

Breaking Barriers in Maxillary Rehabilitation: Evolving Treatment Strategies

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Abstract

Rehabilitating an atrophied maxilla is a significant challenge in implant dentistry because of the limited bone volume and density in this area. The maxilla often has reduced bone height and width from tooth loss, periodontal disease, or trauma, which can make placing conventional implants difficult. Additionally, the bone in the maxilla is typically less dense than the mandible, which can affect the implant's initial stability and the biological process of osseointegration. Traditionally, treatments for an atrophied maxilla include bone augmentation techniques such as sinus floor elevation, onlay grafting, and guided bone regeneration. While effective, these procedures can increase patient discomfort, extend treatment times, and raise costs.

Zygomatic implants offer another option for severe maxillary atrophy by anchoring implants in the zygomatic bone, but they require advanced surgical skills and may not be suitable for all patients.

Keywords

Implant prosthesis; Pterygoid implants; One piece tissue level implants; Dual retention; Retrievability.

Treatment Modalities for Atrophied Maxilla

Introduction

Rehabilitating an atrophied maxilla is a significant challenge in implant dentistry because of the limited bone volume and density in this area. The maxilla often has reduced bone height and width from tooth loss, periodontal disease, or trauma, which can make placing conventional implants difficult. Additionally, the bone in the maxilla is typically less dense than the mandible, which can affect the implant's initial stability and the biological process of osseointegration.

Traditionally, treatments for an atrophied maxilla include bone augmentation techniques such as sinus floor elevation, onlay grafting, and guided bone regeneration. While effective, these procedures can increase patient discomfort, extend treatment times, and raise costs.

Zygomatic implants offer another option for severe maxillary atrophy by anchoring implants in the zygomatic bone, but they require advanced surgical skills and may not be suitable for all patients.

Recently, one-piece tissue-level implants have emerged as a promising alternative for compromised maxillary conditions. These implants have an integrated abutment and implant body, simplifying the surgical procedure and reducing the risk of complications related to micro-gaps. When combined with early loading protocols, this approach can speed up the rehabilitation process, allowing for functional prosthetic restoration sooner and potentially improving patient comfort and satisfaction.

Case Report 1: Immediate Loading of a Fixed Prosthesis in the Maxilla

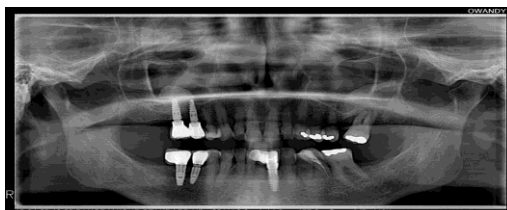


Figure 1: 63-year-old female patient x-ray.

A 63-year-old female patient presented with pain and increased tooth mobility in the left posterior maxilla (Figure 1). Clinical and radiographic evaluation revealed advanced periodontal breakdown and compromised alveolar bone support in the affected region. The patient reported significant functional impairment and discomfort during mastication. Notably, she expressed dissatisfaction with the extended healing period of nearly one year required in a previous treatment on the contralateral side, where conventional augmentation techniques and delayed implant placement had been employed. Consequently, her primary request was to explore a treatment strategy that would provide predictable functional and esthetic rehabilitation while minimizing the overall treatment duration. This clinical situation illustrates the need for innovative surgical and prosthetic protocols that can accelerate osseointegration, reduce patient morbidity, and ensure long-term stability in cases of advanced maxillary bone loss.

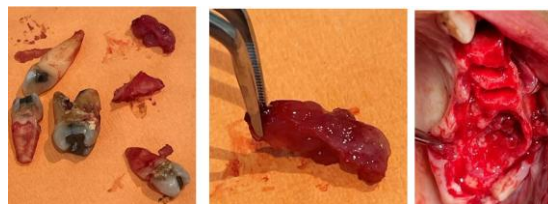


Figure 2: Extraction of compromised teeth.

The treatment plan consisted of the immediate extraction of the compromised maxillary teeth followed by placement of dental implants in the same surgical session (Figure 2). Immediate implant placement was selected to preserve alveolar bone volume, limit post-extraction resorption, and shorten the overall treatment timeline. This approach also aimed to maintain the natural gingival architecture and soft tissue contours, thereby optimizing esthetic outcomes.

