

Planning The Full Mouth Rehabilitation

¹Siddharam M Patil, Reader, Department of Prosthodontics Crown and Bridge, PMNM Dental College and Hospital, Navanagar, Bagalkot-587103

²Madhura Mangalvedhekar, Professor, Department of Prosthodontics Crown and Bridge, PMNM Dental College and Hospital, Navanagar, Bagalkot-587103

Corresponding Author: Siddharam M Patil, Reader, Department of Prosthodontics Crown and Bridge, PMNM Dental College and Hospital, Navanagar, Bagalkot-587103.

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Abstract

Full mouth rehabilitation continues to be the biggest challenge to any clinician. It claims careful attention and meticulous treatment planning. Considerations need to be made with regard to full-arch or full-mouth comprehensive care: Will the care being considered be tolerated and accepted physiologically by the patient? Is it required to alter the VDO? If yes, by how much and by what method? What material should be used for restoration? And so on and so forth. This article describes in brief steps to be taken for planning of optimal restoration in case of severe worn out dentition.

Keywords: Vertical dimension of occlusion (VDO). Stabilisation splint. Intercuspal position (ICP). Anterior guidance

Introduction

Full mouth rehabilitation requires efficient diagnosis and elaborate treatment planning to simultaneously fulfil

aesthetic, occlusal and functional parameters essential for long term success. A treatment plan should be formulated taking into account the number of teeth to be treated, condylar position, space availability, the vertical dimension of occlusion (VDO), and the choice of restorative material.¹

The rehabilitation of the severely worn dentition is challenging when the space for restoration is not sufficient. Assessment of the VD is important for the management, and careful comprehensive treatment plan is required for each individual case. Articulated study casts and diagnostic wax-up can provide important information which is helpful for the evaluation of treatment options.

This article demonstrates how to develop a comprehensive treatment plan for full mouth rehabilitation taking into account various factors like health of the stomatognathic system, endodontic/

periodontic treatment if required, approach to vertical dimension of occlusion (VDO), provisionalisation, choice of definitive restorations.

It is a challenge to understand and address the chief concerns and desires of the patient, as well as to understand all the medical and dental implications related to treatment. Considerations need to be made with regard to full-arch or full-mouth comprehensive care: Will the care being considered be tolerated and accepted physiologically by the patient? Is it required to alter the VDO? If yes, by how much and by what means? Can the desired treatment be provided within the financial constraints of the patient? Can a trial bite position be done? How can a trial bite position be transferred to the final bite records? In a case with full mouth rehabilitation requiring increase in VDO, traditional quadrant dentistry is not applicable. Therefore, new methods must be devised to create holding patterns until the next phase of care can be started.

Restoration of the worn dentition is a challenge as space availability for prosthetics becomes limited. If lengthening the teeth is a goal in order to achieve a more aesthetic smile, then the question of the need to alter VDO subsequently arises. An increase of VDO is always mandatory, in order to reduce the need for substantial tooth preparation and to avoid the necessity of elective endodontic treatments. However, in cases where VDO is not to be altered, intentional endodontic treatment with respect to some teeth and consequently more tooth reduction is necessary to provide space for crowns.

Meticulous treatment planning is mandatory for full mouth/ arch rehabilitation. For better understanding let us categorise treatment planning steps in different phases.

Phase I: Control Phase

Full-mouth rehabilitation is the combination of all the different dental specialties under one treatment plan, covering all different dental aspects under one umbrella. The treatment goals have to be formulated: to restore the lost occlusal vertical dimension (OVD), to correct the occlusal plane, to restore function, and to restore the esthetics of the patient's dentition. Keeping in mind the desired end result, we have to clean up the existing dentistry, removing all dental and periodontal pathology. Carious teeth must be restored, if required treated endodontically. Any elective endodontic procedure must be planned and carried out in this phase. Teeth with advanced bone loss and poor prognosis are to be extracted.

When restoring a short clinical crown, the clinician may attempt to gain length by placing a subgingival margin. Therapeutic modalities which include surgical lengthening of clinical crowns, forced eruption of teeth, altering tooth preparation design and foundation restorations should be performed in the control phase.² Laser tissue surgery of the gingiva is also considered to equalize and create an ideal contour for aesthetic smile. Grossly decayed, lone without opposing tooth, supraerupted and half impacted 3rd molars are best to be extracted and sufficient healing time provided to avoid pocket formations later.

Phase II: Bite Raising: To Do or Not To Do???

