

# Selection of Occlusal Philosophy and Scheme for Full Mouth Rehabilitation: A Comprehensive Review

**Dr Manish Kumar Bairwa<sup>1</sup>, Dr Rajesh Kumar<sup>2</sup>, Dr Sunil Kumar M.V<sup>3</sup>**

<sup>1</sup>PG Student, Department of Prosthodontics, Jaipur Dental College, Jaipur, Rajasthan, India.

<sup>2</sup>Professor and Head, Department of Prosthodontics, Jaipur Dental College, Jaipur, Rajasthan, India.

<sup>3</sup>Professor, Department of Prosthodontics, Jaipur Dental College, Jaipur, Rajasthan, India.

## Abstract

**Objective:** This comprehensive review synthesizes current evidence on occlusal philosophies and schemes for full mouth rehabilitation, providing clinicians with a framework for evidence-based decision-making.

**Methods:** The review examines the theoretical foundations and clinical applications of major occlusal philosophies (Gnathological, Pankey-Mann-Schuyler, Hobo twin-stage and Functionalist approaches) and compares the biomechanical and clinical characteristics of principal occlusal schemes (mutually protected occlusion/canine guidance, group function, and balanced occlusion). A literature-based synthesis was conducted to identify key factors guiding the selection of appropriate approaches for individual patients.

**Results:** The analysis reveals that no single occlusal philosophy or scheme is universally applicable. Selection must be individualized based on patient-specific factors including existing occlusal patterns, periodontal status, temporomandibular joint (TMJ) health, degree of tooth wear, presence of parafunctional habits, and clinician expertise. Special considerations for implant-supported rehabilitations and assessment/alteration of vertical dimension of occlusion (VDO) are addressed.

**Conclusion:** Evidence-based recommendations emphasize thorough diagnostic evaluation, provisional testing of proposed occlusal changes, and systematic implementation of the chosen philosophy to achieve predictable functional and esthetic outcomes. Successful full mouth rehabilitation depends on individualized treatment planning rather than rigid adherence to any single approach.

**Keywords:** Full Mouth Rehabilitation, Occlusal Philosophy, Occlusal Scheme, Vertical Dimension Of Occlusion, Pankey-Mann-Schuyler, Hobo Twin-Stage, Canine Guidance, Group Function, Temporomandibular Disorders

## 1. INTRODUCTION

Full mouth rehabilitation encompasses the comprehensive restoration of the entire dentition to achieve optimal function, esthetics, and structural integrity while maintaining harmonious relationships with the temporomandibular joints (TMJ) and neuromuscular system. This complex procedure is indicated for patients presenting with generalized tooth wear, loss of vertical dimension of occlusion, mutilated dentition, congenital enamel defects, or extensive carious destruction requiring restoration of all or most

teeth. The success of full mouth rehabilitation depends critically on the selection and implementation of an appropriate occlusal philosophy and scheme that guides the restoration of occlusal relationships.  
11,14,15,16

The concept of occlusal philosophy refers to a systematic approach or set of principles that governs how occlusal relationships are diagnosed, planned, and restored during comprehensive rehabilitation. Over the past century, multiple occlusal philosophies have been developed, each with distinct theoretical foundations, diagnostic protocols, and clinical techniques. The major philosophies include the Gnathological concept, which emphasizes precise condylar guidance and bilateral balanced contacts; the Pankey-Mann-Schuyler (PMS) philosophy, which incorporates "freedom in centric" and mutually protected occlusion; Hobo Twin stage concept of posterior disocclusion, using a sequential approach in which anterior guidance and vertical dimension are established before posterior rehabilitation; and the Functionalist approach, which prioritizes adaptation to the patient's existing neuromuscular patterns.  
11,14,16,17

Complementing these philosophies are specific occlusal schemes—the patterns of tooth contact during static and dynamic jaw movements. The three principal schemes employed in full mouth rehabilitation are mutually protected occlusion (also termed canine guidance), group function occlusion, and balanced occlusion. Each scheme has distinct biomechanical characteristics, indications, and contraindications that must be understood for appropriate clinical application.  
4,5,14,15

Despite extensive literature on occlusal concepts, significant controversy persists regarding the optimal approach for full mouth rehabilitation. The diversity of available philosophies and schemes, combined with limited high-quality comparative evidence, creates challenges for clinicians in selecting the most appropriate strategy for individual patients. Furthermore, the selection process must account for multiple patient-specific variables including the degree and pattern of tooth wear, presence of temporomandibular disorders, periodontal status, existing vertical dimension of occlusion, and the patient's adaptive capacity.  
15,16,17

This comprehensive review synthesizes current evidence on occlusal philosophies and schemes for full mouth rehabilitation, providing clinicians with a framework for evidence-based decision-making. The review examines the theoretical foundations and clinical applications of major occlusal philosophies, compares the biomechanical and clinical characteristics of different occlusal schemes, and identifies key factors that should guide selection of the appropriate approach for individual patients.  
4,5,14,15

## 2. Occlusal Philosophies in Full Mouth Rehabilitation

### 2.1 Gnathological Concept

The Gnathological concept, developed in the mid-20th century, represents one of the earliest systematic approaches to occlusal rehabilitation. This philosophy is founded on the principle that optimal occlusion should be based on precise anatomical relationships between the mandibular condyles, the temporomandibular joints, and the occlusal surfaces of the teeth. The Gnathological approach emphasizes the establishment of centric relation defined as the most superior, anterior, and medial position of the condyles in the glenoid fossae as the foundation for all occlusal contacts.  
1,4,5,11