ROOTT P implants (Figure 3) were selected for rehabilitation of the posterior maxilla because of their capacity to achieve high primary stability, even in areas of advanced alveolar atrophy. Their design characteristics—specifically the combination of extended implant length and a deep, aggressive thread configuration—allow for enhanced mechanical engagement with the residual cortical and trabecular bone.



Figure 3: ROOTT P Implant (Pterygoid).

This is particularly advantageous in the maxillary region, where bone density is often reduced (Lekholm and Zarb classification D3–D4). The thread geometry not only facilitates controlled insertion torque but also improves the distribution of occlusal forces along the implant surface, thereby reducing the risk of micromotion during the critical healing phase. From a biological perspective, primary stability is the key predictor of successful osseointegration.

Implants were placed immediately after tooth extraction, and a bone graft material was used to fill the voids (Figure 4). Post-extraction sockets often present residual gaps between the implant surface and the surrounding alveolar bone, particularly along the buccal aspect.



Figure 4: ROOTT P Implants and bone graft placed.

Bone graft material was placed in these voids to enhance osseointegration and minimize ridge resorption, promoting stability of the implant during the critical healing phase and preserving the contour of the alveolar ridge for improved esthetic and functional outcomes.

An analog impression was taken immediately after the surgery using screwed impression transfers (Figure 5). This technique is commonly employed in immediate implant protocols to accurately capture the three-dimensional position and angulation of the implants relative to the surrounding soft and hard tissues.

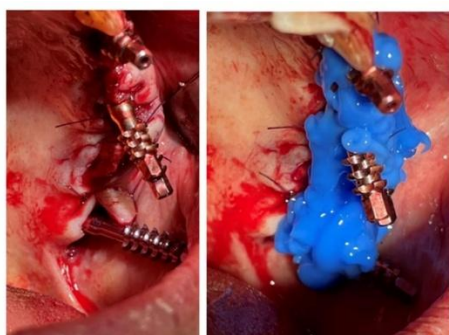


Figure 5: Impression with open tray transfer.

Screw-retained impression copings are directly connected to the implant fixtures, allowing for a precise, rigid transfer of the implant positions to the working model. Taking the impression at the time of surgery minimizes additional patient visits and facilitates the fabrication of a provisional or definitive prosthesis without delaying the healing process. Moreover, immediate impressions help reduce soft tissue distortion that might occur with delayed procedures and contribute to maintaining the peri-implant mucosal architecture, especially in the esthetic zone.

At the second appointment, the laboratory-fabricated working model and control key (Figure 6) were received and meticulously evaluated for accuracy. The control key is used to verify the passive fit of the framework and confirm the implant positions, ensuring the model replicates the intraoral situation.



Figure 6: Model and control key.

Accurate verification is critical to avoid complications such as misfit-induced stress on the implants or prosthetic components, which can lead to mechanical or biological failures.

Following this, an esthetic try-in was performed (Figure 7), allowing for the assessment of tooth shape, shade, and overall harmony with the patient's facial features. The try-in also served as a functional evaluation of occlusion and phonetics. Once these parameters were verified and approved, the metal framework was tried intraorally to assess passive fit, marginal adaptation, and structural integrity.



Figure 7: Aesthetic try-in mic bridge.

The final metal-ceramic bridge was fabricated (Figure 8), combining the strength of a metal substructure with the esthetic qualities of layered ceramic to achieve both long-term durability and natural appearance.



Figure 8: Metal-ceramic bridge.

The soft tissue has healed well around the implants (Figure 9).



Figure 9: Soft tissue before placement.

In this case, the final ceramic bridge was delivered and fixed just three weeks after surgery (Figure 10). The patient managed the treatment well, and no complications.

