

ALL-ON-4 IMPLANT REHABILITATION OF THE MAXILLA WITHOUT SINUS LIFT WITH SCREW-RETAINED PROSTHESIS-A CASE REPORT

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Abstract: In today's modern world, patients are increasingly seeking advanced fixed dental solutions that provide a natural look and feel, while eliminating the discomfort and limitations associated with removable dentures. Over the years, medical and dental sciences have continuously evolved to find faster, simpler, and more efficient solutions for full mouth rehabilitation. Newer-generation dental implants and screw-retained dental prostheses have brought several advancements that significantly improve clinical outcomes, patient satisfaction, and long-term success. Bone resorption, remodeling, and atrophy following tooth extraction commonly result in insufficient jawbone volume. Treatment options include complete upper and lower dentures, implant-supported overdentures, and fixed implant-supported prostheses. Implant supported fixed prostheses offer superior comfort, stability, and patient satisfaction but require adequate bone support for successful implant placement. In the posterior maxilla, inadequate bone beneath the maxillary sinus often makes sinus lifting necessary for implant placement. That makes the process of dental implant placement more complicated and increases the total cost of the procedure. In the All-on-4 procedure, two implants are placed axially in the anterior region and two longer implants are placed tilted at approximately 30° in the posterior premolar region. This angulation allows longer implants to engage more bone, avoiding the maxillary sinus and eliminating the need for grafting. Using newer generation of implants with multi-unit abutments make this technique available. The All-on-4 treatment concept presents a minimally invasive and cost-effective alternative for full-arch rehabilitation in edentulous or atrophic jaws. This configuration provides favorable biomechanical support for a screw-retained, implant-supported fixed prosthesis used in full-arch rehabilitation. Patients with a resorbed maxilla can often be successfully treated without the need for bone grafting or sinus lifting, making this technique a simpler and more cost-effective alternative. The protocol enables cost-effective, fixed full-arch rehabilitation with high success and satisfaction rates. Additionally, by simplifying surgical procedures, the technique becomes accessible to a broader range of clinicians and patients. After completing treatment, patients are able to chew and eat comfortably, smile with confidence, and easily care for their new teeth. This report supports the clinical utility of the All-on-4 technique, particularly in resource-limited or anatomically constrained cases. This case report presents successful full-mouth rehabilitation of a 60-year-old male patient with severe periodontal disease and generalized tooth loss using and atrophied maxilla with the All-on-4 implant concept.

Keywords: full-mouth rehabilitation, All-on-4, implant supported fixed prosthesis, prosthesis

1. INTRODUCTION

Alveolar bone atrophy following tooth extraction is a common condition that typically worsens over time, with bone remodeling varying individually based on multiple factors (Couso – Queiruga et al., 2021). Insufficient bone volume in the maxilla, particularly beneath the maxillary sinus, often necessitates a sinus lift procedure when placing implants in the posterior region (Alshamrani et al., 2023). Tilted implants represent a viable therapeutic alternative for restoring a completely edentulous, atrophic maxilla, with clinical outcomes comparable to those of conventional implantology (Mehta et al., 2021). Treatment options include complete upper and lower dentures, implant-supported overdentures, and fixed implant-supported prostheses. Among these, fixed implant-supported prostheses are often better accepted by patients, offering greater comfort and functionality (Gonçalves et al., 2022). However, severe bone resorption and jaw atrophy can make removable dentures difficult to wear, negatively impacting quality of life (Soboleva & Rogovska., 2022). The All-on-4 concept addresses these challenges by using four strategically placed implants, including two long tilted implants, to support a full-arch prosthesis (Patzelt et al., 2014). This approach results in a more aesthetic and rapidly accepted prosthetic solution. This case report presents a full-mouth rehabilitation using a screw-retained complete arch prosthesis supported by four implants in the maxilla, and a fixed circular bridge in the mandible.