Key principles of the Gnathological concept include bilateral simultaneous posterior contacts in centric relation, immediate anterior disocclusion during protrusive movements, and canine guidance during lateral excursions. The philosophy advocates for mutually protected occlusion, wherein posterior teeth protect anterior teeth during closure and maximum intercuspation, while anterior teeth protect posterior teeth

during all excursive movements. This approach requires precise recording of condylar guidance using mechanical articulators and careful adjustment of occlusal contacts to eliminate interferences.<sup>1,4,5,11</sup>

The Gnathological concept has been influential in establishing systematic protocols for occlusal analysis and rehabilitation. However, critics have noted that its rigid adherence to specific anatomical positions may not account for individual variations in neuromuscular adaptation and functional patterns. Additionally, the philosophy's emphasis on precise mechanical relationships has been questioned in light of evidence suggesting that many asymptomatic individuals exhibit occlusal patterns that deviate from Gnathological ideals.<sup>1,4,5,11</sup>

## 2.2 Pankey-Mann-Schuyler Philosophy

The Pankey-Mann-Schuyler (PMS) philosophy represents a modification and refinement of Gnathological principles, incorporating greater flexibility to accommodate individual patient variations. Developed by Pankey, Mann, and Schuyler, this approach introduced the concept of "freedom in centric" (also termed "long centric"), which allows for a small range of anteroposterior movement (approximately 0.5-1.0 mm) in the retruded contact position without posterior interferences.<sup>2,3,4,14,15,16</sup>

The PMS philosophy maintains the principle of mutually protected occlusion but provides greater tolerance for minor discrepancies between centric relation and maximum intercuspal position. This flexibility is particularly valuable in full mouth rehabilitation cases where achieving perfect coincidence between these positions may be challenging or unnecessary. The philosophy emphasizes systematic treatment planning through careful analysis of the occlusal plane using tools such as the Broadrick Occlusal Plane Analyzer, and refinement of posterior occlusion using the Functionally Generated Path (FGP) technique.<sup>2,3,4,14,15,16</sup>

Clinical implementation of the PMS philosophy follows a structured sequence: establishment of anterior guidance to provide posterior disocclusion during excursive movements, restoration of posterior occlusion in harmony with anterior guidance and condylar guidance, and verification of stable centric contacts with freedom in centric. The approach has been widely adopted due to its systematic nature, clinical predictability, and accommodation of biological variability.<sup>2,3,4,14,15,16</sup>

Multiple case reports and clinical studies have documented successful outcomes using the PMS philosophy for full mouth rehabilitation in patients with severe attrition, loss of vertical dimension, and mutilated dentition. A systematic review by Thimmappa et al. found that PMS was the most commonly employed philosophy in published case reports of full mouth rehabilitation, accounting for 57.69% of cases. The philosophy's popularity reflects its balance between systematic rigor and clinical flexibility.<sup>2,3,4,14,15,16</sup>

## 2.3 Functionalist Approach

The Functionalist approach to occlusal rehabilitation emphasizes adaptation to the patient's existing neuromuscular patterns rather than imposing predetermined anatomical relationships. This philosophy recognizes that the masticatory system exhibits considerable adaptive capacity and that many individuals function successfully with occlusal patterns that deviate from theoretical ideals. Functionalists argue that attempting to change long-established neuromuscular patterns may be unnecessary and potentially detrimental.<sup>16,17,20</sup>

Key principles of the Functionalist approach include acceptance of the patient's habitual occlusal position as the treatment position, minimal alteration of existing occlusal vertical dimension when stable, and conformational restoration that replicates pre-existing occlusal patterns. This approach is particularly applicable when the patient exhibits no signs or symptoms of occlusal dysfunction, has stable centric

relation coinciding with maximum intercuspal position, and requires rehabilitation primarily for esthetic or structural reasons rather than functional correction.<sup>16,17,20</sup>

The Functionalist philosophy is often contrasted with the "reorganized" approach advocated by Gnathological and PMS philosophies. While reorganized approaches seek to establish ideal occlusal relationships based on anatomical and biomechanical principles, the Functionalist approach prioritizes preservation of adapted functional patterns. Clinical decision-making in the Functionalist framework focuses on identifying whether the existing occlusion is acceptable or whether reorganization is necessary.<sup>16,17,20</sup>

## 2.4 Hobo Twin-Stage and Twin-Table Concepts

Sumiya Hobo developed two related but distinct approaches to full mouth rehabilitation: the Twin-Table technique and the Twin-Stage procedure. Both concepts aim to simplify the complex process of occlusal rehabilitation while maintaining systematic rigor and predictability.<sup>6,7,8,9,15</sup>

The Hobo Twin-Table technique utilizes two articulators with different settings to establish anterior guidance and posterior occlusion separately, then integrates them in the final restoration. This approach allows independent optimization of anterior esthetics and function before establishing posterior occlusal relationships. The Twin-Stage procedure, in contrast, employs a sequential two-stage approach: the first stage establishes the occlusal vertical dimension and anterior guidance through provisional restorations, while the second stage completes posterior rehabilitation based on the established anterior parameters.<sup>6,7,8,9,15</sup>

The Hobo Twin-Stage technique offers several practical advantages including single-step tooth preparation, use of pre-set articulator values that eliminate the need for complex condylar and lateral records, and systematic evaluation of patient adaptation to the proposed vertical dimension through provisional restorations. The approach aims to achieve mutually protected occlusion with canine guidance and posterior disocclusion during excursive movements.<sup>6,7,8,9,15</sup>