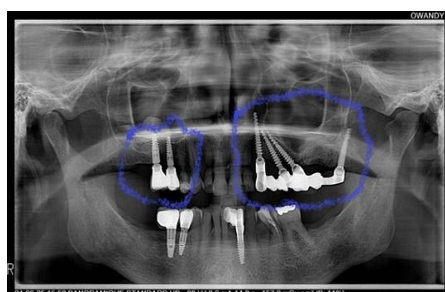


Figure 10: Final placement after three weeks.

Case Report 2: Immediate Loading with Oblique Implant Placement

A 61-year-old male patient reported with localized pain in the left posterior maxillary region and clinical evidence of mobility in an existing fixed dental prosthesis (Figure 11). Clinical and radiographic examination confirmed compromised periodontal support of teeth 23, 24, 25, and 27, warranting their extraction.



Figure 11: 61-year-old male patient x-ray.



Figure 12: Extractions carried out. The bone void on the buccal side in position 23 is filled with bone graft material, Osteobiol, stitches are placed followed by transfers to take the impression.



Figure 13: Tissue level implants placed in position 23, 24, 25 and ROOTT P 3.5/20mm placed position 28.



Figure 14: The bone void on the buccal side in position 23 filled with the bone graft material.

A comprehensive treatment plan was devised involving the atraumatic extraction of these teeth (Figure 12). During the surgical phase, the failing teeth were carefully extracted, and implant osteotomies were prepared.

Particular attention was given to the alveolar ridge and bone density in the maxillary region. Implants were placed with a trajectory designed to maximize engagement with the available native bone (Figure 13). Notably, at position 23, a residual bone defect was encountered and subsequently augmented with xenogeneic bone graft material to optimize future osseointegration and ensure adequate ridge contour (Figure 14).

The implants selected featured macro- and micro-thread designs, as well as lengths that permitted bicortical stabilization. Their insertion was performed at slightly oblique angulations to achieve increased cortical bone contact and high primary stability, with insertion torque values exceeding 50 Ncm across all sites. Such stability was essential to support an early loading protocol, thus reducing the overall treatment duration. Following implant placement, an open-tray impression was taken to capture the precise three-dimensional implant positions.



Figure 15: Verification jig.



Figure 16: Verification jig to confirm the accuracy of the cast.



Figure 17: Perfect fit of the jig intra oral.

At the 2nd appointment, a verification jig (Figure 15) was employed to confirm the accuracy of the cast (Figure 16) and to ensure the passive fit of the prosthetic framework. A successful try-in of the verification jig, validating the precision of the impression technique (Figure 17).



Figure 18: Metal frame milled in one piece.



Figure 19: Finished metal ceramic bridge.

The definitive prosthesis, a screw-retained, ceramic-bonded bridge, was delivered two weeks post-surgery (Figure 18,19).

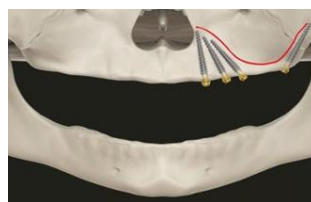


Figure 20: Final bridge screwed in patient's mouth.

The treatment was successfully completed (Figure 20) within a shortened clinical timeframe, attributable to the use of high primary stability implants and an early loading protocol. At delivery, the prosthesis demonstrated excellent fit, stability, and occlusal harmony.



Figure 21: X-ray with final bridge.



Illustration

The patient's esthetics and function were restored, and the prosthesis was securely retained with screw fixation, thereby providing the retrievability for future maintenance (Figure 21).

Case Report 3: Immediate Fixed Restoration for Periodontal Issues

Periodontal disease is a leading cause of tooth loss, particularly in the maxillary posterior region, where bone resorption and infection can complicate rehabilitation. This case report describes the successful management

of a patient with periodontal disease using immediate implant placement with ROOTT P one-piece tissue-level implants and an early loading protocol.



Figure 22: OPG of the patient.

A 45-year-old female patient presented with complaints of pain and mobility associated with the upper posterior maxillary teeth. Clinical and radiographic examination confirmed severe periodontal challenges of the maxillary molars with associated infection (Figure 22).



Figure 23: Periodontal effected teeth were extracted.

Under local anaesthesia, the affected molar teeth were a traumatically extracted. During the procedure, a large osseous defect was encountered because of chronic infection (Figure 23).



