

Complex Occlusal Rehabilitation: A Case Report

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INTRODUCTION

The most difficult problems in clinical practice are those where there is interaction of various pathogenic factors with consequent complication of therapeutic solutions. Sometimes the initial situation that the patient presents with is so mutilated that an end result is difficult to easily visualize. This article presents a case report of one such patient where an organized and comprehensive approach was necessary to have a predictably stable long term result with full mouth rehabilitation.

Full mouth rehabilitation is the reconfiguration of occlusal and guiding surfaces of teeth in one or both arches thus achieving a physiologic occlusion that allows the muscles to function without undue stress and allows the TMJ to perform its function without any pain or pathology.

CHIEF COMPLAINT

A 45 year old female patient reported to our dental office with severe pain in upper anterior teeth. She also complained of inability to chew food well and was looking for a solution to her dental maladies (Figures 1-4).

CLINICAL FINDINGS

On examination, it was found that the palatal surfaces of upper anterior teeth had moderate recession along with a positive pain response to percussion. The lower anterior teeth were found to be having severe supra eruption, due to which the upper teeth had

Table 1A: Cephalometric Analysis - Vertical Dimension

	Normal Values	Pre Treatment Findings
Posterior Facial Height (S-Gn)	65%	74.3%
Anterior Facial Height (N-Me)		

Table 1A indicates that the anterior facial height is reduced as compared to the posterior facial height.

Table 1B: Cephalometric Analysis - Vertical Dimension

	Normal Values	Pre Treatment Findings
Lower Anterior Facial Height (ANS - Me)	60%	52.2%
Anterior Facial Height (N-Me)		

Table 1B indicates that the lower anterior facial height is reduced as compared to the overall anterior facial height. Thus we can increase the VDO and restore the lower anterior facial height to correct proportions.

Table 1C: Cephalometric Analysis - Vertical Dimension (Tweed's Analysis)

	Normal Values	Pre Treatment Findings
Frankfort - Mandibular Plane Angle	25°	20°

Tweed's analysis in Table 1C confirms that the mandible is rotated anti-clockwise and can be turned clockwise (Vertical Dimension Opened) during the treatment to achieve the desired result.

problems. The patient had a severe skeletal deep bite, with multiple posterior teeth missing that had led to a posterior bite collapse. This further caused the anterior segment in lower arch to impinge on palatal gingiva of upper teeth. The clinical examination revealed that the occlusal plane was deranged severely in both arches as even the upper anterior teeth along with the alveolus were supraerupted. The situation was grim on the left side as the lower premolars were in

occlusion with the alveolar ridge in the upper left quadrant leaving virtually no space for replacing the missing upper left posterior teeth. The clinical findings in the patient have been tabulated in Table 2. To assess the suitability of various treatment options a lateral cephalogram was traced and various readings analyzed. All the relevant findings of preoperative lateral cephalometric measurements have been tabulated in Tables 1A, 1B and 1C.



FIG 1-3: Pre operative intraoral status



FIG 4: Pre operative protrusive guidance

CLINICAL OPTIONS IN TREATMENT PLANNING

In this patient with complex oral and skeletal problems we require not only a practical solution, but one that is comfortable and above all esthetically acceptable.

It was clear that the occlusal vertical dimension of the patient is lost and needs to be restored. This was complicated by derangement of occlusal plane due to supra-eruption of anterior segment. The first option presented to the patient was orthognathic surgery. This would allow us to reorient the upper and lower anterior segments and thus get an acceptable occlusal plane. This option was declined by the patient. The second option was to intrude the upper and lower anterior teeth orthodontically. The lack of posterior teeth and thus lack of anchorage was cited as the reason for refusal of orthodontic option by the orthodontist. In current times orthodontic implants could be used for anchorage, but in late 2002 that was not an option we could consider. The third option was a combined restorative-periodontal approach. We proposed endodontic treatment for upper and lower anterior teeth followed by crown lengthening surgery with osteoplasty and full coverage restorations on all existing teeth. The missing teeth could be replaced with implants, but economic considerations ruled that out. Thus we decided to replace missing teeth with a cast partial denture in the upper and lower jaw. **Table 2** summarizes the clinical findings and treatment possibility in this patient.

FINAL TREATMENT PLAN

Based on our clinic findings, our final treatment plan was to replace all missing teeth with a cast partial denture preceded by full coverage restorations on all existing natural teeth. The contours needed to support the cast partial denture including the rest seats for the direct retainer were planned in these full coverage restorations. Implants were considered to be an option for replacing the missing teeth, but the lack of adequate bone quantity and economic considerations deterred the patient from choosing this option. Crown lengthening for all anterior teeth and restoration of lost vertical dimension were the prerequisites.

CLINICAL PROCEDURES

Table 3 summarizes the treatment goals we set for this patient.

