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REHABILITATION OF THE MAXILLARY ARCH WITH CAST METAL DENTURE AND MANDIBULAR MISSING TEETH WITH FIXED PARTIAL DENTURE: A CASE REPORT

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ABSTRACT

Background: Rehabilitation of partially edentulous patients requires a carefully planned approach to restore function, esthetics, and comfort. Conventional acrylic denture bases have certain limitations, including dimensional instability and reduced strength, which may affect long-term outcomes. Cast metal denture bases and fixed partial dentures offer improved biomechanical properties and functional efficiency in selected cases.**Case-Presentation:** A 54-year-old female patient presented with difficulty in mastication due to missing teeth in both arches. Clinical examination revealed a completely edentulous maxillary arch and a partially edentulous mandibular arch. The treatment plan included fabrication of a maxillary complete denture with a cast metal base and restoration of the mandibular arch with a fixed partial denture. Diagnostic impressions, facebow transfer, and mounting on a semi-adjustable articulator were performed. Broadrick's occlusal plane analysis was used to establish and correct the occlusal plane. The maxillary metal denture base was fabricated using conventional casting techniques, while the mandibular abutments were prepared for fixed prosthesis. Both prostheses were fabricated, evaluated, and delivered with appropriate occlusal adjustments. **Conclusion:** The combined use of a maxillary cast metal denture and a mandibular fixed partial denture, along with occlusal plane correction using Broadrick analysis, provides a predictable and effective treatment option. This approach enhances prosthesis performance, patient comfort, and long-term prognosis in partially edentulous cases.

INTRODUCTION

Rehabilitation of partially edentulous patients often requires a carefully planned and individualized approach to restore function, esthetics, and overall patient comfort. The selection of an appropriate prosthesis depends on multiple factors, such as the number and location of missing teeth, the condition of the remaining dentition, ridge anatomy, available interarch space, and the patient's functional and esthetic expectations. In many cases, combining different prosthodontic treatment modalities can provide a more predictable and satisfactory outcome[1].

Traditionally, denture bases have been fabricated using polymethyl methacrylate (PMMA) due to its ease of handling, acceptable esthetics, and affordability[2,3]. Despite its widespread use, PMMA has certain limitations that may affect long-term success. Issues such as polymerization shrinkage, reduced thermal conductivity, dimensional changes over time, and a tendency to fracture can compromise the fit and durability of the prosthesis[1,4]. In the maxillary arch, particularly in cases with extensive edentulous areas or compromised ridge support, these drawbacks may result in decreased retention, instability, and patient dissatisfaction[5].

To address these concerns, cast metal denture bases commonly made from cobalt–chromium alloys have been recommended in selected cases. These materials are known for their excellent strength, rigidity, and resistance to deformation, allowing the fabrication of thinner yet durable prostheses[1,3]. An added advantage is their superior thermal conductivity, which enables patients to better perceive temperature changes, contributing to a more natural oral sensation and improved control during mastication[2]. Moreover, metal bases are dimensionally stable and provide a more accurate and long-lasting fit compared to conventional acrylic dentures[4]. Their smooth, polished surface also tends to accumulate less plaque, which can be beneficial for maintaining oral hygiene and reducing the risk of mucosal inflammation[6,7].

On the other hand, when suitable abutment teeth are available in the mandibular arch, fixed partial dentures (FPDs) are often preferred for replacing missing teeth. FPDs offer improved chewing efficiency, enhanced esthetics, and greater patient acceptance, as they closely resemble natural teeth and do not require removal[2,3]. They also allow for effective distribution of occlusal forces through the abutment teeth, contributing to better functional stability and preservation of the remaining dentition[7].

Using a cast metal denture in the maxillary arch along with a mandibular fixed partial denture can be a well-balanced and effective treatment strategy in selected cases. This combination takes advantage of the strengths of both removable and fixed prostheses, helping to achieve optimal support, stability, and occlusal harmony. Careful planning and precise execution are essential to ensure long-term success and patient satisfaction[8].

This case report presents the rehabilitation of the maxillary arch using a cast metal denture base, along with the replacement of missing mandibular teeth using a fixed partial denture. It highlights the clinical considerations, advantages, and overall outcomes of this combined approach in improving function and patient comfort.

Maxillary occlusal view

mandibular occlusal view

Materials and methods

Case presentation

A 54-year-old female patient reported to the department of Prosthodontics with the chief complaint of difficulty in

chewing due to missing teeth in both the upper and lower arches for the past 8 months.

