

All-on-4 and complete denture rehabilitation utilizing dual surgical guide for partially edentulous mandible - a case report

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All-on-4 and complete denture rehabilitation utilizing dual surgical guide for partially edentulous mandible - a case report

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ABSTRACT

Growing numbers of people are using implant-supported fixed prosthesis for mandibular resorbed arch, which has created a need for primary care physicians to be more knowledgeable about popular prosthetic attachments and provide access to a wide range of treatment alternatives to assist patient care. ² The purpose of this study was to report a case of full-mouth rehabilitation on four endosseous implants loaded by established protocol. In a hypertensive and diabetic patient, the decision was made to place four ² implants in the mandibular arch and a removable complete denture in the maxillary arch.



A good implant-supported fixed prosthesis depends on precise impressions and meticulous attention to detail.

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Keywords: Dental implants, Full mouth rehabilitation, Implant-supported fixed prosthesis, vertical dimension resorted

Abbreviations:

8

VDO - vertical dimension of occlusion

CAD/CAM - Computer -aided design/computer-aided manufacturing

INTRODUCTION

The idea of mandibular arch implant-supported rehabilitations has increased in acceptance in current years due to its capability to restore oral function and improve the quality of life for patients with extensive mandibular bone loss [1,2]. For mandibular arch, the combination of a multi-unit abutment and a screw-retained system is usually designated to offer maximum retention, stability, and aesthetic results for mandibular arch restoration with fewer hard tissue injury [3,4].

Full mouth rehabilitation is a demanding treatment approach that enhances the patient's look and fixes occlusal flaws. Speech, tone of muscles, vertical dimension, and centric relationship are the fundamentals of full mouth rehabilitation. Every element of the current natural dentition and its connection to the stomatognathic system needs to be carefully examined. Complete mouth rehabilitation typically results in a smile that is both aesthetically pleasing and comfortable to use [5]. Throughout a patient's lifetime, the occlusal surfaces of their teeth will gradually wear down. On the other hand, severe occlusal wear can lead to aesthetic deformity, occlusal disharmony, pulpal pathology, and reduced function [5]. Depending on what causes it, tooth wear can be categorized as either erosion, abrasion, or attrition. Because a combination of these processes is present in many circumstances, a differential diagnosis is not always achievable [6]. As a result, it's critical to determine the causes of excessive wear and assess how the damaged dentition has altered the VDO [6,7].



For centuries, complete dentures have been a good treatment choice for edentulousness. But since they were formerly significantly more common than they are now, they are becoming less and less of a regular treatment and more of an uncommon occurrence for many practitioners [8]. Dentures that use implants for retention and support are becoming more popular as a result of growing patient requests for better function and permanent tooth replacement, as well as the expansion of implant treatments' availability.

The aim of this case report is to demonstrate the combination of a maxillary complete denture with a mandibular multi-unit abutment system and a screw-retained abutment for treatment of an elderly medically compromised patient complaining of mobility of remaining mandibular natural teeth, and uneasiness throughout wearing of the existing maxillary old complete denture.

11 CASE REPORT

A Caucasian 62-year-old male patient reported to the School of Dental Medicine, Post Grad Pros clinics with a chief complaint of missing upper and lower teeth and severe chipping and cracking in the remaining teeth of the lower arch. The patient was a chronic smoker under regular medications for hypertension, Type 2 Diabetes Mellitus, and hypercholesterolemia. According to the patient's dental history, he had all of his maxillary and posterior mandibular teeth extracted several years ago because of failed restorations, poor periodontal health, and dental cavities. The patient reported that he was unable to use maxillary denture that had been created for him. He said it had been five years since his last dental appointment.

On extra oral examination, his face showed no gross symmetry, a symmetrical smile line with 2-4mm of lower teeth visible, and good neuromuscular coordination. White corrugated patches that were probably compatible with frictional keratosis in the maxillary and mandibular edentulous ridges were found during the intraoral examination soft tissue examination. The oral hygiene was poor. The attached gingiva had a firm consistency and a thick gingival phenotype. General probing depths were between 3-7 mm and a gingival recession of 3-6mm was seen. Bleeding on probing was present. There were no anomalies found in the other soft tissues. The maxillary and mandibular arches were U-shaped and showed a favorable anatomy for complete denture fabrication (Figures 1 A and B). The mandibular left central and lateral incisors, left and right canines, and first premolars were all present during the hard tissue examination. While the other teeth had cavities, the lower first premolars were incorrectly restored with silver amalgam. All the teeth present had grade II mobility according to Miller Classification. Every tooth had



worn facets and did not react to an electric pulp tester or cold testing. Additionally, the mandibular incisors were extruded (Figure 1C). On radiographic examination, the panoramic radiograph showed that the maxillary and mandibular alveolar ridges had good and moderate alveolar bone height (Figure 1D).

