DeepScience

Full Mouth Rehabilitation

Stalin M, Manu Rathee, Shefali Singla, Balavignesh S. *Editors*

Full Mouth Rehabilitation

Stalin M

Department of Prosthodontics, Post Graduate Institute of Dental Sciences, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India

Manu Rathee

Department of Prosthodontics, Post Graduate Institute of Dental Sciences, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India

Shefali Singla

Department of Prosthodontics, Dr Harvansh Singh Judge Institute of Dental Sciences & Hospital, Panjab University, India

Balavignesh S

Department of Prosthodontics, Post Graduate Institute of Dental Sciences, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India

DeepScience

Published, marketed, and distributed by:

Deep Science Publishing
USA | UK | India | Turkey
Reg. No. MH-33-0523625
www.deepscienceresearch.com
editor@deepscienceresearch.com
WhatsApp: +91 7977171947

ISBN: 978-93-49910-05-8

E-ISBN: 978-93-49910-79-9

https://doi.org/10.70593/978-93-49910-79-9

Citation: Stalin M., Rathee, M., Singla, S., & Balavignesh, S. (2025). *Full Mouth Rehabilitation*. Deep Science Publishing. https://doi.org/10.70593/978-93-49910-79-9

Preface

Full Mouth Rehabilitation is a comprehensive academic volume designed to serve as a vital reference for postgraduate students, clinicians, and academicians in the field of prosthodontics. This edited book encompasses foundational concepts, advanced clinical protocols, and evolving digital innovations for the complete oral rehabilitation of patients. Each chapter has been thoughtfully authored by experienced professionals and reviewed for clinical relevance and scientific integrity.

The book spans key themes, from the biological principles underlying occlusion to the application of CAD/CAM and implant-supported restorations, offering a well-rounded perspective for those involved in planning and executing full-mouth rehabilitative treatments. Our goal is to bridge the gap between traditional methods and emerging technologies in prosthodontics, thereby equipping the next generation of practitioners with both confidence and competence.

We extend our heartfelt thanks to all the contributors who have enriched this book with their clinical expertise and academic insights. We hope this work contributes meaningfully to ongoing education and patient care.

Stalin M
Manu Rathee
Shefali Singla
Balavignesh S

Table of Contents

Deep Science Publishing
https://doi.org/10.70593/978-93-49910-79-9

Chapter 1: Foundations of Full Mouth Rehabilitation: Scope and Significance

Manu Rathee, Stalin M, Shefali Singla, Balavignesh S

Abstract: This chapter presents an in-depth overview of Full Mouth Rehabilitation (FMR) in prosthodontics. It traces the historical evolution of occlusal philosophies, outlines key clinical indications and objectives, and addresses challenges in diagnosis and execution. Special emphasis is given to modern techniques such as digital workflows, AI-assisted planning, and implant-supported prosthodontics. The chapter explores traditional and emerging protocols in occlusal reconstruction through a philosophy-based framework, offering a practical guide for clinicians aiming for functional, esthetic, and biologically sound outcomes.

Keywords: Artificial intelligence, Digital dentistry, Full mouth rehabilitation, Occlusion philosophy, Vertical dimension.

1 Introduction

Prosthodontics, a specialised discipline within dentistry, is dedicated to the diagnosis, treatment planning, rehabilitation, and maintenance of oral function, esthetics, comfort, and health for patients with missing or structurally compromised dentition. It serves as a bridge between biology and engineering, transforming a deficient oral environment into a harmonious system that supports health, restores functionality, and enhances the overall quality of life (Dawson, 2007).

A successful prosthodontic outcome requires not only scientific rigour but also a refined clinical artistry.

Manu Rathee,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Stalin M,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Shefali Singla,
Department of Prosthodontics, Panjab University, Chandigarh, India.
Balavignesh S,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.

The prosthodontist must skillfully coordinate the interplay of teeth, Muscles, joints, bones, and soft tissues to reestablish the physiological and esthetic balance of the stomatognathic system. It is not merely a technical endeavour but a holistic rehabilitation of oral health and function (Hobo & Takayama, 1997).

Full Mouth Rehabilitation (FMR) represents the comprehensive restoration of all teeth in both arches to optimise occlusion, esthetics, phonetics, and overall oral well-being. This multifaceted approach demands seamless integration of several dental disciplines—including prosthodontics, periodontics, endodontics, orthodontics, and oral surgery. Rather than being a singular technique, FMR is a biological and biomechanical strategy that realigns function and esthetics in a patient-centred manner (Pankey & Mann, 1960).

> *"Full Mouth Rehabilitation is the art and science of re-establishing function, esthetics, and structural integrity in a compromised oral environment to support long-term oral health and patient well-being."*

1.1 Historical Evolution

The historical evolution of Full Mouth Rehabilitation (FMR) highlights the shifting paradigms in occlusion and restorative philosophy, progressively refining both diagnostic protocols and treatment planning methodologies over time.

Gysi (1920s): Dr. Edward Gysi pioneered balanced occlusion using anatomical articulators. He emphasised achieving multiple contact points between arches throughout functional movements, enhancing denture stability—a foundation still relevant in prosthodontic protocols (Zarb, Bolender, & Carlsson, 2013).

Pankey-Mann-Schuyler (1950s): Drs. Pankey, Mann, and Schuyler introduced a functional occlusion concept centred on centric relation. Their method used CR as a reproducible reference for constructing restorative occlusion, establishing a standard for long-term functional harmony (Pankey & Mann, 1960).

Hobo and Takayama (1980s): Their Twin-Table Technique linked occlusal morphology with anterior guidance and offered scientific reproducibility of disocclusion angles for full-mouth cases (Hobo & Takayama, 1997).

Kois Philosophy (21st Century): Dr. John Kois proposed a risk-based approach based on periodontal, biomechanical, functional, and dentofacial parameters, allowing phased, individualised care (Kois & Kois, 2015).

Digital Era: Digital scanning, CAD/CAM, and implant-supported prosthodontics transformed FMR by improving diagnostic precision, treatment planning, and prosthesis accuracy (Rosenstiel, Land, & Fujimoto, 2016).

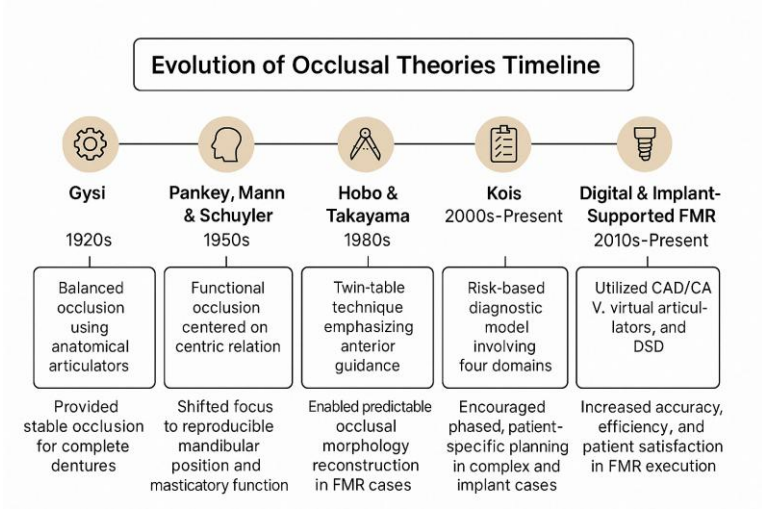


Figure 1.1: Evolution of Occlusal Theories Timeline

1.2 Indications for Full Mouth Rehabilitation

Full Mouth Rehabilitation (FMR) is indicated in various clinical scenarios where the integrity, function, and aesthetics of the stomatognathic system are compromised (Dawson, 2007; Kumar et al., 2021). The following conditions commonly warrant consideration for FMR:

Generalised Tooth Wear: Due to attrition, abrasion, or erosion, resulting in significant loss of tooth structure that affects both function and esthetics (Duryodhan & Mahajan, 2021).

Developmental Anomalies: Such as *Amelogenesis Imperfecta* or *Dentinogenesis Imperfecta*, which cause defects in enamel or dentin formation, leading to compromised tooth structure and function (Jain et al., 2013).

Advanced Periodontal Breakdown: Severe periodontal disease with significant bone loss and compromised tooth support, necessitating comprehensive restorative care to restore function and stability (Rosenstiel et al., 2016).

Collapsed Occlusion and Altered Vertical Dimension: A collapsed occlusion due to tooth wear, loss, or improper bite alignment, requiring a complete reconstruction to re-establish the proper vertical dimension and occlusal relationship (Thimmappa et al., 2021).

Multiple Missing Teeth and Edentulous Spans: Large edentulous areas or complete tooth loss that affects the patient's ability to function, requiring rehabilitation to restore oral function and esthetics.

Recurrent Prosthetic Failure: Failure of previous prosthetic restorations due to poor adaptation, material degradation, or functional issues, necessitating a comprehensive approach to restore the oral health and function (Hobo & Takayama, 1997).

Severe Malocclusion with Functional Impairment: Significant malocclusion that impairs proper function, causing discomfort or dysfunction, which requires a full rehabilitation plan to achieve an optimal functional and aesthetic outcome (Kois & Kois, 2015).

1.3 Objectives of Full Mouth Rehabilitation (FMR)

The primary goals of Full Mouth Rehabilitation (FMR) are to restore and optimise both the functional and aesthetic aspects of the stomatognathic system. These objectives are designed to ensure that the rehabilitation process results in a balanced, healthy, and sustainable outcome for the patient (Dawson, 2007; Kumar et al., 2021; Kois & Kois, 2015):

Re-establish Occlusal Equilibrium: Restore a harmonious balance between the upper and lower arches, ensuring proper tooth contact during functional movements and preventing abnormal forces that could lead to further damage or discomfort (Pankey & Mann, 1960; Dawson, 2007; Thimmappa et al., 2021).

Restore Appropriate Vertical Dimension of Occlusion (VDO): Re-establish the correct vertical dimension to restore proper jaw alignment, facial appearance, and masticatory function (Rosenstiel et al., 2016; Jain et al., 2013; Duryodhan & Mahajan, 2021).

Achieve Aesthetic Integration with Facial Features: Ensure that the restored dentition is in harmony with the patient's facial characteristics, including smile design, lip support, and overall facial aesthetics (Kois & Kois, 2015; Dawson, 2007; Zarb et al., 2013).

Reinstate Phonetic Balance: Restore proper speech function by addressing any occlusal or prosthetic issues that could affect the patient's ability to speak clearly and comfortably (Zarb et al., 2013; Jain et al., 2013; Kumar et al., 2021).

Ensure Biological Harmony with Hard and Soft Tissues: Achieve a restoration that integrates seamlessly with the surrounding hard and soft tissues, promoting optimal oral health and minimising complications (Hobo & Takayama, 1997; Rosenstiel et al., 2016; Thimmappa et al., 2021).

Facilitate Long-Term Prosthesis Longevity and Maintenance: Design restorations that ensure long-term stability, durability, and ease of maintenance (Dawson, 2007; Kois & Kois, 2015; Duryodhan & Mahajan, 2021).

Preserve or Improve Speech and Chewing Efficiency: The rehabilitated dentition should support clear articulation and improved mastication (Jain et al., 2013; Kumar et al., 2021; Zarb et al., 2013).

Minimise Biological Cost: Through conservative preparation, biocompatible materials, and AI-guided planning (Kois & Kois, 2015; Duryodhan & Mahajan, 2021; Kumar et al., 2021).

Utilise Evidence-Based Occlusal Philosophy: The chosen occlusal scheme must align with the patient's T&M classification, functional demands, and esthetic goals (Pankey & Mann, 1960; Hobo & Takayama, 1997; Kois & Kois, 2015).

1.4 Clinical Challenges in Full-Mouth Rehabilitation

Full Mouth Rehabilitation (FMR) involves a highly complex and multidisciplinary approach, and several clinical challenges can arise throughout the treatment process (Dawson, 2007; Hobo & Takayama, 1997; Kumar et al., 2021):

Accurate Recording of Centric Relation: Achieving a precise and reproducible centric relation (CR) is critical for successful occlusion (Pankey & Mann, 1960; Dawson, 2007; Hobo & Takayama, 1997).

Determination of Vertical Dimension of Occlusion (VDO) Without Overloading the Masticatory System: Overestablishing the VDO can cause discomfort and strain; restoring the correct dimension is essential (Kumar et al., 2021; Duryodhan & Mahajan, 2021; Rosenstiel et al., 2016).

Managing Temporomandibular Joint Disorders (TMD): Occlusal changes must not aggravate TMJ dysfunction (Zarb et al., 2013; Dawson, 2007; Kois & Kois, 2015).

Synchronising Multidisciplinary Treatment Components: Coordinating prosthodontics, periodontics, orthodontics, and surgery poses logistical challenges (Thimmappa et al., 2021; Hobo & Takayama, 1997; Kumar et al., 2021).

Communicating Effectively with Laboratories: Accurate lab instructions ensure success in fabrication and fit (Rosenstiel et al., 2016; Dawson, 2007; Kois & Kois, 2015).

Aligning Treatment Goals with Patient Expectations and Finances: Treatment planning must be balanced between ideal outcomes and realistic expectations (Kois & Kois, 2015; Kumar et al., 2021; Zarb et al., 2013).

Risk Assessment & Phased Execution: As emphasised by Kois, evaluating risks across periodontal, biomechanical, functional, and esthetic domains guides sequencing (Kois & Kois, 2015; Dawson, 2007; Thimmappa et al., 2021).

1.5 Recent Advances and Innovations in Full-Mouth Rehabilitation

Full Mouth Rehabilitation (FMR) has witnessed significant advancements in recent years, driven by innovations in digital technology and materials science. These developments have enhanced the precision, efficiency, and predictability of treatment outcomes (Rosenstiel et al., 2016; Duryodhan & Mahajan, 2021; Kois & Kois, 2015). Key recent innovations include:

Digital Smile Design (DSD) allows for esthetic previsualization, enabling both clinicians and patients to visualise the outcome of their rehabilitation before treatment begins. By incorporating facial and dental parameters, DSD aids in designing smiles that are harmonious with the patient's facial features, ensuring more predictable and satisfying aesthetic results (Kumar et al., 2021; Kois & Kois, 2015; Jain et al., 2013).

CAD/CAM fabrication has significantly improved the accuracy of prosthetic restorations and reduced the turnaround time for fabricating crowns, bridges, and dentures. This technology allows for precise measurements and customisation, leading to better-fitting prostheses and reduced need for adjustments (Rosenstiel et al., 2016; Dawson, 2007; Zarb et al., 2013).

Virtual articulators have revolutionised the way occlusal relationships are analysed and simulated. By replacing traditional mechanical articulators with digital simulation, they provide a more accurate and efficient means of studying occlusion and jaw movement, enhancing the precision of treatment planning and the final prosthetic outcomes (Hobo & Takayama, 1997; Thimmappa et al., 2021; Kumar et al., 2021).

Implant-supported FMR offers a predictable, fixed solution for patients with extensive tooth loss or compromised dentition. Techniques such as the All-on-4 protocol allow for the placement of a full set of fixed teeth on just four implants, offering enhanced stability and reduced treatment time (Jain et al., 2013; Dawson, 2007; Zarb et al., 2013).

Artificial Intelligence (AI) is increasingly used to assist in diagnostic decisions, treatment planning, and prosthetic design. AI can analyse large datasets to identify patterns, predict outcomes, and suggest optimal treatment options. In prosthodontics, AI tools help in the design of prostheses, allowing clinicians to make data-driven decisions (Kois & Kois, 2015; Kumar et al., 2021; Duryodhan & Mahajan, 2021).

Step	Traditional FMR Workflow	Digital FMR Workflow
Impression Taking	Physical impressions using alginate or PVS materials	Digital impressions using intraoral scanners
Model Fabrication	Models are manually poured from impressions	No physical models; digital data is used directly
Wax-up/Design	Manual wax-up performed by a technician	CAD design with precise digital tools
Try-in and Adjustments	Physical try-in followed by manual adjustments	Virtual try-in with digital simulation
Prosthesis Creation	Cast/milled from wax-up (labour-intensive)	CAM milling or 3d printing from CAD design
Chair Time	Multiple visits for fit and adjustment	Reduced due to precision and fewer adjustments
Final Placement	Cemented after final checks	Placed with minimal or no adjustments
Accuracy	Prone to human error	High accuracy via CAD/CAM
Time Efficiency	Slower, requires several appointments	Faster, fewer appointments
Patient Comfort	Potential discomfort during impressions	Comfortable digital scans
Customization	Limited by the technician's skill	Highly customizable digitally
Cost	Lower upfront but labour-intensive	Higher initial cost, but efficient over time

Table 1.1. Comparison of Traditional vs Digital FMR Workflows

1.6 Philosophy-Based Approach to Occlusion

Various occlusal philosophies guide the execution of Full Mouth Rehabilitation (FMR), each offering unique advantages. No single philosophy fits all patients. Selection must be based on T&M classification, patient anatomy, functional habits, and esthetic demand (Thimmappa et al., 2021; Dawson, 2007; Kois & Kois, 2015).

Philosophy	Key Principles	When to Use
Pankey Mann Schuyler	Anterior guidance first, then occlusal planes	T&M Category 1 and 2. High aesthetic control
Hobo Twin Table	Uses two incisal guide tables. Posterior guidance first	Posterior wear cases: simple reproduction
Hobo Twin Stage	Sets cusp angle and anterior guidance to control disclusion	For precision; T&M Category 1 & 3
Kois Philosophy	Risk-based diagnosis; phasing allowed	Long-term cases, phased patient-centred rehab
Gnathological Concept	Based on condylar movements, it uses a fully adjustable articulator	TMJ dysfunction or complex occlusion

Table 1.2. Philosophy-Based Approach to Occlusion

Conclusion

Full Mouth Rehabilitation (FMR) represents the pinnacle of prosthodontic expertise, combining advanced diagnostic techniques with meticulous restorative artistry to restore not only function but also form and self-confidence. It is a comprehensive approach that requires a deep understanding of the complexities of the stomatognathic system, the integration of various dental disciplines, and the use of cutting-edge technology.

As dental technologies continue to advance, so too do the methodologies and approaches to FMR, resulting in more precise, biologically compatible, and patient-centred outcomes. Innovations such as digital workflows, implant-supported prosthetics, and artificial intelligence are enhancing the predictability, efficiency, and customisation of treatment plans, ensuring that Full Mouth Rehabilitation continues to evolve in alignment with patient needs and expectations.

References

Dawson, P. E. (2007). *Functional occlusion: From TMJ to smile design*. Elsevier Health Sciences.

Duryodhan, S., & Mahajan, A. (2021). Occlusal schemes and philosophies in full mouth rehabilitation – A review. *International Journal of Science and Research (IJSR)*, *10*(8), 488–493.

Hobo, S., & Takayama, H. (1997). *Oral rehabilitation: Clinical determination of occlusion*. Quintessence Publishing.

Jain, A. R., Nallaswamy, D., Ariga, P., & Philip, J. M. (2013). Full mouth rehabilitation of a patient with reduced vertical dimension using multiple metal ceramic restorations. *Contemporary Clinical Dentistry*, *4*(4), 531–536.

Kois, D. E., & Kois, J. C. (2015). Comprehensive risk-based, diagnostically driven treatment planning. *Dental Clinics of North America*, *59*(3), 1–16. https://doi.org/10.1016/j.cden.2015.01.001

Kumar, D., Hazra, R., Srivastava, A., Khattak, A., & Kalia, D. (2021). Occlusal forms and philosophies in full mouth rehabilitation: A literature review. *IP Annals of Prosthodontics and Restorative Dentistry*, *7*(2), 79–83.

Pankey, L. D., & Mann, A. W. (1960). Oral rehabilitation: Part I. *Journal of Prosthetic Dentistry*, *10*(4), 586–595. https://doi.org/10.1016/0022-3913(60)90001-7

Rosenstiel, S. F., Land, M. F., & Fujimoto, J. (2016). *Contemporary fixed prosthodontics* (5th ed.). Elsevier.

Thimmappa, M., Katarya, V., & Parekh, I. (2021). Philosophies of full mouth rehabilitation: A systematic review. *Journal of Indian Prosthodontic Society*, *21*(1), 19–27.

Zarb, G. A., Bolender, C. L., & Carlsson, G. E. (2013). *Prosthodontic treatment for edentulous patients: Complete dentures and implant-supported prostheses* (13th ed.). Elsevier Mosby.

Deep Science Publishing
https://doi.org/10.70593/978-93-49910-79-9

Chapter 2: Aetiology and Clinical Indications for Full-Mouth Rehabilitation in Prosthodontics

Sarthak Singh Tomar, Amit Tamrakar, Komal Saroya, Mahima Singh

Abstract: Full-mouth rehabilitation (FMR) is a comprehensive dental treatment approach aimed at restoring function, esthetics, and health in patients with multiple compromised teeth or occlusal irregularities. The need for FMR often arises from multifactorial etiologies including dental caries, periodontal disease, occlusal wear, congenital anomalies, and trauma. This chapter explores the various causes that necessitate full-mouth rehabilitation and outlines the clinical indicators guiding its implementation. A clear understanding of the underlying aetiology is crucial for formulating an effective and personalised treatment plan. Through detailed analysis of patient conditions and restorative needs, clinicians can better determine the timing, scope, and objectives of full-mouth rehabilitation for long-term success.

Keywords: Aetiology, Diagnosis, Indications, Occlusion, Prosthodontics

1 Introduction

Full mouth rehabilitation (FMR) refers to the comprehensive restoration and/or replacement of all or most teeth within the maxillary and mandibular arches. The goal is to optimise oral function, health, and aesthetics in patients who have experienced significant deterioration in their dentition due to multiple etiological factors. A successful FMR case depends on a clear understanding of the underlying causes, proper diagnosis, and carefully planned treatment protocols.

Sarthak Singh Tomar,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Amit Tamrakar,
Department of Prosthodontics, Jamia Millia Islamia, New Delhi, India.
Komal Saroya,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Mahima Singh,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.

2. Pathological Tooth Wear: Attrition, Erosion, and Abrasion

Tooth wear is a progressive, multifactorial condition characterised by the irreversible loss of dental hard tissues due to mechanical and/or chemical processes. It is a primary indication for full-mouth rehabilitation, as it often leads to functional impairment and esthetic concerns (Lambrechts et al., 2006).

Category	Examples
Pathological Tooth Wear	Attrition, Erosion, and Abrasion
Congenital/Hereditary Disorders	Amelogenesis Imperfecta, Dentinogenesis Imperfecta
Extensive Caries/Restoration Failure	Rampant Caries, Failing Prostheses
Occlusal Collapse	Loss of Posterior Teeth, Vertical Dimension Loss
Psychosocial/Esthetic Factors	Self-esteem Issues, Smile Rejuvenation

Table 2.1: Common Etiological Factors Leading to Full-Mouth Rehabilitation (FMR)

2.1 Attrition

Attrition is defined as mechanical tooth wear resulting from direct tooth-to-tooth contact. It is commonly associated with parafunctional habits such as bruxism and clenching, leading to flattened occlusal surfaces, loss of cusp morphology, and a decrease in vertical dimension of occlusion (VDO) (Kelleher et al., 2012).

In full-mouth rehabilitation, these cases require comprehensive occlusal reconstruction using full-coverage restorations. Anterior guidance and VDO must be reestablished, and occlusal splints may be prescribed post-rehabilitation to prevent further damage.

2.2 Erosion

Erosion is the chemical loss of enamel and dentin due to non-bacterial acid exposure, either from intrinsic sources like gastroesophageal reflux disease (GERD) or bulimia, or from extrinsic sources such as acidic foods and drinks (Shellis et al., 2013).

Clinically, erosion presents as smooth, shiny surfaces, loss of occlusal anatomy, and dentin exposure. Management involves medical collaboration to address the etiology, along with restorative treatment to protect exposed dentin and restore occlusal function.

2.3 Abrasion

Abrasion results from mechanical wear due to external factors such as aggressive tooth brushing or the use of abrasive dentifrices. Lesions often appear at the cervical margins, causing notching, sensitivity, and loss of enamel (Addy & Hunter, 2003).

Prosthodontic intervention may include minimally invasive restorations like composite resins, veneers, or full-coverage crowns, depending on the extent of the lesion.