Clinical Examination and Diagnosis

Extraoral examination revealed a bilaterally symmetrical face with no noticeable abnormalities. Intraoral examination showed a completely edentulous maxillary arch, while the mandibular arch was partially edentulous with missing teeth in relation to 31, 41, and 35.

Treatment plan

Based on these findings, a treatment plan was formulated to restore the maxillary arch with a cast metal base complete denture and rehabilitate the mandibular arch with a fixed partial denture with 33,32,31,41,42,43,44,45,46.

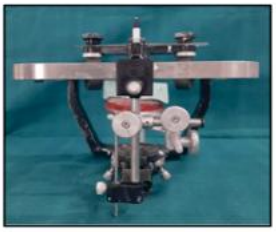
Diagnostic Phase and Occlusal Plane Correction

Preliminary impressions of both arches were made using irreversible hydrocolloid to obtain diagnostic casts. A facebow transfer was carried out to record the spatial orientation of the maxilla, and the casts were mounted on a semi-adjustable articulator (Hanau Wide-Vue articulator).

Diagnostic impression of maxillary arch

Diagnostic impression of mandibular arch

Facebow transfer



Facebow transfer to Hanau wide veu articulator

Broadrick's occlusal plane analyzer was then used to evaluate the existing occlusal plane. The curve of Spee was assessed, and an appropriate radius was selected to establish an ideal occlusal plane. This step helped identify any discrepancies and allowed correction of the occlusal plane. The finalized plane served as a guide for subsequent tooth preparation and prosthetic procedures, ensuring proper occlusal harmony and functional efficiency.

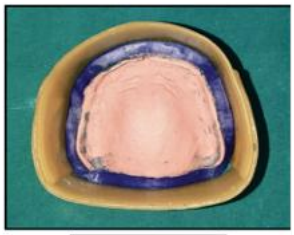
Diagnostic mounting frontal view

Broadrick's occlusal plane analysis

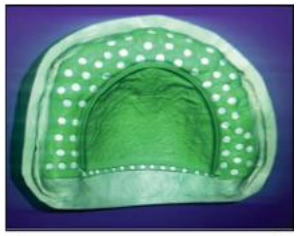
Maxillary Arch Procedure (Metal Denture Base)

Primary casts were used to fabricate custom trays. Border molding was performed, followed by final impressions to accurately record the denture-bearing tissues. Master casts were then obtained, and the design of the metal denture base was planned with consideration for support, stability, and comfort.

The metal framework was fabricated using conventional casting techniques and tried intraorally to assess its fit and adaptation. Jaw relation records were made, and the casts were mounted using the facebow record. Arrangement of artificial teeth was carried out in accordance with the corrected occlusal plane. A trial denture insertion was performed to evaluate esthetics, phonetics, and occlusion, followed by necessary adjustments before final processing.



Final impression



Metal denture base designing

Mandibular Arch Procedure (Fixed Partial Denture)

Abutment teeth (32, 33, 42, 43, 34, and 36) were prepared following standard principles, with guidance from the established occlusal plane. Gingival retraction was performed, and final impressions were made using elastomeric impression material.

Tooth preparation with 32,33,42,43,34,36

Final impression with lower arch

Working casts were fabricated from the impressions, and wax patterns were prepared. The metal framework was cast and tried intraorally to verify marginal integrity and fit. Also, denture try in done simultaneously.

Metal try in with lower arch

Try in upper denture and lower metal try in

Occlusion and Prosthesis Delivery

Both prostheses were assessed on the articulator to ensure proper occlusal relationships in harmony with the established Broadrick plane. Trial insertion was carried out to evaluate function, esthetics, and occlusion. Minor adjustments were made to achieve balanced occlusion.

Metal denture base complete denture with upper arch

Final prosthesis with lower arch

Left occlusal view

Right occlusal view

The final prostheses a maxillary cast metal base complete denture and a mandibular fixed partial denture were delivered to the patient. Post-insertion instructions regarding maintenance and oral hygiene were provided.

Follow-up

The patient was recalled for periodic evaluation to monitor adaptation, comfort, and function. Necessary adjustments were made during follow-up visits, and the patient reported significant improvement in mastication and overall satisfaction.

