



Case Report

Immediate Implant Placement in the Esthetic Zone Utilizing a Fully Digital Workflow for Crown Delivery

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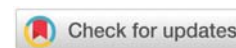
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Abstract

The installation of immediate implants in fresh alveoli is a valuable technique for preserving surrounding structures. In this case, a male patient presented with trauma leading to a root fracture of tooth 21. Atraumatic extraction and immediate implant placement were performed, with biomaterial used to maintain periodontal tissues. A provisional restoration was placed due to torque exceeding 45N, and monthly follow-ups were conducted for six months. Prosthetic rehabilitation was completed through a digital workflow using CAD design and 3D milling technology.

Introduction

Immediate implant placement, introduced in 1976, offers advantages such as reduced treatment time and fewer surgical interventions, ensuring greater patient comfort. Studies indicate a high success rate for immediate implants in fresh sockets compared to healed ridges. Primary stability (40–60 N/cm²) is crucial, achieved through mechanical fixation within the residual socket. Proper implant positioning, especially with a palatal approach, minimizes bone remodeling and enhances stability. Biomaterials mixed with autogenous grafts help compensate for natural bone resorption. Maintaining

the gingival contour and papillae is essential for aesthetics, facilitated by temporary crowns with an appropriate emergence profile. Atraumatic extraction techniques are critical in anterior regions to preserve soft and hard tissue architecture. Digital workflows, including intraoral scanning and 3D printing, optimize implant planning and execution. These advancements improve long-term functional and aesthetic outcomes in implant rehabilitation.

Clinical case report

A 46-year-old male patient sought treatment at the Senac University Center in Brazil after experiencing trauma to the

anterior region of his teeth. The CBCT examination revealed a root fracture in tooth 21 (Figure 1). Consequently, the patient underwent an atraumatic extraction of tooth 21 (Figure 2), followed by the immediate placement of a Bionnovation CM 3.5 × 15 mm implant, during the surgical procedure, the decision was made to initiate the osteotomy for implant placement using a lance drill, engaging the palatal wall of the socket, 6 mm above the apex of the extracted root. The drilling was centered on the bisector of the socket of the recently extracted tooth (Figure 3). To preserve the bone and gingival tissue architecture, Bionnovation material was used: small, dense fine xenograft particles of Bonefill material, with a volume of 0.50 cc was applied to fill the peri-implant gaps. (Figure 4) provisional restoration was installed without occlusal contact to support the osseointegration process. The patient was instructed to follow a soft diet consisting of cold or room temperature liquid and pasty foods for the first three days. During the six-month bone healing period, the patient was advised to avoid biting or applying functional load with the anterior region. Oral hygiene routines were to be maintained as usual, with special care to avoid pressure on the surgical site (Figure 5). The prosthetic rehabilitation was performed through a fully digital workflow, including intraoral scanning, CAD design, and 3D printing, ensuring the precise fabrication of the final restoration (Figures 6-9). Periapical x-rays were taken at the time of implant placement and after 2 months with the zirconia crown (Figure 10).

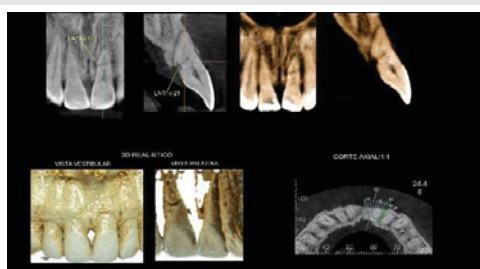


Figure 1: CBCT image showing root fracture of tooth 21.



Figure 2: Atraumatic extraction of tooth 21.



Figure 3: Osteotomy initiated using a lance drill, centered along the bisector of the socket.



Figure 4: Placement of xenograft (Bone fill) to fill peri-implant gaps.



Figure 5: Surgical site post-placement with provisional restoration in place.



Figure 6: Digital intraoral scan for prosthetic planning.

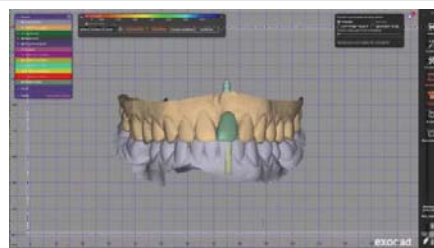


Figure 7: CAD-based design of final restoration.



Figure 8: 3D milling process of the prosthesis.



Figure 9: Final prosthetic crown fabrication outcome.

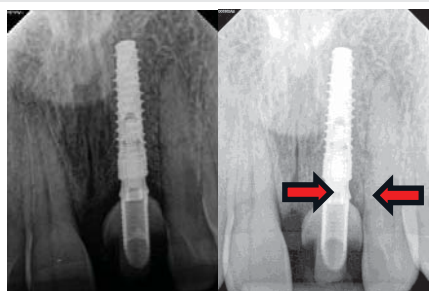


Figure 10: Periapical x-rays: (a) after implant placement and (b) two months post-crown.

Discussion

The upper anterior teeth are highly prone to trauma, cavities, periodontal disease, and failed endodontic treatments, often leading to tooth loss. Minimally invasive extractions help preserve the fragile bone structure, preventing additional resorption [1]. Immediate implant placement following extraction has proven to be a predictable treatment, requiring careful planning and specific conditions such as absence of infection, sufficient apical bone, and good vestibular cortical bone support [2].

This approach offers functional, aesthetic, and psychological benefits by reducing surgical interventions and overall treatment time. Proper three-dimensional implant positioning, particularly using a palatal approach, ensures better primary stability and space for bone regeneration [3]. Bone grafting in the jumping gap minimizes ridge resorption and enhances long-term stability [4].

Studies show that up to 30% of horizontal bone volume may be lost within three months after extraction. Thus, immediate implantation with grafting is preferred to avoid additional regenerative procedures. Additionally, atraumatic surgical techniques that preserve soft tissues contribute to better outcomes [5].

Achieving aesthetic success in the anterior maxilla is challenging, as it depends on bone volume and interdental papilla preservation. Immediate loading implants support soft tissues and facilitate hygiene, while provisional restorations help shape the gingival architecture. Various techniques, such as gingivoplasty and customized impressions, enhance tissue adaptation [6].

Finally, early implant placement maintains the socket anatomy, reducing alveolar ridge resorption, which can reach 50% post-extraction. Strict adherence to clinical criteria is essential for osseointegration and achieving both functional and aesthetic success in rehabilitation [7].

Final considerations

In conclusion, immediate-load implants represent a major advancement in dentistry, offering a fast and efficient solution

for tooth replacement. This technique reduces treatment time and enhances quality of life by enabling prosthesis placement on the same day as the implant. However, careful planning and execution are essential to prevent complications such as micromovements and implant instability.

Advancements in implant technology and clinical expertise continue to improve the success of immediate-load procedures, making them a reliable option in modern dentistry. Maintaining gingival contour is crucial for aesthetic outcomes, requiring precise implant positioning to preserve tissue integrity and ensure seamless integration with adjacent teeth.

The immediate placement of implants in fresh extraction sockets represents a predictable and efficient approach for preserving hard and soft tissues, especially in esthetically demanding regions. In the present case, atraumatic extraction, careful implant positioning, and the use of biomaterials contributed to favorable clinical and esthetic outcomes. However, as this is a single case, clinical variability must be considered. Future studies involving multiple cases would provide a broader understanding of the overall success rate and limitations of immediate implant placement.

Ethical considerations

Written informed consent was obtained from the patient for the treatment and the publication of this case report, including accompanying images.

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