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FULL MOUTH REHABILITATION-A REVIEW

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ABSTRACT

Restoring the bite in patients with severely worn dentures is a challenging clinical situation, as each case is unique in itself. Restoration of mutilated dentition is a technique oriented procedure, because there are different opinions about the choice of an occlusal system suitable for successful rehabilitation of the oral cavity. The etiology, investigations, the sequence of treatment procedure all requires meticulous diagnosis and treatment planning. This article is an overview of the different occlusal concepts/philosophies in full mouth rehabilitation to help the practitioner aware of the treatment phases and the appropriate occlusal system for a particular case.

Keywords: Full mouth rehabilitation, Occlusal concepts/philosophies, treatment planning

INTRODUCTION

The goal of dentistry is to increase the life span of the functioning dentition, just as the goal of medicine is to increase the life span of functioning individual¹. The word rehabilitate implies to restore to good condition or to restore to former privilege¹.

Full Mouth Rehabilitation (FMR) is a challenging treatment plan for a restorative dentist. FMR involves complex and sequential treatment planning. FMR is used to indicate extensive and intensive restorative procedure where the occlusal plane is corrected if required in various ways to achieve functional harmony with facial structures. Patients are often unaware of the process as the loss of tooth structure is a gradual and slow process and are only aware of it when there has been sufficient loss of dental structures.² Various factors such as vertical dimension of occlusion centric relationship occlusal pattern esthetics and phonetics are taken into account during rehabilitation. This can be further complicated by existing restorations pulp exposure missing teeth dental tenderness supraerupted teeth and TMJ pain.³

ETIOLOGY:

The loss of functional harmony could be due to various reasons: Multiple missing teeth due to caries or any trauma, Fractured or chipped teeth abrasion (worn out teeth due to long term acid exposure), TMJ disorders, Fluorosis, Periodontal problems, Malocclusion, Due to developmental anomalies like amelogenesis imperfecta, dentinogenesis imperfecta, enamel hypoplasia and due to congenital anomalies: hypodontia, anodontia and macrodontia.⁴

OBJECTIVES:

The objective for full mouth rehabilitation are to obtain and maintain the health of periodontal tissues, temporomandibular joint and associated structures.

The **Indications** for full mouth rehabilitation procedures are

- restore the impaired occlusal function,
- preserve the longevity of remaining teeth,
- maintain healthy periodontium, improve esthetics,
- to relieve pain and discomfort of teeth and its surrounding structures.⁵

CLASSIFICATION**CLASSIFICATION BY TURNER AND MISSIRLAIN (1984)⁶**

The patients were classified into three categories

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

			-restorative repositioning -surgical repositioning of the segments ⁶
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CLASSIFICATION BY BRECKER (1966)⁷