Type	Cause	Clinical Features	FMR Approach
Attrition	Parafunctional habits	Flattened occlusal surfaces, VDO loss	Occlusal splints, full-coverage crowns
Erosion	Acidic exposure (GERD, diet)	Smooth enamel, dentin exposure	Protective restorations address the systemic cause
Abrasion	Aggressive brushing	Cervical notching, enamel loss	Veneers, cervical composites, crowns

Table 2.2: Types of Tooth Wear and FMR Considerations

3. Congenital and Hereditary Disorders Affecting Tooth Structure

Developmental anomalies such as **Amelogenesis Imperfecta** (AI) and **Dentinogenesis Imperfecta** (DI) cause early and extensive structural deficiencies in teeth. These conditions necessitate early prosthodontic intervention, often leading to full-mouth rehabilitation (Witkop, 1988).

3.1 Amelogenesis Imperfecta (AI)

AI is a group of genetic disorders affecting enamel development, presenting with hypoplastic, hypomature, or hypocalcified enamel. Teeth appear yellow or brown, with increased susceptibility to wear and esthetic concerns (Seow, 1993).

Management involves full-coverage crowns or adhesive restorations to protect the remaining tooth structure and restore esthetics and function. Early treatment improves psychosocial outcomes and long-term prognosis.

3.2 Dentinogenesis Imperfecta (DI)

DI affects dentin formation and is characterised by opalescent, translucent teeth, early pulpal obliteration, and increased fracture risk (Shields et al., 1973).

Prosthodontic rehabilitation ranges from full crowns to overdentures or implants in severe cases. Early intervention is essential to preserve oral function and esthetics.

4. Developmental Anomalies and Orofacial Trauma

Developmental disturbances and traumatic injuries significantly compromise oral form and function, often necessitating full-mouth rehabilitation (FMR). These conditions affect both hard and soft tissues and present complex challenges in achieving long-term stability and esthetic outcomes.

4.1 Developmental Anomalies

Congenital conditions such as **ectodermal dysplasia**, **oligodontia**, **microdontia**, and **cleft palate** can result in partial or complete absence of teeth, malformed tooth structures, and underdeveloped alveolar ridges. These anomalies impair the vertical dimension of occlusion (VDO), facial esthetics, mastication, and speech (Pigno et al., 1996).

In ectodermal dysplasia, patients typically present with hypodontia or anodontia, conical teeth, and reduced alveolar growth. Prosthodontic management involves the use of **overlay dentures**, **telescopic overdentures**, or **implant-supported prostheses**, planned according to age, growth status, and ridge morphology (Guckes et al., 2002).

A multidisciplinary team—comprising prosthodontists, oral surgeons, orthodontists, and pediatric dentists—is vital for long-term management and to address both functional and psychosocial aspects.

4.2 Traumatic Tooth Loss or Fracture

Traumatic injuries to the orofacial region, commonly from road traffic accidents, falls, or sports, may result in tooth avulsion, alveolar fractures, and loss of anterior guidance. This can compromise posterior occlusion, phonetics, and facial support (Kumar et al., 2021).

Rehabilitation following trauma is staged:

- **Immediate phase**: stabilisation with splints or provisional restorations;

- **Intermediate phase**: healing and evaluation of osseous structures;
- **Definitive phase**: full-coverage restorations, fixed partial dentures, or implant-retained prostheses.

Each case demands a customised FMR plan focused on reestablishing esthetics, occlusal function, and patient confidence (Spear & Kokich, 2007).

5. Extensive Caries and Restoration Failure

Rampant caries and failed restorations are among the most common etiologies requiring full-mouth rehabilitation. These conditions lead to progressive destruction of the dentition and structural collapse if not intercepted early.

Common clinical findings include:

- Multiple non-restorable teeth,
- Secondary caries beneath crowns or bridges,
- Loose or fractured prostheses,
- Periodontal involvement or mobility (Petersen & Ogawa, 2012).

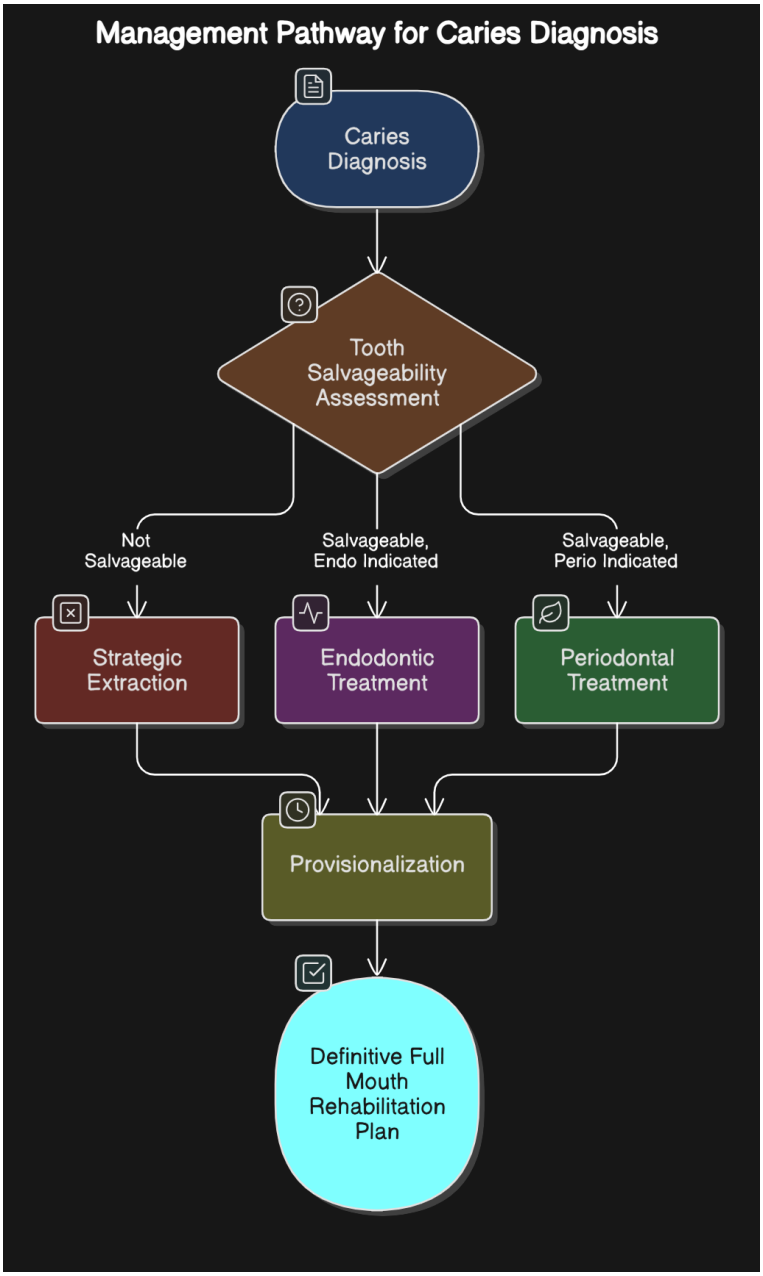
FMR in such patients requires:

- **Extraction** of hopeless teeth,
- **Endodontic therapy** for salvageable teeth,
- **Periodontal therapy** to stabilise the foundation,
- **Strategic occlusal rehabilitation** using full-arch prostheses or implant-supported restorations.

Depending on residual ridge support and patient factors, treatment options include:

- Removable complete dentures,
- Implant-retained overdentures,
- Fixed implant-supported prostheses (Felton et al., 2009).

Patient education and preventive strategies (oral hygiene, fluoride use, dietary counselling) are essential to prevent recurrence and maintain long-term success.



Flowchart 2.1: Management Pathway

6. Occlusal Collapse and Loss of Vertical Dimension

Prolonged edentulism or the early loss of posterior teeth often leads to occlusal collapse, compromising not only mastication but also phonetics, esthetics, and temporomandibular joint (TMJ) health. The absence of posterior support results in

excessive anterior loading, loss of vertical dimension of occlusion (VDO), and altered facial proportions.

Common clinical manifestations include:

- Overclosure of the jaws,
- Deepening of nasolabial folds and perioral wrinkling,
- TMJ discomfort or dysfunction,
- Speech disturbances and reduced masticatory efficiency.

The primary goal of full-mouth rehabilitation in such cases is to:

- Restore the lost vertical dimension,
- Reestablish anterior guidance and posterior occlusal support,
- Improve perioral soft tissue support and achieve balanced facial esthetics.

Treatment begins with a comprehensive diagnostic phase involving **facial and occlusal plane analysis, diagnostic wax-ups, and the use of interim prostheses** to evaluate esthetic and functional changes. Depending on the clinical scenario, the final prosthesis may be conventional or implant-supported. A phased and reversible approach is often preferred to monitor patient adaptation before definitive restoration.

7. Psychosocial and Aesthetic Concerns

While structural damage and functional loss are primary drivers of full-mouth rehabilitation, **psychosocial and aesthetic concerns** often play a crucial role in patient motivation and perceived treatment success. Individuals with worn, discoloured, missing, or malpositioned teeth may experience:

- Reduced self-confidence,
- Avoidance of social interactions,
- Anxiety regarding speech or appearance,
- Negative impact on professional and personal relationships.

Modern prosthodontic protocols address these dimensions through:

- Digital smile design and facial esthetic analysis,
- Use of high-performance aesthetic materials,

- Customisation of tooth form, shade, and gingival contours based on patient feedback.

The success of full-mouth rehabilitation is not merely measured by occlusal correction or prosthesis longevity but also by the patient's emotional and psychological transformation. A well-executed treatment can significantly elevate quality of life, reinforcing the holistic impact of comprehensive oral rehabilitation.

Conclusion

Full-mouth rehabilitation represents a comprehensive, interdisciplinary approach to restoring oral function, esthetics, and patient well-being. A deep understanding of the etiological factors, such as pathological tooth wear, congenital and developmental anomalies, trauma, extensive caries, occlusal collapse, and psychosocial influences, is critical in initiating and planning FMR.

Success depends on accurate diagnosis, individualised treatment strategies, and meticulous execution that balances biological, mechanical, and esthetic principles. Integration of modern technologies, materials, and patient-centric protocols ensures predictable, long-term outcomes. As awareness grows about the integral link between oral and systemic health, full-mouth rehabilitation stands as a pivotal tool in improving the overall quality of life for affected individuals.

References

Addy, M., & Hunter, M. L. (2003). Can tooth brushing damage your health? Effects on oral and dental tissues. *International Dental Journal, 53*(S3), 177–186. https://doi.org/10.1111/j.1875-595X.2003.tb00762.x

Felton, D. A., Cooper, L. F., Duqum, I., & McGarry, T. J. (2009). Edentulism and comorbid factors. *Journal of Prosthodontics, 18*(2), 88–96. https://doi.org/10.1111/j.1532-849X.2009.00424.x

Guckes, A. D., Scurria, M. S., & King, T. S. (2002). Prospective clinical trial of dental implants in persons with ectodermal dysplasia. *Journal of Prosthetic Dentistry, 88*(1), 21–25. https://doi.org/10.1067/mpr.2002.126795

Kelleher, M. G., Bishop, K., Briggs, P., & Winstanley, R. B. (2012). Tooth surface loss: An overview. *British Dental Journal, 213*(4), 171–176. https://doi.org/10.1038/sj.bdj.2012.760

Kumar, A., Maheshwari, S., Verma, M., & Goel, S. (2021). Management of orofacial trauma: An updated review. *National Journal of Maxillofacial Surgery, 12*(2), 161–166. https://doi.org/10.4103/njms.NJMS_71_20

Lambrechts, P., Van Meerbeek, B., Perdigão, J., Gladys, S., & Braem, M. (2006). Restorative considerations in tooth wear. *Dental Clinics of North America, 50*(3), 591–610. https://doi.org/10.1016/j.cden.2006.03.001

Petersen, P. E., & Ogawa, H. (2012). The global burden of periodontal disease: Towards integration with non-communicable diseases. *Periodontology 2000, 60*(1), 15–39. https://doi.org/10.1111/j.1600-0757.2011.00425.x

Pigno, M. A., Blackman, R. B., Cronin, R. J., & Cavazos, E. (1996). Prosthodontic management of ectodermal dysplasia: A review of the literature. *Journal of Prosthetic Dentistry, 76*(5), 541–545. https://doi.org/10.1016/S0022-3913(96)90433-8

Seow, W. K. (1993). Clinical diagnosis and management strategies of amelogenesis imperfecta variants. *Pediatric Dentistry, 15*(6), 384–393.

Shellis, R. P., Ganss, C., Ren, Y., Zero, D. T., & Lussi, A. (2013). Methodology and models in erosion research: Discussion and conclusions. *Caries Research, 45*(S1), 69–77. https://doi.org/10.1159/000351000

Shields, E. D., Bixler, D., & el-Kafrawy, A. M. (1973). A proposed classification for heritable human dentine defects with a description of a new entity. *Archives of Oral Biology, 18*(4), 543–553. https://doi.org/10.1016/0003-9969(73)90089-0

Spear, F. M., & Kokich, V. G. (2007). A multidisciplinary approach to esthetic dentistry. *Dental Clinics of North America, 51*(2), 487–505. https://doi.org/10.1016/j.cden.2006.12.004

Witkop, C. J. (1988). Amelogenesis imperfecta, dentinogenesis imperfecta and dentin dysplasia revisited: Problems in classification. *Journal of Oral Pathology & Medicine, 17*(9-10), 547–553. https://doi.org/10.1111/j.1600-0714.1988.tb01332.x

Deep Science Publishing
https://doi.org/10.70593/978-93-49910-79-9

Chapter 3: Classification Systems in Full-Mouth Rehabilitation

Manu Rathee, Stalin M, Aarti sulekh, Nang Nalika Moungkhom.

Abstract: Classification systems in full-mouth rehabilitation (FMR) serve as essential diagnostic and treatment planning tools that guide clinicians in organising complex clinical scenarios. These systems categorise cases based on factors such as the extent of tooth wear, occlusal conditions, vertical dimension loss, skeletal discrepancies, and prosthetic requirements. A well-chosen classification provides a framework for decision-making, helps in predicting treatment complexity, and facilitates communication among clinicians. This chapter reviews widely accepted classification systems, including Turner and Missirlian's classification, Dawson's occlusal dysfunction types, Pankey-Mann-Schuyler philosophy, and more recent digital approaches, highlighting their relevance, strengths, and limitations in contemporary prosthodontic practice.

Keywords: Diagnosis, Occlusion, Prosthodontics, Treatment Planning. Vertical Dimension.

1 Introduction

Full-mouth rehabilitation (FMR) requires a systematic and comprehensive approach to evaluate case complexity, develop a functional occlusal scheme, and make evidence-based treatment decisions. Classification systems in FMR are valuable tools that help categorise patients based on structural, functional, aesthetic, or implant-related considerations. systems guide the clinician in diagnostic reasoning, risk assessment, and treatment sequencing, improving the predictability of outcomes and interdisciplinary communication (Sharma et al., 2021).

Manu Rathee,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Stalin M,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Aarti Sulekh,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Nang Nalika Moungkhom,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.

Over the years, numerous classification models have been introduced, each emphasising a specific dimension of oral rehabilitation, from occlusal wear to implant support and esthetic demands.

2. Turner and Missirlian Classification (1976)

Overview

One of the most widely used systems in FMR, the Turner and Missirlian classification evaluates patients based on the degree of tooth wear and vertical dimension loss (Turner & Missirlian, 1984). It facilitates decision-making regarding whether the vertical dimension of occlusion (VDO) needs to be restored.

Classification Criteria

- **Category I** – Excessive wear with loss of VDO
- **Category II** – Excessive wear without VDO loss, space available
- **Category III** – Excessive wear without VDO loss, limited restorative space

Clinical Relevance

This classification remains a gold standard for diagnosing worn dentitions and guiding restorative planning.

3. Dawson's Functional Classification System

Overview

Peter E. Dawson proposed a classification based on occlusal function and centric relation (CR), rather than tooth wear alone. He emphasised that functional stability precedes esthetic or restorative concerns (Dawson, 2007).

Functional Classifications

- **Category A**: Stable CR and occlusion – No rehabilitation required
- **Category B**: Stable CR but unstable occlusion – Minor rehabilitation
- **Category C**: Unstable CR and occlusion – Full-mouth rehabilitation needed

Clinical Relevance

Ideal for evaluating patients with TMJ issues and parafunctional habits, ensuring neuromuscular harmony.

4. Misch Classification

Overview

Carl Misch's classification addresses FMR in edentulous or partially edentulous patients requiring implant-supported prostheses (Misch, 2008).

Key Categories

- **Category I–IV**: Based on bone volume and implant space
- **P-I to P-IV**: Based on dentition status
- ACP complexity classification: Based on ridge form, muscle attachments, and interarch space

Clinical Relevance

Used to evaluate prosthetic and surgical complexity, especially in full-arch implant cases.

5. Jain's Clinical Classification

Overview

A simplified, clinically oriented system was introduced to help categorise FMR cases in academic and practice settings (Jain et al., 2013).

Categories

- **Type I**: Functional or esthetic compromise without structural loss
- **Type II**: Tooth structure loss with or without occlusal collapse
- **Type III**: Structural loss with TMJ/muscle involvement

Clinical Relevance

Useful for early diagnosis and case triaging in both institutional and private practices.

6. Chiche's Aesthetic Classification

Overview

This classification assesses esthetic involvement in prosthodontic cases based on lip dynamics, smile line, and anterior display (Chiche & Pinault, 1994).

Risk Levels

- **Low**: Minimal aesthetic visibility
- **Moderate**: Average visibility and demands

- **High**: High smile line, gingival exposure, high expectations

Clinical Relevance

Guides esthetically driven FMR using tools like digital smile design and soft tissue management.

7. Dawson's Adapted Biomechanical Classification

Overview

This adaptation focuses on occlusal and neuromuscular balance across the TMJ, musculature, and teeth (Dawson, 2007).

Types

- **Type I**: Balanced joint–muscle–tooth system
- **Type II**: Functional disturbances without TMJ pathology
- **Type III**: Functional disturbances with TMJ pathology

Clinical Relevance

Highly applicable in TMD-associated FMR cases and multidisciplinary planning.

8. Hobo and Takayama Classification (Twin Table & Twin Stage Philosophy)

Overview

This system offers an occlusion-centric approach using mechanical tables and programmed cusp angles for occlusal reconstruction (Hobo & Takayama, 1997).

Methods

- **Twin Table**: Dual incisal guidance tables
- **Twin Stage**: Cusp angle and condylar guidance are defined to ensure posterior disocclusion

Clinical Relevance

Preferred for posterior disocclusion control and anterior guidance development in FMR.

Conclusion

Classification systems in full-mouth rehabilitation serve as foundational tools for diagnosis, case selection, and treatment planning. While Turner and Missirlian provide a structural and wear-based classification, Dawson emphasises functional and occlusal harmony. Misch's system supports implant-driven planning, and classifications like

Jain's and Chiche's offer insights into esthetic and comprehensive clinical management. Together, these systems offer clinicians a multi-dimensional framework for predictable and patient-centred prosthodontic rehabilitation.

References

Chiche, G. J., & Pinault, A. (1994). *Esthetics of anterior fixed prosthodontics*. Quintessence Publishing.

Dawson, P. E. (2007). *Functional occlusion: From TMJ to smile design*. Elsevier Health Sciences.

Hobo, S., & Takayama, H. (1997). *Oral rehabilitation: Clinical determination of occlusion*. Quintessence Publishing.

Jain, A. R., Nallaswamy, D., Ariga, P., & Philip, J. M. (2013). Full mouth rehabilitation of a patient with reduced vertical dimension using multiple metal ceramic restorations. *Contemporary Clinical Dentistry, 4*(4), 531–536. https://doi.org/10.4103/0976-237X.123027

Misch, C. E. (2008). *Contemporary implant dentistry* (3rd ed.). Mosby Elsevier.

Sharma, A., Singh, J. P., & Meena, A. (2021). Classification systems in full mouth rehabilitation: A review. *Journal of Prosthodontics and Restorative Dentistry*, 7(2), 53–58.

Turner, K. A., & Missirlian, D. M. (1984). Restoration of the extremely worn dentition. *Journal of Prosthetic Dentistry, 52*(4), 467–474. https://doi.org/10.1016/0022-3913(84)90379-4

Deep Science Publishing
https://doi.org/10.70593/978-93-49910-79-9

Chapter 4: Clinical Examination and Diagnostic Protocols

Shefali Singla, Monika Nagpal, Manjot Kaur, Komalpreet kaur

Abstract: A thorough clinical examination and structured diagnostic protocol form the foundation of successful full-mouth rehabilitation (FMR). This chapter outlines the systematic assessment of the patient's extraoral and intraoral status, including facial analysis, temporomandibular joint evaluation, occlusal assessment, and dental charting. It emphasises the importance of diagnostic tools such as mounted diagnostic casts, occlusal splints, radiographs, intraoral scans, and photographs in planning comprehensive rehabilitation. A detailed evaluation helps identify etiological factors, define treatment objectives, and establish a predictable sequence of care. Incorporating patient-specific functional, esthetic, and structural needs ensures that the rehabilitation plan is both evidence-based and personalised.

Keywords: Bite Registration, Clinical Findings, Diagnostic Casts, Esthetic Evaluation, TMJ Assessment.

1 Introduction

Accurate diagnosis forms the bedrock of successful full-mouth rehabilitation (FMR). A well-structured diagnostic protocol integrates extraoral and intraoral examination, radiographic imaging, mounted casts, clinical photographs, and digital scans to ensure a comprehensive evaluation. These components allow clinicians to identify functional, esthetic, and structural challenges and formulate an individualised, interdisciplinary treatment plan. By following a systematic approach, clinicians can enhance treatment predictability, ensure long-term functional stability, and achieve optimal esthetic and patient-centred outcomes (Kois & Kois, 2015).

Shefali Singla,
Department of Prosthodontics, Panjab University, Chandigarh, India.
Monika Nagpal,
Department of Prosthodontics, Panjab University, Chandigarh, India.
Manjot Kaur,
Department of Conservative Dentistry and Endodontics, Panjab University, Chandigarh, India.
Komalpreet Kaur,
Department of Prosthodontics, Panjab University, Chandigarh, India.

2. Intraoral and Extraoral Examination

The diagnostic journey begins with a thorough clinical examination. Extraoral assessment includes analysis of facial esthetics, skeletal proportions, muscle tone, and temporomandibular joint (TMJ) function. Frontal and lateral facial views help detect asymmetries and vertical discrepancies, especially in the lower third of the face (Dawson, 2007).

Key extraoral assessment elements include:

- Facial profile (convex, concave, straight)
- Smile line and lip mobility
- Tooth display at rest and during smiling
- TMJ evaluation (range of motion, deviation, pain, joint sounds)

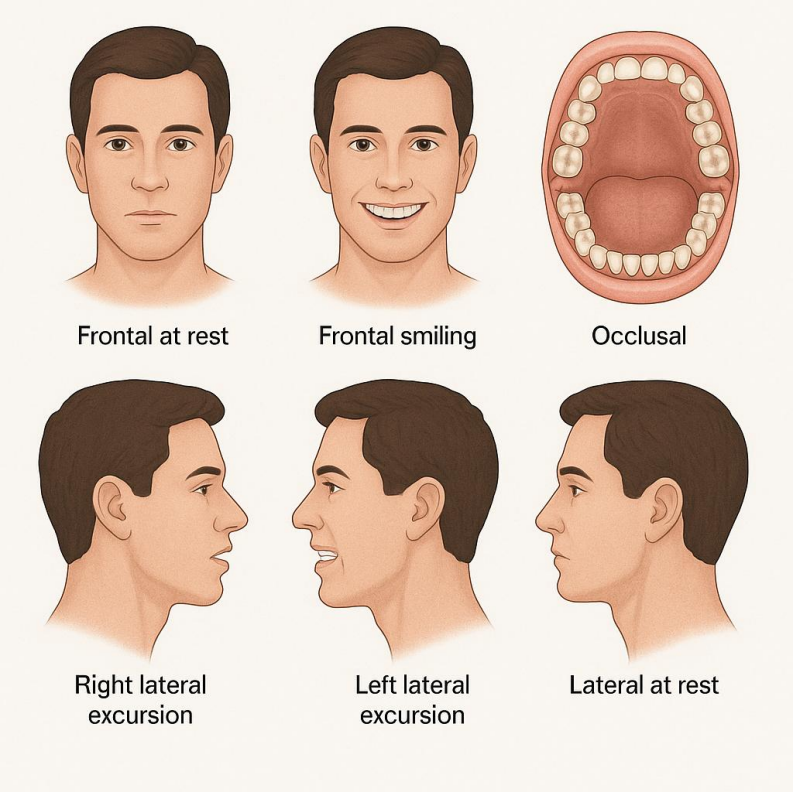
The **intraoral examination** assesses:

- Mucosal health
- Structural integrity of the teeth
- Periodontal condition
- Presence of parafunctional habits (bruxism, tongue thrusting)
- Condition of edentulous ridges

These observations guide decisions regarding vertical dimension correction, prosthetic design, and occlusal scheme selection (Sadhwani & Choudhary, 2012).

