

Conservative Approach to Restore Function and Aesthetics with Two-Implant Retained Maxillary Overdenture and Tooth-Tissue Supported Mandibular Overdenture: A Clinical Case Report

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Abstract

Background:

Conventional denture wearers often experience low satisfaction levels due to poor retention and excessive tissue coverage.

Purpose:

This clinical report describes a conservative approach to address the functional, esthetic, and biological needs of a patient with a maxillary implant overdenture retained by two implants with equator resilient attachments, and a mandibular tooth-tissue supported overdenture.

Patient and methods:

A 65-year-old male patient with poor retention and discomfort from conventional dentures received a maxillary implant overdenture retained by two implants with equator resilient attachments, and a mandibular tooth-tissue supported overdenture. Thorough treatment planning, including prosthetically driven guided implants, was conducted, and the patient was followed up for one year.

Results:

The two-implant retained maxillary overdenture and tooth-tissue supported mandibular overdenture allowed the patient to achieve improved function, aesthetics, and overall satisfaction. The equator resilient attachments provided adequate retention and stability for the maxillary overdenture, while the mandibular overdenture provided additional support and stability through tooth-tissue contact. The patient reported improved comfort, speech, and chewing ability, along with increased confidence and satisfaction with the appearance of their dentures.

Conclusion:

The two-implant retained maxillary overdenture with equator attachment and tooth-tissue supported mandibular overdenture provided a successful treatment option for addressing the functional, esthetic, and biological needs of the patient. However, more precise and strict research is needed to provide definite quality assurance to patients and guidelines for daily practice.

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1 Introduction

Implant retained overdenture with resilient attachments is a smart solution to restore functional, esthetic and biological needs. Conventional denture wearers may not only complain of discomfort with mastication and extensive coverage, but also low self-esteem with esthetics and speech^{1,2}. In addition, implant retained maxillary overdenture is better than fixed implant prosthesis when bone quality is questionable as bone quality type D3.

Maxillary implant overdenture is of a major concern regarding the sparse data in literature with planning of such a treatment option^{3,4}. Maxillary implant overdentures have a pivotal role in retention and reduction of the palatal coverage compared to other traditional mucosa supported dentures^{5,6}. However, far too little scientific evidence investigated the exact distribution and number needed to sustain a successful maxillary implant overdenture modality⁷.

A major issue encompasses the foundation of implant maxillary overdenture, is bone quality and quantity remaining, future implant location, function, phonetics, aesthetics and rate of jaw atrophy if present⁸⁻¹⁰. Previous studies¹¹⁻¹² have suggested that the success rate of implant-retained maxillary overdentures may be less than that of mandibular implant-retained overdentures due to several factors; Bone density, The maxilla (upper jaw) has less dense bone compared to the mandible (lower jaw), which can affect the stability of implants and the success of the overdenture, Anatomic factors: The maxilla has a more complex and irregular shape compared to the mandible, which can make it more difficult to achieve adequate implant placement and support for the overdenture, Prosthetic factors: The maxillary overdenture may require more complex prosthetic components and design compared to the mandibular overdenture, which can increase the risk of technical complications and failure, and Maintenance: Maintenance of hygiene and regular follow-up care is also important for the long-term success of both maxillary and mandibular overdentures. However, the maxillary overdenture may be more difficult to clean and maintain due to its location and design, which can increase the risk of peri-implant infections and failure. Overall, while implant-retained overdentures can be an effective treatment option for edentulous patients, several factors may contribute to a lower success rate for maxillary overdentures compared to mandibular overdentures^{11,12}. It has been recorded that, there is a reduced success rate of 71 % along five years follow-up period for maxillary

implant-retained overdenture besides increased prevalence of implant loss compared to other kinds of implant prosthesis^{6,9}.