Group I –Class I

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

Class II

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

Class III

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

Group II -Class I

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

Class II

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

Group III

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

Group IV

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

CONCEPTS⁸

S. no	Occlusal concept/philosophy	Salient features	Limitation
1	Gnathological concept (McCollum, Stuart, Stallard)	<ul style="list-style-type: none"> -Mutually protected occlusion -Point centric concept -Maximum intercuspation coincides with centric relation (RUM position) -Cusp to fossa relationship with tripodism. -Narrow occlusal table 	<ul style="list-style-type: none"> -Point centric and cusp-to-fossa tripodization complicate the need to obtain precise gnathologic restorations -Need for a fully adjustable articulator - Cast metal transitional restorations had some limitations relating cost and its inability to increase the occlusal vertical dimension, and some changes in mandibular position that might not be equilibrated easily to a new maximum intercuspation relation
2	Freedom in centric Concept (Schuyler)	<ul style="list-style-type: none"> -Balancing the contacts are deleterious should be avoided in natural dentition - Incisal guidance is a foremost factor for selection of posterior guiding tooth inclines than condylar guidance so it must be the initial step of occlusal rehabilitation -Antero-posterior freedom of movement must be incorporated in the restoration 	<ul style="list-style-type: none"> -According to gnathologists, the task of adjusting maximum intercuspation contacts in two variable positions on an articulator to achieve freedom in centric might lead to inadequacy of precision in both positions - Cusp-to-surface rather than cusp-to-fossa relation affects chewing efficiency
3	Simplified occlusal design concept (Wiskott and Belser)	<ul style="list-style-type: none"> - Cusp-fossa relation with only one occlusal contact for each tooth - Anterior disclusion during all eccentric movements - Freedom in centric occlusion - might be modified to most anterior guidances and different degrees of group function 	
4	Pankey, Mann and Schuyler philosophy (1960)	<ul style="list-style-type: none"> -Maxillary cuspids in good functional contact -Group function on working side -Absence of nonworking side contacts. -Freedom of movement in centric occlusion is essential. -Long centric is incorporated in the lingual surfaces of maxillary incisors 	<ul style="list-style-type: none"> -Cusp to fossae marginal ridge contact - The use of wax functionally generated path techniques might cause flaws -The PM philosophy was advanced and its use endorsed on a non-arcon articulator, which might not accept interocclusal records made at increased occlusal vertical dimension
5	Twin Table technique - Hobo (1991)	<ul style="list-style-type: none"> -Incisal guidance and condylar path are dependent factors -Posterior teeth are restored using two customized incisal tables: without disclusion; and with disclusion 	<ul style="list-style-type: none"> -Cusp angle was formulated parallel to measured condylar path, and the cusp angle became too steep. - To obtain a standard amount of disclusion with such a steep cusp angle, the incisal path must be set at an angle that was exceedingly steep. This made the patient not comfortable

			-The customized guide tables were fabricated by the use of resin molding. It was technique sensitive
6	Twin Stage Procedure- Hobo and Takayama	-Since cusp angle is the main determinant of occlusion, the measurement of the condylar path is not necessary. -The procedure is indicated for single crowns, fixed prosthodontics and implants, complete-mouth reconstructions, and also complete dentures - Suitable for transmandibular disorder patients -It can also be incorporated with commonly used clinical techniques such as facebow transfer, various centric recording methods, and cusp-fossa waxing	-Contraindicated for malocclusion cases
7	Youdelis Scheme	-Cuspal anatomy is so arranged if canine disclusion is lost through wear or tooth movement, posterior teeth drop into group function	-Used in advanced periodontitis cases
8	Nyman and Lindhe Scheme	-When there are long tooth-borne cantilevered restorations, balanced occlusion must be achieved -When distal support is present, anterior disclusion is provided	-For extremely advanced periodontitis cases -Type of contacts not specified ⁸

MATERIALS AND METHODS

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

The step wise sequential procedure in the treatment planning:

Patient's medical and dental history:

Medical History: This section includes information about the patient's general health status, any pre-existing medical conditions, medications, allergies, surgeries, hospitalizations, and systemic diseases. It is crucial in determining potential risks, complications, or interactions with dental treatments.⁹

Dental History: This part covers the patient's past dental treatments, oral hygiene habits, history of cavities, gum disease, dental trauma, previous restorations, and any ongoing oral health concerns.

Clinical dental examination:

Extraoral Examination: Extra oral examination involves assessing the head, neck, and jaw joints for abnormalities, swelling, or asymmetry.¹⁰

Intraoral Examination: Intra oral examination involves evaluating the oral cavity, teeth, gums, soft tissues, occlusion, conditions like decay, gum disease, alignment problems, and other oral health conditions.¹⁰

Diagnostic Tests: Diagnostic tests for assessing tooth loss is done clinically and radiographically. Clinical assessment involves photographs, assessment of occlusion using interocclusal records facial vertical measurements and diagnostic jaw relations. Radiographic measurements include all radiographic investigations.¹¹

Investigations: X-rays used to capture images of the entire mouth. It includes periapical views of each tooth, bitewing views, panoramic X-rays, and occlusal X-rays to assess teeth, roots, bone levels that are not visible during a regular examination.¹²

Diagnostic casts fixed to an articulator:

Diagnostic Cast: Physical models of the patient's teeth, created from impressions.