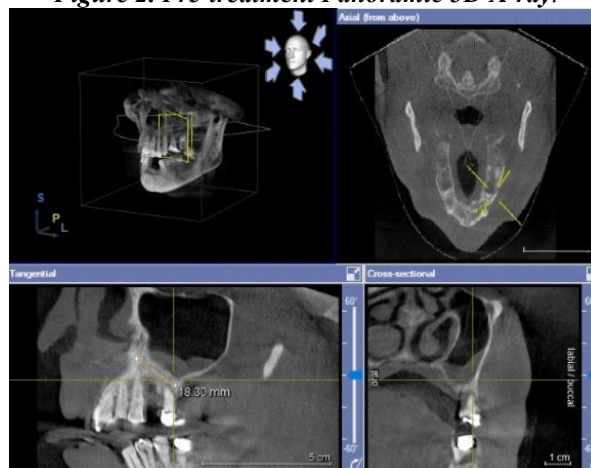
2. CASE REPORT

A 60-year-old male patient presented with multiple missing and mobile teeth. Intraoral examination revealed generalized periodontitis, with grade III mobility in the maxillary teeth and gingival recession affecting the remaining dentition (Figure 1). The mandibular premolars and first molars were stable and considered suitable for supporting a fixed prosthesis. A panoramic 3D X-ray confirmed the diagnosis and revealed that all maxillary teeth and those with grade III mobility needed extraction. The mandibular canines, premolars, and first molars were in good condition and planned to support a fixed circular bridge (Figures 2, 3).

Figure1. Pre-treatment intraoral photo



Figure 2. Pre-treatment Panoramic 3D X-ray.