Regarding mandibular implant overdentures, extensive research work has already been established in literature¹³⁻¹⁵. According to McGill consensus and York consensus et.al 2002 and et.al 2009 respectively, which approves a two-implant retained mandibular overdenture as the "minimum offered to edentulous patients as a first choice of treatment.", also as the "first choice of treatment for the edentulous mandible"¹⁵⁻¹⁷. Despite this fact, in the daily clinical practice many patients may show high satisfaction rate with their conventional mucosa supported complete mandibular denture unlike the recommendations by the York and McGill consensuses. A significant analysis and discussion on the subject of patient satisfaction together with the prosthetic outcomes of mandibular overdentures retained by one or two implants was presented by Walton and MacEnte, where 36% participants with edentulous mandible refused implant modality as a free offer to compensate for their mandibular dentures, mainly as they were already satisfied with their present conventional dentures and feared the surgical procedure and consequent results of implant treatment option¹⁸.

Principally, a specific treatment option can't be the ultimate concept for all members with edentulous mandibles, as reported by the significant results of a mandibular overdenture retained by a single implant in the midline^{19,20}. Similarly, different treatment concepts would be suggested regarding edentulous maxilla. Prior to any maxillary implant retained overdenture modality, patient satisfaction should be firstly evaluated with their maxillary complete denture as no future significant difference would be found in mastication, stability, esthetics or phonetics if they are already satisfied with their conventional denture²¹⁻²³. Nevertheless, studies stated that, there was a significant satisfaction with patients whom had the motivation to shift from conventional maxillary complete denture to implant retained maxillary overdenture^{22,23}.

Clinical reports with two-implant retained maxillary overdenture are sparse but is not absolutely an unappealing idea^{24,25}. Probable future problems as rotational movements and low patient satisfaction have been mentioned as limitations but not meticulously evidenced¹⁰. It should be taken into consideration, economic status and surgical prerequisites for patients with the use of fewer numbers of implants, as a result, maxillary two implant-retained overdenture may be a reliable treatment modality.

2 Case Description

A 65 years old male patient with completely edentulous maxilla and partially edentulous mandible visited the outpatient clinic of the faculty of Dentistry, October University for Modern Sciences and Arts, with the primary complaint of difficulty eating properly. The patient had no medical conditions and was not taking any medications but had a history of smoking. Due to poor oral hygiene, the patient had lost most of his teeth. Additionally, the patient reported that his old temporary denture had excessive palatal coverage and poor retention.

2.1 Clinical Findings

Clinical examination showed multiple edentulous spaces, plaque induced gingivitis and the presence of plaque and calculus accompanied with extensive decay in teeth number #11 #21 #34 #32 #42. There was gingivitis and grade III mobility in teeth number #11 #21 #32 #34 #42 with 3 mm clinical attachment loss measured from cemento-enamel junction to the base of the sulcus, while grade I mobility in teeth #33 #35 #43. Moreover, there was overeruption of #33 #43 as in Figure 1, Figure 2 and Figure 3.



Figure 1. Intraoral frontal view of preoperative clinical display.



Figure 2. Intraoral right lateral view of preoperative clinical display.



Figure 3. Intraoral left lateral view of preoperative clinical display.

2.2 Diagnosis and Assessment

Panoramic radiograph was made to assess the remaining dentition regarding the prognosis of the remaining teeth #11 #21 #35 #34 #33 #32 #42 #43 and screening for the absence of any bony lesions. Moreover, Cone Beam Computed Tomography (CBCT) (i-CAT Vision software; Imaging Sciences International) was taken to observe the patient's bone quantity and quality. After discussion of different treatment options with the patient, four-implant retained maxillary overdenture with equator resilient attachments and mandibular tooth-tissue retained overdenture was the plan of choice. Extraction of non-restorable remaining teeth #34 #32 #42 was performed.

Maxillary and mandibular primary impressions were made using stock tray and alginate impression material (Cavex) to obtain a study cast with diagnostic bite. Supragingival and subgingival scaling, root planning and patient motivation on proper oral hygiene measures were carried out.