Restoring "lost" vertical dimension in a worn occlusion really amounts to opening the bite because wear does not normally produce a loss of vertical dimension as the eruptive process matches the wear to maintain the original vertical dimension. However, it is true that some occlusions are worn so badly that we have no logical alternative but to increase the vertical dimension

slightly. When we do it, we must remember that the patient who wears the teeth badly is the one who can least afford to have disharmony with the musculature.³ Restoring vertical dimension of occlusion (VDO) has always been a challenge to the clinician. Knowing where to start and where to finish in order to get a proper tooth morphology and facial aesthetics, is the dilemma. While restoring the patient's VDO we must first consider how and why the patient lost VDO. The causes of tooth wear and subsequently loss of VDO was discussed in the previous article. Once a complete understanding of the etiology of the dentition's present state is appreciated, a treatment plan can be formulated. We must first mount the maxillary and mandibular casts on a semi adjustable articulator with the help of face bow and at the existing habitual bite. Elaborate diagnostic wax-up should be done to evaluate the required increase in VDO, change in occlusal plane and anterior aesthetics. We shall discuss about diagnostic wax up in next part of this series.

Understanding what determines the VDO and what the effects of altering it have on the temporomandibular joint (TMJ), muscle comfort, bite force, speech, and long term occlusal stability are prerequisites to restoring the worn dentition. Patients can function at many acceptable vertical dimensions, provided the condyles are functioning from centric relation and the joint complex is healthy.⁴ The best vertical dimension is the one that satisfies the patient's aesthetic desires and the practitioner's functional goals with the most conservative approach.⁴ According to a systematic review investigating the implications of increasing the VDO, a permanent increase in the vertical dimension from 1 to 5 mm is a safe and reliable procedure, provided it is done step-wise, and the associated signs

and symptoms are self-limiting with a tendency to resolve within 2 weeks.⁵

In many cases, VDO is maintained by tooth eruption and alveolar bone growth. As teeth are worn, the alveolar bone undergoes an adaptive process and compensates for the loss of tooth structure to maintain the VDO. Therefore, VDO should be altered conservatively and with a careful approach.⁶ Especially, increasing the VDO in bruxers puts a severe overload on the teeth and often results in the destruction of the restorations or teeth themselves.⁷

Turner classified the treatment of a severely worn dentition by the amount of the loss of VDO and available space to restore.⁸

Category 1: Excessive wear with loss of VDO.

Category 2: Excessive wear without loss of VDO but with space available.

Category 3: Excessive wear without loss of VDO but with limited space.

Certain guidelines can be followed to determine when VD must be changed.

1. Either increase the VD or perform multiple endodontics to provide enough room for restorations.
2. Either increase the VD or perform surgical crown lengthening for esthetic needs.
3. Some orthodontic results may be difficult to achieve without increasing the VD.
4. In case of severe arch malrelationships or extreme occlusal plane problems.
5. Anterior open bite requires a reduction of VD in order to get acceptable result.

If patients have periodontal disease, crown-lengthening procedures will aggravate any reduction in bony support.

A more reliable method is to increase the VDO to

provide space for restorative materials, enhance the aesthetic tooth display, rectify anterior teeth relationships, and minimize the need for biologically invasive clinical surgery and elective endodontic treatments.⁹ Multiple techniques have been proposed to quantify the VDO, including the use of pre-treatment records, incisor height measurements, phonetic evaluation, patient relaxation, assessment of facial appearance, radiographic evaluation, and neuromuscular evaluation.¹⁰

When starting from a centric relation position, opening of the anterior teeth by 3 mm will yield a posterior separation of approximately 1 mm and stretch the masseter muscle length approximately 1 mm. If the condyles are not in centric relation and are subsequently seated to a more superior position, every millimeter of vertical seating will reduce the masseter muscle length by 1 mm, thereby eliminating the need for a true opening of vertical dimension.⁴

When inter-occlusal rest space is found inadequate, the VDO should be increased and set in the incisal guidance pin in the articulator. VDO can be increased by removable appliances including splints or provisional restorations, to be used by the patient for a period of 3 weeks to 3 months, with intermittent evaluation of the gained space and any discomfort to the patient.