The patient was diagnosed to have maxillary complete edentulism and Kennedy Class I modification for the mandibular arch. Prosthodontic Diagnostic Index Class III for complete edentulous patient with a Class II maxillomandibular Relationship. A medical clearance for prosthodontic and surgical treatment was obtained from the patient's physician. Fabrication of interim maxillary complete denture and interim immediate mandibular complete denture after taking diagnostic impressions.

After explaining all possible treatment options, he accepted his treatment in the following sequence:

- 1- Extractions of all the mandibular teeth followed by placement of four dental implants in the mandibular arch and Insertion of the interim dentures for maxillary and mandibular arches.
- 2- Fabrication of new maxillary conventional complete denture and mandibular implant-supported screw-retained fixed complete denture using CAD\CAM.
- 3- Post-denture hygiene and post-insertion/ placement instructions, and Follow-up and recall program.

The treatment was started with the fabrication of interim dentures in the conventional technique. Mandibular cast surgery was done to accommodate for lower teeth setup. Interim maxillary teeth setup was tried in. lower teeth set up was used to plan implant placement. 2 CT based surgical guides were fabricated (Figure 2A). The two most distal implants were placed first with distal angulation of 30 degrees to increase the implants anterior- posterior spread utilizing tooth and fixation pins supported surgical guide to gain the highest possible accuracy [9] (Figure 2B). After placement, the remaining mandibular teeth were extracted. The remaining two anterior implants were placed using the second surgical guide which was implant and fixation pin supported (Figure 2C) [10]. All implants were Straumann BLT 4.1X12 SLA. There was very little alveoloplasty done on the mandibular arch. Both interim complete dentures were inserted on the day of surgery. The patient was followed up regularly and the mandibular denture was relined multiple times during implant healing. After 4 months, 2nd stage surgery was done to expose the implants. Ostell ISQ readings were >75. Straight and 30-degree multi-unit abutments were inserted and double torqued to 35Ncm. The mandibular interim complete denture was converted to an Interim mandibular fixed complete denture.



Custom trays were made from the prior diagnostic casts using wax relief and visible light polymerized resin (Triad) (VLC urethane dimethacrylate). Before the appointment for the final impressions, the patient was instructed to refrain from wearing his denture for at least 48 to 72 hours. Green-stick thermoplastic impression material was used to border mould the custom trays once the appropriate extensions were made (Figure 3A).

Light-body vinyl polysiloxane impression material was used to make the final maxillary arch impression. Using Dr Thompson's indelible marker, the vibrating line was marked in the mouth, then transferred to the impression, and finally to the master cast (Figure 3B). Every abutment on the mandible had its torque adjusted to 35 Ncm. 24 hours prior to the appointment, open tray impression copings were attached extra-orally, sectioned, and connected intra-orally using GC pattern resin that autopolymerizes. After adjusting the mandibular tray to allow for full seating and tray removal, medium-body vinyl polysiloxane impression material was used to make the final impression (Figure 3C). After the impression was removed, the implant analogues were attached to the copings. A type III dental stone that had been vacuum-mixed was used to pour, package, and disinfect the impressions.

With the existing interim dentures in place, phonetics and aesthetics were assessed. Pink triad denture base material was used to fabricate record bases. The occlusal rims were prepared using baseplate wax and triad denture base material. In order to assess stability and expansions, the record bases were fitted intraorally (Figure 3D-F).

After verifying the accuracy of the master cast, four splinted implant temporary cylinders were utilized for the mandibular record base. The incisal length was assessed using fricative sounds and aesthetics, and the maxillary occlusal rim was modified to give sufficient lip support. The maxillary occlusal plane was made to be parallel to both the interpupillary line in the frontal view and the ala-tragus (Camper's) line in the sagittal view. This was confirmed Fox occlusal plane. Both the canine locations and the facial midline were marked by drawing vertical lines that were extended from the ala of the nose.

To help record the patient's resting vertical dimension and occlusal vertical dimension, marks were placed on his chin and nose. The patient was asked to repeat (mmaa) sounds while licking his lips and swallowing to establish the physiologic rest position. The dimension of rest was recorded. After subtracting 3mm from the physiological rest position, aesthetics and phonetics were reassessed in order to approximate the OVD. The relationship between the maxillary occlusal rim a Hanau Modular D190 articulator was transferred using a Hanau spring facebow. The master casts were indexed and maxillary cast mounted with mounting plaster.