The first step in the treatment restores

Table 2

Clinical Findings/Signs/Symptoms	Treatment (for this case)
Skeletal Class II	Not possible
Posterior Bite Collapse	Possible
Deranged Occlusal Plane	Partly possible
Recession on palatal gingiva of 12 - 22	Possible
Sensitivity	Possible
Disharmony in gingival levels	Possible
Reduced anterior face height	Partly possible



FIG 5



FIG 6

Table 3 - Treatment Goals

Restore comfort
Restore lost vertical dimension of occlusion
Replace missing teeth
Improve esthetics
Correct occlusal plane

comfort and helps the patient get rid of severe pain in upper anterior teeth. Endodontic treatment was carried out for teeth 13 through 22. We now had to decide the tentative vertical dimension of occlusion at which we would restore the patient's occlusion. A bite-raising appliance was fabricated as shown in **Figure 5** and delivered to the patient. The patient was instructed to wear the appliance all the time, allowing removal only during hygiene procedures. Three weeks are sufficient with such an appliance. Thereafter a provisional will be made at the same approved vertical dimension of occlusion and kept in function for another 3 weeks at least.

At this juncture the findings of cephalometric analysis, assessment of freeway space and phonetics were used as a guide to arrive at an empirical, working vertical dimension of occlusion. It has to be kept in mind that the vertical dimension should be raised as much as necessary to accommodate the final restorative materials keeping other guidelines in mind. There are no fixed formula's to arrive at the vertical dimension of occlusion, but esthetic judgment of upper occlusal plane and phonetic guides (F,V,S,M and E sounds)

are crucial tools to assess where the mandible should belong in relation to the upper incisal edges. It must be understood that using the rest position of the mandible to arrive at a vertical dimension of occlusion is a very unreliable technique. The rest position has diurnal variations and also depends on the head position of the patient. At the most it can be used as a general guideline but freeway space and its encroachment is not the first thing that a dentist must consider in treatment planning such cases where vertical dimension of occlusion is clearly collapsed.

Radiographically, the position of the condyles in the glenoid fossa can be assessed with a transcranial radiograph. These radiographs are taken at close mouth positions with and without the bite raising appliance. If the condyle has translated too far forward in the glenoid fossa when the bite-raising appliance is worn, it means that the vertical dimension of occlusion may have been opened too much, this calls for a reduction in the vertical dimension of occlusion. It must be understood that radiographs are very technique sensitive and dentists must not determine the final VDO only with help of these alone. To summarize, all techniques as tabulated in **Table 4** are used together to verify the vertical dimension of occlusion. The patient perception in these calculations of VDO is a very important factor.

The next step was to get the crown lengthening done for the upper and lower teeth. The goal here was to reposition the final incisal edges of all anterior teeth in line with occlusal plane formed by 14, 15 and 44, 45

PROSTHODONTIC SECTION



FIG 7



FIG 8

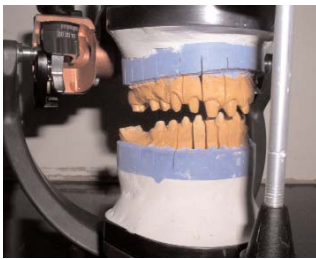


FIG 9



FIG 10



FIG 11



FIG 12



FIG 13



FIG 14



FIG 15



FIG 16



FIG 17



FIG 18



FIG 19

Table 4: Guidelines to Increase/Restore Vertical Dimension of Occlusion

- Cephalometric analysis
- Esthetics
- Phonetics
- Minimum amount required to accommodate restorative materials
- TMJ X-rays
- Freeway space
- Patient perception of comfort

keeping biological and esthetic guidelines in mind. The periodontist used this guideline to decide the level at which the bone should be adjusted keeping the principles of biologic width in mind.

At 8 weeks after the crown lengthening procedure (Figure 6) all teeth were prepared and impressions taken to fabricate indirect provisional restorations. Here the patient is asked to wear the original bite raising appliance first and close the teeth together. A point is marked on the nose and chin and the measurements between these will determine the reading for the vertical dimension of occlusion. The appliance is then removed and a wax record taken with the patient's jaw in centric relation at the premeasured vertical dimension of occlusion. Heat cured acrylic temporary teeth were fabricated and delivered to the patient. At 4 weeks post provisionalization, a final impression was taken with polyvinyl siloxane impression material. A face bow record to orient the upper cast and centric record at desired vertical dimension of occlusion were made. The vertical dimension was maintained at the desired level by an anterior bite appliance such as the Lucia jig (Figures 7 and 8). Protrusive record was made to program the condylar guidance and right and left lateral records were made to program the lateral guidance on the articulator (Figure 9). Wax that becomes dead soft on heating and rock hard and brittle on cooling is needed for these records. Any silicone based bite registration materials are prone to incorporate errors in the bite as they are not rigid and are better suited for partial records where vertical dimension of occlusion is maintained by sufficient number of intact teeth that provide stable centric contacts, rather than full arch bite records such as in this case.