Recent clinical applications have integrated Hobo's philosophy with digital technologies, including CAD/CAM fabrication of multilayered zirconia restorations, demonstrating the adaptability of the concept to contemporary materials and techniques. A meta-analysis comparing the Hobo Twin-Stage and PMS philosophies found that Hobo's approach provided superior esthetic outcomes while both philosophies yielded comparable functional results. The choice between philosophies should be tailored to patient expectations, clinical expertise, and available resources.<sup>6,7,8,9,15</sup>

## 2.5 Other Contemporary Approaches

Beyond the major philosophies described above, several other conceptual frameworks have been proposed for full mouth rehabilitation. The Neuromuscular approach emphasizes the use of computerized mandibular scanning and electromyographic analysis to determine the optimal occlusal vertical dimension and mandibular position based on neuromuscular relaxation. This philosophy aims to harmonize facial profile, functional occlusion, joint function, and neuromuscular control through physiological measurements.<sup>16,17,20</sup>

The Biological Occlusion concept, developed by Becker and Kaiser, emphasizes the biological adaptation of the masticatory system and advocates for conservative approaches that minimize alteration of existing occlusal relationships when the system is functioning adequately. The Scandinavian School introduced the concept of "centric slide," recognizing that a small discrepancy between centric relation and maximum intercuspal position is common and often clinically acceptable.<sup>16,17,20</sup>

More recent approaches have emphasized evidence-based decision-making, moving away from rigid adherence to specific philosophical doctrines toward individualized treatment planning based on patient-specific factors and available scientific evidence. This pragmatic approach recognizes that different clinical situations may require different strategies and that the clinician's knowledge, skill, and experience play crucial roles in treatment success.<sup>15,16,17,23</sup>

### 3. Occlusal Schemes

#### 3.1 Mutually Protected Occlusion and Canine Guidance

Mutually protected occlusion, also termed canine-guided occlusion or canine disocclusion, represents one of the most widely advocated occlusal schemes for full mouth rehabilitation. This scheme is characterized by bilateral simultaneous posterior contacts in maximum intercuspal position, with immediate disocclusion of all posterior teeth during any excursive mandibular movement. During lateral movements, only the canine teeth on the working side maintain contact (canine guidance), while all other teeth separate. During protrusive movements, anterior teeth guide the mandible while posterior teeth disengage.<sup>4,5,14,15</sup>

The biomechanical rationale for mutually protected occlusion is based on the principle of load distribution and proprioceptive feedback. Posterior teeth, with their broad occlusal surfaces and multiple roots, are well-suited to resist vertical occlusal forces during closure and mastication. Anterior teeth, particularly canines with their long roots and favorable crown-to-root ratios, are better positioned to guide excursive movements and dissipate lateral forces. The rich proprioceptive innervation of the periodontal ligament surrounding canines provides enhanced neuromuscular feedback during lateral movements.<sup>16,17,20</sup>

Canine-guided occlusion is particularly favored when natural canines are present in both maxillary and mandibular arches with adequate periodontal support. This scheme is considered the preferred option in most full mouth rehabilitation cases involving natural dentition, as it provides clear separation of function between anterior and posterior teeth. The scheme is incorporated into both Gnathological and PMS philosophies as the ideal pattern for excursive guidance.

Clinical implementation requires careful establishment of anterior guidance with appropriate horizontal and vertical overlap, ensuring that canine contacts during lateral excursions are sufficient to immediately disengage all posterior teeth. The anterior guidance must be harmonized with condylar guidance to prevent binding or interference. Provisional restorations are often used to test the proposed anterior guidance before final restoration.

#### 3.2 Group Function Occlusion

Group function occlusion is characterized by simultaneous contact of multiple teeth on the working side during lateral mandibular movements. In this scheme, the canine and one or more posterior teeth (typically the premolars and sometimes the first molar) share the load during lateral excursions. The non-working side teeth should disengage to avoid balancing interferences.<sup>14,15,17</sup>

The primary indication for group function occlusion is when canine guidance is contraindicated or impractical. Specific situations favoring group function include: severe tooth wear affecting canines, compromised periodontal support of canines that cannot sustain lateral forces alone, missing canines that cannot be replaced, and cases where the existing neuromuscular pattern has adapted to group function. Group function may also be preferred in patients with heavy masticatory forces or parafunctional habits where distributing lateral loads across multiple teeth reduces stress on individual teeth.<sup>16,17,20</sup>

Clinical studies have documented successful outcomes with group function occlusion in full mouth rehabilitation. A case report by Sudhir and Parkash described successful rehabilitation of a patient with

severe dental fluorosis using group function, emphasizing that clinicians should select an occlusal scheme after comprehensive diagnosis of the patient's clinical condition and consideration of their oral health, function, comfort, and esthetic requirements. Another case report by Chauhan et al. employed group function specifically to avoid functional overload on canines in a patient with severe attrition.<sup>14,15,17</sup>

The biomechanical advantage of group function is the distribution of lateral forces across multiple teeth, potentially reducing stress on individual teeth and their supporting structures. However, this scheme requires more complex occlusal adjustment and may be more challenging to maintain over time compared to canine guidance. The scheme also demands careful attention to ensure that working-side contacts are simultaneous and harmonious, without premature contacts or interferences.<sup>4,5,14,15,17</sup>