An occlusal splint is a removable appliance covering some or all of the occlusal surfaces of the teeth in either the maxillary or mandibular arches. It should provide even simultaneous contacts on closure with all opposing teeth and anterior guidance causing immediate disclusion of the posterior teeth and splint surface other than the intercuspal position (ICP). The splint provides the patient with an ideal occlusion with posterior stability and anterior guidance. It will disrupt the

habitual path of closure into ICP by separating the teeth and removing the guiding effect of the cuspal inclines. It causes an immediate and pronounced relaxation in the masticatory muscles, which will eventually result in the mandible repositioning and closing in the centric position uninterfered with by the teeth.¹¹ In order to achieve this muscle relaxation and mandibular repositioning the occlusal surface of the splint is smooth, so as not to hold or guide the mandible into any predetermined position. The only exception to this is the area lateral to the canine and anterior to the incisor ICP contacts which is gently ramped to provide anterior guidance. To achieve muscle relaxation and repositioning of the mandible, the splint ideally must be worn continuously. The repositioning occurs because the pre-existing discrepancy between RCP and ICP is hidden by the patient's neuromuscular system.¹²

Occlusal splints are preferably made from clear chemical or heat activated polymethyl methacrylate resin. Vacuum formed vinyl sheets that are adapted on patient's diagnostic casts have limited use as the resilient surface is not amenable to the maintenance of stable occlusion necessary to achieve muscle relaxation.



Figure 1: Maxillary and mandibular heat activated acrylic resin occlusal splints

Fabrication of stabilisation splint

The maxillary and mandibular casts should be mounted in a semi-adjustable articulator using a facebow record to mount the maxillary cast; and an interocclusal centric

record to establish the maxillo-mandibular relation. The interocclusal registration is recorded using a rim of hard wax (aluwax) which fits accurately over the maxillary teeth without contacting the soft tissues. Control of the mandible is improved by means of a traditional anterior jig which prevents the teeth from coming into contact making manipulation of the mandible easier and determining the vertical dimension of the record. The incisal pin of the articulator is adjusted to provide a space of a roughly 2 mm between the most posterior teeth. Outline of splint is marked with pencil. Maxillary splint should extend about 3 mm onto the palatal soft tissues and wrap just over the buccal cusps and incisal edges. Similarly, if mandibular splint is planned, it should be 6 mm short of floor of the mouth. The splint will be retained by clipping into proximal, buccal and lingual undercuts and so these should not be blocked out prior to waxing. Two thicknesses of baseplate wax are softened and adapted over the cast and then trimmed to the pencil outline. The articulator is closed together until the incisal pin contacts the incisal table, establishing the vertical dimension of occlusion of the splint. The wax is then trimmed and the occlusion adjusted using articulating paper to establish the desired occlusion. Contacts are established between the flat surface of the splint and all opposing teeth while a shallow, smooth concave ramp is built up in the anterior region to provide immediate, but smooth, disclusion of the posterior teeth on mandibular movements. The cast on which wax is adapted is then removed from the articulator invested in a flask, the wax boiled out, and then the mould packed with clear acrylic resin which is then processed. The splint is retrieved, cleaned, trimmed and polished and is then ready for fitting. Check for retention and if too tight relieve in the undercut areas. The splint should not rock

and should be seated completely. Occlusal adjustments are done using thin articulating paper (40 microns). The occlusal adjustments are done so that the opposing arch teeth make even contact on the splint when mandible is in centric position. In lateral movements, the split is adjusted so that the guidance is provided by contact between the mandibular canines and the splint surface, which separates all the other teeth. In protrusive movements, disclusion is provided by even contact between the mandibular incisors and the splint. No other teeth should make contact outside ICP.



Figure 2: Maxillary and mandibular casts mounted on semi-adjustable articulator with inter-occlusal centric record. Anterior jig in place, which prevents contact of teeth and helps to determine vertical dimension



Figure 3: Maxillary chemically activated acrylic resin occlusal splint in place extending 3 mm on palatal side and just wrapping over buccal cusps and incisal edges and with even.

The splint should be reviewed at weekly intervals for as long as is necessary to achieve a stable centric position. At each appointment, the occlusion is re-examined and the splint readjusted to re-establish even contact and to eliminate excursive interferences. A stable relationship is said to be achieved when the occlusal contacts marked on the splint remain unchanged for two successive appointments.

Anterior guidance and condylar guidance

Treatment for any excessive wear problem should be designed to accomplish the following⁷:

1. Equal-intensity contacts on all teeth in a verifiable centric relation.
2. Anterior guidance that is in harmony with the patient's normal functional jaw movements.
3. Immediate disclusion of all posterior contacts when mandible moves in any direction from centric relation.
4. Restoration of any tooth surface that have problem wear through the enamel.
5. Counselling so that the patient understands rest position.
6. Night time occlusal splint if bruxism persists.