Articulator: Placing the diagnostic casts on an articulator allows dentists to assess and plan restorative or prosthodontic treatments more accurately, especially for complex cases involving multiple teeth or jaw alignment issues^{13,14,15}.

Diagnostic Wax - up: Diagnostic wax-up involves creating a physical model of a patient's teeth using wax, replicating the desired tooth size, shape, and alignment as planned for dental procedures.¹⁶ It serves as a visual guide for both the dental team and the patient, helping in understanding and finalizing the expected outcomes of full mouth rehabilitation before any procedures commence. Adjustments can be made to this wax model to refine the treatment plan before the actual dental work begins.¹⁷

The **types of treatment plan:** Distinction can be made between those therapeutic modalities that modify the occlusal scheme (occlusal treatment) and those which don't modify it (collateral treatment)^{9,10,18}

OCCLUSAL TREATMENT	COLLATERAL TREATMENT
<ul style="list-style-type: none"> • Temporary occlusal treatment, occlusal splints • Definitive occlusal treatment: orthodontic treatment, selective grinding, prosthodontic treatment • Occlusal and articular surgical therapy 	<ul style="list-style-type: none"> • Biofeedback • Other relaxation techniques • Exercise • Physiotherapy • Electrogalvanic stimulation • Drug treatment^{9-10,18}

The **stages of treatment plan** involving first stage will be Temporary occlusal treatment and collateral therapy and Duration of treatment -few weeks to 5-6 months or more. The second stage involves Definitive occlusal treatment and collateral therapy and Duration depends on the complexity of therapeutic program eg. orthodontic treatment followed by FPD.¹⁹

The phase of treatment plan comes under 4 phases²⁰.

Phase 1 will be removing all the faulty restorations and assess each teeth for structural worthiness.

phase 2 will be Basic work and Surgical Phase: Extractions, Implants and Crown lengthening carried out based on their needs and other periodontal procedures as required. Any restorations, coronoplasty, endodontic treatments if necessary, is done during this phase²¹.

Phase 3 will be Final restorative phase, during which crown is cemented.

and phase 4 is the maintenance phase²²

Preparation of mouth: After completing the necessary diagnostic procedure and treatment planning, we must now prepare the mouth for restoration. Depending upon our findings, if there is any defect to be corrected before the

full mouth rehabilitation, like removing any infective process such as retained roots, impaction, unimportant devitalized teeth, it should be first corrected with proper endodontic treatment.²⁰

PRE REQUISITES BEFORE RESTORATIVE PHASE: The restoration of the posterior teeth before the completion of the anterior guidance is an example of a common sequence error. The two best rules for avoiding problems with corrective actions are:²⁰

1. Never initiate a corrective action unless all of the following steps have been outlined in advance and correctly linked together in the correct order.

2. Never start a restorative procedure until you have a clear understanding of desired outcome.

1. Preliminary mouth preparation

2. Mouth hygiene instructions should be given

3. Caries control should be achieved

4. Periodontal therapy should be completed.

5. The movement of the small tooth must be perfect. The bite must be stabilized after every orthodontic treatment. After the teeth have been moved, plenty of time should be given before the final fillings are made to organize the periodontal fibers and provide support to the bones.

6. Necessary debridement procedures and tissue healing before permanent placement of a fixed prosthesis.

Full mouth rehabilitation is a sequential procedure and requires restoration in a phased manner.

Examination of vertical height of the face, plane of occlusion are the determinants of FMR.

Increase of VD is done after deprogramming the facial muscles. Decrease in VD due to tooth surface loss, causes contraction of muscle fibers. Relaxation of muscle fibers is necessary before restoring the tooth to a new vertical dimension. This muscle relaxation is done by deprogramming devices.