### 3.3 Balanced Occlusion

Balanced occlusion is characterized by bilateral simultaneous contacts during all mandibular movements, including lateral and protrusive excursions. This scheme was originally developed for complete dentures to enhance stability and retention by maintaining contact on both working and non-working sides during function. In the context of natural or fixed dentition, balanced occlusion is rarely indicated and is generally considered inappropriate due to the potential for excessive lateral forces on posterior teeth.<sup>14,17</sup>

For complete denture patients, several variations of balanced occlusion have been described, including bilateral balanced occlusion, lingualized occlusion, and monoplane articulation. Lingualized occlusion, which has gained prominence in recent years, represents a modification of balanced occlusion wherein the maxillary palatal cusps occlude with the mandibular occlusal surfaces, providing some working-side balance while reducing non-working side contacts. This scheme offers benefits including improved adaptation to residual ridges, enhanced masticatory effectiveness, elimination of lateral interferences, and easier maintenance.<sup>14,17</sup>

The selection of occlusal scheme for complete dentures remains controversial, with limited high-quality evidence comparing different options. Lingualized occlusion may be particularly viable for patients with mandibular deviation due to facial asymmetry, as it allows freedom of eccentric movements. However, no scientific evidence conclusively demonstrates the superiority of one complete denture occlusal scheme over others.

### 3.4 Comparative Analysis of Occlusal Schemes

The selection between mutually protected occlusion and group function represents the primary decision point for most full mouth rehabilitation cases involving natural or fixed dentition. Both schemes have been successfully employed in clinical practice, and the literature does not provide definitive evidence that one scheme is universally superior.<sup>4,5,14,15,17</sup>

Canine guidance offers the advantages of simplicity, clear functional separation between anterior and posterior teeth, and ease of maintenance. The scheme is well-supported by biomechanical principles and is consistent with the occlusal patterns observed in many individuals with healthy, functional dentitions. However, canine guidance requires adequate canine structure and periodontal support, which may not be present in patients with severe wear or periodontal disease.<sup>4,5,14,15,17</sup>

Group function provides the advantage of load distribution across multiple teeth, which may be beneficial in patients with compromised canines or heavy occlusal forces. The scheme may also be more compatible with existing neuromuscular patterns in patients who have adapted to group function over time. However, group function requires more complex occlusal adjustment and may be more difficult to maintain, particularly in the presence of progressive tooth wear or periodontal changes.<sup>16,17,20</sup>

The decision between schemes should be based on comprehensive evaluation of patient-specific factors including the condition of canines, periodontal status, existing occlusal patterns, degree of tooth wear, presence of parafunctional habits, and the patient's adaptive capacity. In many cases, the existing occlusal scheme, if functional and asymptomatic, may be replicated in the rehabilitation (conformative approach) rather than attempting to change to a different scheme.<sup>10,21,23</sup>

#### **4. Clinical Decision-Making: Criteria for Selection**

##### **4.1 Patient Assessment and Diagnostic Considerations**

Comprehensive patient assessment forms the foundation for selecting an appropriate occlusal philosophy and scheme in full mouth rehabilitation. The diagnostic process should include thorough evaluation of multiple factors: existing occlusal relationships, temporomandibular joint function, masticatory muscle status, periodontal condition, degree and pattern of tooth wear, vertical dimension of occlusion, and the patient's functional and esthetic concerns.<sup>11,15,18,20</sup>

Clinical examination should document the patient's existing occlusal scheme, noting the pattern of contacts in maximum intercuspal position and during excursive movements. The relationship between centric relation and maximum intercuspal position should be assessed, as significant discrepancies are associated with occlusal instability and temporomandibular disorders. Detailed initial occlusion records including photographs, mounted diagnostic casts, and clinical charts are essential for diagnostic comparison with the proposed therapeutic occlusion.<sup>18,20,21</sup>

Evaluation of the temporomandibular joints should include assessment of range of motion, presence of joint sounds, pain or tenderness, and any history of TMJ dysfunction. The masticatory muscles should be palpated for tenderness, hypertrophy, or asymmetry. Periodontal examination must document the health and stability of the supporting structures, as this directly influences the selection of occlusal scheme and the distribution of occlusal forces.<sup>18,20,21</sup>

Assessment of tooth wear should identify the pattern (localized vs. generalized), severity, and probable etiology (attrition, erosion, abrasion, or combination). The presence of active wear facets suggests ongoing parafunctional activity that must be addressed in treatment planning. Medical history should include inquiry about gastroesophageal reflux, eating disorders, or other conditions that may contribute to dental erosion.<sup>10,21,23</sup>

##### **4.2 Conformative vs. Reorganized Approach**

A fundamental decision in full mouth rehabilitation is whether to employ a conformative or reorganized approach to occlusal reconstruction. The conformative approach maintains the existing intercuspal position and replicates the pre-existing occlusal scheme, making minimal changes to established occlusal relationships. This approach is indicated when the existing occlusion is stable, centric relation coincides with maximum intercuspal position (or the discrepancy is minimal and asymptomatic), vertical dimension is adequate, and the patient exhibits no signs or symptoms of occlusal dysfunction.<sup>13,16,17,18,20</sup>

The reorganized approach, in contrast, seeks to establish new occlusal relationships based on centric relation, often with alteration of the vertical dimension and modification of the occlusal scheme. This approach is necessary when the present intercuspal position is unacceptable due to instability, significant discrepancy between centric relation and maximum intercuspal position, loss of vertical dimension, or presence of occlusal dysfunction. The reorganized approach requires more complex treatment planning and typically involves provisional restorations to test the proposed occlusal changes before final restoration.<sup>13,16,17,18,20</sup>