Anterior and condylar guidances are the key factors in protecting the posterior teeth. If anterior guidance is worn flat, posterior disclusion is relied on condylar guidance. But if both anterior and condylar guidances are worn flat, disclusive effect is not available which is hazardous for the stable occlusion. Hence, we can summarize it as if only anterior teeth are worn flat, it is an indication that posterior disclusion can be achieved without the anterior guidance being steepened. However, if both anterior and posterior teeth are worn flat, posterior disclusion must be accomplished by steepening of the anterior guidance.

Phase III: Temporisation

Temporaries are only an interim solution, but they fulfil important functions until definite restorations are cemented and thus they have a lasting effect on the success of full mouth rehabilitation. In full mouth rehabilitation cases, provisional restorations are one of the ways to increase the VDO. The provisional crowns protect the pulp from thermal and chemical insults after crown preparation and enamel removal. It serves to maintain gingival health and contour while providing for an aesthetic and/or functional interim restoration.¹³ Most importantly, provisional restorations maintain interocclusal and intra-arch tooth relationships.¹⁴ Interim restorations are useful for diagnostic purposes where the functional, occlusal and aesthetic parameters are developed to identify an optimum treatment outcome before the completion of definitive procedures.

The preferred method for fabrication of provisional restorations is using a putty index by the indirect technique. The material of choice is heat activated polymethyl methacrylate resin as it has more strength and is more durable; exhibits polishability and good surface quality in the interdentium and region of crown boundary; provides an accurate fit, hence sufficient marginal seal; and gives better aesthetics. After fabrication it has to be finished and corrected for occlusal interferences and luted with eugenol free temporary luting cement. The provisional restorations should be subsequently equilibrated to harmonize canine guidance and anterior guidance.

The patient should be monitored with provisional restorations for a period from 3 weeks to 3 months. The patient should not have any discomfort, pain in TMJ, muscle fatigue or tenderness. The range of mandibular movements, swallowing, and speech are to be evaluated.

Improvement in mastication, speech and facial aesthetics confirms the patient's tolerance to the new mandibular position with restored VDO.

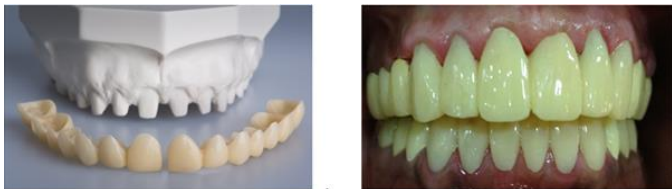


Figure 4: Heat activated acrylic resin provisional restorations.

Phase V: Definitive Restorations

In cases where there are missing teeth with no distal abutment present, removable partial denture in conjunction with fixed crowns is the treatment of choice. Herein, cast partial dentures should be preferred for optimum results and longevity. Many factors influence the choice of all-ceramic systems for restoration of teeth. Strength, fit, and esthetics are traditionally considered in the selection of material for full coverage restorations. The wear of restorative materials needs to be matched to that of normal tooth wear; otherwise, the occlusion may be destabilized and other problems may occur. Metal-ceramic restorations have a long history of satisfactory clinical performance. However, rough porcelain surfaces can cause substantial wear of opposing teeth and other restorations.¹⁵ The primary advantage of a zirconia restoration is esthetic benefit as it is translucent and tooth-colored. A metal-free ceramic crown can transmit a great amount of incident light through to a ceramic core where light is scattered in a natural fashion.¹⁶ Thus, taking into consideration the advantages and disadvantages of metal-ceramic and metal-free restorations as well as the financial constraints of the patient, final material for definitive restoration should be decided.

After the provisional restorations are deemed satisfactory, the case should be tried in and evaluated for aesthetics, occlusion and phonetics. Final equilibration should be done by 40 microns articulating paper.

Conclusion

In conclusion, proper treatment plan should be established before clinical procedures. With the aim of it, a thorough examination including clinical examination, radiographic assessment and diagnostic wax up are essential. A segmental approach to treatment planning, in a manner that allows the patient and practitioner to achieve goals over time, is very valuable. Not only can it help a patient achieve a desired outcome; but also this approach allows the doctor to know the care provided will be accepted and well-tolerated by the patient.

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