The mandibular occlusal rim's posterior sections were modified. The patient was guided into centric relation several times and instructed to close to the first contact by injecting poly (vinyl siloxane) registration material onto the mandibular rim and assisting the patient in centric relation, centric relation records were made. Three separate records were taken for verification. At this point, a protrusive record was produced utilizing PVS material. The mandibular cast was articulated against the maxillary casts using centric relation records. On the maxillary cast, the posterior palatal seal was drawn in the shape of a cupid's bow (based on palpation with a ball burnisher of the corresponding areas intra-orally) after evaluation of the palate clinically.

Differentiating between the patient's preferences and the previous teeth in the interim dentures, teeth were chosen. The choice of anterior teeth was influenced by the intercanine distance and the shape of the face. The final prosthesis used Ivoclar Vivodent Blue line teeth Ortholingual DCL. (The shade was A1, the anterior teeth were A27/A8, and the posterior teeth were LU6/LL6). Anterior teeth set-up was done and tried in, then final teeth try-in with the patient was completed; centric and protrusive occlusion was verified on the articulator using PVS registration material. The VDO was verified by evaluating esthetics, phonetics. The patient was very pleased with the esthetics and contours of the wax trial-dentures and approved to proceed with processing (Figure 4-A-F). The maxillary wax setup was then festooned and sealed onto the master cast. The wax was smoothed to minimize the need for polishing after processing.

The maxillary denture was flaked and wax was eliminated (boiled out), denture processing was done in an injection molding technique (IvoBase System) using High Impact denture base PMMA (Ivocap colore Preference). After allowing the flasks to cool, the processed denture was deflaked and remounted on the articulator then finished and polished and (Figure 5 A&B). The mandibular wax trial denture was scanned using a desktop scanner and copy-milled into CAD\CAM Zirconia. It was shaded before centering and stained and characterized after that. Laboratory remount of processed maxillary denture against the mandibular prosthesis and minimal occlusal calibrations were performed to correct the processing errors until contact of the guide pin with the incisal table was reestablished. The intaglio surfaces were evaluated and any sharp areas were removed. The Ti-bases were cemented using resin cement (Panavia V5) (Figure 5 C&D). The prosthesis was checked for passive fit on the master cast, intraorally and confirmed radiographically.

At prostheses placement, the maxillary denture was evaluated intraorally for any overextensions using disclosing wax. The patient was instructed to perform border-molding movements. Pressure spots were revealed using pressure-indicating paste and



high spots were adjusted. The prostheses were also evaluated for phonetics, esthetics, and occlusion. A centric relation record was made using a PVS occlusal registration material. The dentures were clinically remounted and the occlusion was refined. The mandibular abutments were re-torqued to 35Ncm, and the mandibular final prosthesis was connected, torquing the prosthetic screws to 15Ncm twice. Teflon tape and composite resin were placed to seal the access holes. Clearance of the mandibular prosthesis was verified by easily passing a perio probe. Figure 6 A to D shows intraoral views of the final prostheses with different mandibular movements and periapical radiographs of the mandibular dental implants Figure 6 E&F.

In addition to post-operative instructions, the patient was counselled to practice proper oral hygiene. Instructions were provided on how to take out and clean dentures as well as how to use oral hygiene products intraorally for mandibular implant supported prostheses. It was recommended to clean the oral tissues with mouthwash and a gauze or brush to get rid of biofilm and stimulate the tissues that support dentures. The patient received thorough hygiene education during the recall to ensure the preservation of their dental implants, prosthetic treatment, and overall oral health. Maintenance and recall were scheduled and executed at distinct times.

DISCUSSION

⁴ Dental implant is a substance made of alloplastic materials inserted into the oral tissues beneath the mucosal and periosteal layer and the arch bone to provide retention and support for a fixed dental prosthesis [11]. This case report demonstrates the combination of a maxillary complete denture and a mandibular with a screw-retained abutment for treatment of an elderly medically compromised patient complains of mobility of remaining mandibular natural teeth, and ill-fitting maxillary denture.

²² For generations, people with edentulousness have been successfully rehabilitated with complete dentures. That being said because they were once significantly more common than they are now, many practitioners will meet them with increasing rarity rather than as a frequent treatment [8]. Patients' views towards dental care are also evolving; they are becoming more optimistic about their oral health, more inclined to avoid having dental extractions, and less favorable towards full conventional dentures [12].

