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(CASE REPORT)

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Occlusal Rehabilitation of a Partially Edentulous Mandible with a Complete Maxillary Edentulism: Clinical and Functional Insights

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Abstract

Occlusion remains a cornerstone in the planning and execution of restorative and prosthetic dental treatments. In cases of complete and partial edentulism, establishing a functional, comfortable, and stable occlusion requires detailed analysis of the patient's neuromuscular coordination, condylar position, and vertical dimension. This case report presents the occlusion-guided rehabilitation of a patient with a completely edentulous maxilla and a partially edentulous mandible retaining only three premolars. Treatment was completed at Giorgi Martiashvili Dental Clinic, emphasizing a gnathological and prosthodontic approach rooted in centric relation, balanced articulation, and restoration of vertical dimension. Pre- and post-treatment images document the esthetic and functional transformation.

Keywords: Occlusion; Centric Relation; Vertical Dimension; Bilateral Balanced Occlusion; Complete Denture; Removable Partial Denture; Gnathology; Edentulism; Prosthodontic Rehabilitation; Articulator

1. Introduction

In dental science, occlusion refers to the static and dynamic contact relationships between the teeth of the maxilla and mandible. It encompasses how teeth come into contact during rest, speech, mastication, and other mandibular movements [2]. A well-balanced occlusion ensures the integrity of the temporomandibular joints (TMJs), the proper functioning of the masticatory muscles, and the stability of dental and prosthetic restorations [1,2].

From a gnathological perspective, occlusion is studied as a dynamic system involving the functional biomechanics of the masticatory apparatus. This includes joint position, muscle coordination, and neuromuscular feedback [1]. Gnathology aims to establish harmony between the centric relation of the condyles and the occlusal contacts of the teeth. It emphasizes repeatable mandibular positioning and the use of articulators to simulate jaw function during treatment planning [1].

In prosthodontics (orthopedic dentistry), occlusion plays a decisive role in the design of both removable and fixed prostheses [3]. It dictates tooth arrangement, occlusal morphology, and prosthetic support. An accurately planned occlusion distributes masticatory forces evenly, prevents overloading of abutments or implants, and increases the long-term success rate of restorations.

In therapeutic and restorative dentistry, occlusal analysis helps in diagnosing issues like malocclusion, temporomandibular disorders (TMD), and parafunctions such as bruxism. Occlusal harmony is critical in procedures involving fillings, crowns, bridges, and orthodontic interventions, as disharmony may lead to muscle hyperactivity, joint pathology, and restoration failure [2].

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Thus, occlusion is a unifying factor across dental disciplines, directly influencing diagnostics, treatment planning, and clinical outcomes [1,2,3].

2. Case Description

- Patient Overview
- A middle-aged female patient presented to Giorgi Martiashvili Dental Clinic with complaints of:
- Difficulty in chewing
- Impaired speech articulation
- Poor denture retention
- Esthetic dissatisfaction

Clinical and radiographic examinations revealed:

- Completely edentulous maxilla
- Partially edentulous mandible with only two premolars on the right and one premolar on the left side
- (Figure 1) documents the patient's initial intraoral condition, showing the asymmetrical mandibular support, collapsed vertical dimension, and lack of interarch coordination.

Figure 1 Pre-treatment intraoral view: Fully edentulous maxilla and partially edentulous mandible with three remaining premolars. Evident loss of vertical dimension and functional instability

2.1. Functional Concerns

The asymmetry in posterior support compromised the occlusal stability and vertical dimension, leading to:

- Imbalanced mandibular movements
- Overloading of remaining teeth
- Potential risk for TMD
- Loss of facial support and altered phonetics

These findings necessitated a treatment plan rooted in gnathological and prosthodontic principles, emphasizing the reestablishment of centric relation (CR), restoration of vertical dimension of occlusion (VDO), and bilateral balanced articulation.

