

Current Concepts and Trends in Full Mouth Rehabilitation: A Prosthodontic Outlook

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Received: 02-01-2026 Revised: 26-02-2026 Accepted: 15-03-2026 Date of Publication: 30-03-2026

Abstract

Restoring proper bite function in patients with severely worn dentures is a complex clinical challenge, as every case presents its own unique considerations. Rehabilitating such compromised dentition is a highly technique-sensitive process, with varying opinions on selecting the most appropriate occlusal scheme for successful oral rehabilitation. A thorough understanding of the etiology, careful investigation, and a well-planned sequence of treatment procedures are essential for accurate diagnosis and effective management. This article provides an overview of the various occlusal concepts and philosophies used in full-mouth rehabilitation, aiming to guide practitioners in understanding treatment phases and choosing the most suitable occlusal approach for each individual case.

Keywords: Full Mouth Rehabilitation, Occlusal Concepts, Philosophies, Treatment Planning

INTRODUCTION

The objective of dentistry is to prolong the functional life of the dentition, much like medicine aims to extend the lifespan of an individual. The term "rehabilitate" refers to restoring something to a good condition or returning it to its original state or function¹. Full Mouth Rehabilitation (FMR) represents a demanding area of restorative dentistry, requiring detailed and sequential treatment planning. It involves extensive restorative procedures, often including correction of the occlusal plane, to establish proper functional harmony with the facial structures². Patients are frequently unaware of the progression of dental deterioration because it occurs gradually over time, and they typically notice it only after significant loss of tooth structure has occurred. During rehabilitation, several important factors must be considered, including vertical dimension of occlusion, centric relation, occlusal patterns, esthetics, and phonetics. The complexity of treatment may increase due to additional conditions such as existing restorations, pulp exposure, missing teeth, dental sensitivity, supra-erupted teeth, and temporomandibular joint (TMJ) pain.³

ETIOLOGY

Loss of functional harmony can result from several factors, including the absence of multiple teeth due to dental caries or trauma. It may also arise from fractured or chipped teeth, as well as abrasion caused by prolonged acid exposure. Other contributing conditions include temporomandibular joint (TMJ) disorders, fluorosis, periodontal disease, and malocclusion. Additionally, developmental anomalies such as amelogenesis imperfecta, dentinogenesis imperfecta, and enamel hypoplasia can play a role. Congenital conditions like hypodontia, anodontia, and macrodontia may also lead to disruption of functional harmony.⁴

OBJECTIVES

The goals of full mouth rehabilitation are to achieve and preserve the health of the periodontal tissues, the temporomandibular joint and related structures.

The procedure is indicated to:

- * Restore compromised occlusal function,
- * Extend the lifespan of the remaining teeth,
- * Maintain a healthy periodontium and enhance esthetics,

CLASSIFICATION

Classification by Turner And Missirlain (1984)⁶

The patients were classified into three categories:

Category	Definition	Characters	Treatments
Category 1 Excessive wear with loss of vertical dimension	A typical patient in category 1 is missing a few posterior teeth has an unstable posterior occlusion, exhibits excessive wear of anterior teeth	-loss of VDO -the closest space is more than 1 mm - The interocclusal space is more than 4 mm and has some loss of facial contour that includes dropping of corners of mouth	-removable splint or partial denture is placed and observed periodically for 6 to 8 weeks -Fixed temporary restorations are placed for a period of 2-3 months before planning a permanent restoration.
Category 2 Excessive wear without loss of VDO but with space available	Patients in this category has long history of gradual wear caused by bruxism, moderate oral habits or environmental habits	-The VDO is maintained by continuous eruption - Preparation of tooth to determine retention and strength can be critical due to Shorter crown length	- Gingivoplasty can be necessary to obtain crown length. - Enameloplasty of opposing posterior teeth might provide some space for restorative material
Category 3 Excessive wear without loss of VDO but with limited space available	There is excessive wear of anterior teeth which has occurred over a long period and there is minimal wear of posterior teeth	-Centric relation and centric occlusion are coincidental with closest speaking space of 1 mm and interocclusal distance of 2 to 3 mm	In such cases vertical space must be obtained for restorative materials. This can be accomplished by -orthodontic treatment -restorative repositioning -surgical repositioning of the segments ⁶

Classification By Brecker (1966)⁷

Group I

Class I

Patients who have lost the vertical dimension of occlusion because of shifting of existing teeth caused by failure to replace missing teeth

Class II

Patients who have lost the vertical dimension of the occlusion due to the loss of all posterior teeth with one or both jaws with the remaining teeth in inadequate occlusal relationship.