The decision between conformative and reorganized approaches should be based on careful analysis of the existing occlusion and the treatment objectives. In many cases, a hybrid approach may be appropriate, maintaining certain aspects of the existing occlusion while modifying others to address specific problems. The intercuspal position should ideally be developed at the centric relation position of the mandible to provide even, stable occlusion without pathological deflective contacts.<sup>13,16,17,18,20</sup>

#### 4.3 Factors Influencing Philosophy and Scheme Selection

Multiple patient-specific and clinician-related factors influence the selection of occlusal philosophy and scheme. Patient-specific factors include the existing occlusal pattern and the patient's adaptation to it, the condition and position of canines, periodontal status and bone support, degree and pattern of tooth wear, presence of temporomandibular disorders, parafunctional habits, and the patient's esthetic and functional expectations.<sup>18,20,21</sup>

The presence of healthy, well-positioned canines with adequate periodontal support favors selection of canine-guided occlusion. Conversely, compromised canines, severe canine wear, or missing canines that cannot be replaced may necessitate group function. The existing occlusal scheme, if functional and asymptomatic, may be the most appropriate choice for replication, as the patient's neuromuscular system has adapted to this pattern.<sup>16,17,20</sup>

Clinician-related factors include the dentist's knowledge and experience with different philosophies, available equipment and technology, and the complexity of the case. The PMS philosophy, for example, offers a systematic and relatively straightforward approach that may be more accessible to clinicians with limited experience in complex rehabilitation. The Hobo Twin-Stage technique may be preferred for its simplicity and elimination of complex condylar records. The choice should be tailored to patient expectations, clinical expertise, and available resources.<sup>2,3,4,14,15,16</sup>

The literature emphasizes that no single philosophy or scheme is universally applicable. Each case must be evaluated individually, with the selected approach based on comprehensive diagnosis and consideration of all relevant factors. The clinician's ability to execute the chosen philosophy competently is as important as the philosophy itself.<sup>15,16,17</sup>

### 5. Vertical Dimension of Occlusion: Assessment and Alteration

#### 5.1 Methods of VDO Assessment

Accurate assessment of the vertical dimension of occlusion (VDO) is critical in full mouth rehabilitation, particularly in cases of severe tooth wear where significant loss of tooth structure has occurred. Multiple methods have been described for determining the appropriate VDO, though no single method is universally accepted as the gold standard.<sup>15,16,17</sup>

Clinical methods for VDO assessment include facial measurements (Willis method), which compare the distance from the base of the nose to the chin in rest position versus occlusal position. Niswonger's method uses the distance between two points marked on the face in rest position, subtracting 2-3 mm of freeway space to determine occlusal vertical dimension. Silverman's method involves phonetic assessment, particularly the pronunciation of "s" sounds, to verify appropriate vertical dimension.<sup>19,21,22,23,24</sup>

Cephalometric analysis can provide objective measurements of facial proportions and vertical dimensions. The use of mounted diagnostic casts allows evaluation of available space for restorations and assessment of the existing vertical dimension. Some clinicians advocate for the use of interocclusal records at various vertical dimensions to determine the most comfortable and functional position.<sup>19,21,22,23,24</sup>

More recently, neuromuscular approaches have employed computerized mandibular scanning and electromyographic analysis to determine the physiological vertical dimension based on neuromuscular relaxation. This methodology aims to assess the patient's ability to manage significant vertical dimension increases and restore functional VDO through objective physiological measurements.<sup>16,17,20</sup>

Despite the variety of available methods, clinical judgment remains essential in VDO determination. Multiple methods should be used in combination, with the final decision based on integration of objective measurements, esthetic evaluation, phonetic testing, and patient comfort. The patient's adaptation capacity to any proposed change in VDO must be carefully considered.<sup>19,21,22,23,24</sup>

## 5.2 Indications for VDO Alteration

Alteration of the vertical dimension of occlusion is indicated in several clinical situations commonly encountered in full mouth rehabilitation. The primary indication is loss of VDO due to severe tooth wear (attrition, erosion, or abrasion) that has resulted in reduced crown height and inadequate space for restorations. In such cases, increasing VDO creates the necessary restorative space while restoring facial esthetics and function.<sup>10,21,23</sup>

Additional indications for VDO increase include inadequate interocclusal space for planned restorations, compromised esthetics due to reduced lower facial height, and the need to establish appropriate anterior guidance. Some patients with severe wear may present with over-closed facial appearance, protuberant lips, wrinkles at the corners of the mouth, and reduced lower facial height, all of which can be improved by increasing VDO.<sup>19,21,22,23,24</sup>

However, the decision to alter VDO must be made cautiously, as there is ongoing debate regarding the effects of VDO changes on the temporomandibular joints and masticatory system. Historical concerns about adverse effects of VDO increase have been challenged by clinical evidence demonstrating that patients can successfully adapt to moderate increases in vertical dimension. The key is to verify that any loss of VDO has actually occurred before planning restoration at an increased dimension.<sup>18,20,21</sup>

Contraindications to VDO alteration include active temporomandibular disorders that have not been stabilized, limited adaptive capacity due to age or systemic conditions, and cases where the existing VDO is adequate and functional. In patients with parafunctional habits such as bruxism, the increased VDO must be carefully planned and protected with occlusal splints after rehabilitation.<sup>18,20,21</sup>