Figure 4.1: Extraoral and Intraoral Clinical Photography Views

- Frontal view at rest
- Full smile
- Right and left buccal views in occlusion
- Occlusal views (maxillary and mandibular)
- Lateral excursions



3. Diagnostic Aids

A complete diagnostic record forms the foundation for treatment planning in FMR.

Essential diagnostic tools include:

- **Conventional impressions** using alginate or PVS for diagnostic cast fabrication
- **Digital intraoral scans**, which offer precision and seamless integration with CAD/CAM workflows (Mangano et al., 2017)
- **Mounted casts** on semi-adjustable articulators in centric relation (CR) for assessing occlusal discrepancies (Dawson, 2007)
- **Esthetic and functional wax-ups**, which visualise the final treatment goals and aid communication (Petrie & Walker, 2005)
- **Clinical photographs** for documentation, aesthetic planning, and baseline records

These tools enable structural, occlusal, and esthetic evaluation and provide a clear visual foundation for interdisciplinary discussions.

Parameter	Observations	Clinical Significance
TMJ Palpation	Clicking, crepitus, tenderness	Indicates potential internal derangements
Mandibular Opening Pattern	Deviation, deflection	Affects jaw relation recording
Muscle Palpation	Tenderness, hypertrophy	Suggests parafunctional activity or overload
Trigger Point Identification	Localised pain zones	May indicate myofascial disorders
Maximum Mouth Opening	<40 mm or deviation from norm	Impacts prosthetic space and access

Table 4.1: TMJ and Muscle Evaluation Checklist

4. Radiographic Evaluation

Radiographs are indispensable in evaluating anatomical structures beyond clinical visibility.

- **Panoramic Radiograph (OPG)**: Provides a full overview of the dentition, jawbones, root morphology, and TMJ status
- **Periapical Radiographs**: Offer fine detail for root and periapical health assessment
- **Cone Beam Computed Tomography (CBCT)**: Delivers 3d views of the maxillofacial complex, assisting in implant planning, sinus evaluation, and TMJ assessment (Scarfe & Farman, 2008; Mupparapu, 2009)

Radiographs complement clinical findings and guide surgical and prosthetic planning in FMR cases.

Flowchart 4.1: Diagnostic Workflow in Full-Mouth Rehabilitation

Patient History and Chief Complaint
↓
Extraoral and Intraoral Examination
↓
Diagnostic Impressions / Digital Scanning
↓
Mounted Diagnostic Casts in CR
↓
Clinical Photography and Documentation
↓
Radiographic Imaging (OPG / CBCT)
↓
TMJ, Muscle, and Occlusal Analysis
↓
Esthetic and Functional Wax-ups
↓
Final Diagnosis and Custom Treatment Plan

5. Evaluation of TMJ, Muscles, and Occlusion

A functional evaluation of the masticatory system ensures the stability of the prosthodontic outcome.

TMJ Assessment:

- Palpation and auscultation for clicks, crepitus, or tenderness
- Assessment of mandibular movements (opening range, deviation, deflection)

Muscle Evaluation:

- Palpation of masseter, temporalis, and pterygoid muscles
- Identification of tenderness, hypertrophy, or myofascial trigger points (Okeson, 2014)

Occlusal Analysis:

- Evaluate CR–MI discrepancies
- Detect occlusal interferences, wear facets, and loss of posterior support
- Assess occlusal plane orientation using interpupillary and Camper's lines (Boucher et al., 1997)

- Confirm posterior stability and anterior guidance requirements

6. Integrating Findings into Treatment Planning

Once all data is collected, integration into a structured treatment plan is essential. Key considerations include:

- Evaluation of **vertical dimension** using phonetic tests (/s/, /m/), esthetic analysis, and facial measurements
- Establishing **centric relation** as a stable mandibular reference
- Determining an **appropriate occlusal scheme** (e.g., canine guidance, group function)
- Utilising **mock-ups or trial restorations** for patient approval (Spear & Kokich, 2007)
- Providing **comprehensive patient education** on treatment phases, prognosis, and maintenance

Conclusion

A systematic diagnostic approach is essential for predictable and successful full-mouth rehabilitation. Thorough clinical examination, combined with high-quality diagnostic records—including radiographs, mounted casts, and photographs—provides a multidimensional understanding of the patient's needs. Recognising and evaluating skeletal, dental, muscular, and occlusal parameters allows for the development of an individualised, interdisciplinary treatment plan. By prioritising functional stability, aesthetic harmony, and patient satisfaction, the foundation for long-term rehabilitative success is established.

References

Boucher, C. O., Zwemer, T. J., & Swoope, C. C. (1997). *Prosthodontic treatment for edentulous patients* (11th ed.). Mosby.

Dawson, P. E. (2007). *Functional occlusion: From TMJ to smile design*. Elsevier Health Sciences.

Kois, D. E., & Kois, J. C. (2015). Comprehensive risk-based, diagnostically driven treatment planning. *Dental Clinics of North America*, 59(3), 1–16.

Mangano, F. G., Hauschild, U., Veronesi, G., Imburgia, M., Mangano, C., & Admakin, O. (2017). Trueness and precision of four intraoral scanners in oral

implantology: A comparative in vitro study. *PLoS ONE*, 12(9), e0183239. https://doi.org/10.1371/journal.pone.0183239

Mupparapu, M. (2009). Cone beam computed tomography (CBCT) basics. *Dental Clinics of North America*, 53(1), 113–130. https://doi.org/10.1016/j.cden.2008.08.005

Okeson, J. P. (2014). *Management of temporomandibular disorders and occlusion* (7th ed.). Mosby Elsevier.

Petrie, C. S., & Walker, M. P. (2005). Esthetic and functional evaluation of wax-ups. *Journal of Esthetic and Restorative Dentistry*, 17(6), 338–346. https://doi.org/10.1111/j.1708-8240.2005.tb00118.x

Sadhwani, B. S., & Choudhary, S. (2012). Diagnostic and treatment planning considerations for full mouth rehabilitation. *Journal of Indian Prosthodontic Society*, 12(4), 225–232. https://doi.org/10.1007/s13191-012-0165-0

Scarfe, W. C., & Farman, A. G. (2008). What is cone-beam CT, and how does it work? *Dental Clinics of North America*, 52(4), 707–730. https://doi.org/10.1016/j.cden.2008.05.005

Spear, F. M., & Kokich, V. G. (2007). A multidisciplinary approach to esthetic dentistry. *Dental Clinics of North America*, 51(2), 487–505. https://doi.org/10.1016/j.cden.2006.12.004

Deep Science Publishing
https://doi.org/10.70593/978-93-49910-79-9

Chapter 5: Determining Vertical Dimension

Stalin M, Sarthak Singh Tomar, Komal Saroya, Balavignesh S.

Abstract: Determining the vertical dimension is a critical component in full-mouth rehabilitation (FMR), influencing facial esthetics, occlusal harmony, phonetics, and temporomandibular joint health. This chapter discusses the concepts of vertical dimension at rest (VDR) and vertical dimension of occlusion (VDO), along with various clinical methods to assess, establish, and verify them. These include phonetic evaluation, facial measurements, esthetic assessment, and use of pre-extraction records or existing prostheses. Special emphasis is placed on identifying vertical dimension loss and making reversible adjustments during the diagnostic phase. A structured and individualised approach to determining vertical dimension enhances treatment predictability, patient comfort, and long-term prosthetic success.

Keywords: Centric Relation, Mandibular Rest Position, Phonetic Assessment, Prosthetic Adaptation, Vertical Space Analysis

1 Introduction

Vertical dimension is one of the most critical parameters in full-mouth rehabilitation (FMR), directly influencing function, esthetics, phonetics, temporomandibular joint (TMJ) health, and patient comfort. Accurate assessment and re-establishment of vertical dimension are paramount to ensure prosthodontic success, especially in cases involving worn dentition, collapsed occlusion, or previous prosthetic failure (Dawson, 2007; Kois & Kois, 2015). A multi-modal and patient-specific approach significantly improves predictability and long-term clinical outcomes.

Stalin M,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Balavignesh S,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Sarthak Singh Tomar,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Komal Saroya,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.

2. Concepts: VDO, VDR, and Interocclusal Rest Space

Vertical dimension is assessed in two distinct contexts:

- **Vertical Dimension of Occlusion (VDO):** The vertical distance between two defined points (usually on the maxilla and mandible) when the teeth are in maximal intercuspation. It reflects the functional vertical height during chewing.
- **Vertical Dimension at Rest (VDR):** The same measurement when the mandible is in a relaxed, postural position with the teeth slightly apart (Turner & Missirlian, 1984).
- **Interocclusal Rest Space (IRS):** The difference between VDR and VDO, typically 2–4 mm, allowing muscular relaxation and functional efficiency (Boucher et al., 1997).

A reduced IRS may suggest an excessive VDO, while an increased IRS often indicates vertical collapse.

3. Methods of Assessing VDO

As no single method guarantees accuracy, a combination of techniques is recommended.

3.1 Facial Measurements

Using stable landmarks such as the tip of the nose and chin, clinicians can estimate freeway space by comparing measurements at rest and in occlusion. This non-invasive technique is simple but may be influenced by facial asymmetry, postural variation, or soft tissue laxity (Chatterjee & Bhattacharya, 2010).

3.2 Phonetic Evaluation

Phonetic tests provide dynamic insight into vertical relationships:

- **"M" sounds** help approximate VDR.
- **"S" sounds** identify incisal overlap and potential excessive VDO.
- **"F" and "V" sounds** evaluate the labio-incisal position of maxillary anterior teeth (Silverman, 1951).

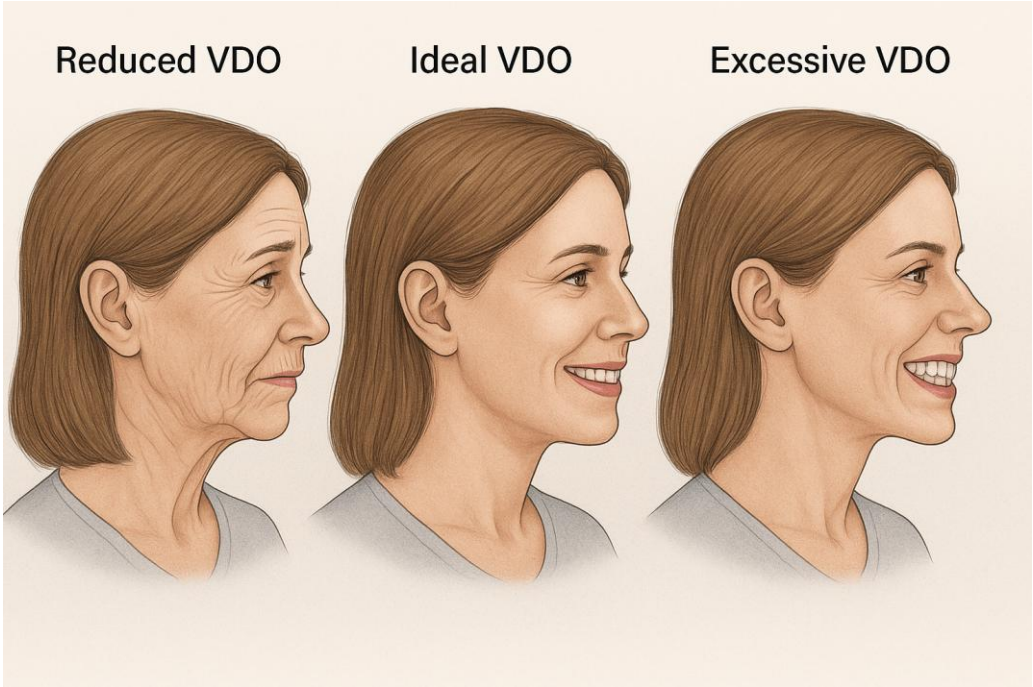
3.3 Aesthetic Evaluation

Esthetics is often the first indicator of altered vertical dimension:

- Signs of reduced VDO: sunken cheeks, angular cheilitis, reduced lower facial height.

- Signs of excessive VDO: overextended lips, facial elongation, phonetic distortion (Spear & Kokich, 2007).

Figure 5.1: Comparison of Facial Profiles at Reduced, Ideal, and Increased VDO



3.4 Swallowing and Functional Tests

Swallowing provides a physiologic reference for VDR. Patients instinctively return to their natural rest position after swallowing, and the VDO can then be estimated by subtracting the normal freeway space (Dawson, 2007).

3.5 Pre-extraction Records and Prosthesis Evaluation

Historical records—photos, old dentures, study models, or radiographs—serve as guides when planning VDO restoration. Well-functioning prostheses or minimally worn dentitions are useful references (Zarb & Bolender, 2004).

3.6 Digital Tools and Esthetic Templates

Digital tools enhance accuracy and visualisation:

- **Digital Smile Design (DSD)** helps simulate changes in vertical dimension.
- **Intraoral scanning** and **virtual articulators** assess occlusal harmony.

- **Facial scanning** and **esthetic templates** allow correlation between facial structures and proposed VDO (Mangano et al., 2017).

Method	Key Features	Limitations
Facial Measurements	Non-invasive, quick	Influenced by soft tissue laxity
Phonetic Evaluation	Functional and dynamic	Dependent on patient cooperation
Esthetic Evaluation	Guides' smile and facial harmony	Subjective to clinician judgment
Swallowing Tests	Reflect on physiological position	Altered by anxiety or neuromuscular issues
Pre-extraction Records	Valuable baseline	May be unavailable in older cases
Digital Tools	Integrated visualisation and precision	Requires digital infrastructure

Table 5.1: Summary of VDO Assessment Methods

4. Effects of Incorrect Vertical Dimension

4.1 Loss of VDO

Common in patients with attrition, erosion, or prosthetic wear:

- **Esthetic:** Collapsed profile, deepened nasolabial folds
- **Functional:** Inefficient mastication, altered speech
- **Muscular:** Fatigue, myofascial pain
- **TMJ:** Strain, disc displacement, dysfunction

4.2 Excessive VDO

Results from overbuilt prostheses or improper occlusal rehabilitation:

- **Speech Distortion:** Lisping, improper phonation
- **Swallowing Difficulty:** Discomfort in deglutition

- **TMJ Issues:** Condylar displacement, pain
- **Facial Discomfort:** Stretching, imbalance

5. Aesthetic and Phonetic Considerations

5.1 Esthetics

Restoring VDO improves:

- Lip support and closure
- Smile arc and incisal display
- Lower facial symmetry
- Youthful appearance

5.2 Phonetics

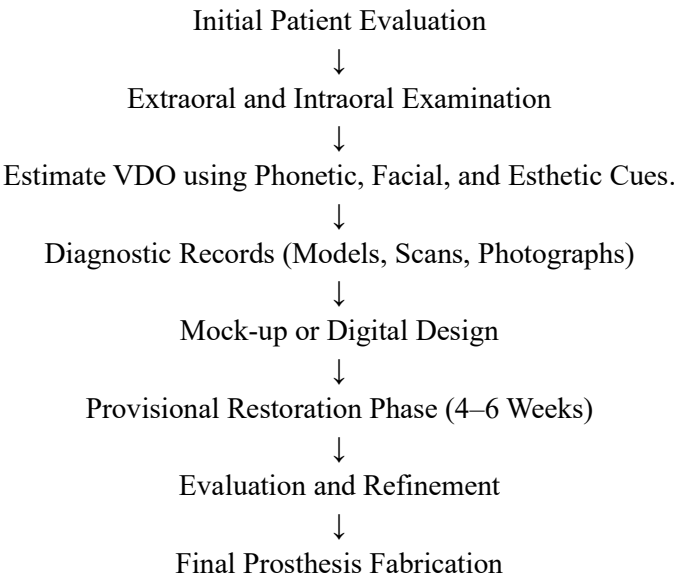
- **"F" and "V" sounds** evaluate labio-incisal relationships.
- **"S" sounds** assess horizontal/vertical overlaps important for clarity. Speech is a sensitive diagnostic tool for detecting vertical discrepancies (Silverman, 1951).

6. Role of Temporization and Patient Adaptation

Temporization allows patient adaptation before definitive prosthesis fabrication.

- **Provisional restorations** should be worn for 4–6 weeks.
- Evaluate function, comfort, esthetics, and phonetics.
- Patient feedback and clinician observations guide VDO refinement (Spear & Kokich, 2007).

Flowchart 5.1: Clinical Workflow for VDO Determination



7. Digital and Analogue Integration

Contemporary prosthodontics merges traditional techniques with digital innovations for greater precision:

- **DSD** for planning aesthetic and VDO-related changes
- **Virtual articulators** for occlusal simulation
- **Facebows and facial scans** for aligning midlines
- **Hybrid workflows** that combine analogue records with digital planning (Mangano et al., 2017; Kois & Kois, 2015)

Conclusion

Determining the vertical dimension is a cornerstone of full-mouth rehabilitation. Through a patient-centered, multi-modal approach—incorporating esthetics, phonetics, functional analysis, and advanced digital tools—clinicians can achieve accurate, stable, and esthetically pleasing results. Proper temporization, guided by patient feedback, ensures adaptation and enhances the predictability of final prosthetic outcomes. Mastery over vertical dimension determination significantly elevates the standard of prosthodontic care.

References

Boucher, C. O., Zwemer, T. J., & Swoope, C. C. (1997). *Prosthodontic treatment for edentulous patients* (11th ed.). Mosby.

Chatterjee, S., & Bhattacharya, A. (2010). Determination of vertical dimension of occlusion: A cephalometric study. *Journal of Indian Prosthodontic Society, 10*(4), 204–209.

Dawson, P. E. (2007). *Functional occlusion: From TMJ to smile design*. Elsevier Health Sciences.

Kois, D. E., & Kois, J. C. (2015). Comprehensive risk-based, diagnostically driven treatment planning. *Dental Clinics of North America, 59*(3), 1–16.

Mangano, F. G., Hauschild, U., Veronesi, G., Imburgia, M., Mangano, C., & Admakin, O. (2017). Trueness and precision of four intraoral scanners in oral implantology: A comparative in vitro study. *PLoS ONE, 12*(9), e0183239. https://doi.org/10.1371/journal.pone.0183239

Silverman, M. M. (1951). The speaking method is used in measuring the vertical dimension. *Journal of Prosthetic Dentistry, 1*(2), 203–211.

Spear, F. M., & Kokich, V. G. (2007). A multidisciplinary approach to esthetic dentistry. *Dental Clinics of North America, 51*(2), 487–505.

Turner, K. A., & Missirlian, D. M. (1984). Restoration of the extremely worn dentition. *Journal of Prosthetic Dentistry, 52*(4), 467–474.

Zarb, G. A., & Bolender, C. L. (2004). *Prosthodontic treatment for edentulous patients: Complete dentures and implant-supported prostheses* (12th ed.). Mosby Elsevier.

Deep Science Publishing
https://doi.org/10.70593/978-93-49910-79-9

DeepScience
Open Access Books

Chapter 6: Occlusal Evaluation and Interarch Relationship Analysis

Manu Rathee, Amit Tamrakar, Monika Nagpal, Manjot Kaur

Abstract: A comprehensive occlusal evaluation and interarch relationship analysis are fundamental components in full-mouth rehabilitation (FMR). Proper understanding of static and dynamic occlusion—including centric relation (CR), maximum intercuspation (MI), occlusal interferences, and guidance schemes—is essential to achieving long-term functional stability. This chapter explores the principles of occlusal assessment, methods for recording jaw relationships, and the clinical significance of vertical, horizontal, and sagittal discrepancies between arches. Emphasis is placed on diagnosing occlusal pathologies, analysing wear patterns, and integrating findings into prosthetic design. Accurate evaluation of interarch dynamics enables the development of a predictable, patient-specific rehabilitation plan tailored to both functional demands and esthetic expectations.

Keywords: Centric Relation, Functional Occlusion, Interarch Space, Occlusal Interference, Occlusal Plane.

1 Introduction

Occlusion is the cornerstone of full-mouth rehabilitation (FMR). A comprehensive evaluation and restoration of occlusion must include assessment of centric relation (CR), occlusal plane orientation, occlusal determinants, and the influence of functional and parafunctional movements. Achieving a harmonious and functional occlusal scheme is essential for the long-term stability, comfort, and success of prosthodontic treatment (Dawson, 2007; Kois & Kois, 2015). Careful occlusal planning ensures biomechanical stability and prevents restorative failures.

Dr. Manu Rathee,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Dr. Amit Tamrakar,
Department of Prosthodontics, Jamia Millia Islamia, New Delhi, India.
Dr. Monika Nagpal,
Department of Prosthodontics, Panjab University, Chandigarh, India.
Dr. Manjot Kaur,
Department of Conservative Dentistry and Endodontics, Panjab University, Chandigarh, India.

2. Centric Relation (CR): Definition and Methods of Recording

Centric relation is defined as the maxillomandibular relationship in which the condyles articulate with the thinnest avascular portion of their respective disks, positioned in the most anterior-superior location against the articular eminence. It is independent of tooth contact and is considered a reproducible and stable position, ideal for mounting diagnostic casts (Dawson, 2007; Hobo & Takayama, 1997).

2.1 Methods of Recording CR

- **Bimanual Manipulation (Dawson's Technique):** The clinician guides the mandible into CR by relaxing the elevator and lateral pterygoid muscles.
- **Lucia Jig and Leaf Gauge:** These tools help deprogram the musculature and eliminate posterior tooth contact for precise CR positioning (Duryodhan & Mahajan, 2021).
- **Gothic Arch Tracing:** Intraoral or extraoral tracings locate the centric position using a stylus-path tracing method.
- **Digital Systems:** Tools like T-Scan and ARCUSdigma improve the reproducibility and visualisation of CR registration (Kumar et al., 2021).

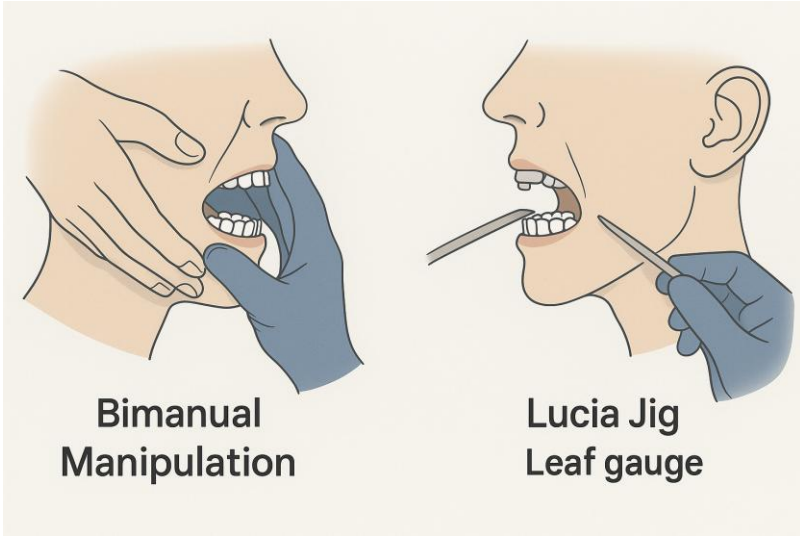


Figure 6.1: Schematic comparison of Bimanual Manipulation and Lucia Jig CR Recording

3. Occlusal Plane Orientation

A properly oriented occlusal plane enhances esthetics and function, contributing to the long-term prosthetic outcome.

3.1 Anterior Orientation

The interpupillary line acts as a reference for aligning the incisal plane horizontally and symmetrically (Duryodhan & Mahajan, 2021).

3.2 Posterior Orientation

The Camper's plane serves as a posterior reference, extending from the ala of the nose to the tragus of the ear. The Broadrick Occlusal Plane Analyser helps in designing a functional curve of Spee.

Reference Line	Application	Importance
Interpupillary Line	Anterior esthetics	Symmetry and smile arc
Camper's Plane	Posterior occlusal orientation	Functional mastication
Broadrick Analyzer	Curve of Spee determination	Balanced occlusal contacts

Table 6.1: Key Reference Lines for Occlusal Plane Orientation

4. Anterior and Posterior Determinants of Occlusion

4.1 Anterior Determinants

Anterior guidance, defined by incisal edge position, overjet, and overbite, ensures disocclusion of posterior teeth during functional excursions (Kois & Kois, 2015).

4.2 Posterior Determinants

Condylar guidance is shaped by the anatomy of the articular eminence and affects cusp-fossa morphology during mandibular movements.