Class III

Patients whose vertical dimension collapses as a result of excessive wear and tear of occlusal surfaces

Group II

Class I

Patients whose natural teeth is complete or sufficient, exhibits satisfying occlusal relationship

Class II

Patients with limited teeth present but in a satisfactorily occlusal relationship requiring help in the form of occlusal rims.

Group III

Patients requiring maxillofacial surgery of orthodontic treatment as an aid in restoring the last vertical dimension.

Group IV

Patients in whom sectional treatment is required over extended period of time because of status of health of patient, age or economic factor.

MATERIALS AND METHODS

A PubMed, science direct, Google scholar, NCBI and Google search was done using the terms, classification of occlusal concepts /philosophies and treatment planning and overview of full mouth rehabilitation.

The step wise sequential procedure in the treatment planning

Patient’s medical and dental history

*Medical History: This section provides details about the patient’s overall health, including any existing medical conditions, medications being taken, known allergies, past surgeries, hospital stays, and systemic illnesses.⁹

*Dental History: This section outlines the patient’s previous dental care, oral hygiene practices, and history of tooth decay, gum problems, and associated dental injuries, past restorations, and any current oral health issues.

CONCEPTS⁸

S. no	Occlusal concept /philosophy	Salient features	Limitation
1.	Gnathological concept (McCollum, Stuart, Stallard)	-Mutually protected occlusion. -Point centric concept. -Maximum intercuspation coincides with centric relation (RUM position). -Cusp to fossa relationship with tripodism. -Narrow occlusal table.	-Point centric and cusp-to-fossa tripodization complicate the need to obtain precise gnathologic restorations -Need for a fully adjustable articulator - Cast metal transitional restorations had some limitations relating cost and its inability to increase the occlusal vertical dimension, and some changes in mandibular position that might not be equilibrated easily to a new maximum intercuspation relation
2.	Freedom in centric Concept (Schuyler)	-Balancing the contacts are deleterious should be avoided in natural dentition - Incisal guidance is a foremost factor for selection of posterior guiding tooth inclines than condylar guidance so it must be the initial step of occlusal rehabilitation -Antero-posterior freedom of movement must be incorporated in the restoration	-According to gnathologists, the task of adjusting maximum intercuspation contacts in two variable positions on an articulator to achieve freedom in centric might lead to inadequacy of precision in both positions - Cusp-to-surface rather than cusp-to-fossa relation affects chewing efficiency
3.	Simplified occlusal design concept (Wiskott and Belser)	- Cusp-fossa relation with only one occlusal contact for each tooth. - Anterior disclusion during all eccentric movements - Freedom in centric occlusion. - might be modified to most anterior guidances and different degrees of group function.	-Freedom in centric occlusion
4.	Pankey, Mann and Schuyler philosophy (1960)	-Maxillary cuspids in good functional contact. -Group function on working side. -Absence of nonworking side contacts. -Freedom of movement in centric occlusion is essential. -Long centric is incorporated in the lingual surfaces of maxillary incisors.	-Cusp to fossae marginal ridge contact - The use of wax functionally generated path techniques might cause flaws -The PM philosophy was advanced and its use endorsed on a non-arcon articulator, which might not accept interocclusal records made at increased occlusal vertical dimension
5.	Twin Table technique - Hobo (1991)	-Incisal guidance and condylar path are dependent factors. -Posterior teeth are restored using two customized incisal tables: without disclusion; and with disclusion.	-Cusp angle was formulated parallel to measured condylar path, and the cusp angle became too steep. - To obtain a standard amount of disclusion with such a steep cusp angle, the incisal path must be set at an angle that was exceedingly steep. This made the patient not comfortable -The customized guide tables were fabricated by the use of resin molding. It was technique sensitive
6.	Twin Stage Procedure Hobo and Takayama	-Since cusp angle is the main determinant of occlusion, the measurement of the condylar path is not necessary. -The procedure is indicated for single crowns, fixed prosthodontics and implants, complete-mouth reconstructions, and also complete dentures. - Suitable for transmandibular disorder patients. -It can also be incorporated with commonly used clinical techniques such as facebow transfer, various centric recording	-Contraindicated for malocclusion cases

		methods, and cusp-fossa waxing.	
7.	Youdelis Scheme	-Cuspal anatomy is so arranged if canine. disclusion is lost through wear or tooth movement, posterior teeth drop into group function.	-Used in advanced periodontitis cases
8.	Nyman and Lindhe Scheme	-When there are long tooth-borne cantilevered restorations, balanced occlusion must be achieved. -When distal support is present, anterior disclusion is provided.	-For extremely advanced periodontitis cases -Type of contacts not specified ⁸

Clinical Dental Examination

* Extraoral Examination: This involves examining the head, neck, and jaw joints to identify any abnormalities, swelling, or asymmetry.¹⁰

* Intraoral Examination: This includes assessing the inside of the mouth, such as the teeth, gums, soft tissues, and bite (occlusion), to detect issues like tooth decay, gum disease, misalignment, and other oral health problems.