3. Diagnostic Workflow

The diagnostic phase included:

- Intraoral and Extraoral Photography
- Digital Panoramic Radiography

- Primary Impressions using irreversible hydrocolloid
- Custom Tray Fabrication for border molding and secondary impressions
- Facebow Transfer to relate the maxillary arch to the cranial base
- Centric Relation Registration using bimanual manipulation and leaf gauge deprogramming
- Mounting of Casts in a semi-adjustable articulator (Artex/Candulor system)
- Articulator Programming using protrusive and lateral bite registrations
- Centric Relation Registration

CR was recorded using Dawson's bimanual technique [1]. To eliminate proprioceptive influence from habitual closure patterns, a leaf gauge was inserted between anterior teeth to disclude the posterior teeth. After muscular deprogramming, the mandible was gently guided into CR and the record was captured using rigid bite registration material.

This allowed precise articulation of both casts and eliminated discrepancies between centric occlusion (CO) and CR.

4. Treatment Plan

- The treatment goals were to:
- Restore lost vertical dimension and occlusal stability
- Rehabilitate esthetics and facial harmony
- Provide bilateral balanced occlusion
- Ensure prosthetic function with minimal strain on the TMJ and musculature
- Preserve and protect remaining mandibular teeth
- Maxillary Rehabilitation

A complete removable denture was fabricated for the maxilla. Key procedures included:

- Wax rim adjustment for VDO
- Midline and smile line markings
- Phonetic assessment using "F" and "S" sounds
- Trial tooth arrangement in bilateral balanced occlusion
- Final processing with heat-polymerized acrylic
- Mandibular Rehabilitation

Due to limited abutments, a removable partial denture (RPD) was selected for the mandible. Considerations included:

- Design of metal framework with appropriate clasps
- Placement of rests and minor connectors to optimize support and retention
- Balanced occlusion to avoid dislodgement during mastication
- Use of surveyed crowns where necessary to guide insertion and improve retention
- The occlusion was adjusted intraorally and in the articulator to achieve harmonious centric and eccentric contacts.

5. Occlusal Scheme

A bilateral balanced occlusion (BBO) scheme was implemented. This was critical due to the lack of posterior occlusal stability and the use of complete dentures. The BBO provides:

- Simultaneous contacts on both sides during lateral excursions
- Reduced tipping forces on the denture bases
- Improved comfort and masticatory efficiency

The posterior teeth were arranged in a compensating curve (Spee and Wilson) to facilitate occlusal contact during excursions. The anterior guidance was minimized to avoid dislodgement of the maxillary denture.

6. Clinical Outcome

The prostheses were delivered, and adjustments were made to:

- Occlusal contacts in CR and functional movements
- Pressure points and flange extensions
- Phonetics and esthetics

The final result (Figure 2) demonstrates:

- Restoration of facial harmony and lip support
- Stable occlusion with simultaneous bilateral contacts
- Balanced articulation and restored chewing function

Figure 2 Post-treatment intraoral view: Maxillary complete denture and mandibular partial denture in bilateral balanced occlusion, with restored esthetics and function

Patient follow-up at 1 week and 1 month confirmed high satisfaction with speech, esthetics, and mastication.

7. Discussion

This case demonstrates the indispensable role of occlusion in complex rehabilitations. Failure to address occlusal discrepancies may result in:

- Condylar displacement
- Muscular hyperactivity
- Prosthesis dislodgement
- Excessive wear of abutment teeth
- By adhering to gnathological protocols, clinicians can ensure:
- Condylar stability (CR = CO)
- Neuromuscular harmony
- Long-term success of prosthetic work
- The use of articulators, CR records, and balanced occlusal schemes form the backbone of occlusion-driven therapy in partially and fully edentulous patients.

8. Conclusion

Occlusion is more than a contact relationship; it is a biomechanical and neuromuscular interaction central to oral function and prosthetic longevity. This case highlights the value of a gnathologically guided approach in managing partial and complete edentulism. Accurate centric relation registration, restoration of vertical dimension, and use of balanced occlusion collectively contributed to a successful and predictable rehabilitation.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of ethical approval

This case study involved a human subject. The patient provided informed consent for treatment and publication of clinical data. No personal identifiers or facial images are included in this article to ensure patient confidentiality. The study was conducted in accordance with ethical standards.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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