⁹ The clinical design of implants and their superstructures will affect patient satisfaction, prosthetic maintenance, peri-implant outcomes, and implant survival. The dental implants provide a long-term solution for lost or loose teeth, an alternative to wearing dentures, and a chance to regain confidence with a stable and functioning smile [13,14].



Recent standards in implantology aim to deliver prosthetic restorations with optimal functional and aesthetic outcomes. To get benchmark results, several characteristics have been proposed, including sufficient bone height, width, and sagittal projection; sufficient amount and quality of soft tissue; preservation of the buccal sulcus; and sufficient papillae and gingival contour [15].

Four implant fittings were recommended for the restoration of a resorbed maxillae in the original Brånemark surgical prosthetic protocol, and six implant fixtures were recommended for mandibles with minimal-to-moderate resorption [16]. There is an increased risk of up to 50% of mechanical difficulties in prostheses due to cantilever presence, which is dependent on the placement of the posterior implant and the degree of jaw atrophy [17-18]. Therefore, it is advantageous to have larger bone volume in the posterior jaw (six implants in each arch) in order to optimize prosthetic support and reduce cantilever length [17-19]. For increased accuracy and precision, the impression posts were splinted using pattern resin and floss. Throughout the prosthetic protocol, the vertical dimension of occlusion was developed and maintained.

Our patient showed a high level of satisfaction with the treatment during follow-up consultations.

Based on the patient's attitude, motivation, denture tolerance, appropriate retention, and balanced occlusion, a favorable long-term prognosis was anticipated. A fair prognosis was indicated by the potential for systemic disease symptoms and insufficient keratinized tissue surrounding the implants. These factors were closely observed throughout recall appointments.

CONCLUSION

Full mouth rehabilitation is a type of care that enhances the health of the entire stomatognathic system in addition to addressing the dentition's aesthetic and functional aspects. To attain consistent success, a thorough diagnostic and treatment plan is required. The ultimate goal of complete mouth rehabilitation is to return the masticating mechanism to its natural, healthy function.

The secret to an effective implant recovery process is precise implant planning and a suitable diagnosis. A successful implant-supported fixed prosthesis required good impressions and painstaking attention to detail. For the great majority of edentulous patients, complete dentures have been and will continue to be the cornerstone of therapy in the maxilla. There is a wealth of data in the mandible that supports the first-choice rehabilitation option being a four-implant assisted overdenture.



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AUTHOR'S CONTRIBUTIONS

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“Conceptualization, methodology investigation, data curation, writing—original draft preparation, review and editing, project administration was made by A.H.A. The author has read and agreed to the published version of the manuscript.”

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FIGURES

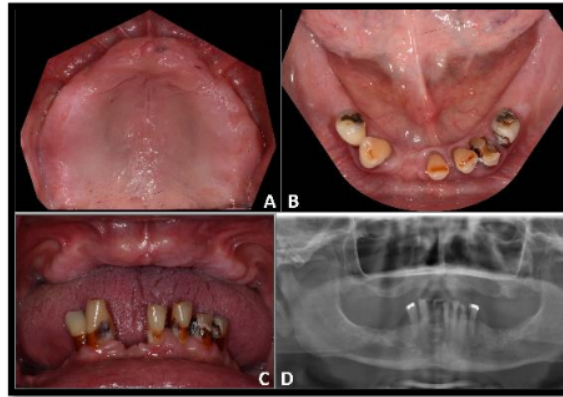


FIGURE 1. Pre-treatment (A) Maxillary arch, (B) Mandibular arch, (C) Frontal view of both arches, (D) Panoramic x-ray

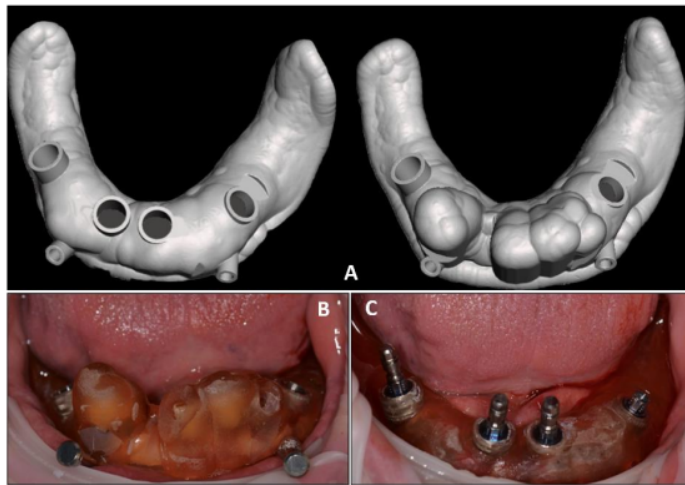


FIGURE 2. First guide (right), teeth and fixation pins supported and second guide (left) implants and fixation pins supported (A), First guide in place (B), Second guide in place with all implants placed (C).

