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Case Report

Immediate Implant in The Esthetic Zone: A Three Year Clinical, X-Ray and CBCT Follow-Up of Peri-Implant Tissues

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ABSTRACT

Nowadays, with technological advances in implantology and knowledge of healing patterns after tooth extraction, rehabilitations of patients with immediate esthetic needs, with adequate success rates and favorable esthetic outcomes, are a reality. However, case selection criteria should be followed to ensure high-quality functional and esthetic results and a good prognosis, particularly in patients with unfavorable gingival phenotype. This report describes a three-year clinical and cone beam computed tomography follow-up of post extraction immediate dental implant placement in the aesthetic region (teeth #11 and #21), provisionalization using the crown of the freshly extracted natural teeth, subsequent rehabilitation and three-year follow-up. Results are compared with findings reported in recent studies, and the ideal treatment to maintain gingival architecture is discussed.

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Introduction

Dental rehabilitation of patients with immediate esthetic needs in the anterior maxillary region has grown steadily in Dental Implantology, particularly when the use of removable prosthesis during osseointegration does not meet patient expectations and demands or patient does not adapt to them [1, 2]. Post extraction placement of a dental implant with an adequate immediate provisionalization is an alternative that should follow several criteria: local anatomy should be respected; the provisional crowns should have a good emergence profile and a smooth surface resulting from adequate polishing. Attention should be paid to functional performance, considering centric and eccentric mandibular movements. Esthetic results should be compatible with the harmony of the patient's smile [3-6].

Bone repair after extraction has been studied to find favorable mid- and long-term solutions that preserve buccal bone, which is usually thin. The absence of bone in case of bone resorption may negatively affect gingival architecture [7-10]. Cases that are easily treated, in which the area to be rehabilitated in the dental arch has adequate bone height and width and a favorable gingival phenotype, undoubtedly have more predictable esthetic and functional results [2]. However, questions

remain about whether certain cases should be immediately loaded in fresh sockets after extraction, particularly in patients with unfavorable gingival phenotype [2]. These cases reflect the current state of Dentistry, and patients expect treatments to meet the esthetic needs of gingival harmony, using prostheses that harmonize with adjacent teeth in the dental arch [11-15].

Before the final prostheses are placed, provisionals should be used to ensure adequate gingival preparation. The crown of the natural teeth may be an option for this stage, particularly because, in addition to smoothness of natural enamel, it has a more harmonious profile because, preserves the anatomy and provides better gingival sealing than the acrylic provisionals conventionally used [16, 17]. Another factor is the preservation of enamel characteristics and the remaining root covered by cementum in the cervical portion of the natural teeth veneers, which have biological characteristics that may adapt more physiologically to the soft tissues of the gingiva than synthetic materials [1, 16, 18].

One of the greatest difficulties in implant placement in the anterior maxilla immediately after extraction is associated with the buccal bone plate [19]. Ankylosis, hypercementosis, excessive crown destruction and

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very long and robust tooth roots may generate important surgical difficulties, as their presence often rules out the chance of maintaining any buccal bone, which is extremely thin, during surgery [19]. This may lead to an unfavorable prognosis, not only because of local darkening and dehiscence that may affect the gingiva, but also, and mainly, because of the possible late exposure of the abutment [2]. In some cases of major bone fracture, bone grafts are necessary, and the patient has to undergo several surgeries to improve esthetics [15, 20-22]. In such cases, not even a suitable prosthetic rehabilitation achieves good esthetic results, as the gingival architecture and soft tissue harmony are not preserved [2]. his study describes a clinical case in which teeth #11 and #21 were extracted, dental implants were immediately placed and loaded with provisionals made of the crowns of the freshly extracted teeth. Radiographs and cone beam computed tomography (CBCT) were used to follow up results, which are here compared with current findings in the literature and ideal rehabilitation procedures to preserve original gingival architecture.



Figure 1: A, B, C & D – The Initial clinical aspect where the rehabilitative aim by dental implants will occur in teeth #11 and #21 and respectively X-ray and CBCT. Note the quality of the gum tissue and health, as the slender phenotype making it very difficult treatment. **E, F, G & H** – 30 days postoperatively after dental implants installation, the x-ray and CBCT showing the vestibular bone. **I, J, K & L** – 60 postoperative days of dental implants placement. Note, both rx and in CBCT the maintenance of bone tissue. **M, N, O & P** – 120 days postoperatively. Clinical, radiographic and tomographic follow-up showing the stability of the periimplant tissues. **Q, R, S & T** – 3 years follow-up with respective clinical, X-ray and CBCT examinations maintaining the quality of the bone tissue and the line obtained by this technique.