4.3 Occlusal Scheme Design

Depending on patient needs and remaining dentition, schemes like mutually protected occlusion, group function, or canine guidance may be chosen (Hobo & Takayama, 1997).

5. Functional and Parafunctional Habits

5.1 Functional Movements

Activities such as chewing, swallowing, and speaking require an occlusion free of interferences. Custom anterior guidance tables may be used for verification (Kumar et al., 2021).

5.2 Parafunctional Habits

Habits like bruxism and clenching can cause occlusal wear, muscle fatigue, and prosthesis failure.

Management Strategies:

- Occlusal splints or night guards
- Behaviour modification therapy
- Use of high-strength materials such as monolithic zirconia

6. Interarch Space and Occlusal Clearance

Adequate vertical and horizontal space is fundamental for the design and function of prostheses. Evaluation is done using:

- Wax rims
- Mounted casts
- Digital scans
- Vertical dimension assessment (Jain et al., 2013)

7. Role of Articulators and Facebows

7.1 Semi-Adjustable Articulators

Appropriate for most FMR cases; allows simulation of condylar and Bennett movements.

7.2 Fully Adjustable Articulators

Provide high precision for complex rehabilitation involving TMJ dysfunction or significant occlusal discrepancies.

7.3 Facebows

Used to transfer the spatial relationship of the maxillary arch to the articulator based on the cranial base (Dawson, 2007).

8. Digital Occlusion Analysis

Modern digital systems provide accurate, real-time occlusal data:

- **T-Scan:** Evaluates timing and force distribution of occlusal contacts.
- **Intraoral Scanners:** Capture occlusal anatomy with high precision.

- **Virtual Articulators:** Simulate jaw dynamics digitally (Kumar et al., 2021).

9. Occlusal Evaluation and Rehabilitation Workflow

Patient History and Clinical Examination
↓
Diagnostic Casts and Digital Scans
↓
Centric Relation Registration
↓
Occlusal Plane Analysis and Mock-Up
↓
Functional and Parafunctional Analysis
↓
Provisional Phase and Occlusal Adjustment
↓
Final Prosthesis Design and Delivery

10. Establishing Occlusal Harmony

Occlusal harmony refers to a functional occlusion without interferences that allows for smooth, reproducible mandibular movements. It is achieved by establishing stable contact points, ideal cusp inclinations, and well-defined anterior guidance. Post-insertion equilibration and follow-up are essential, especially in cases with parafunctional activity or TMJ issues (Duryodhan & Mahajan, 2021).

Conclusion

Occlusal evaluation and interarch relationship assessment are essential pillars of full-mouth rehabilitation. Accurate recording of centric relation, proper occlusal plane orientation, and careful consideration of functional determinants help avoid long-term prosthetic failures. The integration of digital analysis and advanced articulators ensures reproducibility, patient comfort, and functional success.

References

Dawson, P. E. (2007). *Functional occlusion: From TMJ to smile design*. Elsevier Health Sciences.

Duryodhan, S., & Mahajan, A. (2021). Occlusal schemes and philosophies in full mouth rehabilitation – A review. *International Journal of Science and Research*, 10(8), 488–493.

Hobo, S., & Takayama, H. (1997). *Oral rehabilitation: Clinical determination of occlusion*. Quintessence Publishing.

Jain, A. R., Nallaswamy, D., Ariga, P., & Philip, J. M. (2013). Full mouth rehabilitation of a patient with reduced vertical dimension using multiple metal ceramic restorations. *Contemporary Clinical Dentistry*, 4(4), 531–536.

Kois, D. E., & Kois, J. C. (2015). Comprehensive risk-based, diagnostically driven treatment planning. *Dental Clinics of North America*, 59(3), 1–16.

Kumar, D., Hazra, R., Srivastava, A., Khattak, A., & Kalia, D. (2021). Digital occlusion in full mouth rehabilitation – A new era of precision. *Journal of Prosthodontics and Restorative Dentistry*, 9(2), 45–52.

Deep Science Publishing
https://doi.org/10.70593/978-93-49910-79-9

Chapter 7: Treatment Planning in Full-Mouth Rehabilitation

Mahima Singh, Stalin M, Aarti Sulekh, Nang Nalika Moungkhom

Abstract: Treatment planning in full-mouth rehabilitation (FMR) is a multidimensional process that integrates clinical findings, diagnostic records, patient expectations, and long-term prognostic considerations. It involves the systematic evaluation of dental, periodontal, occlusal, functional, esthetic, and systemic parameters to develop a comprehensive, individualised, and sequenced treatment strategy. Key components include risk assessment, vertical dimension analysis, occlusal scheme selection, and restorative space management. Modern treatment planning emphasises an interdisciplinary approach and leverages digital diagnostics and simulation tools for precise communication and execution. A well-structured treatment plan ensures predictability, longevity, and patient satisfaction in complex rehabilitative cases.

Keywords: Digital workflow, full-mouth rehabilitation, occlusal scheme, prosthodontics, treatment planning.

1 Introduction

Full-mouth rehabilitation (FMR) requires not only technical expertise but also a comprehensive treatment planning protocol that addresses the complex interplay of biological, mechanical, esthetic, and psychosocial factors. The planning process involves systematic analysis of the patient's oral and systemic conditions, functional demands, esthetic expectations, and financial constraints to develop a tailored and phased approach (Kois & Kois, 2015). Proper treatment sequencing—from disease control to definitive prosthesis delivery—enhances predictability and long-term success.

Mahima Singh,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Stalin M,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Aarti Sulekh,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Dr. Nang Nalika Moungkhom,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.

This chapter explores the fundamental concepts, strategies, and risk-based considerations that guide treatment planning in FMR, including the choice between sequential and simultaneous approaches, aesthetic assessments, geriatric concerns, and phased treatment execution.

2. Sequential versus Simultaneous Full-Mouth Rehabilitation

Treatment planning in FMR begins with a crucial decision: whether to follow a **sequential** or **simultaneous** rehabilitation protocol.

2.1 Sequential Rehabilitation

Sequential treatment divides the rehabilitation process into organised, manageable phases. This approach allows progressive assessment of biologic and esthetic parameters, enabling mid-course corrections. It reduces biological stress, enhances psychological acceptance, and facilitates financial planning (Duryodhan & Mahajan, 2021). Moreover, it aids in identifying complications early and adapting accordingly.

2.2 Simultaneous Rehabilitation

Simultaneous rehabilitation involves comprehensive arch or full-mouth restoration in a single coordinated phase. It is suited for patients with generalised severe tooth wear or high aesthetic demands. It provides immediate occlusal and esthetic improvement but demands meticulous preoperative planning, systemic stability, and extended clinical sessions (Jain et al., 2013).

Approach	Advantages	Limitations
Sequential FMR	Flexibility, phased risk management, and adaptation	Longer treatment time, delayed outcome
Simultaneous FMR	Immediate occlusal harmony, esthetic outcome	Requires detailed planning, higher patient stress

Table 7.1: Advantages of Sequential vs Simultaneous Rehabilitation

3. Aesthetic Risk Assessment

Aesthetic evaluation plays a critical role in patient satisfaction and psychological well-being. It involves:

- **Smile analysis:** Tooth display at rest and during smiling, lip mobility, and midline alignment.

- **Tooth proportions:** Evaluation of golden proportions and width-to-length ratios.
- **Gingival architecture:** Assessment of symmetry, smile arc, and gingival display (Dawson, 2007).
- **Material considerations:** Shade selection, translucency, and surface texture matching.
- **Digital tools:** Digital Smile Design (DSD), mock-ups, and photographic overlays improve visualisation and communication (Kumar et al., 2021).

High esthetic-risk patients—those with high smile lines or asymmetry—require interdisciplinary planning involving orthodontists, periodontists, or plastic surgeons.

4. Phased Approach to Rehabilitation

Phased protocols ensure controlled progression and validation of biological and functional responses.

4.1 Phase I: Disease Control

Initial therapy includes caries excavation, periodontal therapy, endodontic treatment, and extraction of non-restorable teeth. Establishing a healthy baseline is critical before initiating prosthetic steps.

4.2 Phase II: Diagnostic Phase

This includes CR registration, facebow transfer, diagnostic wax-up, and evaluation of vertical dimension, occlusal plane, and anterior guidance (Hobo & Takayama, 1997).

4.3 Phase III: Provisionalization Phase

Long-term provisionals test esthetics, function, phonetics, and TMJ response. This stage is critical for adjusting VDO and verifying occlusal schemes in vivo.

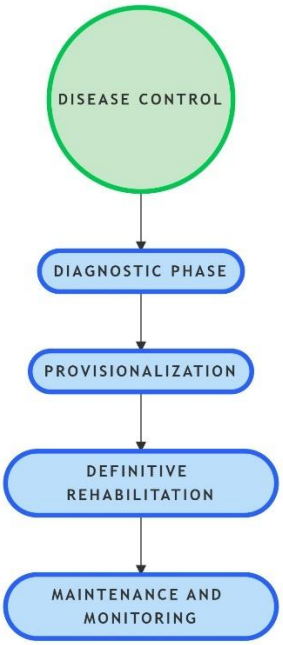
4.4 Phase IV: Definitive Rehabilitation

The definitive restorations are fabricated based on validated parameters. Accurate impressions, material selection, and lab communication are essential for success (Jain et al., 2013).

4.5 Phase V: Maintenance Phase

Regular reviews, hygiene reinforcement, occlusal equilibration, and patient education sustain the rehabilitation outcome.

Flowchart 7.1: Phased Approach in Full Mouth Rehabilitation



5. Considerations in Geriatric and Medically Compromised Patients

5.1 Geriatric Considerations

Older patients may present with reduced salivary flow, bone loss, and compromised manual dexterity. Simplified, functional prosthetic designs are often preferred. Implant-retained prostheses improve stability and satisfaction when bone quality permits (Felton, 2009).

5.2 Medically Compromised Patients

Conditions such as diabetes, cardiovascular disease, and immunosuppression affect treatment prognosis and timing. Collaboration with physicians, antibiotic prophylaxis when indicated, and stress-reduction protocols are critical (Budtz-Jørgensen, 1981). Modifications in surgical protocols, like delayed implant loading, are often warranted.

5.3 Treatment Priorities

Focus should remain on:

- Maintaining oral and systemic health
- Restoring essential function
- Enhancing esthetics within realistic expectations
- Ensuring psychological comfort and simplified maintenance

Conclusion

Treatment planning in full-mouth rehabilitation is a comprehensive and individualised process rooted in accurate diagnostics and risk-based strategy selection. Success depends on choosing the appropriate approach (sequential or simultaneous), conducting a meticulous aesthetic and functional evaluation, adhering to a phased rehabilitation workflow, and adapting protocols for geriatric and medically complex patients. By integrating digital diagnostics, interdisciplinary collaboration, and evidence-based techniques, clinicians can achieve durable, functional, and esthetically pleasing outcomes that enhance patient quality of life.

References

Budtz-Jørgensen, E. (1981). Oral mucosal lesions are associated with the wearing of removable dentures. *Journal of Oral Pathology*, 10(2), 65–80.

Dawson, P. E. (2007). *Functional occlusion: From TMJ to smile design*. Elsevier Health Sciences.

Duryodhan, S., & Mahajan, A. (2021). Occlusal schemes and philosophies in full mouth rehabilitation – A review. *International Journal of Science and Research*, 10(8), 488–493.

Felton, D. (2009). Edentulism and comorbid factors. *Journal of Prosthodontics*, 18(2), 88–96.

Hobo, S., & Takayama, H. (1997). *Oral rehabilitation: Clinical determination of occlusion*. Quintessence Publishing.

Jain, A. R., Nallaswamy, D., Ariga, P., & Philip, J. M. (2013). Full mouth rehabilitation of a patient with reduced vertical dimension using multiple metal ceramic restorations. *Contemporary Clinical Dentistry*, 4(4), 531–536.

Kois, D. E., & Kois, J. C. (2015). Comprehensive risk-based, diagnostically driven treatment planning. *Dental Clinics of North America*, 59(3), 1–16.

Kumar, D., Hazra, R., Srivastava, A., Khattak, A., & Kalia, D. (2021). Digital occlusion in full mouth rehabilitation – A new era of precision. *Journal of Prosthodontics and Restorative Dentistry*, 9(2), 45–52.

Deep Science Publishing
https://doi.org/10.70593/978-93-49910-79-9

Chapter 8: Restorative Materials in Full-Mouth Rehabilitation

Manu Rathee, Stalin M, Komalpreet Kaur, Balavignesh S

Abstract: The selection of restorative materials in full-mouth rehabilitation (FMR) is pivotal to achieving optimal esthetics, function, biocompatibility, and long-term success. The materials must withstand masticatory forces, integrate with soft and hard tissues, and fulfil both mechanical and biological requirements of the oral environment. Contemporary options include metal-ceramics, all-ceramics, high-performance polymers, and zirconia-based systems. Each material offers unique advantages in terms of strength, aesthetic potential, wear resistance, and digital adaptability. This chapter provides a comprehensive overview of material selection criteria, clinical indications, and performance characteristics relevant to FMR. Emphasis is placed on individualised material choices based on occlusal loading, esthetic zones, interarch space, and patient-specific needs.

Keywords: All-ceramics, biocompatibility, digital workflow, metal-ceramics, zirconia

1 Introduction

Restorative materials are the structural and esthetic backbone of full-mouth rehabilitation (FMR), playing a pivotal role in achieving biological harmony, functional durability, and long-term clinical success. The complexity of FMR demands a thorough understanding of the material properties, their interaction with occlusal dynamics, and compatibility with the digital workflow. Advances in dental material sciences—ranging from high-strength ceramics to hybrid composites—have expanded the clinician's armamentarium, enabling personalised restorative solutions tailored to esthetic zones, loading conditions, and patient-specific needs (Dawson, 2007; Kois & Kois, 2015).

Manu Rathee,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Dr. Stalin M,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Dr. Komalpreet Kaur,
Department of Prosthodontics, Panjab University, Chandigarh, India.
Dr. Balavignesh S,

This chapter outlines the clinical indications, comparative benefits, and limitations of commonly used materials in FMR, along with insights into digital fabrication technologies and temporization protocols

2. Full Coverage Crowns: PFM, Zirconia, and Lithium Disilicate

Full coverage crowns remain a cornerstone in the restoration of structurally compromised teeth in FMR.

2.1 Porcelain-Fused-to-Metal (PFM)

PFM crowns offer excellent mechanical performance and long-standing clinical success due to their durable metal substructure. However, challenges like veneering porcelain chipping and marginal discolouration can compromise esthetics over time (Hobo & Takayama, 1997).

2.2 Monolithic Zirconia

Zirconia crowns provide superior flexural strength and are ideally suited for posterior and high-load areas. Improvements in translucency have expanded their application in the esthetic zone. Proper occlusal adjustments and polishing are essential to minimise wear on opposing dentition (Kumar et al., 2021).

2.3 Lithium Disilicate

This glass-ceramic material offers enamel-like translucency and is ideal for anterior and premolar restorations. Although its strength is lower than zirconia, careful case selection and conservative preparation ensure favourable outcomes (Jain et al., 2013).

Material	Strength	Esthetics	Ideal Use	Limitations
Porcelain-Fused-to-Metal	High	Moderate	Anterior and Posterior	Veneer chipping, marginal staining
Monolithic Zirconia	Very High	Good to Excellent	Posterior, high-stress areas	Opposing tooth wear
Lithium Disilicate	Moderate	Excellent	Anterior, premolar areas	Lower fracture resistance

Table 8.1: Comparison of Crown Materials in Full-Mouth Rehabilitation

3. CAD/CAM Milled Restorations

Computer-aided design and manufacturing (CAD/CAM) technology has revolutionised the way restorations are fabricated in FMR.

Digital impressions using intraoral scanners eliminate errors from conventional impressions and enhance patient comfort. CAD/CAM enables the production of restorations from zirconia, lithium disilicate, or hybrid ceramics with excellent marginal adaptation and occlusal precision. The integration of digital design enhances clinician-laboratory coordination and reduces treatment turnaround time, particularly beneficial in staged FMR workflows (Kumar et al., 2021).

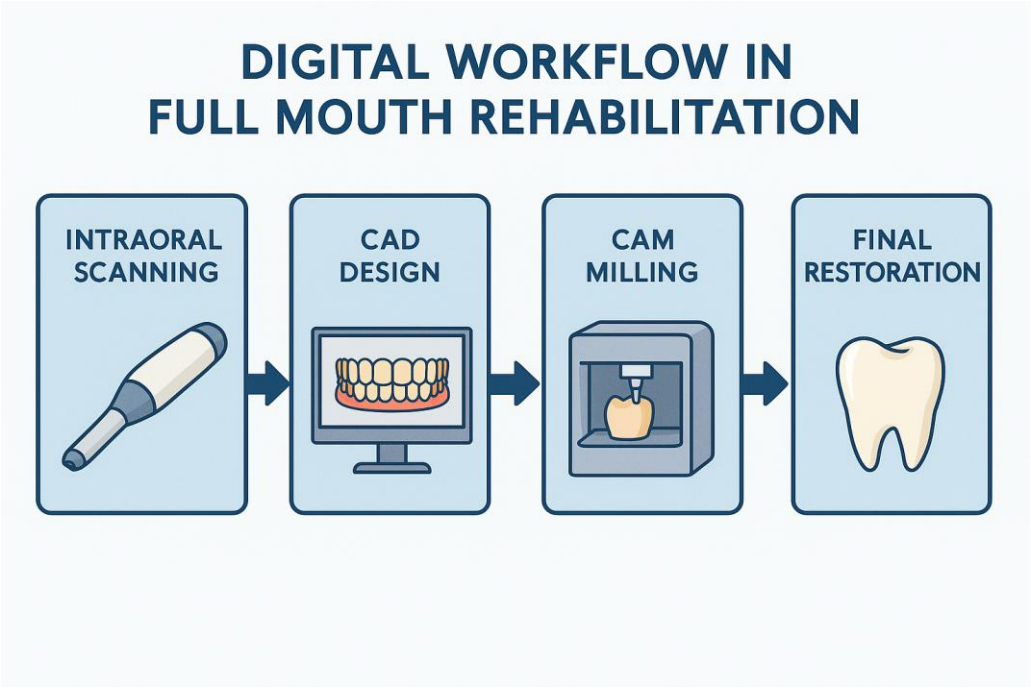


Figure 8.1: Digital Workflow in Full Mouth Rehabilitation – from Scan to Final Restoration

4. Hybrid and Layered Restorations

In scenarios requiring both strength and aesthetics, hybrid and layered techniques are employed.

Zirconia cores veneered with translucent ceramics provide a balance of structural support and natural appearance. However, veneering ceramics remain prone to chipping, especially in posterior zones. The introduction of multilayered zirconia blocks and gradient ceramics addresses this by creating esthetically stratified monolithic units (Duryodhan & Mahajan, 2021).

Polymer-infiltrated ceramic networks (PICNs) serve as biomimetic alternatives by combining the flexibility of polymers with ceramic durability. These are useful in minimally invasive situations and for teeth with limited structural support.

5. Temporization Materials and Protocols

Temporization serves a diagnostic and functional purpose in FMR, enabling real-time assessment of vertical dimension, esthetics, speech, and occlusal schemes.

5.1 Materials

- **PMMA resins**: High strength and longevity for long-term provisionals.
- **Bis-acrylic composites**: Better marginal fit and ease of handling but less resistant to high occlusal loads (Jain et al., 2013).

5.2 Techniques

Provisionals can be fabricated via:

- Direct method (chairside)
- Indirect method (lab-fabricated)
- CAD/CAM-based (digitally milled)

Flowchart 8.1: Temporization Workflow in Full Mouth Rehabilitation

Tooth Preparation
↓
Provisional Fabrication (PMMA or Bis-Acrylic)
↓
Clinical Assessment (Function, Esthetics, Phonetics)
↓
Adjustments Based on Feedback
↓
Transfer to Final Prosthesis Design

Conclusion

The success of full-mouth rehabilitation is intrinsically linked to the judicious selection of restorative materials. A thorough understanding of the strengths and limitations of PFM, zirconia, lithium disilicate, and modern hybrid systems allows clinicians to balance esthetic demands with functional longevity. The integration of CAD/CAM technology and advanced temporization strategies further enhances predictability and

efficiency. By tailoring material choices to patient-specific needs and clinical scenarios, prosthodontists can deliver restorations that are esthetically superior, biologically compatible, and structurally durable.

References

Dawson, P. E. (2007). *Functional occlusion: From TMJ to smile design*. Elsevier Health Sciences.

Duryodhan, S., & Mahajan, A. (2021). Occlusal schemes and philosophies in full mouth rehabilitation – A review. *International Journal of Science and Research*, 10(8), 488–493.

Hobo, S., & Takayama, H. (1997). *Oral rehabilitation: Clinical determination of occlusion*. Quintessence Publishing.

Jain, A. R., Nallaswamy, D., Ariga, P., & Philip, J. M. (2013). Full mouth rehabilitation of a patient with reduced vertical dimension using multiple metal ceramic restorations. *Contemporary Clinical Dentistry*, 4(4), 531–536.

Kois, D. E., & Kois, J. C. (2015). Comprehensive risk-based, diagnostically driven treatment planning. *Dental Clinics of North America*, 59(3), 1–16.

Kumar, D., Hazra, R., Srivastava, A., Khattak, A., & Kalia, D. (2021). Digital occlusion in full mouth rehabilitation – A new era of precision. *Journal of Prosthodontics and Restorative Dentistry*, 9(2), 45–52.

Deep Science Publishing
https://doi.org/10.70593/978-93-49910-79-9

Chapter 9: Occlusal Scheme Design in Full-Mouth Rehabilitation

Balavignesh S, Manu Rathee, Sarthak Singh Tomar, Stalin M,

Abstract: Occlusal scheme design is a critical component of full-mouth rehabilitation (FMR), directly influencing function, comfort, joint health, and the longevity of prosthetic restorations. The selection and implementation of an appropriate occlusal scheme must consider the patient's neuromuscular coordination, vertical dimension, parafunctional habits, periodontal status, and existing occlusal anatomy. Commonly employed schemes include mutually protected occlusion, group function, and balanced occlusion—each with unique clinical indications and biomechanical implications. This chapter explores the philosophies, criteria, and clinical guidelines for selecting occlusal schemes in FMR. It also emphasises the importance of individualised planning, articulator use, anterior guidance evaluation, and digital aids in achieving a harmonious, stable, and interference-free occlusion.

Keywords: Anterior guidance, balanced occlusion, full-mouth rehabilitation, group function, mutually protected occlusion

1 Introduction

Occlusal scheme design is a fundamental aspect of full-mouth rehabilitation (FMR), directly influencing the function, comfort, and longevity of the prosthetic outcome. A properly selected and executed occlusal scheme helps prevent overloading of individual teeth or implants, ensures harmonious mandibular movements, supports periodontal and peri-implant health, and optimises esthetic outcomes. The ideal occlusal design is not universal but patient-specific, tailored according to anatomical, functional, and biomechanical variables (Dawson, 2007; Kois & Kois, 2015).

Balavignesh S,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Dr. Manu Rathee,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Sarthak Singh Tomar,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Stalin M,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.

This chapter explores the clinical rationale and application of various occlusal schemes, including canine guidance, group function, mutually protected occlusion, and their modifications in implant-supported FMR.

2. Canine Guidance and Group Function

2.1 Canine Guidance

Canine guidance is an occlusal scheme in which the maxillary and mandibular canines disengage all posterior teeth during lateral excursions. Due to their favourable root morphology and position, canines are capable of absorbing lateral forces, minimising stress on posterior segments (Hobo & Takayama, 1997). This occlusal configuration promotes neuromuscular harmony, protects the temporomandibular joint (TMJ), and reduces the risk of parafunctional damage. It is best suited for patients with intact canines and sound periodontal support.

2.2 Group Function

Group function involves the distribution of occlusal contacts across multiple posterior teeth on the working side during lateral movements. It is indicated in cases where the canines are missing, worn, or periodontally compromised (Duryodhan & Mahajan, 2021). While it provides better load distribution across the arch, it necessitates the elimination of non-working side contacts to avoid harmful lateral interferences. Selection between canine guidance and group function must be based on an individualised assessment of periodontal support, tooth position, and functional demands.

3. Balanced Occlusion and Mutually Protected Occlusion

3.1 Balanced Occlusion

Balanced occlusion aims to achieve simultaneous bilateral contacts in centric and eccentric movements. This scheme is primarily employed in complete denture prosthodontics to enhance denture stability and reduce displacement during function (Zarb et al., 2013). It is not suitable for fixed restorations or implant-supported prostheses due to the transmission of lateral forces that may compromise periodontal or peri-implant tissues.