1. History documentation and Diagnostic impression
2. Tentative jaw relation and face bow transfer
3. Model analysis
4. Determining the plane of occlusion
5. Deprogramming of muscles if need arises
6. Diagnostic wax up in the increased VD
7. Pre prosthetic procedures
8. Crown preparation and temporization
9. Final impression
10. Brisque trial of substructure if PFM crown planned
11. Precementation trial –verifying premature occlusal contacts and the determined occlusion
12. Glazing and cementation

RESTORING ALL UPPER POSTERIOR ONLY²³

- Preliminary mouth preparation
- Selective grinding
- Preparing all upper posterior
- Correctness of anterior guidance should be verified and then modified based on it
- If canine guided set condylar path at 20 degrees complete wax up or complete the restoration on fully adjustable articulator out of excursion
- For group function -use FGP
- Place posterior restorations and do what all the necessary modifications to be done

RESTORING ALL UPPER TEETH ONLY²⁴

- Preliminary mouth preparation
- Selective grinding of lowers
- Prepare upper posterior
- Correct anterior guidance
- Do “alternate tooth preparation “in anteriors
- Centric record and then articulate lower cast by using first upper cast
- Customize guide table
- Articulate final cast
- Duplicate anterior restorations by the use of throw away patterns
- Replace upper posteriors as described

RESTORING ALL POSTERIORES ONLY²⁰

- Reevaluate disclusion and guidance and do whatever corrections needed in patients mouth
- Preliminary mouth preparation
- Broadrick occlusal plane analysis
- Prepare lower teeth accordingly
- Harmonize anterior guidance
- Complete lower wax pattern and restoration
- Place lower restoration
- Prepare upper posteriors
- Complete upper posterior restoration
- Remove balancing contacts
- Redefine working contacts

RESTORING ALL LOWER TEETH ONLY²⁵

- Preliminary mouth preparation
- Redefine interferences in upper arch
 - Correct marginal ridges
 - Equilibrate occlusion
 - Harmonious anterior guidance
- Every other lower anterior teeth should be prepared, through away patterns
- CR record with anterior teeth in contact
- Remaining teeth should be prepared
- Articulate working cast
- Place through away patterns
- By using this guide prepare lower anterior restoration
- Prepare and place posterior restoration
- Remove balancing contacts
- Redefine working contacts

RESTORING ALL UPPER AND LOWER POSTERIOR TEETH ONLY²⁶

- Preliminary mouth preparation
- Reestablish anterior guidance
- Prepare every other maxillary anterior tooth
- Place through away wax pattern
- Prepare all anterior teeth

- Establish predetermined anterior guidance
- Prepare mandibular posteriors
- By using Broadrick occlusal plane analyzer establish occlusal plane
- Complete lower restorations
- Prepare maxillary posteriors
- Established desired occlusion
- Place all restorations
- Redefine balancing and working side contacts

RESTORING ALL UPPER AND LOWER TEETH²⁶

- Preliminary mouth preparation
- Prepare lower anterior teeth
- If anterior relation is acceptable, prepare the lower wax pattern against unprepared maxillary anteriors
- If unacceptable relation, reestablish anterior guidance
- Place provisional restorations in redefined anterior guidance
- Complete the lower restoration by exactly duplicating incisal edge position of provisional restorations
- Place lower restoration against upper provisionals to verify anterior guidance
- Prepare and restore upper anterior teeth (exactly duplicate pattern of provisionals)
- Place upper anterior restoration
- Redefine anterior guidance
- Prepare the lower posterior teeth by taking guidance of Broadrick occlusal plane analyzer
- Reestablish the occlusal plane
- Complete lower posterior restorations
- Complete upper posterior restorations accordingly
- Redefine centric, working and non-working contacts

CONCLUSION

Tooth wear is multifactorial. Attrited, abraded and eroded teeth can contribute to tooth surface loss in same dentition at different stages of life. Organized data collection and methodological analysis of the cause of tooth wear is imperative to generating a treatment decision that will be successful in long term. In such advanced cases, it may be necessary to reconstruct dentition with minimally invasive indirect restoration or full coverage based on degree and cause of destruction.

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