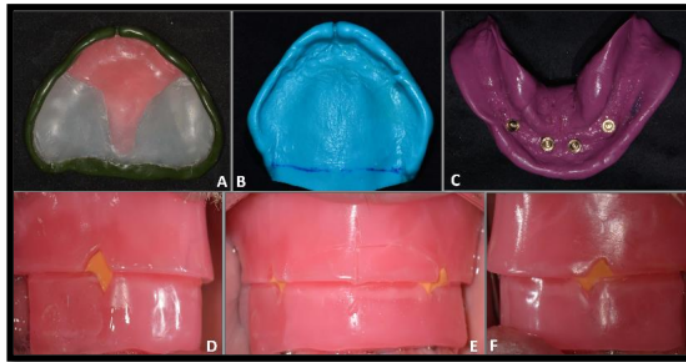


FIGURE 3. Border moulding of the custom tray (A), Final maxillary impression with Vibrating line to be transferred to maxillary master cast (B), Final impression made with medium-body impression material (C), Recorded blocks during maxillomandibular relation record (D-F).

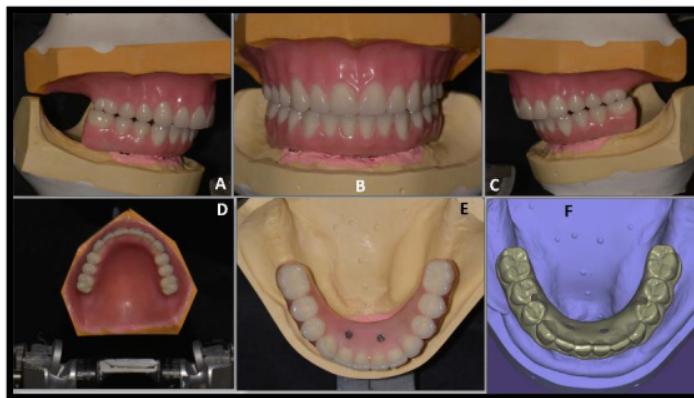


FIGURE 4. Different wax trial dentures (A-F)

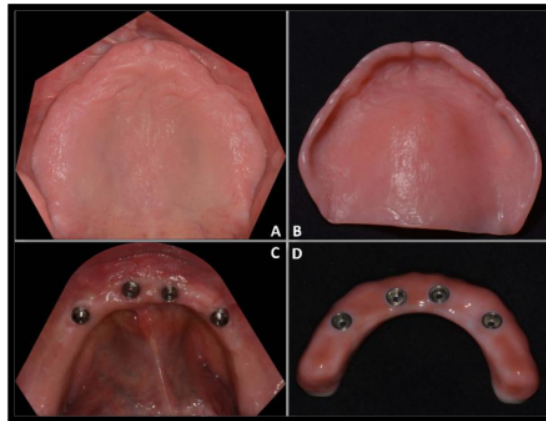


FIGURE 5. Maxillary complete denture (A-B) and mandibular denture bases with implant cemented using resin cement (C-D).

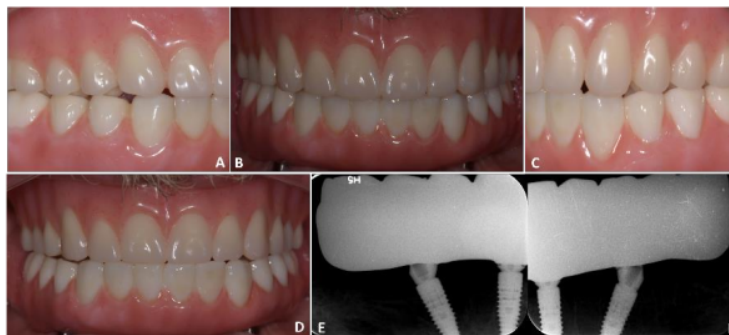


FIGURE 6. Final prostheses intra oral images with different mandibular movements (A-D) and periapical radiographs of the dental implants (E&F)