Extraoral smile view

DISCUSSION

Rehabilitation of partially edentulous patients demands a carefully planned approach that restores function, esthetics, and comfort while ensuring long-term oral health. In the present case, a combination of a maxillary cast metal base complete denture and a mandibular fixed partial denture (FPD) was chosen to achieve favorable biomechanical and functional outcomes.

Although acrylic denture base resins are widely used, they present certain limitations such as polymerization shrinkage, dimensional instability, and lower mechanical strength, which can negatively affect the fit and durability of the prosthesis. Dimensional changes during processing and intraoral use may compromise tissue adaptation and retention[9]. In addition, the relatively low impact strength of PMMA increases the risk of fracture under functional loads, particularly in patients with high occlusal forces[10].

In comparison, cobalt–chromium metal denture bases offer superior mechanical properties, including greater rigidity, strength, and resistance to deformation[11]. These characteristics allow the fabrication of thinner yet durable prostheses, making them especially useful in cases with limited interarch space. Their rigidity minimizes flexure during function, thereby improving stability and overall prosthesis performance. Studies have also shown that cobalt–chromium frameworks enhance fracture resistance and increase the longevity of prostheses subjected to masticatory forces[10].

Another advantage of metal denture bases is their excellent dimensional stability. Unlike acrylic resins, they do not undergo polymerization shrinkage or significant water absorption, which helps maintain an accurate fit over time[9]. Their higher thermal conductivity enables better transmission of temperature changes, improving sensory feedback and contributing to more efficient neuromuscular control during mastication.

From a biological standpoint, cobalt–chromium alloys demonstrate good biocompatibility and resistance to corrosion, making them suitable for long-term intraoral use [10,16]. The smooth, polished surface of metal bases is less porous than acrylic, reducing plaque accumulation and microbial adhesion. This helps in maintaining better oral hygiene and decreasing the risk of denture-related mucosal lesions.

For the mandibular arch, a fixed partial denture was selected due to the availability of suitable abutment teeth. FPDs provide improved masticatory efficiency, superior esthetics, and better patient acceptance compared to removable prostheses. The rigid connection between abutments allows effective distribution of occlusal forces, thereby enhancing stability and preserving the remaining dentition.

An important aspect of this case was the correction of the occlusal plane using Broadrick's occlusal plane analyzer. Establishing a proper curve of Spee is essential for achieving harmonious occlusion and efficient mandibular movements. An improperly oriented occlusal plane can lead to occlusal interferences, uneven force distribution, and reduced longevity of the prosthesis[11]. The use of Broadrick analysis facilitated accurate determination of the occlusal curvature, guiding both mandibular tooth preparation and maxillary tooth arrangement, thereby improving occlusal harmony and functional efficiency[13].

The biomechanical advantages of cobalt–chromium frameworks are further supported by studies demonstrating improved stress distribution and reduced deformation under occlusal loads, which contribute to enhanced prosthesis longevity[12]. Additionally, advancements in fabrication techniques, such as CAD/CAM and selective laser melting, have improved the accuracy, fit, and retention of metal frameworks, thereby increasing their clinical reliability[13].

The combined use of a maxillary cast metal denture and a mandibular FPD represents a well-balanced treatment strategy that integrates the benefits of both removable and fixed prosthodontics. While the metal denture base offers strength, stability, and improved hygiene, the FPD provides a fixed, natural-feeling restoration with enhanced function. This approach is particularly beneficial in cases involving a completely edentulous maxilla and a partially edentulous mandible, where achieving proper occlusal balance is critical[14,16].

However, certain limitations must be considered. Metal denture bases involve higher cost, technique sensitivity, and complex laboratory procedures. Similarly, FPDs require careful planning, adequate abutment support, and precise execution to avoid complications such as overloading or marginal discrepancies.

Overall, this case highlights that the use of a cast metal denture base in the maxillary arch, combined with a mandibular fixed partial denture and proper occlusal plane correction, can significantly improve prosthesis performance, patient comfort, and long-term prognosis. It also emphasizes the importance of individualized treatment planning and the application of sound biomechanical principles in achieving successful prosthodontic rehabilitation.

CONCLUSION

The combined use of a maxillary cast metal denture and a mandibular fixed partial denture, along with occlusal plane correction using Broadrick analysis, provides a predictable and effective treatment option. This approach enhances prosthesis performance, patient comfort, and long-term prognosis in partially edentulous cases.

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