*Diagnostic Tests: Evaluation of tooth loss is carried out through both clinical and radiographic methods. Clinical assessment includes photographs, analysis of occlusion using interocclusal records, facial vertical measurements, and diagnostic jaw relations. Radiographic evaluation involves performing all necessary imaging investigations¹¹.

*Investigations: Radiographic examinations are used to obtain detailed images of the entire oral cavity. These include periapical radiographs of individual teeth, bitewing views, panoramic radiographs, and occlusal X-rays. They help evaluate the teeth, roots, and surrounding bone structures that cannot be seen during a routine clinical examination.¹²

Diagnostic casts fixed to an articulator

*Diagnostic Casts: These are physical replicas of a patient's teeth made using dental impressions.

*Articulator: Mounting these casts on an articulator enables dentists to evaluate and design restorative or prosthodontic treatments with greater precision, particularly in complex cases involving multiple teeth or issues with jaw alignment.^{13,14,15}

Diagnostic Wax-Up

A diagnostic wax-up is a technique in which a wax model of the patient's teeth is fabricated to simulate the planned size, shape, and alignment¹⁶. It acts as a visual reference for both the dentist and the patient, aiding in the evaluation and approval of the anticipated results of full mouth rehabilitation before treatment begins. This model can be modified as needed to fine-tune the treatment plan prior to carrying out the actual procedures.¹⁷

Types of Treatment Plan

Treatment approaches can be broadly classified into two categories: those that alter the occlusal scheme

(occlusal therapy) and those that do not affect it (collateral therapy).^{9,10,18}

Occlusal Treatment

- * Temporary occlusal therapy, such as occlusal splints
- * Definitive occlusal therapy, including orthodontic procedures, selective grinding, and prosthodontic treatments
- * Occlusal and joint-related surgical interventions.

Collateral Treatment

- * Biofeedback techniques
- * Relaxation methods
- * Physical exercises
- * Physiotherapy
- * Electrogalvanic stimulation
- * Pharmacological management.

*Stages of Treatment Plan

The first stage involves temporary occlusal therapy along with collateral treatments, typically lasting from a few weeks to 5–6 months or longer.

The second stage includes definitive occlusal therapy combined with collateral measures, with duration depending on the complexity of the treatment plan—for example, orthodontic therapy followed by fixed partial denture (FPD) placement.¹⁹

*Phases of Treatment Plan²⁰

*Phase 1: Removal of defective restorations and evaluation of each tooth for structural integrity

*Phase 2: Basic and surgical procedures, including extractions, implant placement, crown lengthening, periodontal therapy, and, if required, restorations, coronoplasty, and endodontic treatment²¹.

*Phase 3: Final restorative phase, during which crowns are placed and cemented

*Phase 4: Maintenance phase to ensure long-term success of the treatment.²²

*Pre-requisites before the Restorative Phase

Restoring posterior teeth before establishing proper anterior guidance is a common sequencing mistake. To avoid such errors, two key principles should be followed.²⁰

1. Do not begin any corrective procedure unless all steps have been carefully planned and arranged in the correct sequence.

2. Avoid starting restorative treatment without a clear vision of the final outcome.

The essential preparatory steps include:

- * Initial mouth preparation
- * Providing oral hygiene instructions
- * Achieving complete caries control
- * Completing periodontal therapy
- * Ensuring precise orthodontic tooth movement, followed by stabilization of occlusion; adequate time should be allowed after tooth movement for periodontal fiber reorganization and bone support before final restorations
- * Performing necessary debridement and allowing proper tissue healing prior to placing a permanent fixed prosthesis.

Full Mouth Rehabilitation (FMR) is a stepwise procedure that must be carried out in phases. Key determinants include evaluation of facial vertical dimension and occlusal plane. An increase in vertical dimension (VD) should only be done after deprogramming the facial muscles. Loss of VD due to tooth wear leads to muscle contraction, so muscle relaxation is essential before restoring to a new VD. This is achieved using deprogramming devices.