## 5.3 Provisional Testing and Patient Adaptation

Provisional testing of proposed VDO changes represents a critical step in full mouth rehabilitation and is strongly advocated by most contemporary approaches. The use of provisional restorations or occlusal splints allows evaluation of the patient's tolerance and adaptation to the proposed vertical dimension before committing to definitive restorations.<sup>19,21,22,23,24</sup>

The typical protocol involves fabrication of provisional restorations or an occlusal splint at the proposed increased VDO, which the patient wears for a period of 6 weeks to 3 months. During this evaluation period, the clinician monitors for signs of TMJ dysfunction, muscle tenderness, difficulty in adaptation, or other adverse effects. The patient's subjective comfort, ability to function, and satisfaction with esthetics are assessed.<sup>19,21,22,23,24</sup>

This provisional phase serves multiple purposes: it allows physiological adaptation of the neuromuscular system to the new vertical dimension, permits evaluation of TMJ tolerance, provides an opportunity to assess and refine the proposed occlusal scheme, and allows the patient to experience the esthetic changes before final restoration. Any necessary adjustments can be made to the provisional restorations before proceeding to definitive treatment.<sup>16,17,20</sup>

The Hobo Twin-Stage technique explicitly incorporates this provisional evaluation as the first stage of treatment, with the second stage (definitive posterior restoration) proceeding only after successful adaptation has been confirmed. Similarly, the PMS philosophy emphasizes the use of provisional restorations to verify the proposed occlusal relationships. The use of removable overlay prostheses has also been described as a cost-effective method for provisional testing of VDO changes, particularly for patients with financial limitations.<sup>2,3,4,14,15,16</sup>

Clinical evidence supports the safety and efficacy of moderate VDO increases when properly planned and provisionally tested. However, the magnitude of increase should be conservative, typically limited to 2-5 mm, and the patient's adaptation should be carefully monitored throughout the provisional phase.<sup>19,21,22,23,24</sup>

## **6. Role of TMD, Tooth Wear, and Existing Occlusion**

### **6.1 Temporomandibular Disorders in Treatment Planning**

The presence of temporomandibular disorders (TMD) significantly influences treatment planning for full mouth rehabilitation and must be carefully evaluated before initiating comprehensive occlusal reconstruction. TMD encompasses a range of conditions affecting the temporomandibular joints, masticatory muscles, and associated structures, with symptoms including pain, limited range of motion, joint sounds, and functional impairment.<sup>18,20,21</sup>

The relationship between occlusion and TMD has been extensively debated in the literature. While occlusal factors were historically considered primary etiological factors in TMD, contemporary understanding recognizes TMD as a multifactorial condition with biological, psychological, and social components. However, occlusal instability and significant discrepancies between centric relation and maximum intercuspal position have been associated with increased risk of TMD.<sup>18,20,21</sup>

In patients presenting with active TMD, stabilization of the condition should precede definitive full mouth rehabilitation. Initial treatment may include occlusal splint therapy, physical therapy, pharmacological management, and behavioral interventions. The occlusal splint serves multiple purposes: it provides a stable occlusal platform, reduces muscle hyperactivity, protects teeth from parafunctional forces, and allows assessment of the patient's response to altered occlusal relationships.<sup>18,20,21</sup>

For patients requiring full mouth rehabilitation who have a history of TMD or present with TMJ dysfunction, the treatment approach should emphasize comprehensive diagnostics considering the biomechanics of the musculoskeletal system and optimal load distribution on the dentition. The goal is to establish occlusal relationships that minimize adverse loading of the TMJ and promote balanced distribution of functional and parafunctional forces. Restoration in centric relation is generally recommended for patients with TMD to establish a stable, reproducible occlusal position.<sup>18,20,21</sup>

### **6.2 Tooth Wear Patterns and Etiology**

Tooth wear represents one of the most common indications for full mouth rehabilitation, and understanding the pattern and etiology of wear is essential for treatment planning. Tooth wear can result from attrition (tooth-to-tooth contact), erosion (chemical dissolution), abrasion (mechanical wear from external agents), or combinations of these processes.<sup>10,21,23</sup>

Attrition is typically associated with parafunctional habits such as bruxism and results in wear facets on occlusal and incisal surfaces. Severe attrition can lead to significant loss of vertical dimension, exposure of dentin, tooth sensitivity, and compromised esthetics. The pattern of attrition provides information about

the patient's occlusal function and parafunctional habits that must be addressed in treatment planning.<sup>10,21,23</sup>

Erosion results from chemical dissolution of tooth structure by acids from intrinsic sources (gastroesophageal reflux, eating disorders) or extrinsic sources (dietary acids, environmental exposure). Erosive wear typically presents with smooth, concave defects on facial and occlusal surfaces, often with preservation of enamel at the gingival margin. Identification of erosive wear should prompt investigation of underlying medical or dietary factors that must be addressed to prevent continued destruction after rehabilitation.<sup>10,21,23</sup>

The presence of active wear facets indicates ongoing destructive processes that will continue after rehabilitation unless addressed. For patients with bruxism or other parafunctional habits, occlusal splint therapy should be incorporated into the treatment plan to protect the rehabilitated dentition. The splint should be designed to provide stable occlusal contacts while minimizing lateral forces on the teeth.