2.3 Pre-prosthetic part

Decayed teeth #35 #33 #43 were prepared for root canal treatment using rotary files (Pepsi gold) under complete isolation with rubber dam followed with irrigation with 2.5% sodium hypochlorite using side vented needle. Master cones (Meta) were verified by tug back tactile sensation and periapical X-rays. Obturation using lateral compaction technique was followed by core build up with light cured Nano-filled composite body (3M Filtek Z350) and universal bonding agent (Bisco). Subsequently, preparing abutment teeth in a dome shape preparation 2-3mm above mucosal tissue and divergence of 30 degrees from buccal and 15 degrees from lingual, thus improving crown/root ratio and getting a better prognosis and support mandibular overdenture.

2.4 Surgical part

After evaluation of the old denture regarding stability and teeth position, it was used together with radiopaque markers in order to fabricate a surgical guide for guided implant surgery in Figure 4, after performance of a planning overview of the implants' position in Figure 5.



Figure 4. Surgical guide for guided implant surgery.

PLANNING OVERVIEW

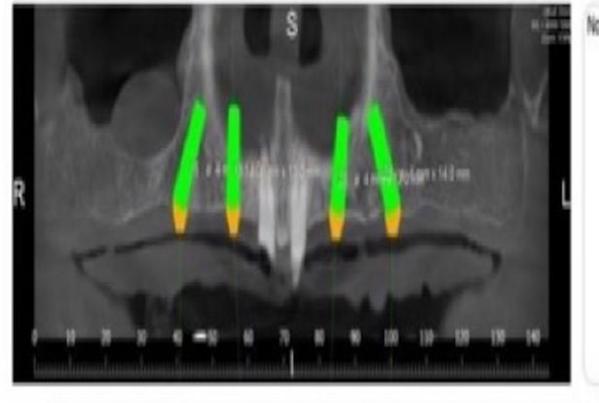


Figure 5. Planning overview of the implants' position.

The surgical guide was tissue supported and fixated by pins. Local anesthesia 4% Articaine with epinephrine 1:100.000 (INIBSA ARTINIBSA 4% 1:100.000) was infiltrated. Dental implants (Nucleoss T6) were placed in the following sites with the mentioned width and lengths, #13 (3.50mm x 13.00 mm), #15 (3.75 mm x 14.00 mm), #23 (3.75mm x 12.00 mm), #25 (4.10mm x 14.00 mm). Implant drilling according to manufacturer's instructions with sequential drilling to prepare the implants sites till the final drill through holes. Dental implants were placed using torque wrench and covering screws were placed over the implants. After the surgery, the patient was instructed to consume soft diet for at least 1 week and use rinse with Chlorohexidine 2% (Hexitol) mouthwash daily for 14 days.

After two months, a CBCT revealed that only two implants #15 #25 were osteo-integrated, while the other two implants #13 #23 failed and removed. Replacement of the failed implants was suggested as a possible corrective treatment plan to the patient; open a flap and removed all the failed implants #13 #23, then debridement and removal of fibrous tissue formed around failed implants, placing bone graft at exact site and allow healing for 4 months. Implant replacement was not pursued because of the failure risk and probable need for grafting. Moreover, the patient preferred to avoid a future maneuver, and wanted to continue with his two-implant retained maxillary overdenture.

Thus, a modified treatment plan was assigned were, a crestal incision was done using blade 15C, the covering screws were removed and a healing collar was inserted on the osteo-integrated implants. After a healing period of two weeks, the healing collar was removed and the equator resilient attachment was administrated over the remaining two implants in Figure 6.



Figure 6. Administration of equator resilient attachment

2.5 Prosthetic part

For fabrication of a new denture, final impressions for the maxillary and mandibular arches were made using medium rubber base impression material (Zhermack SpA). Then bite registration was done using occlusal wax rims and recording vertical dimension and centric relation. In the try-in stage, the denture was evaluated regarding extension, retention, stability, occlusal plane, vertical relation, centric relation, even bearing, speech, teeth color and shape. Final prosthesis was fabricated from heat cured polymethyl methacrylate material (Beginor). Equator resilient attachments were incorporated in the denture using direct pickup technique, where the male parts were screwed over the implants and the female parts were fixed in the fitting surface by polymethyl methacrylate monomer free chair side self-curing material (Acrostone) exactly at the site of the two-implants in Figure 7.