3.2 Mutually Protected Occlusion

Mutually protected occlusion (MPO) is the gold standard for natural dentition and implant-supported reconstructions. In this scheme, anterior teeth disclude posterior teeth during eccentric movements, while posterior teeth provide stable vertical contacts in centric relation (Dawson, 2007). MPO reduces lateral forces, preserves the periodontium, and enhances biomechanical efficiency. Precise coordination of anterior

guidance, condylar guidance, and occlusal plane orientation is essential for achieving a successful MPO.

Parameter	Balanced Occlusion	Mutually Protected Occlusion
Application	Complete dentures	Natural dentition, implants
Lateral Force Control	Forces distributed	Forces minimized
Risk to Periodontium	High	Low
Esthetic Consideration	Less critical	Highly critical
Stability in FMR	Limited	Preferred standard

Table 9.1: Comparison Between Balanced and Mutually Protected Occlusion

4. Customised Occlusal Schemes for Implant-Supported FMR

Implants differ fundamentally from natural teeth due to their lack of periodontal ligament, absence of proprioception, and reduced shock absorption capacity. As a result, the occlusal scheme in implant-supported FMR must prioritise **load control and biomechanical safety** (Misch, 2015).

Key Modifications in Implant Occlusion:

- **Light centric contacts** on implants
- **Minimal or eliminated lateral contacts** in excursive movements
- **Shallow anterior guidance** to reduce off-axis loading
- **Broader occlusal tables** to distribute forces
- **No non-working side interferences**

When implant-supported canines are restored, **group function** is often preferred to distribute lateral forces across multiple teeth, minimising stress on individual implants. Additionally, **digital occlusal analysis systems** like T-Scan and computerised jaw tracking assist in visualising occlusal force distribution, enabling objective refinement of implant occlusion (Kumar et al., 2021).

Successful implant-supported FMR relies on designing a custom occlusal scheme that balances esthetics, function, and biomechanical integrity while preserving osseointegration.

Conclusion

Occlusal scheme design is foundational to the clinical success of full-mouth rehabilitation. Thoughtful selection between canine guidance, group function, balanced occlusion, and mutually protected occlusion allows clinicians to address individual anatomic and functional needs. Implant-supported rehabilitations require special attention to biomechanical principles, necessitating modified occlusal strategies to protect peri-implant tissues. Through individualised occlusal planning, guided by sound prosthodontic principles and supported by digital technologies, clinicians can ensure functional harmony, esthetic excellence, and long-term stability in FMR.

References

- Dawson, P. E. (2007). *Functional occlusion: From TMJ to smile design*. Elsevier Health Sciences.
- Duryodhan, S., & Mahajan, A. (2021). Occlusal schemes and philosophies in full mouth rehabilitation – A review. *International Journal of Science and Research*, 10(8), 488–493.
- Hobo, S., & Takayama, H. (1997). *Oral rehabilitation: Clinical determination of occlusion*. Quintessence Publishing.
- Kois, D. E., & Kois, J. C. (2015). Comprehensive risk-based, diagnostically driven treatment planning. *Dental Clinics of North America*, 59(3), 1–16.
- Kumar, D., Hazra, R., Srivastava, A., Khattak, A., & Kalia, D. (2021). Digital occlusion in full mouth rehabilitation – A new era of precision. *Journal of Prosthodontics and Restorative Dentistry*, 9(2), 45–52.
- Misch, C. E. (2015). *Contemporary implant dentistry* (3rd ed.). Mosby Elsevier.
- Zarb, G. A., Bolender, C. L., & Eckert, S. E. (2013). *Prosthodontic treatment for edentulous patients: Complete dentures and implant-supported prostheses* (13th ed.). Elsevier.

Deep Science Publishing
https://doi.org/10.70593/978-93-49910-79-9

Chapter 10: Tooth Preparation Guidelines in Full-Mouth Rehabilitation

Komal Saroya, Aarti Sulekh, Stalin M, Nang Nalika Moungkhom

Abstract: Tooth preparation is a fundamental determinant of success in full-mouth rehabilitation (FMR), directly influencing the biological compatibility, mechanical durability, and esthetic outcome of prosthetic restorations. This chapter explores essential principles of preparation, including the ferrule effect, axial reduction, and finish line design, highlighting their impact on restoration longevity and periodontal health. It contrasts deep chamfer and shoulder margin designs and discusses clinical considerations for choosing between minimally invasive and aggressive preparation strategies. Emphasis is placed on preserving tooth structure without compromising restorative integrity, aligning modern preparation philosophy with evolving material sciences and adhesive techniques to optimise long-term functional and esthetic outcomes.

Keywords: Axial reduction, ferrule effect, finish line design, full-mouth rehabilitation, minimally invasive preparation.

1 Introduction

Tooth preparation is a foundational step in full-mouth rehabilitation (FMR), with far-reaching implications on restoration durability, periodontal health, esthetic integration, and overall biomechanical performance. Proper tooth preparation must strike a balance between the conservation of tooth structure and providing adequate space for restorative materials. It demands a thorough understanding of mechanical principles, biological limitations, esthetic requirements, and material-specific needs (Dawson, 2007; Kois & Kois, 2015).

Komal Saroya,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Aarti Sulekh,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Stalin M,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Nang Nalika Moungkhom,

This chapter outlines key elements such as ferrule effect, axial reduction, margin design, and the decision-making process between minimally invasive and aggressive preparations, each tailored to achieve long-term restorative success in FMR.

2. Ferrule, Axial Reduction, and Finish Lines

2.1 The Ferrule Effect

The ferrule effect involves creating a 1.5–2 mm band of sound coronal tooth structure above the crown margin encircling the core or post. This ferrule enhances fracture resistance, particularly in endodontically treated teeth, by dissipating occlusal forces and reinforcing the root (Sorensen & Engelman, 1990). In cases of insufficient ferrule, crown lengthening or orthodontic extrusion may be required to expose additional tooth structure.

2.2 Axial Reduction

Axial reduction must be determined by the restorative material and the esthetic zone. Recommended reductions include:

- **Metal-ceramic crowns**: 1.2–1.5 mm
- **Monolithic zirconia**: 1.0–1.5 mm
- **Lithium disilicate**: 1.5 mm

Uniform axial reduction ensures sufficient material thickness, structural integrity, and esthetic contour, while avoiding pulpal trauma (Jain et al., 2013).

2.3 Finish Lines

Finish line design impacts both periodontal health and restoration integrity. Key designs include:

- **Deep Chamfer**: Suitable for zirconia and metal-ceramic crowns; offers stress distribution with better fit.
- **Shoulder with rounded internal angle**: Indicated for all-ceramic crowns in anterior regions to enhance translucency and mask underlying tooth colour (Duryodhan & Mahajan, 2021).

Margins should be:

- Smooth and continuous
- Preferably supragingival (subgingival only when esthetics demand)

- Placed concerning the biological width

3. Margin Design: Deep Chamfer and Shoulder

Margin design governs marginal adaptation, aesthetic blending, and ease of impression making.

Feature	Deep Chamfer	Shoulder
Tooth Preservation	Greater	Lesser
Strength Support	Ideal for metal-ceramic, zirconia	Ideal for aesthetic ceramics
Stress Concentration	Minimal due to rounded contours	Higher (requires precision)
Esthetics	Good to excellent	Excellent (especially in the aesthetic zone)

Table 10.1: Comparison of Deep Chamfer and Shoulder Margins

Deep chamfers provide sufficient bulk for material while conserving more tooth structure. Shoulder margins enable enhanced ceramic layering in esthetically demanding regions, though they require precise execution to prevent stress concentration.

4. Minimally Invasive and Aggressive Preparation Approaches

4.1 Minimally Invasive Preparation

Guided by biomimetic and adhesive dentistry principles, minimally invasive preparations aim to conserve enamel and dentin, improve bond strength, and reduce pulpal trauma. This is especially applicable in:

- Veneers
- Onlays
- Adhesive crowns
- Partial coverage restorations

Materials like lithium disilicate and PICNs (polymer-infiltrated ceramic networks) perform well under minimal thickness due to strong adhesive bonding (Kumar et al., 2021).

4.2 Aggressive Preparation

Aggressive tooth preparation becomes necessary in cases involving:

- Severe attrition
- Mutilated dentition
- Occlusal plane correction
- Vertical dimension restoration
- Bruxism cases requiring increased material thickness

These situations necessitate a greater reduction to accommodate durable materials and ensure prosthetic strength. Preoperative planning tools like wax-ups, preparation guides, and mock-ups allow precision in balancing biological preservation and prosthetic demands (Hobo & Takayama, 1997).

5. Clinical Guidelines for Optimal Preparation

Key clinical principles include:

- Use of magnification for accuracy
- Rounded internal angles to reduce stress
- Smooth finish lines to aid marginal adaptation
- Avoiding undercuts and unsupported enamel
- Periodic evaluation of pulpal proximity and periodontal response

Conclusion

Tooth preparation in full-mouth rehabilitation is a decisive factor in determining long-term prosthetic success. A systematic approach that incorporates ferrule design, appropriate axial reduction, precise margin execution, and case-specific preparation strategies ensures optimal biological and mechanical outcomes. The modern prosthodontist must integrate conservative principles with material science, digital workflows, and patient-specific considerations to preserve natural tooth structure while delivering predictable, esthetic, and functionally durable rehabilitations.

References

Dawson, P. E. (2007). *Functional occlusion: From TMJ to smile design*. Elsevier Health Sciences.

Duryodhan, S., & Mahajan, A. (2021). Occlusal schemes and philosophies in full mouth rehabilitation – A review. *International Journal of Science and Research*, 10(8), 488–493.

Hobo, S., & Takayama, H. (1997). *Oral rehabilitation: Clinical determination of occlusion*. Quintessence Publishing.

Jain, A. R., Nallaswamy, D., Ariga, P., & Philip, J. M. (2013). Full mouth rehabilitation of a patient with reduced vertical dimension using multiple metal ceramic restorations. *Contemporary Clinical Dentistry*, 4(4), 531–536.

Kumar, D., Hazra, R., Srivastava, A., Khattak, A., & Kalia, D. (2021). Digital occlusion in full mouth rehabilitation – A new era of precision. *Journal of Prosthodontics and Restorative Dentistry*, 9(2), 45–52.

Sorensen, J. A., & Engelman, M. J. (1990). Ferrule design and fracture resistance of endodontically treated teeth. *Journal of Prosthetic Dentistry*, 63(5), 529–536.

Deep Science Publishing
https://doi.org/10.70593/978-93-49910-79-9

Chapter 11: Impression Techniques in Full-Mouth Rehabilitation

Manu Rathee, Stalin M, Shefali Singla, Balavignesh S

Abstract: Accurate impressions are vital to the success of full-mouth rehabilitation, as they provide the foundation for precisely fitting and functionally stable restorations. This chapter explores conventional and digital impression techniques, emphasising material selection, tray design, gingival retraction, and moisture control strategies. Techniques such as dual-viscosity, segmental, and monophase methods are discussed alongside implant-specific protocols and the growing role of intraoral scanners. The integration of these methods into full-mouth workflows enhances clinical accuracy and patient outcomes. A systematic, case-driven approach to impression making ensures that clinicians can capture detail-critical anatomical structures essential for long-term prosthetic success.

Keywords: Digital impressions, full-mouth rehabilitation, gingival retraction, impression techniques, and intraoral scanners.

1 Introduction

Accurate impressions are foundational to the success of full-mouth rehabilitation (FMR), as they capture the essential details of prepared teeth, soft tissue contours, occlusal relationships, and interarch space. The choice of impression technique significantly influences marginal adaptation, prosthetic fit, and long-term success of restorations. In the context of FMR, where precision is paramount, the clinician must select the appropriate materials and techniques based on clinical complexity, patient factors, and restorative goals (Dawson, 2007; Kois & Kois, 2015).

Manu Rathee,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Stalin M,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Shefali Singla,
Department of Prosthodontics, Panjab University, Chandigarh, India.
Balavignesh S,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.

This chapter discusses conventional and digital impression strategies, tray selection, material considerations, gingival retraction methods, and protocols tailored to complex FMR cases.

2. Tray Selection in Full-Mouth Rehabilitation

Proper tray selection ensures dimensional accuracy, adequate material bulk, and patient comfort. Options include:

- **Stock Trays**: Economical and readily available, but often require modification and may not provide uniform material thickness.
- **Custom Trays**: Recommended for FMR due to enhanced stability, uniform space for impression material, and reduced distortion (Hobo & Takayama, 1997). Spacers and tissue stops improve seating and detail capture.

For implant-supported rehabilitations, **open-tray** or **closed-tray implant trays** with splinted transfers are essential for three-dimensional accuracy.

Feature	Dual-Arch	Full-Arch
Efficiency	High	Moderate
Best for	Single units, small bridges	Full-arch, FMR
Accuracy	Dependent on occlusion stability	Highly accurate
Risk	Higher if misaligned bite	Lower with proper technique
Use in FMR	Not recommended	Recommended

Table 11.1: Comparison Between Dual-Arch and Full-Arch Impressions

3. Impression Materials: Properties and Selection

Ideal impression materials for FMR should possess:

- Excellent flow and tear strength
- Dimensional stability
- High detail reproduction
- Compatibility with disinfection and pouring protocols

Commonly used materials include:

- **Polyvinyl Siloxane (PVS)**: Preferred for its dimensional stability, elastic recovery, and ease of use.
- **Polyether**: Offers high accuracy and hydrophilicity but is more rigid and less patient-friendly in undercuts.
- **Vinyl Polyether Siloxane (VPES)**: Combines the benefits of PVS and polyether, suited for both tooth- and implant-supported prostheses (Kumar et al., 2021).

4. Impression Techniques in Full-Mouth Rehabilitation

4.1 Single-Step Dual Viscosity (Putty-Wash)

Widely used in FMR, this technique involves the simultaneous placement of heavy-body (putty) and light-body materials. It captures fine detail and is efficient for multiple units, but requires precise timing and tray seating.

4.2 Two-Step Putty-Wash

Involves an initial putty impression followed by a light-body reline. Spacer techniques (e.g., polyethene sheets) are essential to avoid distortion and overcompression. This technique allows more control over wash thickness and detail reproduction.

4.3 Monophase Technique

Uses medium-body materials throughout. Preferred for implant-level impressions or where simultaneous viscosity is desired. It is technique-sensitive but allows even pressure distribution.

4.4 Segmental Impression Technique

In complex full-arch cases, segmental impressions of different arch regions are taken independently, then reassembled for precise control and reduced patient fatigue. It is useful in long-span cases or when managing multiple preps.

5. Gingival Retraction and Moisture Control

Effective gingival displacement is crucial for margin visibility and impression accuracy.

- **Cord Retraction (Single/Double Cord Technique)**: The double-cord method allows deeper access and improved hemostasis for subgingival margins (Jain et al., 2013).
- **Chemomechanical Agents**: Epinephrine and aluminium chloride are used for vasoconstriction and fluid control.

- **Retraction Pastes and Expanding Foams**: Less traumatic alternatives with moderate displacement capabilities.
- **Laser or Electrosurgical Retraction**: Useful in fibrotic or inflamed tissue cases; provides a bloodless field but requires operator proficiency.

Moisture isolation using saliva ejectors, cotton rolls, cheek retractors, and antisialogogues supports successful impressions, particularly in lengthy FMR procedures.

6. Digital Impressions in Full-Mouth Rehabilitation

Intraoral scanners have revolutionised impression making, offering patient comfort and real-time visualisation. Digital impressions:

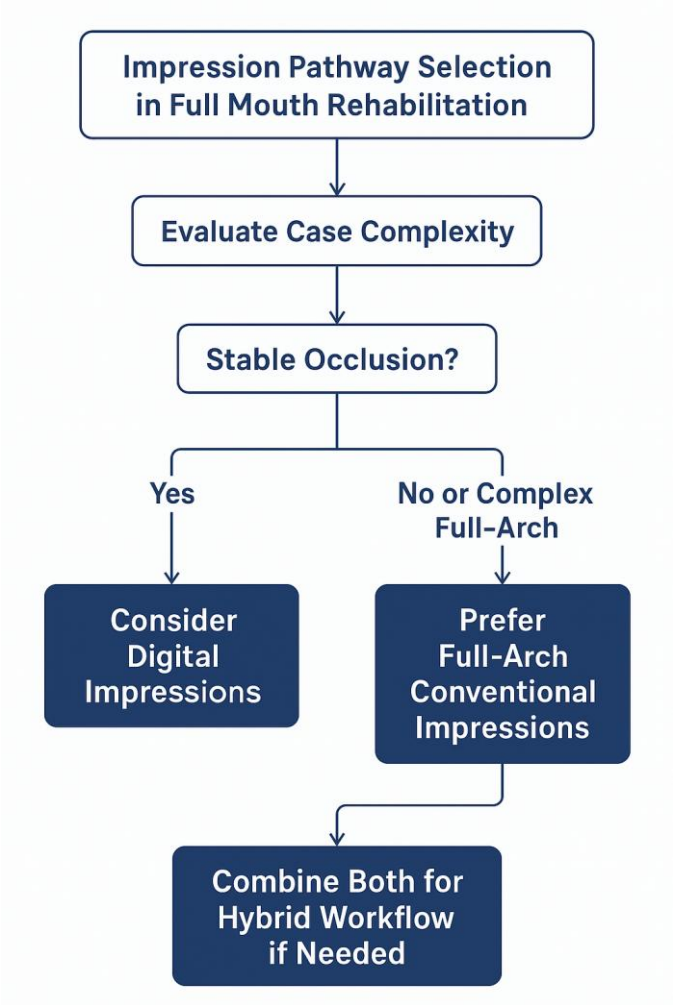
- Eliminate errors from tray distortion and material handling
- Enable faster turnaround and digital integration with CAD/CAM workflows
- Offers excellent precision in quadrant scans but may face challenges in full-arch accuracy if the scanning strategy is not optimised (Mangano et al., 2017)

Best practices in digital scanning include:

- Segmental scanning with overlap stitching
- Optimal retraction and dryness
- Verification with cross-sectional software tools

Digital impressions are increasingly adopted in FMR, particularly for provisionalization, implant-level restorations, and patients with severe gag reflex.

Flowchart 11.1: Impression Pathway Selection in Full Mouth Rehabilitation



7. Implant-Specific Impression Techniques

For implant-supported FMR, achieving precise transfer of the implant analogue position is critical.

- **Splinted Open-Tray Technique**: Ensures minimal movement of impression copings and better accuracy, especially for multiple implants.
- **Closed-Tray Technique**: Simpler but less accurate in full-arch scenarios.
- **Verification Jigs**: Fabricated intraorally or in-lab to confirm the accuracy of the master cast.

Proper torque protocols, impression coping design, and jig trial are essential for the long-term success of implant-based full-mouth rehabilitation.

Conclusion

Impression making in full-mouth rehabilitation is a highly technique-sensitive process requiring meticulous planning, material understanding, and patient management. Whether using traditional materials or digital technologies, the goal remains the same: capturing an accurate, distortion-free representation of the clinical condition. Tray selection, gingival retraction, moisture control, and impression sequencing must be tailored to each case to optimise outcomes. Integrating digital workflows and segmental techniques further refines precision, ensuring functional and esthetic success in complex full-arch rehabilitations.

References

Dawson, P. E. (2007). *Functional occlusion: From TMJ to smile design*. Elsevier Health Sciences.

Hobo, S., & Takayama, H. (1997). *Oral rehabilitation: Clinical determination of occlusion*. Quintessence Publishing.

Jain, A. R., Nallaswamy, D., Ariga, P., & Philip, J. M. (2013). Full mouth rehabilitation of a patient with reduced vertical dimension using multiple metal ceramic restorations. *Contemporary Clinical Dentistry*, 4(4), 531–536.

Kois, D. E., & Kois, J. C. (2015). Comprehensive risk-based, diagnostically driven treatment planning. *Dental Clinics of North America*, 59(3), 1–16.

Kumar, D., Hazra, R., Srivastava, A., Khattak, A., & Kalia, D. (2021). Digital occlusion in full mouth rehabilitation – A new era of precision. *Journal of Prosthodontics and Restorative Dentistry*, 9(2), 45–52.

Mangano, F., Gandolfi, A., Luongo, G., & Logozzo, S. (2017). Intraoral scanners in dentistry: A review of the current literature. *BMC Oral Health*, 17(1), 149.

Deep Science Publishing
https://doi.org/10.70593/978-93-49910-79-9

DeepScience
Open Access Books

Chapter 12: Temporization and Provisionalization

Sarthak Singh Tomar, Amit Tamrakar, Komal Saroya, Mahima Singh

Abstract: Temporization plays a pivotal role in full-mouth rehabilitation, serving both as a transitional phase and a diagnostic tool. Esthetic mock-ups allow real-time visualisation of proposed outcomes, while provisional restorations assist in refining occlusion, vertical dimension, phonetics, and esthetics. The provisional phase enables clinicians to test functional parameters and adjust treatment plans accordingly before committing to definitive prostheses. This chapter highlights the clinical applications of esthetic mock-ups, the phases of occlusal evaluation using provisionals, and the selection of long-term temporization materials, including CAD/CAM solutions. Proper provisionalization enhances clinical predictability, patient satisfaction, and treatment longevity.

Keywords: CAD/CAM provisionals, esthetic mock-up, full-mouth rehabilitation, occlusal adjustment, temporization.

1 Introduction

Temporization is a critical, diagnostic phase in full-mouth rehabilitation (FMR) that bridges the transition from initial tooth preparation to the final prosthesis. Beyond serving as temporary restorations, provisional restorations provide a real-time platform for evaluating esthetics, function, occlusion, phonetics, and patient adaptability. They allow clinicians to fine-tune vertical dimension, test occlusal schemes, and validate the treatment plan with minimal biological risk.

Sarthak Singh Tomar,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Amit Tamrakar,
Department of Prosthodontics, Jamia Millia Islamia, New Delhi, India.
Komal Saroya,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Mahima Singh,

By incorporating provisionalization as a dynamic component of treatment, clinicians can identify potential biomechanical or esthetic complications early and implement corrective strategies before definitive restoration delivery (Dawson, 2007; Kois & Kois, 2015). This chapter outlines the strategic use of esthetic mock-ups, provisional restorations, occlusal testing, and long-term temporization materials in the FMR workflow.

2. Aesthetic Mock-Up

An esthetic mock-up functions as a trial simulation of the proposed restoration and is invaluable for assessing smile design parameters directly in the patient's mouth.

2.1 Objectives

Mock-ups assist in:

- Assessing smile design, midline, and occlusal plane (Gürel, 2003)
- Validating vertical dimension
- Enhancing patient understanding and acceptance
- Minimising invasive preparation (Coachman et al., 2014)

2.2 Techniques

- Direct mock-up involves layering the composite directly onto teeth.
- Indirect mock-up transfers a diagnostic wax-up using a silicone index (Fradeani, 2004).

Mock-ups provide immediate visual and functional feedback, allowing pre-treatment modifications in a reversible, patient-friendly format.

2.3 Clinical Benefits

- Immediate visualisation of proposed outcomes.
- Early identification of phonetic or functional concerns.
- Facilitates patient involvement in aesthetic decisions.

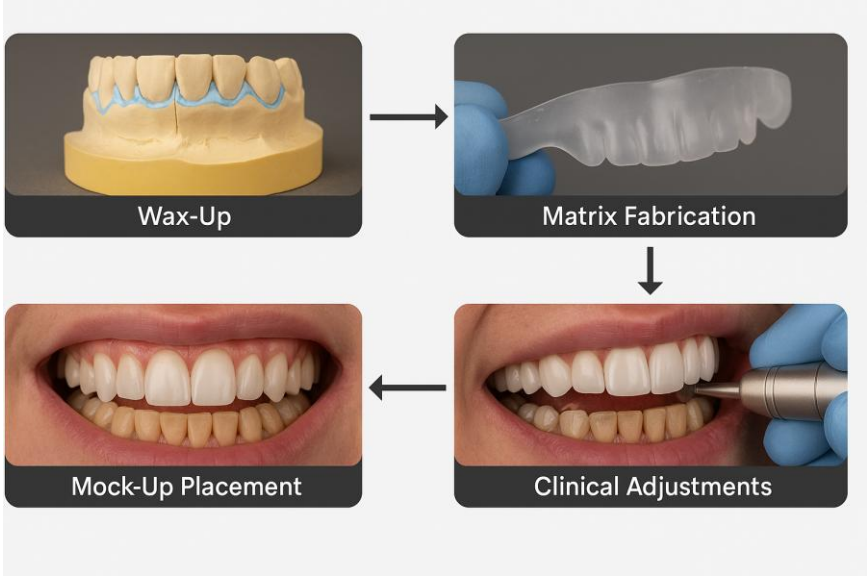


Figure 12.1: Workflow of Esthetic Mock-Up – Wax-Up ➔ Matrix Fabrication ➔ Intraoral Placement ➔ Adjustment.