Figure 23: Infection created a big void.



Figure 24: Large void had to be filled with bone graft.

The defect was debrided and subsequently augmented with a particulate bone graft material to enhance ridge volume and provide support for implant placement (Figure 23,24).



Figure 25: Following extractions ROOTT P Implants were placed.

ROOTT P one-piece tissue-level implants were placed immediately following extraction (Figure 25). Optimal primary stability was achieved through engagement of the available cortical bone, despite compromised local bone conditions.



Figure 26: Upon suturing the screwed transfers were placed for immediate impression post-surgery.



Figure 27: At 2nd appointment a verification jig was tried to check the fitting and passivity.

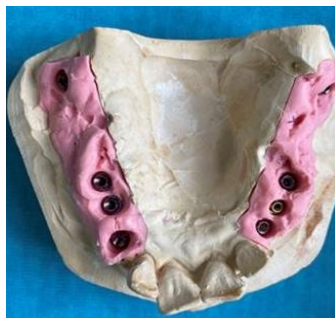


Figure 28: The model. At the second appointment, a verification jig (Figure 27) was utilized to confirm the accuracy and passivity of the cast (Figure 28).



Figure 29: The bite registration was assessed and resolved. The patient's occlusion was also assessed and adjusted to minimize excessive loading forces (Figure 29).



Figure 30: At 3rd appointment a metal frame was tried, upon positive verification confirm final bridge.



Figure 31: 3 weeks later the patient, got her metal ceramic bridges.

At the third appointment, a metal framework was tried in to evaluate passive fit and structural integrity (Figure 30). Final ceramic-bonded, screw-retained bridges were delivered three weeks after surgery, completing the rehabilitation (Figure 31).



Figure 32: Soft tissue. Soft tissue healing before placement (Figure 32).



Figure 33: Final bridge.

Final Placement off bridge (Figure 33). Happy patient.

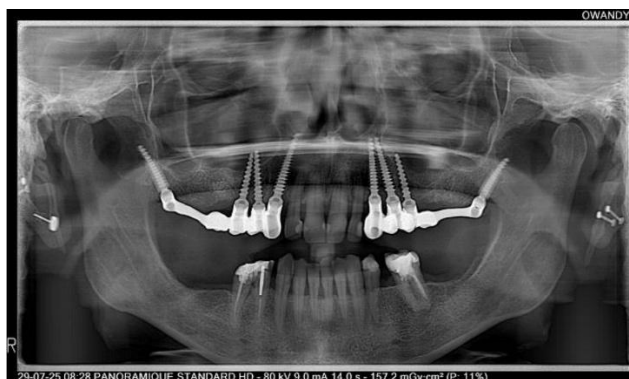


Figure 34: X-ray with final bridge.

Prosthesis was securely retained with screw fixation in both segments (Figure 34).

Discussion

The cases presented in this report highlight the clinical feasibility of rehabilitating patients with an atrophied maxilla using one-piece, tissue-level implants in combination with an early loading protocol. The approach employed ROOTT P implants and proved effective even in situations of limited bone volume, with all procedures performed under local anaesthesia.

Several factors contributed to the successful expedited loading:

1. **Implant macro- and micro-design:** The implants utilized were long, with a specialized thread pattern and a tapered, thin apex. This configuration facilitated insertion along oblique trajectories, enabling engagement of dense cortical bone and maximizing available anchorage.
2. **Oblique angulation:** The strategic inclination of implants enhanced primary mechanical stability by increasing cortical engagement and distributing occlusal forces along favorable vectors, thereby achieving high insertion torque values essential for immediate loading.
3. **Osteofixation design features:** The one-piece implant architecture promoted stable fixation and early osseointegration, supporting both immediate mechanical stability and long-term biological integration.

The minimally invasive nature of this protocol provided significant advantages. By eliminating the need for adjunctive sinus floor elevation or extensive bone grafting procedures, surgical risks, morbidity, and chairside time were reduced. The avoidance of invasive augmentation also minimized patient discomfort, while shortening the overall treatment timeline, with a successful and functional outcome.

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