region after the extrusive movements, and the soft tissues without the use of fibrotomies. If implanted without previous orthodontic treatment, the discrepancy in the size of the teeth and the gingival height would compromise the aesthetic result and without a graft, there would be gingival recession. Periodontics, orthodontics, implantology and fixed dentures complement each other in this previous aesthetic rehabilitation to restore the patient's lost self-esteem with their dental condition before treatment.

CONFLICT OF INTERESTS

The authors declare that there were no conflicts of interest related to this case report.

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