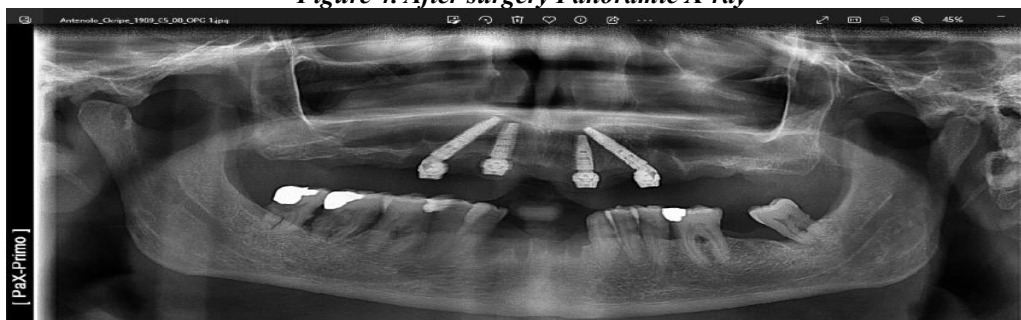
Source: Authors' research

Figure 3. Pre-treatment Panoramic X-ray



Source: Authors' research

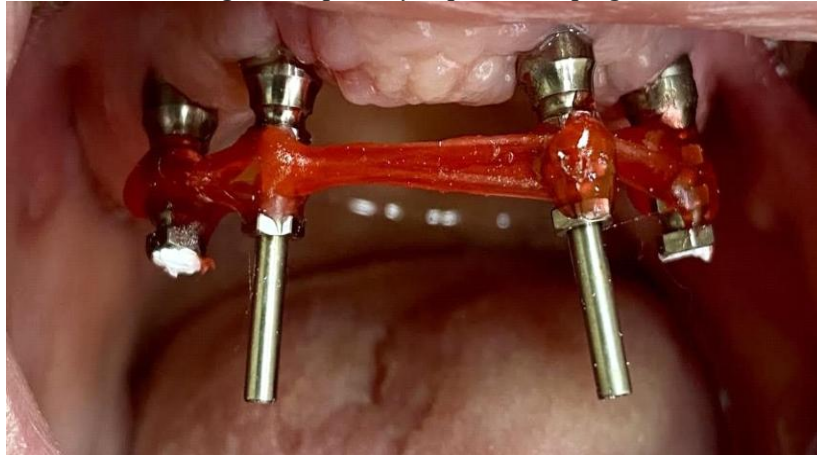
Figure 4. After surgery Panoramic X-ray



Source: Authors' research

All maxillary teeth were extracted, and four implants (Neodent GM) were placed in regions 12, 15, 22, and 25. Implants in the anterior regions (12 and 22) measured 3.5×13 mm, and those in the posterior regions (15 and 25) were 3.75×18 mm. Multi-unit abutments were used to support a screw-retained prosthesis (Figure 4). After a six-month healing period to allow for osseointegration and soft tissue healing, the definitive prosthetic phase was initiated. In the maxilla, an open tray impression technique was used. Open tray impression copings were splinted using dental floss and pattern resin, followed by an impression with A-silicone (Variotime Kulzer Light Flow and Easy Putty) (Figures 5, 6). Dental models were mounted on a semi-adjustable articulator for prosthetic fabrication. In the mandible, feather-edge preparations were done on teeth 36, 35, 34, 33, 43, 44 and 45. A conventional impression technique was used with a double retraction cord and one-phase A-silicone (Variotime Kulzer Light Flow and Easy Putty).

Figure 5. Open tray impression copings



Source: Authors' research

The metal framework trial for the circular bridge was completed, and jaw relations were recorded using a wax occlusal rim. An A2 shade was selected based on the patient's facial features and preferences (Figure 7). A wax mock-up was manually designed with 10 teeth in the arch (Figure 8), then scanned and fabricated using direct metal laser sintering. A metal try-in of the prosthesis was performed to verify the fit (Figure 9). Final prosthesis insertion included occlusion and articulation adjustments, as well as aesthetic and phonetic evaluations before glaze application (Figure 10). The mandibular circular bridge was cemented using radiopaque glass ionomer luting cement (GC Fuji I). The maxillary screw-retained prosthesis was torqued to 10 Nm using a wrench ratchet, screw access holes were sealed with teflon and flowable composite. The patient returned for a regular follow-up one year later (Figure 11).

Figure 6. Open tray Impression with A-silicone

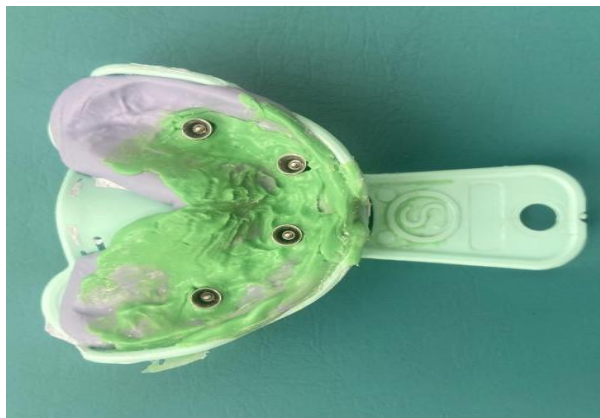


Figure 7. Jaw relations record m



Source: Authors' research

Figure 8. A wax mock-up



Figure 9. A metal try-in



Source: Authors' research

Figure 10. Final work



Figure 11. Regular follow-up after one year



Source: Authors' research

3. DISCUSSION

Dental implants are typically placed vertically; however, in cases of low bone volume in a fully edentulous jaw, tilted distal implants can eliminate the need for bone grafting (Rosén & Gynther, 2007). When distal implants are tilted at approximately 30° and the cantilever length is minimized to 10 mm, fewer implants are required (Bevilacqua et al., 2011). Tilting the distal implants also allows for the use of longer implants with improved bone anchorage (Krekmanov et al., 2000). This technique provides both biomechanical and therapeutic benefits without the need for bone graft surgery, enabling stable fixed prosthetic restorations. Implant-supported fixed prostheses in the edentulous maxilla, especially when opposed by remaining mandibular anterior teeth, have been shown to reduce anterior and posterior maxillary bone loss compared to conventional dentures (Alrajhi et al., 2020). The All-on-4 treatment concept offers significant biomechanical, esthetic, and therapeutic advantages by reducing the number of implants required, avoiding sinus lifting in most cases, and maintaining high success rates at lower costs (Taruna et al., 2014).

4. CONCLUSIONS

The All-on-4 concept offers an effective and minimally invasive treatment option for patients with large maxillary sinuses and atrophic edentulous jaws. By reducing the cantilever and placing 30° tilted distal implants, the need for sinus lifting is avoided, while optimizing biomechanics and achieving primary stability. Full-arch rehabilitation can be accomplished with only four implants, making this approach more affordable and less complex. It significantly reduces surgical intervention, treatment time, and overall cost, leading to a faster and more comfortable recovery for the patient.

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