Figure 7. Direct pickup technique.

Equator resilient attachments were incorporated in the denture using direct pickup technique where the metal housing with the nylon caps were snapped over their abutments, then picked up to the fitting surface of the lower denture using self-curing resin while the patient closed in centric relation. After complete setting, the denture was removed and excessive acrylic resin was trimmed and the final denture was delivered to the patient as in intraoral frontal view of postoperative clinical display in Figure 8, intraoral right lateral view of postoperative clinical display in Figure 9, intraoral clinical occlusal view of maxillary denture in Figure 10 and extraoral frontal view of smile display in Figure 11.

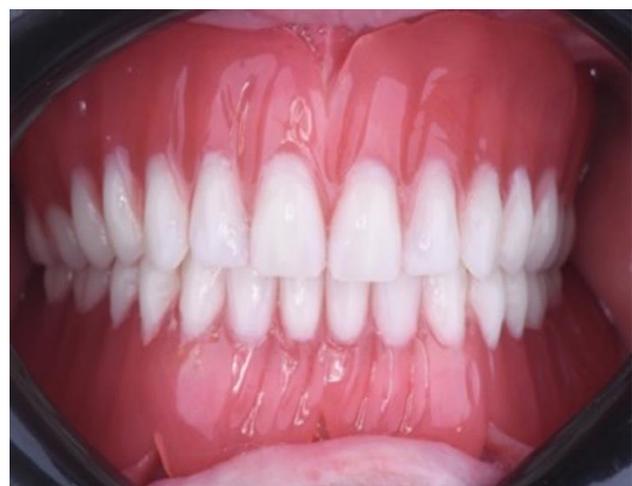


Figure 8. Intraoral frontal view of postoperative clinical display.



Figure 9. Intraoral right lateral view of postoperative clinical display.



Figure 10. Intraoral clinical occlusal view of maxillary denture.



Figure 11. Extraoral frontal view of smile display.

Follow up was performed 4 and 12 weeks after insertion of the overdentures. The patient was satisfied and in his own words, he regains his confidence and regains the ability to smile again.

This clinical report has been described according to the 2013 CARE checklist for case report writing and publishing guidelines²⁶.

3 Results

The results of this clinical report show that the two-implant retained maxillary overdenture and tooth-tissue supported mandibular overdenture provided a successful treatment option for addressing the functional, esthetic, and biological needs of the patient.

The equator resilient attachments used in the maxillary overdenture provided adequate retention and stability, while the mandibular overdenture provided additional support and stability through tooth-tissue interface. The prostheses were fabricated using high-impact acrylic resin and adjusted for optimal fit and function.

The treatment allowed the patient to achieve improved function, aesthetics, and overall satisfaction. The patient reported improved comfort, speech, and chewing ability, along with increased confidence and satisfaction with the appearance of their dentures.

The patient was followed up for one year, and during this time, no implant failures or complications were identified. The success of the treatment is attributed to the thorough treatment planning process and the use of prosthetically driven guided implants.

Overall, the results suggest that the two-implant retained maxillary overdenture and tooth-tissue retained mandibular overdenture can provide a viable treatment option for patients with poor retention and discomfort from conventional complete dentures. This conservative approach can allow patients to avoid more invasive surgical procedures while achieving improved prosthetic outcomes. However, additional research is needed to provide more precise and strict quality assurance to patients and guidelines for daily practice.

4 Discussion

The presented clinical report describes the treatment of a 65-year-old male patient with maxillary edentulous arch and mandibular partially edentulous arch, who complained of inability to eat properly. The patient had multiple edentulous spaces, decayed teeth, and poor oral hygiene, leading to mobility and attachment loss in some teeth.

The treatment plan involved extraction of non-restorable

teeth, root canal treatment of decayed teeth, placement of four dental implants in the maxilla, and fabrication of an implant-retained maxillary overdenture and a tooth-tissue supported mandibular overdenture. However, only two implants were osseointegrated, and implant replacement was not pursued due to the patient's preference. A modified treatment plan was assigned, and a new denture was fabricated with equator resilient attachments incorporated in the denture to provide stability and retention.