The severity and pattern of tooth wear influence the selection of occlusal scheme. In cases of severe canine wear, group function may be preferred over canine guidance to distribute lateral forces across multiple teeth. The degree of wear also influences decisions regarding VDO alteration, as severe wear often necessitates increasing the vertical dimension to create adequate restorative space.<sup>4,5,14,15,17</sup>

### 6.3 Existing Occlusal Condition Assessment

Comprehensive assessment of the existing occlusal condition is fundamental to treatment planning and influences the decision between conformative and reorganized approaches. The evaluation should document the pattern of occlusal contacts in maximum intercuspal position, the relationship between centric relation and maximum intercuspal position, the existing occlusal scheme during excursive movements, and the presence of any occlusal interferences or prematurities.<sup>13,16,17,18,20</sup>

For patients with stable occlusion, coincidence between centric relation and maximum intercuspal position, and no signs or symptoms of dysfunction, a conformative approach that replicates the existing occlusal pattern may be most appropriate. This approach respects the patient's neuromuscular adaptation and minimizes the risk of creating new functional problems. The existing occlusal scheme, whether canine guidance or group function, can be maintained if it has proven functional over time.<sup>16,17,20</sup>

Conversely, patients with unstable occlusion, significant discrepancies between centric relation and maximum intercuspal position, or evidence of occlusal dysfunction require a reorganized approach. In such cases, the rehabilitation should establish new occlusal relationships based on centric relation, with careful attention to creating stable, interference-free contacts. The literature supports restoration in centric relation for patients requiring complete mouth rehabilitation, particularly those with occlusal instability or TMD.<sup>18,20,21</sup>

The periodontal status must be evaluated in conjunction with occlusal assessment, as periodontal health and bone support directly influence the ability of teeth to withstand occlusal forces. Teeth with compromised periodontal support may require modification of the occlusal scheme to reduce lateral forces, such as employing group function rather than canine guidance. The craniocervical relationship and overall posture should also be considered, as these factors can influence mandibular position and occlusal function.<sup>4,5,14,15,17</sup>

## 7. Occlusal Considerations in Implant-Supported Rehabilitations

Full mouth rehabilitation increasingly involves dental implants, either as part of a combined tooth-implant restoration or as complete implant-supported fixed prostheses. Occlusal design for implant-supported

restorations requires special considerations due to fundamental differences between natural teeth and osseointegrated implants.<sup>12,13,25,26</sup>

Unlike natural teeth, which are suspended in the periodontal ligament and possess proprioceptive feedback mechanisms, dental implants are rigidly integrated with bone and lack periodontal mechanoreceptors. This absence of proprioception and shock-absorbing capacity makes implants more vulnerable to excessive occlusal forces and requires modifications to traditional occlusal concepts. Additionally, implants exhibit limited tolerance for lateral forces compared to axially directed loads, necessitating careful attention to occlusal scheme design.<sup>12,13,25,26</sup>

General principles for implant occlusion in full mouth rehabilitation include: minimizing cantilevers and ensuring axial loading when possible, reducing occlusal table width to decrease lateral forces, establishing lighter occlusal contacts on implant-supported restorations compared to natural teeth in maximum intercuspal position, and providing immediate disocclusion of implant-supported posterior restorations during excursive movements. Some authors advocate for complete disocclusion of implant-supported posterior teeth during lateral and protrusive movements, with guidance provided exclusively by natural anterior teeth when present.<sup>12,13,25,26</sup>

For completely implant-supported rehabilitations, the occlusal scheme should typically follow mutually protected occlusion principles with anterior guidance providing posterior disocclusion. However, when anterior implants must provide guidance, the forces should be distributed across multiple anterior teeth rather than concentrated on canines alone. Bilateral balanced occlusion is generally contraindicated for implant-supported fixed prostheses due to the risk of excessive lateral forces.<sup>4,5,14,15,17</sup>

The use of digital planning and CAD/CAM fabrication has enhanced the precision of implant-supported full mouth rehabilitations, allowing for optimal implant positioning and prosthetic design. Mock-up driven planning provides a systematic approach to visualizing the final prosthetic outcome and ensuring appropriate occlusal relationships before surgical and prosthetic implementation. Pre-operative planning of treatment steps and careful attention to occlusal design are essential for achieving satisfactory outcomes in implant-supported full mouth rehabilitations.<sup>12,13,25,26</sup>

## 8. Evidence-Based Recommendations and Clinical Guidelines

Based on synthesis of the available literature, several evidence-based recommendations can be formulated to guide clinical decision-making in the selection of occlusal philosophy and scheme for full mouth rehabilitation:<sup>15,17,18,19,22,23,25</sup>

**Comprehensive Diagnostic Evaluation:** Thorough clinical examination and diagnosis are essential prerequisites for successful full mouth rehabilitation. The diagnostic process should include assessment of existing occlusal relationships, TMJ function, masticatory muscle status, periodontal condition, tooth wear patterns, and vertical dimension of occlusion. Detailed documentation through photographs, mounted diagnostic casts, and clinical records provides the foundation for treatment planning.<sup>10,21,23</sup>

**Individualized Treatment Planning:** No single occlusal philosophy or scheme is universally applicable. Treatment planning must be individualized based on patient-specific factors including existing occlusal patterns, periodontal status, TMJ health, degree of tooth wear, presence of parafunctional habits, and patient expectations. The selected approach should align with the clinician's knowledge, skills, and available resources.<sup>15,16,17</sup>

**Centric Relation as Treatment Position:** For patients requiring complete mouth rehabilitation, particularly those with occlusal instability or TMD, restoration in centric relation is supported by the literature.