Case Report

A white 35-year-old ASA I female patient presented with tooth #11 mobility and severe sensitivity of tooth #21. Her history was carefully examined and revealed dentoalveolar trauma, in her early adolescent

years, with avulsion of her two maxillary central incisors, treated at that time by urgency service with replantation and splinting for three weeks. During clinical examination, patient produced a written referral from her endodontist who, after imaging and clinical evaluation, diagnosed a totally calcified root canal on #21 and severe external cervical resorption on #11, contraindicating endodontic treatment of both teeth (Figure 1, A-D). Therefore, the treatment plan in our Implantology service comprised teeth #11 and #21 extraction, immediate placement of two dental implants and provisionals prepared using the crowns of the freshly extracted teeth. The patient was surprised at the possibility of preserving esthetic harmony by using her own natural crowns and, therefore, agreed with our treatment plan. Procedures were only performed after the patient understood them and signed an informed consent term.



Figure 2: After the extraction of #11 and #21 elements, the socket inspection was performed carefully assessing the remaining buccal bone tissue.



Figure 3: Dental implants already inserted in the bone tissue by palatal approach in order to maintain the buccal bone. Pillars were installed to conduct immediate provisionalization. Note the quality of tissue obtained after gentle handling of the periodontal tissues.



Figure 4: ISQ value obtained through the resonance frequency analysis (Osstell®) device, where the value was 57 ISQ, allowing the realization of immediate loading on the newly installed dental implants.

Surgery was planned to cause minimal trauma. Infiltration anesthesia was applied to the anterior region of the maxilla for the extraction of teeth #11 and #21, a periosteum was used carefully to avoid excessive damage to periodontal tissues and no mucoperiosteal flap was raised. After that, forceps were used to extract teeth #11 and #21. Immediately after extraction, the socket was irrigated with saline solution, and the walls were carefully examined to check their integrity on all surfaces (Figure 2). Two dental implants were placed according to their three-

dimensional positioning, which was determinant to preserve gingival esthetics and the buccal bone (Figure 3) [23, 24]. A surgical guide was used to position the implants accurately for the subsequent steps of the prosthetic treatment. The implants (Cone Morse Alvim, 3.5 x 13mm, Neodent®, Curitiba, Brazil) were placed with torque value for both implants higher than 40N/cm², making immediate loading possible. In addition, resonance frequency analysis (RFA) was recorded using an Osstell® transducer (Gothenburg, Sweden with an ISQ greater than 57, which indicated good bone/implant contact (Figure 4).



Figure 5: #11 and #21 natural teeth veneers were cautiously made from palatine faces worn in high rotation turbine of newly extracted elements for provisionalization.



Figure 6: The surgical guide with facets aspect of prior to mouth placement. Note the adaptation and ease of placement that this technique provides, allowing reproduction of the teeth initial position.

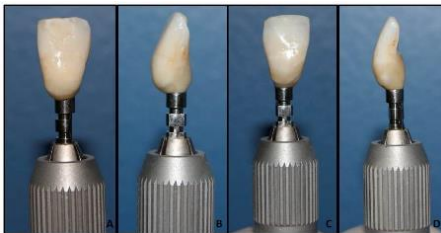


Figure 7: (A) Buccal appearance of the tooth #11 (B) Medial appearance of the tooth #11. (C) Buccal appearance of the tooth #21 (D) Medial appearance of the tooth #21. Note the quality of the resin and polishing of the facet, which will allow proper adjustment and passive soft tissue and possible long-term quality.

Provisional crowns were prepared for the implants using the coronal portion of the natural teeth #21 and #11, shaping them into two veneers (Figure 5). The two crowns were replaced and fixed over a provisional abutment using light-curing composite (Figure 6, 7). Occlusal adjustments were made to ensure that they were free of protusive and lateroprotrusive contacts, which might result in trauma that would complicate osseointegration during the primary peri-implant bone-

remodeling phase and might, therefore, lead to implant failure (Figure 8). After that stage and when all adjustments had been made, the bone graft (Bonefill, fine grain, 0.5g, Bionnovation Biomedical, São Paulo, SP, Brazil) was placed in the labial gap (Figure 9). The graft was necessary because the space between implant and bone, when the implant was placed, was greater than 2mm [8, 10].



Figure 8: Surgical guide repositioning with the natural tooth #11 and #21 element facets aiming to be the best location for the provisional realization, keeping the gingival tissues in the same initial condition facilitating their repair.



Figure 9: Immediately postoperatively placement of biomaterial-based on lyophilized bone in the buccal gap region between the implant and bone. This technique aims to maintain buccal bone long-term preservation, preventing their reabsorption.



Figure 10: Immediately postoperative after provisional cementation where we managed to maintain the original contour gum tissue and the aesthetic quality desired by the patient.

After the clinical treatment was completed, the patient received instructions about hygiene and the maintenance of each prosthetic unit (Figure 10). A follow-up program of was defined to ensure that the level of satisfaction achieved was maintained for the longest possible time. CBCT imaging at 30, 60 days were planned to evaluate the preservation of peri-implant bone (Figure 1, E-L) before final prostheses were placed, at 120 days (Figure 1, M-P). Patient was called for a 3 years follow-up consultation, where adequate quality and volume of buccal bone were verified. Periodontal tissue was preserved, respecting aesthetic concepts, showing similarity to post cementation period (Figure 1, Q-T and Figure 12).