Implant selection is an important factor in the success of implant-retained overdentures. The dental implants (Nucleoss T6) used in this case have been shown to have high success rates and good osseointegration in previous studies. (Nucleoss T6) dental implants are made of titanium alloy and have a sand-blasted, large-grit, acid-etched surface, which has been shown to promote osseointegration²⁷.

Implant placement is also crucial for the success of implant-retained overdentures. The use of a surgical guide and radiopaque markers in this case was useful in achieving accurate implant placement and avoiding complications. A surgical guide is a tool that helps to transfer the implant position planned in the diagnostic wax-up to the patient's mouth during surgery. Radiopaque markers are used to help locate the position of the implant in relation to the surrounding structures on the radiograph. The use of a surgical guide and radiopaque markers can help to ensure accurate implant placement and reduce the risk of complications²⁸.

However, two of the implants in this case failed to osseointegrate. The reasons for implant failure could be attributed to various factors such as inadequate bone quality, insufficient primary stability, and poor surgical technique. Inadequate bone quality can lead to poor osseointegration, and insufficient primary stability can lead to implant micromovement, which can interfere with osseointegration. Poor surgical technique, such as overheating the bone during implant placement or not achieving adequate bone-to-implant contact, can also lead to implant failure. In such cases, implant replacement is often considered to salvage the treatment, but it was not pursued in this case due to the patient's preference. Instead, a modified treatment plan was assigned, and a new denture was fabricated with equator resilient attachments incorporated in the denture to provide stability and retention.

In summary, implant selection, implant placement,

and prosthesis design are important factors in the success of implant-retained overdentures. The use of a surgical guide and radiopaque markers can help to ensure accurate implant placement and reduce the risk of complications. The reasons for implant failure can be multifactorial, and careful evaluation and management are necessary to salvage the treatment.

The use of equator resilient attachments in the denture design provided the patient with improved stability, retention, and comfort compared to conventional dentures^{29,30}. Moreover, the use of direct pickup technique for incorporating the attachments in the denture allowed for easy chairside fabrication and reduced laboratory costs³¹.

The patient's satisfaction with the treatment outcome is an important factor in the success of the treatment. In this case, the patient reported regaining his ability to eat properly and smile confidently, which is consistent with previous studies that have reported improved quality of life and patient satisfaction with implant-retained overdentures^{32,33}.

5 Summary and Conclusion

Two-implant retained maxillary overdenture with equator attachment allowed the patient to achieve his functional, biological and aesthetic needs. Furthermore, precise and strict research work should be done in order to provide definite quality assurance to the patients and guidelines to the daily practice. Even with the lack of evidence about implant retained maxillary overdenture, two implants retained maxillary overdenture treatment modality can be acknowledged in properly chosen patients. It should be taken into consideration, economic status and surgical prerequisites for patients with the use of fewer number of implants, thus, maxillary two implant retained overdenture may be a reliable treatment modality.

In conclusion, this clinical report highlights the importance of careful patient evaluation, proper treatment planning, and meticulous surgical and prosthetic procedures in the success of implant-retained overdentures. The use of equator resilient attachments and direct pickup technique can provide improved stability and retention while reducing laboratory costs. Further studies are needed to evaluate the long-term success and complications of such treatment modalities.

Patient Perspective

All demands regarding esthetics, function and biology were restored and the patient is satisfied with the final result.

Author's contribution:

Dina Elawady managed the conceptualization, Methodology, Writing – Original draft, Resources.

Maya Ali Adam managed the application of the materials and wrote the manuscript.

Wafaa Ibrahim Ibrahim managed the writing – reviewing, editing and supervision.

Mohammed Hamdy managed the writing – reviewing, editing and supervision

Informed Consent

The patient accepted and signed a written informed consent to allow this case report and associated photographs to be published.

Conflict of interest:

The authors have declared no conflict of interest.

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