Coincidence between centric relation and maximum intercuspal position should be the goal, as discrepancies between these positions are associated with occlusal instability and temporomandibular disorders.<sup>18,20,21</sup>

**Conformative vs. Reorganized Approach:** The decision between conformative and reorganized approaches should be based on assessment of the existing occlusion. When the existing occlusion is stable, functional, and asymptomatic, a conformative approach that maintains established patterns may be most appropriate. Reorganization is indicated when significant instability, dysfunction, or loss of vertical dimension is present.<sup>13,16,17,18,20</sup>

**Occlusal Scheme Selection:** For natural dentition with healthy, well-positioned canines, canine-guided occlusion is generally preferred. Group function is indicated when canines are compromised, severely worn, or missing, or when the patient has adapted to group function over time. The existing occlusal scheme, if functional, may be the most appropriate choice for replication.<sup>14,15,17</sup>

**Vertical Dimension Management:** When alteration of VDO is necessary, the proposed change should be provisionally tested using occlusal splints or provisional restorations for 6 weeks to 3 months before definitive restoration. This evaluation period allows assessment of patient adaptation, TMJ tolerance, and functional outcomes. The magnitude of VDO increase should be conservative and based on multiple assessment methods.<sup>19,21,22,23,24</sup>

**TMD Management:** Active temporomandibular disorders should be stabilized before initiating definitive full mouth rehabilitation. Occlusal splint therapy, physical therapy, and other conservative interventions should be employed as needed. The rehabilitation should aim to establish stable occlusal relationships that minimize adverse TMJ loading.<sup>18,20,21</sup>

**Parafunctional Habit Management:** For patients with bruxism or other parafunctional habits, the etiology of tooth wear must be addressed to protect the rehabilitated dentition. Post-rehabilitation occlusal splint therapy should be incorporated into the treatment plan. The occlusal scheme should consider load distribution to minimize stress on individual teeth.<sup>10,21,23</sup>

**Implant Occlusion Principles:** For implant-supported rehabilitations, occlusal design should minimize lateral forces, ensure axial loading, and provide immediate disocclusion during excursive movements. Lighter occlusal contacts on implant-supported restorations compared to natural teeth may be appropriate. Digital planning and mock-up driven approaches enhance predictability.<sup>12,13,25,26</sup>

**Systematic Implementation:** Regardless of the philosophy selected, systematic implementation following established protocols enhances predictability and outcomes. The PMS philosophy offers a well-documented systematic approach that has been successfully employed in numerous cases. The Hobo Twin-Stage technique provides an alternative systematic framework with practical advantages.<sup>2,3,4,14,15,16</sup>

## 9. Conclusion

The selection of occlusal philosophy and scheme for full mouth rehabilitation represents a complex clinical decision that must integrate theoretical principles, scientific evidence, and patient-specific factors. While multiple philosophies have been developed—including Gnathological, Pankey-Mann-Schuyler, Functionalist, and Hobo approaches the literature reveals that no single approach is universally superior or applicable to all clinical situations.<sup>15,16,17</sup>

The major occlusal schemes employed in full mouth rehabilitation—mutually protected occlusion with canine guidance, group function, and balanced occlusion—each have distinct biomechanical characteristics, indications, and contraindications. Canine guidance is generally preferred when healthy

canines are present, while group function is indicated when canines are compromised or when load distribution across multiple teeth is beneficial. Balanced occlusion is primarily applicable to complete denture patients.<sup>4,5,14,15</sup>

Clinical decision-making must be based on comprehensive diagnostic evaluation that assesses existing occlusal relationships, temporomandibular joint function, periodontal status, tooth wear patterns, and vertical dimension of occlusion. The choice between conformative and reorganized approaches depends on the stability and functionality of the existing occlusion. When reorganization is necessary, restoration in centric relation with coincidence between centric relation and maximum intercuspal position is supported by evidence.<sup>18,20,21</sup>

Assessment and potential alteration of vertical dimension of occlusion is a critical component of treatment planning in cases of severe tooth wear. Provisional testing of proposed VDO changes through occlusal splints or provisional restorations is essential to ensure patient adaptation and TMJ tolerance before definitive restoration. The management of temporomandibular disorders, tooth wear etiology, and parafunctional habits must be integrated into the comprehensive treatment plan.<sup>18,20,21</sup>

For implant-supported rehabilitations, occlusal design must account for the biomechanical differences between implants and natural teeth, with emphasis on axial loading, minimization of lateral forces, and immediate disocclusion during excursive movements. Digital planning and systematic implementation enhance predictability in complex cases.<sup>12,13,25,26</sup>

The most important conclusion from this review is that successful full mouth rehabilitation depends not on rigid adherence to a specific philosophical doctrine, but rather on thorough diagnosis, individualized treatment planning, systematic implementation, and careful attention to biological and biomechanical principles. The clinician's knowledge, skill, and experience in executing the chosen approach are as important as the approach itself. Future research should focus on high-quality comparative studies evaluating long-term outcomes of different philosophies and schemes, as well as the development of evidence-based guidelines for specific clinical scenarios.<sup>15,16,17,23</sup>

Full mouth rehabilitation remains one of the most challenging and rewarding procedures in restorative dentistry. By integrating the principles reviewed in this article with comprehensive patient assessment and systematic treatment planning, clinicians can achieve predictable functional and esthetic outcomes that enhance patients' oral health and quality of life.<sup>11,15,18,20</sup>

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