Discussion

Restorations using prostheses over implants in the esthetic region and preserving gingival architecture in harmony with adjacent tissues is one of the great challenges in current Implant Dentistry. Esthetic peri-

implant results may be more accurately predicted using a diagnostic protocol with five keys that may be evaluated and used for decisions. This protocol includes: (I) relative tooth position, (II) form of periodontium, (III) biotype of periodontium, (IV) tooth form and (V) bone crest position. In the case described here, for example, the gingival phenotype was extremely thin and unfavorable if not carefully handled, as there was the chance of retraction, implant transparency or visibility of prosthetic abutments through the tissues. This was thoroughly evaluated together with the patient, who was told about all treatment biases, as well as about the necessary hygiene and care that should be observed to preserve the prosthesis.



Figure 11: Copping Zirconia comparison on dental implants # 11 and # 21 region: (A) scanning the plaster model virtually performed (NEODENT® Curitiba, Brazil), as well as making the virtual structure of the zirconia abutment; (B) coppings on the actual plaster model (B); proved mouth (C). Note the quality of the adaptation and the similarity among the three situations showing great reliability of the technique.



Figure 12: Clinical aspect after 3 years cementation preserving gingival tissue contour and health.

A surgical guide was carefully planned and manufactured before the surgery to position the implants correctly [1, 3]. Provisional restorations should be accurately placed in the initial position, which may be achieved by using this guide. In our case, it ensured that provisionals were placed at the exact place where the natural teeth were. After the placement of the dental implants, the veneers manufactured from the natural permanent teeth were placed over the implant abutments that fit the initial and final positions, according to the guide. Therefore, the gingival architecture was preserved by using the crown of the freshly extracted tooth, and the soft tissue architecture, enamel smoothness and tooth contour were preserved, which promoted healing and other biological processes [2, 7, 9].

Several studies in the literature demonstrated the possibilities of preserving buccal bone height and discussed the known bundle-bone resorption when the biological criteria are not met after extraction [7, 9]. In the same way, these criteria should be met when implants are placed, particularly in the esthetic region, where hard and soft tissues should be handled very carefully. In the first 6 to 12 months after extraction, buccal bone resorption is progressive if no bone regeneration procedure is adopted, even when there is no excessive trauma during surgery [7, 8]. For that purpose, autogenous, allogeneic or heterogenous bone grafts are available, and scientific findings confirm that esthetic preservation is more effective, and prognoses are more predictable when they are used. In the case described here, as in recent studies in the literature, a bone graft was placed in the labial gap (>2 mm) using biomaterial composed of inorganic fine-grained bovine bone to preserve gingival contour in the long term. In the first six months after surgery, the preserved gingival architecture and the healthy aspect of the soft tissue was even better than before surgery. Moreover, preserved gingival health and the correct and natural three-dimensional positioning of peri-implant tissues were confirmed during monthly follow-up visits [15, 19, 21-25].

In implant-supported restorations in the esthetic zone after extractions, immediate provisionalizations should be recommended so that the gingival architecture is preserved, as long as all criteria for initial implant stability and occlusal adjustment of the provisional restoration are met [1]. Moreover, when the crown of the freshly extracted tooth is used, the manufacturing of a provisional restoration seems to promote the preservation of the quality of inserted gingiva. In the case described here, particularly in the first months of bone and gingival repair, the quality of peri-implant tissue repair may be assigned to biological characteristics of enamel and cementum remaining on the surface of the natural veneers of the crown used as a provisional. The contact between enamel and cementum of the provisional restoration with the gingiva may promote better adaptation and tissue response to healing, in contrast with the more porous surface of the type of acrylic used to manufacture provisionals over implants. Despite the quality of the dental tissue remaining in the veneer, the rest of the provisional was carefully manufactured using bis-acrylic resin, which ensured high quality polishing and smoothness and facilitated the adaptation of all peri-implant system [3, 4, 6, 12, 18].

In our Implantology service, as routine, patients should attend periodic follow-up consultations, with tomographic control, in order to observe perimplant conditions, essential for tissue quality maintenance and medium- and long-term success evaluation. Thus, patient underwent tomographic examination, clinical and photographic follow-up, 3-year after definitive prosthesis rehabilitation. Maintenance of peri-implant soft tissue architecture and adequate buccal bone volume can be observed. Perhaps, a great point of interest in this particular clinical case, is the compilation of small details that have fundamental relevance in obtaining success in Implantology. Among possible critical steps is the non-negotiable need to fill the buccal gap, with slow reabsorption biomaterials, when the space between implant surface and remaining buccal bone is $\geq 2\text{mm}$. Following this line of reasoning, a more palatal positioning of the implants allows a better primary stability in addition to buccal bone preservation.

Conclusion

This study described a 3-year follow-up of a clinical case in which

immediate post extraction implants placement, provisionalization using the natural crown of the freshly extracted teeth and posterior final prosthetic rehabilitation, promoted the preservation of gingival architecture and ensured high-quality esthetics of mid- and long-term results.

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Conflicts of interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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