3. Role of Provisionals in Occlusal Adjustment

Provisional restorations allow clinicians to assess and modify occlusal parameters before final prosthesis fabrication.

3.1 Functions

Provisionals are used to:

- Evaluate centric contacts and guidance (Dawson, 2007)
- Modify anterior guidance and posterior disclusion (Shillingburg et al., 2012)
- Validate VDO and TMJ comfort (Kois & Kois, 2015)

3.2 Phases

Table 12.1 outlines a phased protocol for provisional occlusal adjustment based on feedback from muscles, joints, and patient comfort (Hobo & Takayama, 1997).

Phase	Purpose	Key Evaluation
Initial	Establish basic functional contacts	Centric occlusion, esthetic preview

Phase	Purpose	Key Evaluation
Monitoring	Assess joint and muscle response	TMJ symptoms, facial muscle tenderness
Adjustment	Refine occlusal contacts	Excursive pathways, exclusion patterns
Validation	Confirm final prosthetic parameters	Function, esthetics, and phonetics

Clinical Tip: Once provisional occlusion is stable, record centric relation and excursive movements for accurate transfer to definitive prosthesis.

4. Long-Term Temporization Materials

For extended provisionalization, material selection becomes critical for durability, esthetics, and tissue health (Rosenstiel et al., 2015).

When provisional restorations are needed for extended durations (typically more than 6–8 weeks), the selection of long-term materials becomes essential for maintaining function, esthetics, and periodontal health.

4.1 Ideal Characteristics

Ideal materials should offer strength, marginal integrity, colour stability, and repairability (Grewal & Rehani, 2020).

- High fracture and wear resistance
- Good marginal seal and polishability
- Esthetic stability
- Ease of adjustment and repair

4.2 Material Options

Table 12.2: Comparison of Long-Term Temporization Materials

Material	Characteristics	Indications
Bis-Acryl Composite	Esthetic, moderate strength	Short-to-medium term in esthetic zones
PMMA Resin (Cold/Heat Cure)	Durable, strong	Full arches and long-span provisionals

Material	Characteristics	Indications
CAD/CAM PMMA	Digitally milled, precise fit	Complex cases requiring 3–12 months of use

4.3 Advantages of CAD/CAM Provisionals

- Excellent adaptation and marginal fit
- High aesthetic value and colour stability
- Predictable occlusion with minimal adjustment
- Easy duplication for final prostheses

Conclusion

Temporization and provisionalization represent far more than interim solutions in full-mouth rehabilitation. They are integral to verifying and optimising clinical outcomes, allowing for adjustment of esthetic, functional, and biological parameters in a reversible and controlled manner. Esthetic mock-ups guide patient communication and preparation design; provisional restorations enable real-time occlusal testing and TMJ evaluation. Long-term temporization materials, particularly CAD/CAM options, ensure durability and consistency throughout extended treatment phases. By fully utilising the provisional phase, clinicians can improve treatment predictability, prevent complications, and achieve high levels of patient satisfaction.

References

Dawson, P. E. (2007). *Functional occlusion: From TMJ to smile design*. Elsevier Health Sciences.

Jain, A. R., Nallaswamy, D., Ariga, P., & Philip, J. M. (2013). Full mouth rehabilitation of a patient with reduced vertical dimension using multiple metal ceramic restorations. *Contemporary Clinical Dentistry*, 4(4), 531–536.

Kois, D. E., & Kois, J. C. (2015). Comprehensive risk-based, diagnostically driven treatment planning. *Dental Clinics of North America*, 59(3), 1–16.

Kumar, D., Hazra, R., Srivastava, A., Khattak, A., & Kalia, D. (2021). Digital occlusion in full mouth rehabilitation – A new era of precision. *Journal of Prosthodontics and Restorative Dentistry*, 9(2), 45–52.

Deep Science Publishing
https://doi.org/10.70593/978-93-49910-79-9

Chapter 13: Try-In, Occlusal Adjustment, and Cementation in Full Mouth Rehabilitation

Manu Rathee, Stalin M, Aarti sulekh, Nang Nalika Moungkhom.

Abstract: The final clinical phase of full mouth rehabilitation (FMR)—comprising try-in, occlusal adjustment, and definitive cementation—plays a decisive role in ensuring the long-term success of prosthodontic therapy. This chapter outlines the critical checkpoints during try-in, the procedures for verifying and refining occlusal harmony, and the strategic selection of cementation protocols based on restorative material, esthetic considerations, and clinical constraints. Emphasis is placed on passive prosthesis fit, centric and eccentric contact evaluation, and material-specific surface treatments. A systematic approach during these final stages guarantees the optimal integration of prostheses with the stomatognathic system and minimises postoperative complications.

Keywords: Cementation, Centric Relation, Eccentric Contacts, Esthetics, Marginal Fit.

1 Introduction

The final clinical stages of full mouth rehabilitation—try-in, occlusal adjustment, and cementation—are pivotal in translating planned prosthetic designs into functional and esthetic realities. The try-in phase provides a critical opportunity to assess marginal fit, occlusion, phonetics, esthetics, and vertical dimension before definitive cementation (Rosenstiel et al., 2015). Occlusal refinement ensures harmonious contact patterns in centric and eccentric movements, minimising biomechanical stress and enhancing prosthetic longevity (Dawson, 2007).

Manu Rathee,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Stalin M,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Aarti Sulekh,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Nang Nalika Moungkhom,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.

Special attention is required in implant-supported prostheses, where force control is paramount due to the absence of proprioceptive feedback (Misch, 2021). Cementation, as an irreversible step, demands careful selection of luting agents based on the restorative material, preparation geometry, and clinical environment. Surface conditioning protocols must align with the prosthetic substrate to achieve optimal adhesion and long-term success (Kois & Kois, 2015).

Together, these stages ensure a seamless transition from laboratory fabrication to durable oral rehabilitation, completing the prosthodontic workflow with precision and predictability.

2. Verifying Occlusion at Try-In

The **try-in stage** is a critical clinical checkpoint that bridges laboratory fabrication and irreversible cementation. It allows clinicians to verify the functional, esthetic, phonetic, and biological outcomes of prosthetic restorations before finalisation (Kois & Kois, 2015).

Occlusion verification begins with confirming the passive and complete seating of each restoration without cement under magnification. Marginal integrity and internal fit are evaluated with visual and tactile methods, often supplemented with fit-checking materials.

Using bimanual manipulation or anterior deprogrammers, the patient is guided into centric relation. Articulating paper of varying thickness (e.g., 40μ and 200μ) is employed to record and analyse contact distribution. Ideal try-in outcomes include:

- Stable bilateral posterior contacts
- Appropriate anterior guidance or contact
- No tilting or rocking of prostheses
- Adequate esthetics, phonetics, and vertical dimension

Parameter	Criteria
Marginal Fit	Passive, complete seating, no gaps
Occlusal Contacts	Uniform, bilateral, stable
Phonetics	“S” and “F” sounds are crisp and distinct.
Esthetics	Midline, smile arc, tooth proportion harmony

Parameter	Criteria
Patient Comfort	No high points; smooth closure

Table 13.1: Checklist for Try-In Verification

3. Adjusting Eccentric Contacts

Beyond centric relation, **eccentric occlusal contacts** must be evaluated for functional harmony. This involves assessing:

- **Lateral Excursions**: Smooth working-side contacts with disclusion of the non-working side. Canine-guided occlusion is ideal where feasible (Dawson, 2007).
- **Protrusive Movements**: Anterior guidance should be established, with immediate posterior disclusion to protect posterior restorations from shear forces.
- **Group Function**: For patients without adequate canine guidance, group function may be necessary, provided force distribution is even and does not cross the arch.

Adjustments should be done with **fine-grit diamond instruments**, followed by thorough polishing. In implant-supported restorations, occlusal contacts should be lighter due to the absence of proprioceptive feedback (Misch, 2021).

Cementation Protocols

Cementation is the **final irreversible phase** of rehabilitation and must be based on an evidence-based selection of luting agents. Considerations include:

- **Material Type** (ceramic, zirconia, metal-ceramic)
- **Tooth Geometry** (retentive vs. non-retentive prep)
- **Esthetic Demand** (anterior vs. posterior)
- **Moisture Control Feasibility**

Resin cements are preferred for high-strength esthetic ceramics like lithium disilicate. They offer superior bond strength, marginal seal, and esthetics, but are technique-sensitive.
Resin-modified glass ionomer (RMGI) cements are suited for restorations with good mechanical retention and offer ease of use with fluoride release.

Conventional cements (glass ionomer, zinc phosphate) remain viable for full-coverage metal restorations with high retentive features.

Surface conditioning protocols must match the restorative material:

- *Etching and silanization* for lithium disilicate
- *Airborne-particle abrasion with MDP primer* for zirconia
- *Cleansing and tin plating* for metal surfaces

Table 13.2: Cement Selection Guidelines

Restoration Type	Recommended Cement	Notes
Lithium Disilicate Crown	Resin adhesive cement	Etch + Silane + Bonding
Monolithic Zirconia Crown	RMGI or Self-Adhesive Resin Cement	MDP primer enhances bonding
Metal-Ceramic Crown	RMGI Cement	Retentive prep sufficient
Full Metal Crown	Glass Ionomer / Zinc Phosphate	Conventional retention-based approach

Conclusion

The clinical success of full mouth rehabilitation culminates during the **try-in, occlusal refinement, and cementation stages**. Each step must be performed with precision and adherence to biomechanical and esthetic principles. Systematic try-in evaluation helps identify and correct functional or aesthetic discrepancies. Careful occlusal adjustment ensures harmonious integration, and evidence-based cement selection secures long-term retention and marginal integrity. Mastery of these final steps transforms comprehensive treatment plans into durable, biologically compatible, and patient-satisfying prosthodontic outcomes.

References

Dawson, P. E. (2007). *Functional occlusion: From TMJ to smile design*. Elsevier Health Sciences.

Kois, D. E., & Kois, J. C. (2015). Comprehensive risk-based, diagnostically driven treatment planning. *Dental Clinics of North America*, 59(3), 1–16.

Misch, C. E. (2021). *Contemporary implant dentistry* (4th ed.). Elsevier.

Rosenstiel, S. F., Land, M. F., & Fujimoto, J. (2015). *Contemporary fixed prosthodontics* (5th ed.). Elsevier.

Shillingburg, H. T., Hobo, S., & Whitsett, L. D. (2012). *Fundamentals of fixed prosthodontics* (4th ed.). Quintessence Publishing.

Deep Science Publishing
https://doi.org/10.70593/978-93-49910-79-9

Chapter 14: Implant-Supported Full Mouth Rehabilitation

Shefali Singla, Monika Nagpal, Manjot Kaur, Komalpreet kaur

Abstract: Implant-supported full mouth rehabilitation (FMR) offers a transformative solution for edentulous patients by restoring esthetics, function, and quality of life through fixed prosthetic options. Protocols such as All-on-4 and All-on-6 provide predictable outcomes, adapting to anatomical limitations and biomechanical demands. Decisions between bar-supported overdentures, fixed prostheses, or hybrid designs depend on hygiene maintenance ability, bone availability, and esthetic goals. Occlusal design principles must consider the absence of periodontal ligament in implants, emphasising axial load control, immediate disclusion, and minimal lateral forces. This chapter presents clinical protocols, prosthesis design considerations, and occlusal guidelines necessary for successful implant-supported FMR.

Keywords: All-on-4, All-on-6, Hybrid Prosthesis, Implant Occlusion, Prosthesis Design

1 Introduction

Implant-supported full mouth rehabilitation (FMR) offers fixed, esthetic, and functional solutions for edentulous patients. Concepts like All-on-4 and All-on-6 enable strategic implant placement to maximise bone use and support immediate loading (Malo et al., 2003; Patel et al., 2021). Prosthetic options range from bar-supported overdentures to fixed and hybrid designs, selected based on anatomy, hygiene needs, and patient expectations (Slot et al., 2010). As implants lack periodontal proprioception, occlusal schemes must minimise lateral forces and ensure axial loading for long-term success (Misch, 2021).

Shefali Singla,
Department of Prosthodontics, Panjab University, Chandigarh, India.
Monika Nagpal,
Department of Prosthodontics, Panjab University, Chandigarh, India.
Manjot Kaur,
Department of Conservative Dentistry and Endodontics, Panjab University, Chandigarh, India.
Komalpreet Kaur,
Department of Prosthodontics, Panjab University, Chandigarh, India.

2. All-on-4 and All-on-6 Concepts

Implant-supported full mouth rehabilitation (FMR) has revolutionised the management of completely edentulous patients by offering fixed prosthetic solutions that restore esthetics, function, and overall quality of life (Malo, Rangert, & Nobre, 2003). Among the most widely adopted protocols are the **All-on-4** and **All-on-6** concepts, designed to optimise implant positioning and reduce the need for bone grafting.

The **All-on-4 protocol** involves placing four implants per arch—two anterior implants positioned axially and two posterior implants tilted distally at an angle of 30° to 45°. This angulation increases the anteroposterior spread, enhances stability, avoids anatomical structures such as the maxillary sinus and inferior alveolar nerve, and allows for immediate loading of the prosthesis (Patel, Verma, & Padmanabhan, 2021).

The **All-on-6 approach** incorporates six implants per arch, which provides improved force distribution, greater primary stability, and is particularly beneficial in patients with higher occlusal demands or compromised bone density (Slot, Raghoebar, Vissink, & Meijer, 2010). The additional implants reduce cantilever lengths, which is associated with increased prosthetic longevity and biomechanical efficiency.

Clinical decision-making between these two protocols depends on multiple factors, including available bone volume, biomechanical requirements, esthetic expectations, and patient budget constraints (Jivraj, Chee, & Glickman, 2006).

3. Bar-Supported and Fixed Prosthesis Designs

The selection between bar-supported overdentures and fixed implant prostheses significantly affects prosthesis function, maintenance, and patient satisfaction. **Bar-supported overdentures** employ a rigid bar framework that splints multiple implants together, providing retention via clips or precision attachments. These are especially advantageous for patients with poor manual dexterity, significant alveolar ridge resorption, or compromised hygiene access (Slot et al., 2010).

In contrast, **fixed implant prostheses** are either screw-retained or cemented and remain permanently attached to the implants. They offer superior comfort, mimic natural teeth more closely, and eliminate prosthesis mobility. However, they require meticulous hygiene maintenance and precise occlusal adjustment (Rosenstiel, Land, & Fujimoto, 2015).

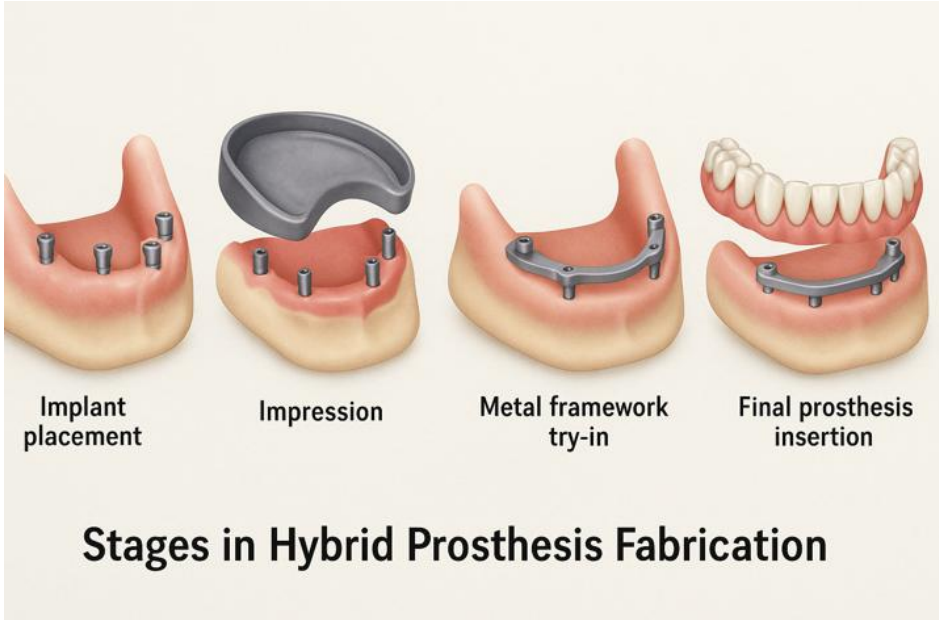
A decision flowchart may aid clinicians in choosing between bar-retained and fixed options based on patient-specific factors such as hygiene ability, esthetic demands, financial considerations, and anatomical conditions.

4. Hybrid Prosthesis Protocols

Hybrid prostheses combine features of both fixed and removable designs. They are typically screw-retained metal frameworks veneered with acrylic resin teeth and pink gingival-colored resin to replace both hard and soft tissue loss resulting from severe resorption. These are indicated when vertical and horizontal ridge deficiencies compromise facial support and lip posture (Misch, 2021).

The clinical protocol for hybrid prostheses includes:

- Optimal implant positioning with wide anteroposterior spread
- Accurate impression-taking and master cast fabrication
- Framework design ensuring passive fit
- Aesthetic setup of teeth and gingival contours
- Occlusal verification and passive screw-tightening



Routine follow-ups are essential to evaluate prosthesis wear, screw loosening, and hygiene status. Despite requiring maintenance, hybrid prostheses remain cost-effective, esthetically pleasing, and functionally efficient for full arch rehabilitation.

5. Occlusion in Implant Full Mouth Rehabilitation

Unlike natural dentition, implants lack the periodontal ligament, resulting in limited proprioception and adaptive capacity. This necessitates a modified occlusal approach to

avoid overloading and preserve implant longevity (Dawson, 2007). Key principles of **implant occlusion** include:

- Light centric contacts with axial loading
- Elimination of non-working side interferences
- Shallow anterior guidance in protrusive movements
- Narrow occlusal tables to minimise lateral stress
- Immediate posterior disclusion during excursions

These principles must be adapted based on prosthesis material, such as monolithic zirconia versus hybrid acrylic, and the patient's functional dynamics. Immediate loading cases particularly demand strict occlusal control to prevent micromovement and implant failure.

Table 14.1: Implant Occlusal Scheme Guidelines

Principle	Purpose
Light Centric Contact	Reduces implant overload
Eliminate Non-Working Contacts	Prevents lateral force damage
Shallow Anterior Guidance	Minimises protrusive stress
Narrow Occlusal Table	Decreases lateral loading
Bilateral Stable Contact	Enhances force distribution

Conclusion

Implant-supported full mouth rehabilitation stands at the intersection of surgical innovation and prosthodontic precision. Protocols like All-on-4 and All-on-6 have broadened the scope of care for edentulous patients, while prosthetic variations such as bar-retained overdentures, fixed prostheses, and hybrid designs allow for personalised treatment solutions. Mastery of occlusal principles specific to implant biomechanics ensures prosthetic longevity and clinical success. Through thorough planning, patient education, and evidence-based protocols, clinicians can restore not only function and esthetics, but also patient confidence and quality of life.

References

Dawson, P. E. (2007). *Functional occlusion: From TMJ to smile design*. Elsevier.

Jivraj, S., Chee, W., & Glickman, R. (2006). Treatment planning of the edentulous mandible. *British Dental Journal*, 201(6), 337–347.

Malo, P., Rangert, B., & Nobre, M. (2003). "All-on-4" immediate-function concept with Brånemark System implants for completely edentulous mandibles: A retrospective clinical study. *Clinical Implant Dentistry and Related Research*, 5(S1), 2–9.

Misch, C. E. (2021). *Contemporary implant dentistry* (4th ed.). Elsevier.

Patel, N., Verma, S. K., & Padmanabhan, T. V. (2021). All-on-four and all-on-six concepts: A review. *Journal of the Indian Prosthodontic Society*, 21(2), 99–104.

Rosenstiel, S. F., Land, M. F., & Fujimoto, J. (2015). *Contemporary fixed prosthodontics* (5th ed.). Elsevier.

Slot, W., Raghoebar, G. M., Vissink, A., & Meijer, H. J. A. (2010). A systematic review of implant-supported overdentures in the edentulous mandible: Clinical and radiographic outcomes. *Clinical Oral Implants Research*, 21(4), 371–380.

Deep Science Publishing
https://doi.org/10.70593/978-93-49910-79-9

DeepScience
Open Access Books

Chapter 15: Full Mouth Rehabilitation in Medically Compromised Patients

Stalin M, Sarthak Singh Tomar, Komal Saroya, Balavignesh S.

Abstract: Full mouth rehabilitation (FMR) in medically compromised patients presents unique clinical challenges that require careful interdisciplinary planning and individualised protocols. Systemic conditions such as diabetes mellitus, cardiovascular disease, xerostomia, bleeding disorders, and immunosuppressive states significantly influence prosthodontic decision-making, from diagnosis to material selection and procedural modifications. Tailoring treatment to accommodate altered healing capacities, impaired immune responses, and oral environment changes is critical to achieving safe and predictable outcomes. This chapter outlines evidence-based strategies for comprehensive rehabilitation in such patients, emphasising risk assessment, modified techniques, patient education, and ongoing maintenance to ensure long-term success and quality of life.

Keywords: Cardiovascular Disease, Diabetes Mellitus, Medically Compromised, Prosthodontic Modifications, Xerostomia

1 Introduction

Full mouth rehabilitation in medically compromised individuals requires an integrative approach that incorporates both systemic health limitations and prosthodontic objectives. Chronic conditions such as xerostomia, poorly controlled diabetes, cardiovascular disease, and age-related impairments introduce complexities at each stage of rehabilitation—from diagnosis to prosthetic delivery and maintenance (Jacob, Palaskar, & Kheur, 2015).

Stalin M,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Balavignesh S,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Sarthak Singh Tomar,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Komal Saroya,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.

Achieving clinical success necessitates interdisciplinary collaboration, comprehensive risk assessment, and the selection of appropriate materials and techniques tailored to the patient's health profile (Al-Harbi & Ahmad, 2018).

2. Xerostomia and Prosthodontic Challenges

Xerostomia is frequently encountered in elderly or medically compromised patients due to polypharmacy, Sjögren's syndrome, head and neck radiation, or systemic conditions like diabetes mellitus. It significantly affects prosthesis retention, oral lubrication, and mucosal health (Villa, Abati, & Strohmenger, 2015).

Clinical Considerations

- **Material Selection**: Use of glazed ceramics or highly polished resin bases to reduce plaque adherence.
- **Prosthesis Design**: Enhanced retention with implant assistance or precision attachments.
- **Preventive Protocols**: Use of saliva substitutes, topical fluorides, sialogogues, and frequent recall visits.

Problem	Solution
Lack of retention	Implant-supported prostheses, attachments
Increased caries risk	Fluoride varnish, remineralising agents
Mucosal irritation	Lubricating oral gels, saliva substitutes

Table 15.1: Strategies to Manage Xerostomia in FMR

3. Full Mouth Rehabilitation in Diabetes Mellitus

Diabetes mellitus impairs wound healing, immune response, and osseointegration, particularly in patients with poor glycemic control (Siddiqi, Payne, & Doughty, 2020).

Clinical Challenges

- Increased susceptibility to peri-implantitis and mucosal infections
- Delayed bone healing and compromised implant stability

- Higher plaque accumulation and gingival inflammation

Management Protocol

- **Preoperative**: Maintain Hba1c < 7% and liaise with the patient's physician.
- **Intraoperative**: Prefer minimally invasive protocols; avoid immediate loading.
- **Prosthetic**: Use designs that facilitate hygiene (e.g., retrievable prostheses, polished margins).
- **Maintenance**: Emphasise quarterly reviews and tailored oral hygiene instructions.

4. Cardiovascular Disease and Prosthodontic Considerations

Prosthodontic care in patients with cardiovascular disease must be modified to prevent complications during treatment. Hypertension, arrhythmias, coronary artery disease, and prosthetic valves demand extra caution (Mandel, 2010).

Clinical Considerations

- **Medical Clearance**: Required for high-risk patients before invasive procedures.
- **Stress Reduction**: Morning appointments and use of anxiolytics where necessary.
- **Anticoagulation**: Coordinate with physician; often, INR <3 allows minor surgery.
- **Antibiotic Prophylaxis**: Required in selected high-risk cases per AHA guidelines.
- **Local Anaesthesia**: Use minimal vasoconstrictor in epinephrine-sensitive patients.