At bisque stage the crowns on all termi-

nal abutments in each arch were surveyed and modified to position undercuts on the buccal side at appropriate gingival thirds so that we could have good placement for retentive terminal of the cast partial denture (Figure 10). The full coverage restorations on upper anterior teeth were designed in a way that the lower anterior teeth would have a definite stop on the palatal surfaces of upper anterior teeth. This would prevent any further supra eruption of these teeth and keep the occlusion stable. A few days after cementation of the restorations, impressions were taken for the cast partial dentures. At 3 weeks the casting trials and jaw relations were done. Final cast partial dentures were then finished and delivered to the patient. These cast partials were designed with a broad stress distribution principle. The design is evident in the occlusal pictures of stone models (Figures 11 and 12).

Immediate post operative pictures show the changes made in the vertical dimension of occlusion and occlusal plane (Figures 13, 14, 15).

OCCUSAL CONCEPTS

For an occlusal scheme to be physiologically acceptable these features are mandatory:


First - Centric occlusion (teeth - teeth relationship in maximum intercuspation) should be in harmony with centric relation ("optimum joint position independent of teeth position when the condyles articulate with the thinnest avascular portion of the articular disc with the condyle disc complex in superior most position in glenoid fossa along the distal inclines of articular eminence"). Any interference that deflects the mandible forward or laterally from centric relation to achieve maximum intercuspation needs to be eliminated when treating the patient.

Second - When the mandible leaves the centric relation and goes into protrusive relation, the anteriors should disclude the posteriors. This is known as anterior guidance. Anterior teeth are best suited to take load during protrusion because of their location is further from TMJ and hence the forces on them are


lesser. Also when the anterior teeth come in contact during protrusion their proprioceptive fibers signal the shutting down of elevator muscle contraction (mainly the masseter, medial pterygoid and temporalis). This further reduces the force on anterior teeth. When developing an occlusal scheme in protrusion the contact between upper and lower teeth should be uniformly distributed between all incisors if possible.

Third - When the mandible is in lateral excursion the canines only should be in contact on the working side thus discluding all remaining teeth in the mouth. The canines are the strongest anterior teeth, with stoutest roots having a very sensitive proprioceptive load that shuts elevator muscle activity as soon as they are in contact. All these factors, plus their distance away from TMJ helps them to comfortably bear the brunt of lateral occlusion.

These principles stated so far are understood as concepts of Mutually Protected (Canine Guided) Occlusion. In some cases



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PROSTHODONTIC SECTION



FIG 20



FIG 21



FIG 22

the canine itself may be periodontally compromised or a missing canine may be replaced prosthetically with a bridge or an implant. In that case the canine is not suitable to take the lateral stresses and it needs help of premolars and sometimes even lateral or central incisors on the same side to share the load of lateral occlusion and provide disclusion to all the remaining teeth. This is the basic principle of Group Function Occlusion.

In this patient we provided canine protected occlusion on the right excursion of mandible and group function on the left as the left canine was missing and replaced in the cast partial denture (Figures 16, 17, 18).

POST OPERATIVE CEPHALOMETRICS

The patient was sent for a lateral cephalogram to check the post treatment findings. This allows us to evaluate the change we have achieved in the vertical dimension of occlusion and skeletal relations of upper and lower jaw. See Tables 5A, 5B, 5C.

CONCLUSION

The stomatognathic system requires the

Table 5A: Cephalometric Analysis - Vertical Dimension

	Normal Values	Pre Treatment Findings	Post Treatment Findings
Posterior Facial Height (S-Gn)	65%	74.3%	69%
Anterior Facial Height (N-Me)			

Table 5A indicates the increase in anterior facial height as compared to the posterior facial height.

Table 5B: Cephalometric Analysis - Vertical Dimension

	Normal Values	Pre Treatment Findings	Post Treatment Findings
Lower Anterior Facial Height (ANS - Me)	60%	52.2%	57.4%
Anterior Facial Height (N-Me)			

Table 5B indicates the increase in lower anterior facial height as compared to the total anterior facial height.

Table 5C: Cephalometric Analysis - Vertical Dimension (Tweed's Analysis)

	Normal Values	Pre Treatment Findings	Post Treatment Findings
Frankfort - Mandibular Plane Angle	25°	20°	27°

Table 5C indicates the degree by which the mandible has been rotated clockwise to restore the vertical dimension of occlusion.

TMJ, muscles, teeth and periodontium to work in precise harmony with each other. Various pathogenic factors, iatrogenic causes as well as stress can sometimes damage this fine balance. An attempt is made here to present an insight into the thought process that goes in treating such complex cases. The eight year follow up pictures show how most of these concepts do stand the test of time (Figures 19, 20, 21 and 22).

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Dr. Ali Tunkiwala, completed BDS from NHDC in 1996, followed by his Masters Degree in Prosthetic Dentistry from Mumbai University (GDC, Mumbai) in 1998. He has acquired training in

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