Sequential Steps in Full Mouth Rehabilitation

1. Recording patient history and making diagnostic impressions
2. Establishing tentative jaw relations and performing facebow transfer
3. Analyzing diagnostic models
4. Determining the occlusal plane
5. Deprogramming muscles if required
6. Performing a diagnostic wax-up at the increased VD
7. Carrying out pre-prosthetic procedures
8. Tooth preparation and placement of temporary restorations
9. Making final impressions
10. Trying the substructure (e.g., for PFM crowns)
11. Conducting a pre-cementation trial to check occlusion and eliminate premature contacts
12. Final glazing and cementation of restorations

Restoration of All Maxillary Posterior Teeth²³

- * Begin with preliminary mouth preparation.
- * Perform selective grinding as required.
- * Prepare all upper posterior teeth.
- * Evaluate the accuracy of anterior guidance and modify it if necessary.
- * In cases of canine guidance, set the condylar path at 20° and complete the wax-up or restoration using a fully adjustable articulator outside of eccentric movements.
- * For group function, utilize the functional generated path (FGP) technique.
- * Finally, place the posterior restorations and carry out any required adjustments.

Restoration of All Upper Teeth²⁴

- * Begin with preliminary mouth preparation.
- * Perform selective grinding on the lower teeth.
- * Prepare the upper posterior teeth.
- * Evaluate and correct anterior guidance as needed.
- * Carry out “alternate tooth preparation” in the anterior region.
- * Record centric relation and mount the lower cast using the initial upper cast.
- * Customize the guide table accordingly.
- * Mount the final casts on the articulator.
- * Reproduce anterior restorations using throwaway patterns.
- * Restore the upper posterior teeth following the prescribed procedure.

Restoration of All Posterior Teeth Only²⁰

- * Reassess disclusion and guidance, and make any necessary intraoral adjustments
- * Perform preliminary mouth preparation
- * Carry out Broadrick occlusal plane analysis
- * Prepare the lower teeth accordingly
- * Establish and harmonize anterior guidance
- * Complete the wax patterns and restorations for the lower teeth
- * Seat/place the lower restorations
- * Prepare the upper posterior teeth
- * Complete the restorations of the upper posterior teeth
- * Eliminate any balancing contacts
- * Refine and redefine working contacts

Restoring All Lower Teeth Only²⁵

- * Begin with initial mouth preparation.
- * Eliminate interferences in the upper arch by:
 - Correcting marginal ridges
 - Balancing the occlusion
 - Establishing smooth anterior guidance
- * Prepare alternate lower anterior teeth and fabricate temporary (throwaway) patterns.
- * Record centric relation (CR) with anterior teeth in contact.
- * Prepare the remaining teeth.
- * Mount the working cast on the articulator.
- * Position the temporary patterns.
- * Use this setup as a guide to complete lower anterior restorations.
- * Proceed with preparation and placement of posterior restorations.
- * Eliminate balancing contacts.
- * Refine and finalize working contacts.

Restoration of All Upper and Lower Posterior Teeth²⁶

- * Perform initial oral preparation.
- * Reestablish proper anterior guidance.
- * Prepare alternate maxillary anterior teeth.
- * Place provisional (throwaway) wax patterns.
- * Complete preparation of all anterior teeth.
- * Establish the planned anterior guidance

- * Prepare the mandibular posterior teeth
- * Determine the occlusal plane using a Broadrick occlusal plane analyzer
- * Complete the restorations of the lower teeth
- * Prepare the maxillary posterior teeth
- * Achieve the desired occlusion
- * Place all restorations
- * Refine and adjust balancing and working side contacts.

Restoration of All Maxillary and Mandibular Teeth²⁶

- * Begin with initial mouth preparation.
- * Prepare the mandibular anterior teeth.
- * If the anterior relationship is satisfactory, fabricate the lower wax pattern opposing the unprepared maxillary anterior teeth.
- * If the relationship is not satisfactory, re-establish proper anterior guidance.
- * Place provisional restorations to maintain the corrected anterior guidance.
- * Finalize the lower restorations by accurately duplicating the incisal edge position of the provisional restorations.
- * Insert the lower restorations against the upper provisionals to confirm anterior guidance.
- * Prepare and restore the maxillary anterior teeth, precisely copying the provisional patterns.
- * Place the maxillary anterior restorations.
- * Refine and finalize anterior guidance.
- * Prepare the mandibular posterior teeth using a Broadrick occlusal plane analyzer as a guide.
- * Reestablish the correct occlusal plane.
- * Complete restorations of the mandibular posterior teeth.
- * Subsequently restore the maxillary posterior teeth in accordance with the established scheme.
- * Finally, refine centric, working, and non-working occlusal contacts.

CONCLUSION

Tooth wear is a multifactorial condition. Attrition, abrasion, and erosion may all play a role in the loss of tooth structure within the same dentition at different stages of life. Careful data collection and systematic evaluation of the underlying causes are essential for developing a treatment plan that ensures long-term success. In advanced cases, rehabilitation of the dentition may require minimally invasive indirect restorations or full-coverage restorations, depending on the severity and etiology of the damage.

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