5. Geriatric Full Mouth Rehabilitation

Elderly patients present multifactorial challenges, including anatomical changes, systemic illnesses, and cognitive decline. Bone loss, reduced salivary flow, and neuromuscular inefficiencies are common (Douglass, Watson, & Fox, 2003).

Key Considerations

- Simple, stable prostheses that are easy to maintain
- Favour implant overdentures to improve retention and masticatory function
- Use lightweight materials, soft liners for sensitive tissues

- Simplify occlusal designs (e.g., bilateral balanced occlusion)

6. Medication Interactions and Prosthodontic Impact

Drug interactions can adversely affect surgical and prosthetic outcomes. Polypharmacy must be reviewed in every medically compromised patient (Preshaw, 2009).

Table 15.2: Medication Interactions with Prosthodontic Therapy

Drug Class	Prosthodontic Impact
Anticoagulants	Bleeding risk during extractions or surgery
Bisphosphonates	Risk of osteonecrosis after implant placement
Immunosuppressants	Delayed healing, increased infection risk
Calcium Channel Blockers	Gingival hyperplasia complicating prosthesis margins.
Xerogenic Drugs	Dry mouth, poor denture adhesion, and mucosal irritation

Conclusion

Rehabilitating medically compromised patients requires far more than technical skill—it demands a comprehensive, interdisciplinary, and preventive approach. Clinicians must modify conventional prosthodontic protocols, select biocompatible materials, and work closely with physicians to address systemic concerns. Ultimately, the successful restoration of aesthetics, function, and comfort in this population relies on patient-specific planning, compassionate care, and continuous monitoring.

References

Al-Harbi, F., & Ahmad, I. (2018). Prosthodontic management of medically compromised patients: Review and clinical considerations. *Journal of Prosthodontics*, 27(7), 601–610. https://doi.org/10.1111/jopr.12751

Douglass, C. W., Watson, A. J., & Fox, C. H. (2003). Oral health status of the elderly in the United States. *Journal of the American Geriatrics Society*, 51(9), 1229–1236. https://doi.org/10.1046/j.1532-5415.2003.51405.x

Jacob, A., Palaskar, J., & Kheur, M. (2015). Full mouth rehabilitation in medically compromised patients: A clinical perspective. *Journal of International Oral Health*, 7(1), 138–142.

Mandel, I. D. (2010). Cardiovascular diseases and dental implications. *The Journal of the American Dental Association*, 141(10), 1240–1245. https://doi.org/10.14219/jada.archive.2010.0046

Preshaw, P. M. (2009). Polypharmacy and the medically compromised patient in prosthodontics. *Dental Update*, 36(10), 630–640.

Siddiqi, A., Payne, A. G., & Doughty, J. (2020). Diabetes and implant dentistry: A review. *British Dental Journal*, 228(9), 697–703. https://doi.org/10.1038/s41415-020-1487-6

Villa, A., Abati, S., & Strohmenger, L. (2015). The role of saliva in prosthetic stability: Impact of xerostomia in complete denture wearers. *Oral Diseases*, 21(6), e19–e24. https://doi.org/10.1111/odi.12315

Deep Science Publishing
https://doi.org/10.70593/978-93-49910-79-9

DeepScience
Open Access Books

Chapter 16: Complications and Redo Cases in Full Mouth Rehabilitation

Manu Rathee, Amit Tamrakar, Monika Nagpal, Manjot Kaur

Abstract: Despite meticulous planning and execution, full mouth rehabilitation (FMR) cases may encounter biological, mechanical, or esthetic complications that necessitate retreatment or a complete redo. Common challenges include prosthetic failures, occlusal disharmony, implant complications, material fractures, and patient-related factors such as poor compliance or parafunctional habits. Early diagnosis, preventive strategies, and structured maintenance protocols are critical to minimising failures. This chapter discusses the aetiology, classification, clinical management, and prevention of complications in FMR, emphasising evidence-based approaches to managing redo cases and enhancing long-term treatment success.

Keywords: Complications, Implant Failure, Occlusal Disharmony, Prosthetic Fracture, Redo Rehabilitation.

1 Introduction

Full mouth rehabilitation (FMR), while comprehensive and precise, is not immune to complications. Biological, mechanical, functional, and esthetic failures may arise due to occlusal errors, material limitations, systemic factors, or patient non-compliance (Misch, 2021; Goodacre et al., 2003). Early recognition and effective management of these issues are essential to ensure long-term success. This chapter outlines common complications in FMR and presents evidence-based strategies for their prevention, correction, and retreatment.

Dr. Manu Rathee,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Dr. Amit Tamrakar,
Department of Prosthodontics, Jamia Millia Islamia, New Delhi, India.
Dr. Monika Nagpal,
Department of Prosthodontics, Panjab University, Chandigarh, India.
Dr. Manjot Kaur,
Department of Conservative Dentistry and Endodontics, Panjab University, Chandigarh, India.

2. Common Prosthetic Failures

Despite meticulous diagnostics and precision in execution, complications in full mouth rehabilitation (FMR) are not uncommon. Identifying failure patterns is essential for early intervention, preventive planning, and long-term success (Misch, 2021).

2.1 Mechanical Failures

Mechanical complications include ceramic veneer chipping, restoration debonding, abutment or screw loosening, and fracture of implant components. These failures often result from occlusal overload, bruxism, insufficient restorative thickness, or poor prosthesis design (Goodacre et al., 2003).

2.2 Biological Failures

Biological issues such as secondary caries, peri-implantitis, and periodontal breakdown threaten long-term prognosis. Contributing factors include marginal discrepancies, poor hygiene due to overcontouring, and violation of the biologic width (Lang et al., 2004).

2.3 Functional Failures

Functional failures arise from improperly designed occlusal schemes—errors in centric relation, absence of anterior guidance, or uneven occlusal contacts may lead to TMJ discomfort, muscle strain, and rapid prosthesis wear (Dawson, 2007).

2.4 Aesthetic Failures

Though not functionally debilitating, aesthetic failures significantly impact patient satisfaction. Common causes include improper tooth size, form, shade selection, and disharmony in smile design, often due to inadequate planning or laboratory miscommunication (Coachman & Calamita, 2014).

Table 16.1: Common Failures and Their Causes

Type of Failure	Examples	Common Causes
Mechanical	Veneer chipping, screw loosening	Parafunction, poor occlusal design
Biological	Peri-implantitis, secondary caries	Marginal misfit, plaque accumulation
Functional	TMJ pain, muscular fatigue	Inadequate guidance, occlusal discrepancies

Type of Failure	Examples	Common Causes
Esthetic	Shade mismatch, asymmetry	Poor communication, design errors

Table 16.1: Common Failures and Their Causes

3. Management of Aesthetic Failures

Aesthetic failures demand a nuanced approach that blends clinical expertise with psychological understanding. First, clinicians must distinguish between objective deficiencies (e.g., shade mismatch, asymmetry) and subjective dissatisfaction based on unmet expectations.

Corrective options include:

- Minor corrections: polishing, external staining, or composite modification.
- Major corrections: recontouring emergence profiles, remaking prostheses.

Engaging patients through visual tools—mock-ups, photographic previews, or digital smile design—helps set realistic expectations and improves satisfaction. Involving the patient in decisions like shade selection and contour evaluation enhances acceptance and reduces perceived failures (Coachman et al., 2017).

4. Mid-Treatment Changes and Patient Compliance

FMR cases often span several appointments over extended periods, making them vulnerable to mid-treatment biological and behavioural changes.

Common Challenges

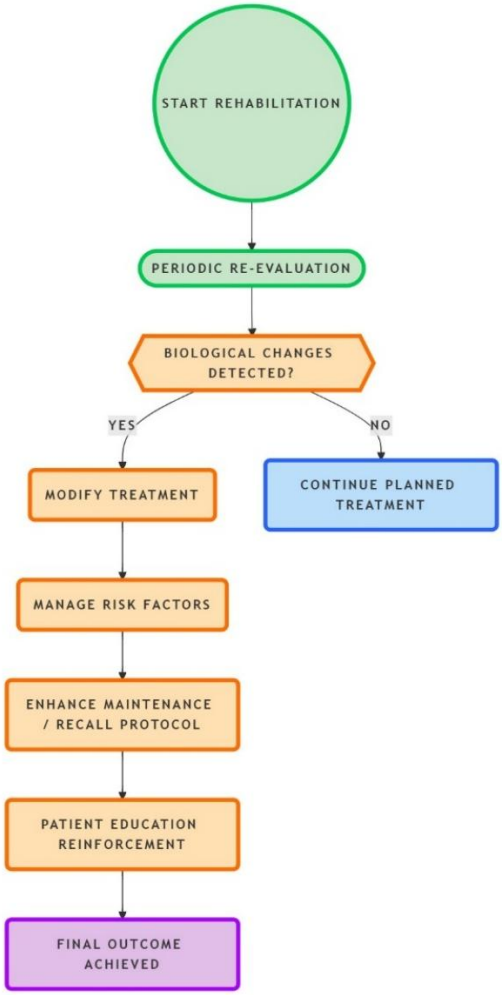
- **Biological**: Tooth loss, peri-implantitis, soft tissue changes.
- **Behavioural**: Bruxism recurrence, poor oral hygiene, missed follow-ups.

Compliance Strategies

- Pre-treatment education on hygiene, diet, and appliance wear
- Reinforcement at every appointment
- Customised home care plans for complex prostheses
- Compassionate, flexible solutions to barriers (e.g., dexterity, finances)

Regular recalls and provisional evaluations allow the timely identification of problems and enable preventive intervention.

Flowchart 16.1: Managing Mid-Treatment Changes in FMR



Conclusion

Full mouth rehabilitation is an evolving, patient-specific endeavour in which complications are inevitable. The clinician's ability to anticipate, diagnose, and address mechanical, biological, functional, and esthetic failures determines long-term success. Mid-treatment adaptability, strong patient compliance, and continuous maintenance are key to sustaining outcomes. Ultimately, successful rehabilitation is not only a measure of prosthetic precision but also of preventive planning, empathetic care, and clinical resilience.

References

Coachman, C., & Calamita, M. A. (2014). Digital smile design: A tool for treatment planning and communication in esthetic dentistry. *Quintessence Dental Technology*, 37, 103–111.

Coachman, C., Paravina, R. D., & Calamita, M. A. (2017). Digital smile design: Methods and protocols. *Compendium of Continuing Education in Dentistry*, 38(9), 702–708.

Dawson, P. E. (2007). *Functional occlusion: From TMJ to smile design*. Elsevier.

Goodacre, C. J., Bernal, G., Rungcharassaeng, K., & Kan, J. Y. (2003). Clinical complications with implants and implant prostheses. *The Journal of Prosthetic Dentistry*, 90(2), 121–132. https://doi.org/10.1016/S0022-3913(03)00212-6

Lang, N. P., Berglundh, T., & Lindhe, J. (2004). *Clinical periodontology and implant dentistry* (Vol. 1). Blackwell Munksgaard.

Misch, C. E. (2021). *Contemporary implant dentistry* (4th ed.). Elsevier.

Deep Science Publishing
https://doi.org/10.70593/978-93-49910-79-9

Chapter 17: Digital Full-Mouth Rehabilitation

Mahima Singh, Stalin M, Aarti Sulekh, Nang Nalika Moungkhom

Abstract: Digital technologies have revolutionised full-mouth rehabilitation (FMR), enhancing precision, predictability, and efficiency across all treatment phases—from diagnosis and treatment planning to prosthesis fabrication and delivery. Tools such as intraoral scanners, cone beam computed tomography (CBCT), computer-aided design/computer-aided manufacturing (CAD/CAM), and virtual articulators enable clinicians to create restorations with superior fit, esthetics, and functional accuracy. Additionally, digital workflows improve communication with laboratories and facilitate patient engagement through visual simulations. This chapter explores the digital integration of FMR, highlighting workflows, advantages, limitations, and future trends in computer-guided prosthodontic rehabilitation.

Keywords: CAD/CAM, CBCT, Digital Workflow, Full-Mouth Rehabilitation, Scanner

1 Introduction

Digital full-mouth rehabilitation represents a paradigm shift in prosthodontics, offering a streamlined, accurate, and patient-centred approach to comprehensive oral reconstruction. Unlike traditional analogue methods that rely on multiple manual steps, digital workflows integrate intraoral scanning, CBCT imaging, virtual articulation, and CAD/CAM technology to enhance precision and efficiency (Patel et al., 2022). These advancements reduce human error, improve marginal fit, and allow for rapid fabrication of both provisional and definitive restorations. Moreover, digital smile design tools enable enhanced patient communication and consent, increasing treatment acceptance and satisfaction.

Mahima Singh,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Stalin M,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Aarti Sulekh,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Dr. Nang Nalika Moungkhom,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.

As digital solutions continue to evolve, their role in full-mouth rehabilitation is becoming indispensable for delivering predictable, esthetic, and functionally integrated outcomes.

2. Digital Planning: Smile Design and Digital Smile Design (DSD)

The integration of digital technology into full mouth rehabilitation (FMR) has redefined clinical precision, workflow efficiency, and interdisciplinary communication. Central to this digital transformation is **Digital Smile Design (DSD)**—a systematic and patient-centred method for esthetic and functional planning. DSD overlays reference lines and proportions on facial photographs and videos to evaluate midlines, smile arcs, gingival contours, and occlusal planes (Coachman et al., 2017).

DSD leverages data from high-resolution imaging, intraoral scanning, and facial analysis to produce a virtual blueprint of the outcome. This enables real-time visual communication among clinicians, technicians, and patients, fostering greater case acceptance and satisfaction (Joda & Gallucci, 2015). In full-mouth cases, it allows integration of esthetic and occlusal parameters across multiple disciplines, including prosthodontics, periodontics, and orthodontics.

3. Digital Impressions and CAD/CAM Workflow

Intraoral scanners replace conventional impressions with high-resolution, distortion-free digital models. These scans improve patient comfort, eliminate material inaccuracies, and facilitate direct data transfer to dental laboratories (Mangano et al., 2017). Digital impressions allow clinicians to capture fine anatomic detail of preparations, soft tissues, and interocclusal relationships with greater speed and reproducibility.

The **CAD/CAM workflow** begins with virtual design of the prosthesis, allowing precise control over occlusion, contacts, emergence profiles, and esthetics. CAM devices then mill or 3d-print restorations from materials such as zirconia, lithium disilicate, or hybrid resins. In full-mouth cases, CAD/CAM enables seamless transitions from diagnostic wax-ups to provisionals and definitive prostheses, while preserving the design integrity through digital duplication (Yuzbasioglu et al., 2014).

Digital workflows also reduce clinical appointments, turnaround time, and human error while improving marginal fit, occlusal accuracy, and reproducibility.

4. 3D-Printed Full-Arch Prostheses

3d printing, or additive manufacturing, has become a transformative modality in full-mouth rehabilitation. It enables the layer-by-layer fabrication of restorations, provisional prostheses, and surgical guides directly from digital designs (Alharbi, Wismeijer, & Osman, 2017).

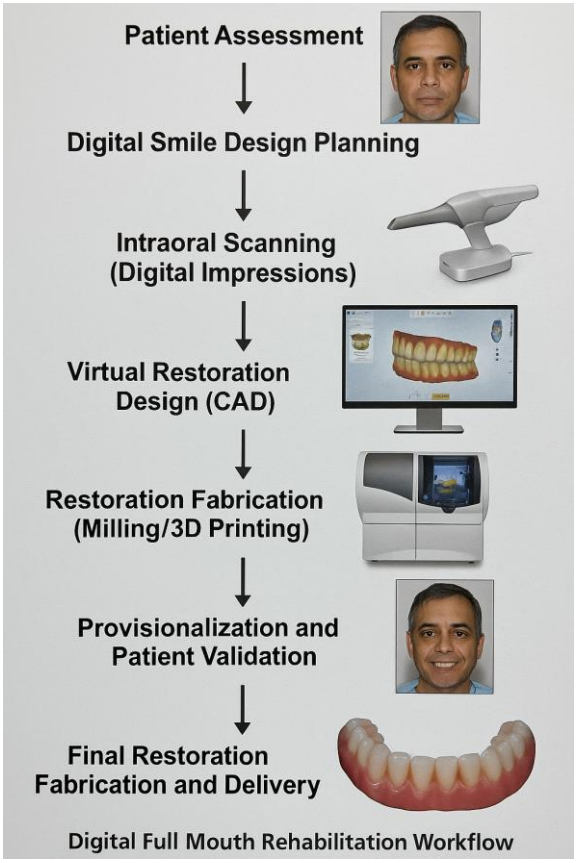
Applications include:

- Surgical guides for guided implant placement
- Long-term provisionals to assess function and esthetics
- Prototype and final prostheses in hybrid resins or printable polymers

3d-printed provisionals allow patients to "test drive" restorations before final delivery. These temporaries can be worn over extended periods, allowing adjustments in esthetics, phonetics, and occlusion. New-generation printable resins now possess mechanical strength and esthetic qualities approaching those of milled restorations (Revilla-León & Özcan, 2019).

Although milling remains preferred for definitive zirconia frameworks, 3d printing is rapidly becoming the method of choice for efficient and cost-effective full-arch provisionalization.

Flowchart 17.1: Digital Full-Mouth Rehabilitation Workflow



Aspect	Digital Workflow	Conventional Workflow
Impressions	Intraoral scanning	Physical elastomeric impressions
Design	Virtual CAD software	Hand-crafted wax-ups
Fabrication	Milling / 3d printing	Casting / Layered ceramics
Accuracy	High, reduced error	Technique-sensitive
Turnaround Time	Shorter	Longer
Patient Comfort	Enhanced	Often reduced due to trays/materials

Table 17.1: Comparison of Digital and Conventional FMR Techniques

Conclusion

Digital full-mouth rehabilitation has redefined prosthodontic care by improving treatment predictability, patient experience, and interdisciplinary collaboration. Tools such as Digital Smile Design, intraoral scanning, CAD/CAM fabrication, and 3d printing enable highly customised and minimally invasive treatment solutions that align with modern expectations of esthetics, function, and efficiency.

By thoughtfully integrating digital workflows, clinicians can deliver restorations that are biologically compatible, functionally durable, and esthetically superior. As technologies continue to evolve, the future of full-mouth rehabilitation is undeniably digital, driven by precision, patient engagement, and clinical excellence.

References

Alharbi, N., Wismeijer, D., & Osman, R. B. (2017). Additive manufacturing techniques in prosthodontics: Where do we currently stand? *Journal of Prosthodontics*, 26(2), 93–102. https://doi.org/10.1111/jopr.12558

Coachman, C., Paravina, R. D., & Calamita, M. A. (2017). Digital smile design: Concepts, developments and applications. *Current Oral Health Reports*, 4(4), 278–286. https://doi.org/10.1007/s40496-017-0166-0

Joda, T., & Gallucci, G. O. (2015). The virtual patient in dental medicine. *Clinical Oral Implants Research*, 26(6), 725–726. https://doi.org/10.1111/clr.12479

Mangano, F. G., Veronesi, G., Hauschild, U., Mijiritsky, E., & Mangano, C. (2017). Trueness and precision of four intraoral scanners in oral implantology: A

comparative in vitro study. *PLoS ONE*, 11(9), e0163107. https://doi.org/10.1371/journal.pone.0163107

Revilla-León, M., & Özcan, M. (2019). Additive manufacturing technologies used for processing polymers: Current status and potential application in prosthetic dentistry. *Journal of Prosthodontics*, 28(2), 146–158. https://doi.org/10.1111/jopr.13090

Yuzbasioglu, E., Kurt, H., Turunc, R., & Bilir, H. (2014). Comparison of digital and conventional impression techniques: Evaluation of patients' perception, treatment comfort, effectiveness and clinical outcomes. *BMC Oral Health*, 14(1), 10. https://doi.org/10.1186/1472-6831-14-10

Deep Science Publishing
https://doi.org/10.70593/978-93-49910-79-9

DeepScience
Open Access Books

Chapter 18: Clinical Case Series in Full Mouth Rehabilitation

Manu Rathee, Stalin M, Komalpreet Kaur, Balavignesh S

Abstract: Clinical case series offer valuable insights into the practical application of full mouth rehabilitation (FMR) principles across diverse patient scenarios. These cases highlight the complexities involved in diagnosis, treatment planning, occlusal scheme selection, material choice, and execution. Each patient presents unique anatomical, functional, and esthetic demands, requiring a tailored, interdisciplinary approach. By examining real-life outcomes, complications, and modifications made during the treatment process, clinicians can better understand the adaptability, challenges, and long-term management strategies essential for successful FMR. This chapter presents selected case series illustrating varied clinical protocols and outcomes in full arch rehabilitation.

Keywords: Case Series, Clinical Outcomes, Full Mouth Rehabilitation, Occlusal Planning, Prosthodontic Management

1 Introduction

Full mouth rehabilitation involves restoring the entire dentition to achieve optimal function, esthetics, and patient comfort. While theoretical frameworks and systematic protocols guide treatment, real-world cases often demand modifications based on individual anatomical and systemic conditions. Clinical case series serve as a bridge between theoretical knowledge and practical execution, offering evidence of decision-making under variable clinical constraints (Dawson, 2007).

Manu Rathee,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Dr. Stalin M,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Dr. Komalpreet Kaur,
Department of Prosthodontics, Panjab University, Chandigarh, India.
Dr. Balavignesh S,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.

These cases provide valuable learning through success stories and complications, reinforcing the need for individualised treatment planning, interdisciplinary collaboration, and continuous evaluation throughout the rehabilitation process.

2. Clinical Case Series

Case 1: Severe Attrition with Loss of Vertical Dimension of Occlusion (VDO)
A 58-year-old male with generalised attrition and reduced facial height underwent occlusal splint therapy followed by zirconia-based restorations at a re-established VDO. Functional improvements and resolution of TMJ discomfort were maintained over six months.
(Patel et al., 2020)

Preoperative Findings:

A 58-year-old male presented with generalised severe dental attrition leading to a collapsed vertical dimension of occlusion (VDO), impaired esthetics, and functional discomfort. Clinical examination revealed anterior overclosure, reduced lower facial height, and mild temporomandibular joint (TMJ) tenderness on palpation.

Step-by-Step Procedure:

Comprehensive diagnostic evaluation included mounted study models in centric relation and diagnostic wax-up to determine the ideal VDO. The patient underwent occlusal splint therapy to test adaptation to an increased VDO. Following successful adaptation, minimal reduction preparations were carried out, preserving maximum tooth structure. Provisional restorations were worn for two months to validate occlusion, esthetics, and function.

Definitive restorations were fabricated using layered zirconia for anterior teeth to maximise esthetics and monolithic zirconia for posterior teeth to withstand occlusal loads. A canine-guided occlusion was established.

Material Choices:

- Provisional restorations: Bis-acryl composite resin
- Final restorations: Layered zirconia (anterior), Monolithic zirconia (posterior)

Follow-up:
At one week, one month, three months, and six months, the patient demonstrated stable occlusion, improved facial esthetics, and resolution of TMJ symptoms.

Case 2: Implant-Supported Full Mouth Rehabilitation

A 65-year-old female received guided implant placement (4 mandibular, 6 maxillary) followed by a titanium bar-supported hybrid prosthesis in the maxilla and monolithic zirconia prosthesis in the mandible. The case demonstrated excellent esthetic and functional outcomes at one-year follow-up. *(Jivraj et al., 2006; Sailer et al., 2018)*

Preoperative Findings:

A 65-year-old female patient presented with terminal dentition and failing restorations, requesting a fixed prosthetic solution.

Step-by-Step Procedure:

Post-extractions, four implants were placed in the mandible and six in the maxilla using guided surgery. After a four-month healing phase, full-arch fixed prostheses were fabricated.

A CAD/CAM-milled titanium bar was constructed for the maxillary arch, supporting a hybrid prosthesis. In the mandible, a monolithic zirconia full-arch prosthesis was delivered. Light centric contacts and shallow anterior guidance were incorporated into the occlusal design.

Material Choices:

- Surgical guides: 3d-printed resin
- Maxillary prosthesis: Titanium bar with acrylic hybrid prosthesis
- Mandibular prosthesis: Monolithic zirconia

Follow-up:
At one-year follow-up, the patient exhibited excellent function, healthy peri-implant tissues, and esthetic satisfaction.

Case 3: TMD-Associated Rehabilitation

A 47-year-old female with TMD and bruxism was managed initially with a stabilising splint, followed by phased metal-ceramic restorations. Canine guidance with group function helped achieve symptom relief and stable occlusion. *(Okeson, 2013; Dawson, 2007)*

Preoperative Findings:

A 47-year-old female presented with generalised tooth wear, TMJ clicking, muscular tenderness, and nocturnal bruxism.

Step-by-Step Procedure:

Initial therapy involved fabrication of a hard acrylic stabilisation splint to manage muscular hyperactivity. Following symptom improvement, a diagnostic wax-up at re-established VDO was completed. Rehabilitation was performed in phases, restoring posterior support first, followed by anterior guidance.

Metal-ceramic restorations were chosen for durability and cost-effectiveness. A canine-guided occlusion with slight group function was planned to distribute forces and minimize joint stress.

Material Choices:

- Splint: Hard acrylic stabilisation splint
- Final restorations: Metal-ceramic crowns and bridges

Follow-up:
After one year, the patient reported marked improvement in comfort, function, and TMJ health.

Case 4: Esthetic Rehabilitation in Amelogenesis Imperfecta (AI)

A 22-year-old male with AI underwent a minimally invasive protocol using lithium disilicate crowns, guided by digital smile design and a conservative mock-up. At 18 months, the patient exhibited excellent aesthetic outcomes and resolution of hypersensitivity.
(Pousette Lundgren et al., 2015; Coachman et al., 2017)

Preoperative Findings:

A 22-year-old male with amelogenesis imperfecta presented with generalised enamel hypoplasia, severe sensitivity, poor aesthetics, and psychological distress.

Step-by-Step Procedure:

Minimally invasive preparation was planned, guided by a diagnostic wax-up and mock-up. Conservative tooth reduction preserved dentin, enhancing adhesive bonding.

Lithium disilicate crowns were fabricated for anterior and posterior teeth to optimise esthetics while maintaining structural integrity. Smile design corrections included midline cant adjustment, incisal edge harmonisation, and proper smile arc development.

Anterior guidance and mutually protected occlusion were established.

Material Choices:

- Provisional restorations: Composite-based mock-up
- Final restorations: Lithium disilicate crowns (IPS e.max Press)

Follow-up:
At 18 months post-rehabilitation, the patient displayed excellent esthetics, resolution of sensitivity, and significantly improved self-confidence.

Table 18.1: ***Summary of Clinical Cases***

Case	Preoperative Diagnosis	Key Procedures	Material Used	Outcome
1	Severe attrition and VDO loss	Splint therapy, minimal prep, zirconia restorations	Layered and monolithic zirconia	Stable occlusion, TMJ relief
2	Terminal dentition	Implants, titanium bar, hybrid and zirconia prostheses	3d-printed guide, hybrid acrylic, monolithic zirconia	High satisfaction, stable function
3	TMD and bruxism	Splint therapy, phased restoration	Metal-ceramic crowns	Symptom resolution, functional success
4	Amelogenesis imperfecta	Conservative prep, aesthetic smile design	Lithium disilicate crowns	High aesthetic outcome, psychosocial improvement

Conclusion

Clinical case studies exemplify the practical application of full mouth rehabilitation principles, emphasising individualised care, comprehensive planning, and strategic material selection. Each case underscores the importance of functional and aesthetic balance, patient communication, and long-term maintenance to ensure predictable, satisfying, and life-enhancing outcomes.

References

Coachman, C., Paravina, R. D., & Calamita, M. A. (2017). Digital smile design: Concepts, developments and applications. *Current Oral Health Reports*, 4(4), 278–286. https://doi.org/10.1007/s40496-017-0166-0

Dawson, P. E. (2007). *Functional occlusion: From TMJ to smile design*. Elsevier Health Sciences.

Jivraj, S., Chee, W., & Corrado, P. (2006). Treatment planning of the full arch implant-supported fixed prosthesis. *British Dental Journal*, 201(11), 660–667. https://doi.org/10.1038/sj.bdj.4814324

Misch, C. E. (2021). *Contemporary implant dentistry* (4th ed.). Elsevier.

Okeson, J. P. (2013). *Management of temporomandibular disorders and occlusion* (7th ed.). Elsevier Mosby.

Patel, D., Banerjee, A., & Thomas, M. S. (2020). Full mouth rehabilitation using digital occlusal analysis and monolithic zirconia restorations: A case report. *Journal of Advanced Prosthodontics*, 12(5), 310–316. https://doi.org/10.4047/jap.2020.12.5.310

Pousette Lundgren, G., Morling Vestlund, G. I., Trulsson, M., & Dahllöf, G. (2015). Aesthetics and oral function in young adults with amelogenesis imperfecta: A qualitative study. *International Journal of Paediatric Dentistry*, 25(5), 327–334. https://doi.org/10.1111/ipd.12144

Sailer, I., Makarov, N. A., Thoma, D. S., Zwahlen, M., & Pjetursson, B. E. (2018). All-ceramic or metal-ceramic tooth-supported fixed dental prostheses (FDPs)? A systematic review of the survival and complication rates. *Clinical Oral Implants Research*, 29(S16), 183–198. https://doi.org/10.1111/clr.13303

Deep Science Publishing
https://doi.org/10.70593/978-93-49910-79-9

Chapter 19: Future Trends in Full-Mouth Rehabilitation

Balavignesh S, Manu Rathee, Sarthak Singh Tomar, Stalin M

Abstract: Full-mouth rehabilitation (FMR) is rapidly evolving with the integration of digital technology, biomaterials, artificial intelligence (AI), and regenerative medicine. Future advancements promise to enhance precision, personalisation, and predictability in diagnosis, treatment planning, and prosthesis fabrication. Developments such as AI-driven diagnostics, virtual articulators, bioprinted prosthetic structures, and smart restorative materials are expected to redefine treatment protocols and improve long-term outcomes. This chapter explores emerging trends and technologies that are poised to transform FMR into a more data-driven, patient-centred, and biologically integrated discipline.

Keywords: Artificial Intelligence, Bioprinting, Digitisation, Nanomaterials, Regeneration

1 Introduction

The landscape of full-mouth rehabilitation (FMR) is undergoing significant transformation, driven by breakthroughs in digital technology, artificial intelligence, and material science. Traditional techniques are being replaced or enhanced by digitally guided workflows, predictive modelling, and biologically active materials that improve precision and long-term success (Mangano et al., 2020; Revilla-León & Özcan, 2019). With the growing emphasis on personalised care and minimally invasive protocols, future trends in FMR aim to merge function, esthetics, and biology through intelligent systems, virtual simulations, and patient-specific prosthetics

Balavignesh S,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Dr. Manu Rathee,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Sarthak Singh Tomar,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Stalin M,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India

This chapter explores how these innovations will redefine FMR in terms of diagnostics, treatment planning, execution, and long-term care.

2. Artificial Intelligence and Machine Learning in Prosthodontics

Artificial intelligence (AI) and machine learning are revolutionising the planning and execution of full-mouth rehabilitation (FMR). AI-driven software can analyse digital impressions, facial scans, and occlusal patterns to recommend precise restorative designs based on facial symmetry, lip dynamics, smile arcs, and midline position (Joda & Gallucci, 2015). These tools also provide virtual treatment simulations that aid in patient communication and consent.

Machine learning continuously refines outcomes by learning from large datasets, offering predictive analytics for implant survival, prosthetic success, and potential complications (Schwendicke et al., 2020). AI also enables early diagnosis of parafunction, TMD, and occlusal discrepancies, supporting preventive intervention. Future systems are expected to provide fully individualised prosthetic plans based on genetic, behavioural, and clinical profiles.

3. Digital Biomaterials and Regenerative Technologies

Recent advances in digital biomaterials are shifting prosthodontics toward regenerative possibilities. Nanostructured ceramics and bioactive surfaces now offer enhanced mechanical strength, esthetics, and biologic compatibility, making them ideal for complex rehabilitations (Revilla-León & Özcan, 2019).

Materials like calcium phosphate-coated titanium and glass-ceramics promote osseointegration and soft tissue healing. Concurrently, regenerative techniques such as stem cell therapy and growth factor delivery (e.g., BMP-2, PDGF) are being explored for ridge augmentation, periodontal regeneration, and even pulp–dentin complex restoration (Bottino et al., 2022). These innovations may enable biological rebuilding before prosthetic replacement, transforming prosthodontics from restorative to regenerative.

4. Robotic-Assisted Implantology and Automation

Robotics is enhancing surgical accuracy in FMR, particularly in implant placement. Robotic-assisted systems utilise preoperative digital planning and real-time navigation to optimise angulation, depth, and positioning, improving implant success and prosthesis longevity (Block et al., 2017).

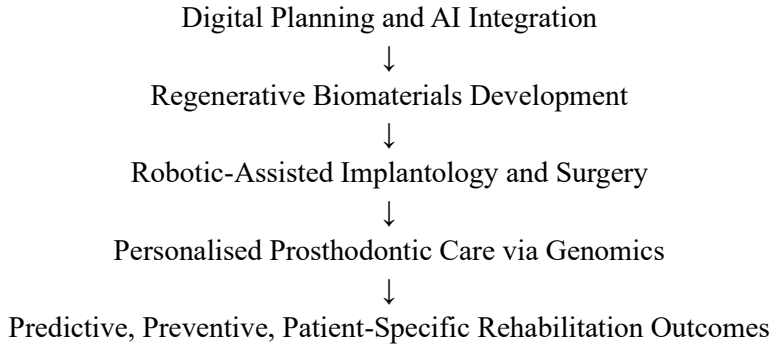
Dynamic navigation systems and haptic-guided robotics allow for safe and minimally invasive full-arch rehabilitations. In parallel, laboratory automation through robotic milling, AI-driven CAD/CAM, and additive manufacturing accelerates turnaround time while improving consistency and accuracy in prosthesis fabrication.

5. Personalised Prosthodontics and Genomics

The future of prosthodontics lies in personalisation. Genetic screening may help identify patients at higher risk of implant failure, peri-implantitis, or periodontal disease (Kinane et al., 2017). Salivary biomarkers and genomic data could inform maintenance schedules and material choices tailored to individual biological responses.

Salivary proteomics and point-of-care biomarker testing could become routine to monitor oral inflammation, caries risk, and soft tissue health. This transition toward predictive, preventive, and personalised prosthodontics will allow clinicians to proactively adapt treatment plans to each patient's unique molecular and clinical profile.

Flowchart 19.1: Future Innovations in Full-Mouth Rehabilitation



Technology/Field	Application in FMR	Future Impact
Artificial Intelligence	Aesthetic and functional digital design	Personalised, predictive prosthodontics
Digital Biomaterials	Smart ceramics, bioactive surfaces	Enhanced regeneration and integration
Robotic Surgery	Guided implant placement, real-time feedback	Minimally invasive, highly precise surgery
Genomics	Risk profiling and preventive strategies	Customised long-term rehabilitation planning

Table 19.1: Emerging Technologies and Their Impact on Full-Mouth Rehabilitation

6. Clinical Vision for the Future

Clinicians of the future will be those who seamlessly integrate emerging technologies into traditional workflows, combining scientific innovation with artistic finesse. Mastery over AI diagnostics, regenerative therapies, robotic precision, and genetic personalisation will define the next generation of full-mouth rehabilitative care.

Conclusion

The future of full mouth rehabilitation is being shaped by technological innovation—AI-driven diagnostics, bioactive materials, robotics, and precision genomics. These tools promise to enhance aesthetic and functional outcomes while minimising invasiveness and improving personalisation. As prosthodontics shifts toward a digitally empowered, biologically driven future, clinicians must blend new technologies with timeless principles to deliver truly patient-centred, evidence-based care.

References

Block, M. S., Emery, R. W., Lank, K., & Ryan, J. (2017). Implant placement accuracy using dynamic navigation. *International Journal of Oral & Maxillofacial Implants*, 32(1), 92–99. https://doi.org/10.11607/jomi.5145

Bottino, M. C., Pankajakshan, D., & Ferreira, J. A. (2022). Recent advances in scaffolds for periodontal regeneration. *Dental Clinics of North America*, 66(1), 61–76. https://doi.org/10.1016/j.cden.2021.08.008

Joda, T., & Gallucci, G. O. (2015). The virtual patient in dental medicine. *Clinical Oral Implants Research*, 26(6), 725–726. https://doi.org/10.1111/clr.12479

Kinane, D. F., Stathopoulou, P. G., & Papapanou, P. N. (2017). Periodontal diseases. *Nature Reviews Disease Primers*, 3(1), 1–14. https://doi.org/10.1038/nrdp.2017.38

Revilla-León, M., & Özcan, M. (2019). Additive manufacturing technologies used for processing polymers: Current status and potential application in prosthetic dentistry. *Journal of Prosthodontics*, 28(2), 146–158. https://doi.org/10.1111/jopr.13090

Schwendicke, F., Krois, J., & Gomez, J. (2020). Artificial intelligence in dentistry: Chances and challenges. *Journal of Dental Research*, 99(7), 769–774. https://doi.org/10.1177/0022034520915714

Deep Science Publishing
https://doi.org/10.70593/978-93-49910-79-9

DeepScience
Open Access Books

Chapter 20: Summary and Clinical Pearls in Full Mouth Rehabilitation

Komal Saroya, Aarti Sulekh, Stalin M, Nang Nalika Moungkhom

Abstract: Full-mouth rehabilitation (FMR) represents a sophisticated blend of science, clinical expertise, and individualised patient care. This chapter summarises key principles, protocols, and decision-making strategies essential for successful FMR outcomes. From comprehensive diagnosis and occlusal evaluation to material selection and final prosthesis delivery, each phase of treatment requires precision and customisation. Clinical pearls gathered from real-world experience and evidence-based practices are presented to assist clinicians in avoiding common pitfalls, enhancing case predictability, and achieving long-term functional and esthetic success. The integration of interdisciplinary collaboration, patient communication, and continual reassessment remains central to the philosophy of full-mouth rehabilitation.

Keywords: Diagnosis, Esthetics, Occlusion, Planning, Rehabilitation

1 Introduction

Full-mouth rehabilitation (FMR) is not merely a mechanical restoration of the dentition but a comprehensive process that involves restoring harmony between form, function, esthetics, and biology. The journey from diagnosis to definitive restoration is layered with clinical decisions that must be both systematic and adaptable to the patient's needs. While numerous protocols exist, it is often clinical experience and attention to detail that determine long-term success (Dawson, 2007; Shillingburg et al., 1997). This chapter aims to consolidate the core principles discussed throughout the book and highlight practical clinical pearls—small yet powerful insights that enhance the quality and predictability of FMR.

Komal Saroya,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Aarti Sulekh,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Stalin M,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.
Nang Nalika Moungkhom,
Department of Prosthodontics, Pt. B.D. Sharma University of Health Sciences, Rohtak, Haryana, India.

2. Summary of Key Concepts

FMR is guided by principles that address biological, functional, mechanical, and esthetic dimensions. A comprehensive diagnostic phase includes mounted casts, digital imaging, occlusal assessment, and esthetic evaluation. Digital smile design (DSD), mock-ups, and wax-ups enable visualisation of outcomes and refinement before irreversible procedures (Coachman et al., 2017).

Provisionalization provides a functional and esthetic testing period, validating vertical dimension, occlusal schemes, and esthetic expectations (Jivraj et al., 2006). Material selection must be biologically compatible, durable, and suited to patient esthetic goals, ranging from PFM to lithium disilicate or monolithic zirconia restorations (Sailer et al., 2015).

Digital tools—such as intraoral scanners, CAD/CAM workflows, and 3d printing—enhance efficiency, accuracy, and communication (Mangano et al., 2017). Implant-supported FMR demands biomechanical precision, prosthetically guided surgery, and peri-implant tissue maintenance (Misch, 2021).

Future trends, including AI, robotics, and regenerative biomaterials, will further elevate FMR by making it more predictive and biologically responsive (Schwendicke et al., 2020).

3. Clinical Pearls for Successful Full-Mouth Rehabilitation

- **Accurate Diagnosis:** Begin with esthetic analysis, functional testing, digital photography, mounted models, and occlusal evaluation.
- **Provisionalization Strategy:** Validate esthetics, phonetics, occlusion, and vertical dimension using long-term provisional restorations.
- **Occlusal Design Discipline:** Ensure stable centric contacts, harmonious anterior guidance, and eliminate non-working interferences.
- **Smart Material Selection:** Choose based on occlusal load, esthetic demand, periodontal health, and restorative margin control.
- **Digital Integration:** Leverage digital impressions, virtual articulation, CAD/CAM, and 3d printing for enhanced precision and predictability.
- **Patient Involvement:** Engage the patient throughout mock-ups, shade selection, and try-ins for increased satisfaction and compliance.
- **Maintenance Programs:** Incorporate night guards, hygiene reinforcement, and periodic recalibration to protect prostheses and biologic structures.

Clinical Domain	Strategic Focus
Diagnosis	Digital photography, functional analysis, and mounted models
Planning	Smile design, occlusal scheme selection, risk evaluation
Provisionalization	Validate vertical dimension, refine aesthetics and function.
Definitive Restorations	Strategic material choice, CAD/CAM accuracy, and gingival design
Occlusion	Stable centric stops, anterior guidance, disclusion control
Patient Communication	Involvement in mock-ups, try-ins, and shade matching
Maintenance	Recall protocols, occlusal guard therapy, and hygiene program

Table 20.1: Key Success Factors – A Clinical Matrix

Conclusion

Full-mouth rehabilitation is the convergence of clinical science, esthetic vision, and technical execution. It requires rigorous planning, patient collaboration, and continual reassessment to ensure long-term success. By mastering the fundamentals—accurate diagnosis, strategic material selection, occlusal harmony, and patient communication—clinicians restore not only dentition but also function, confidence, and quality of life. As digital tools, AI, and biologic materials become more central, the modern prosthodontist must be both artist and innovator, committed to delivering restorations that are not only functional but transformative.

References

- Coachman, C., Paravina, R. D., & Calamita, M. A. (2017). Digital smile design: Concepts, developments and applications. *Current Oral Health Reports, 4*(4), 278–286. https://doi.org/10.1007/s40496-017-0166-0
- Dawson, P. E. (2007). *Functional occlusion: From TMJ to smile design*. Elsevier Health Sciences.
- Jivraj, S., Chee, W., & Corrado, P. (2006). Treatment planning of the full arch implant-supported fixed prosthesis. *British Dental Journal, 201*(11), 660–667. https://doi.org/10.1038/sj.bdj.4814324

- Mangano, F. G., Veronesi, G., Hauschild, U., Mijiritsky, E., & Mangano, C. (2017). Trueness and precision of four intraoral scanners in oral implantology: A comparative in vitro study. *PLoS ONE, 11*(9), e0163107. https://doi.org/10.1371/journal.pone.0163107
- Misch, C. E. (2021). *Contemporary implant dentistry* (4th ed.). Elsevier.
- Sailer, I., Makarov, N. A., Thoma, D. S., Zwahlen, M., & Pjetursson, B. E. (2015). All-ceramic or metal-ceramic tooth-supported fixed dental prostheses (FDPs)? A systematic review. *Clinical Oral Implants Research, 26*(S11), 131–146. https://doi.org/10.1111/clr.12361
- Schwendicke, F., Krois, J., & Gomez, J. (2020). Artificial intelligence in dentistry: Chances and challenges. *Journal of Dental Research, 99*(7), 769–774. https://doi.org/10.1177/0022034520915714
- Shillingburg, H. T., Hobo, S., & Whitsett, L. D. (1997). *Fundamentals of fixed prosthodontics* (3rd ed.). Quintessence Publishing.

Annexures

Key Classification Systems in Full Mouth Rehabilitation

Classification	Description
Turner and Missirlian Classification	Classifies patients based on the amount of vertical dimension loss and restorative space availability.
Dawson's Functional Occlusion	Differentiates occlusal schemes into mutually protected occlusion and group function.
Misch Classification of Bone Density	Classifies bone quality into D1–D4 types, guiding implant planning.
Prosthodontic Diagnostic Index (PDI)	Categorises patients by edentulism severity, influencing FMR complexity and prognosis.
Kennedy's Classification	Organises partial edentulism patterns, critical for planning removable or implant-supported prostheses.

Common Occlusal Philosophies in Full-Mouth Rehabilitation

Philosophy	Key Features
Hobo's Twin-Stage Procedure	Establishes anterior guidance first, followed by balanced posterior disclusion.
Pankey-Mann-Schuyler (PMS) Philosophy	Promotes functional harmony through centric relation, group function occlusion, and dynamic equilibrium.
Neuromuscular Concept	Uses electromyography (EMG) to identify optimal myocentric occlusion positions for rehabilitation.
Organic Occlusion	Emphasises anterior guidance protection and posterior load-bearing in centric occlusion.

Clinical Checklist for Full Mouth Rehabilitation

Step	Key Points
Diagnosis	Esthetic, functional, and biological evaluation; mounted casts; digital smile design analysis.
Treatment Planning	Sequential vs simultaneous FMR decision; occlusal scheme selection; material strategy formulation.
Mock-Up	Esthetic and functional preview; patient involvement and approval.
Tooth Preparation	Preservation of ferrule, correct axial reduction, and finish line optimisation.
Provisionalization	Long-term provisionals to validate vertical dimension, occlusion, and phonetics.
Final Impressions	Full-arch or intraoral digital scans ensure detailed margin capture.
Try-In Phase	Verification of fit, esthetics, occlusion, and eccentric contact adjustments.
Cementation	Optimal cement selection; occlusal re-verification post-cementation.
Maintenance	Periodic recalls, splint therapy (if indicated), and hygiene reinforcement.

Common Prosthetic Failures and Their Management

Failure Type	Example	Management
Mechanical	Porcelain chipping or fracture	Surface repair if minor; replacement if extensive.
Biological	Peri-implantitis	Surgical debridement, guided bone regeneration, and implantoplasty.

Failure Type	Example	Management
Functional	Occlusal instability	Occlusal equilibration, splint therapy, and restoration adjustment.
Esthetic	Shade mismatch, gingival disharmony	External characterisation, veneer placement, or prosthesis remake.

Glossary of Important Terms in Full Mouth Rehabilitation

Term	Definition
Vertical Dimension of Occlusion (VDO)	The distance between two selected anatomic points when teeth are in maximal intercuspation.
Ferrule Effect	The presence of a 360° encircling band of sound tooth structure enhances fracture resistance.
Centric Relation (CR)	The maxillomandibular relationship is where the condyles are in the most anterior-superior position, independent of tooth contact.
Provisionalization	Temporary phase using trial restorations to evaluate function, esthetics, phonetics, and vertical dimension before final treatment.
Immediate Loading	Restoration placement on dental implants within 48 hours of surgery without functional loading stresses.

Digital Era in Full Mouth Rehabilitation

Technology	Application
Digital Smile Design	Previsualization and interdisciplinary aesthetic planning.
Intraoral Scanners	Accurate, comfortable impressions without distortion.
CAD/CAM Systems	Virtual design and precision milling of restorations.
3D Printing	Rapid prototyping of surgical guides, provisionals, and final prostheses.
Artificial Intelligence (AI)	Predictive modelling for prosthesis design, occlusal scheme selection, and treatment planning.

Conclusion to Annexures

The annexures provided herein offer a comprehensive and practical reference that supplements the foundational and advanced principles of full mouth rehabilitation. From critical classifications and occlusal philosophies to clinical checklists and management strategies, these resources equip clinicians, students, and educators with actionable tools to achieve successful, patient-centred rehabilitations.

As prosthodontics continues to advance into a digital, biologically integrated, and highly personalised era, these annexures serve as a bridge between traditional mastery and modern innovation, ensuring that excellence in full mouth rehabilitation remains attainable, replicable, and ever-evolving.

Recommended Further Reading

- *Dawson PE. Functional Occlusion: From TMJ to Smile Design. Mosby; 2007.*
- *Hobo S, Takayama H. Oral Rehabilitation: Clinical Determinants of Treatment Planning. Quintessence Publishing; 2014.*
- *Misch CE. Contemporary Implant Dentistry. Mosby; 2014.*
- *Spear FM. Interdisciplinary Treatment Planning: Principles, Design, Implementation. Quintessence Publishing; 2009.*
- *Kois DE. Advances in Esthetic and Interdisciplinary Dentistry. Mosby; 2011.*

- *Goodacre CJ et al. Clinical Complications in Fixed Prosthodontics. J Prosthet Dent. 2003;90(1):31-41.*
- *Coachman C et al. Dynamic Smile Design. Int J Periodontics Restorative Dent. 2017;37(2):183-193.*
- *Revilla-León M, Özcan M. Additive Manufacturing Technologies in Prosthetic Dentistry. J Prosthodont. 2019;28(2):146-158.*