



Nine Steps To Occlusal Harmony

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Complex occlusal rehabilitation requires a methodical approach to achieving final result and the pathway to that approach can be divided into several phases. Conservation of tooth structure while providing an esthetically and functionally sound result will determine the longevity of the teeth and restorations.

PHASE I: DATA COLLECTION

As far as complex restorative treatment plans are concerned, the clinician needs to gather sufficient data during clinical examination. Photographic records of the patient's pre-operative condition should be kept along with radiographic data in form of panoramic X-rays or CBCT based on the case requirements.

Thorough analysis of the data can be categorized in form of:

Facial Analysis: The position of the dental elements can be studied in relation to the entire face. Any canting of maxillary occlusal plane or severe skeletal problems affecting facial features can be noted down at this stage. The facial proportions can be judged.

Dentolabial Analysis: Dentolabial analysis assesses interaction of teeth with surrounding oral musculature. The visibility of upper incisors in repose (the amount of tooth structure visible when the lips are at rest), number of teeth visible during smile and the fact that the maxillary incisal edge follows the curve of the lower lip or not can be noted down at this stage. The overall display of gingival tissues in smile that may affect the final outcome may be noted down and treatment planning should keep that in mind.

Dental Analysis: Dental analysis usually encompasses checking the dental and the periodontal elements per se. This includes assessment of biotype of gingival tissues, the appropriateness of gingival levels and zeniths in anterior maxilla and relative tooth proportions required to make a pleasing smile. Any missing teeth, caries, malposed teeth, wear due to attrition/erosion or loss of tooth structure due to non-carious lesions may be charted out so that they can be factored in the treatment plan.

Phonetic Analysis: Phonetic analysis during clinical examination will require clinicians to make the patients enunciate sounds like F, V, N, E

to gauge the length and profile of the upper incisors. Pronunciation of M and S sounds can also help the clinician to gauge changes in the vertical dimension of occlusion.

Radiographic Analysis: Radiographic analysis of the entire dentition reveals any hidden carious or periodontal lesions which would require treatment and is crucial to rule out any pathologic conditions affecting the jaw bones.

The final step in data collection and analysis involves a thorough analysis of patient's occlusion to help guide clinician in which direction to head in his quest to provide an ideal occlusal scheme for the restored case. This will be elaborated further in this article.

PHASE II: RISK ASSESSMENT

Risk assessment strategies are used to gauge potential difficulties in treatment execution and understand potential treatment outcome. A systematic approach has to be used in periodontal, bio-mechanical, functional and dentofacial analysis. A high risk rating in any category should raise a red flag in the treatment stage and be communicated well with the patient.

PHASE III: TREATMENT STEPS

- A. Eliminating all disease (Caries/periodontal disease/broken down teeth)
- B. Getting the foundation (restoration/Implants, etc.)
- C. Doing final restorative therapy

To achieve predictable results in the long term for cases requiring complex treatment plan, we recommend following nine steps to achieve occlusal harmony. We will illustrate these steps with 2 cases in the backdrop. The first case is of segmental anterior wear (Fig 1 & 2. We will refer to this as Case 1) in a young patient who seeks a smile design to look better. The posterior tooth form in her case is pristine with no wear. The second is of an elderly patient who seeks functional rehabilitation of the dentition for generalized wear (Fig 3 & 4. We will refer to this as Case 2) of the entire dentition. The first patient will need occlusal equilibration and some conservative options to restore her smile. The latter will need his vertical dimension opened and all teeth restored to proper anatomy as conservatively as possible.



Fig. 1 Young patient with anterior wear seeking smile design.



Fig. 2 Anterior wear evident mainly on lower anteriors.



Fig. 3 Generalized wear with loss of vertical dimension.



Fig. 4 Case with generalized wear with teeth apart.

Step 1: Study models and radiographic records

Alginates are not a good option to take study model impressions. They have poor dimensional stability and are not capable of making accurate and fine reproduction of the patients existing teeth. Since we are looking at finesse in the end result it is prudent to use elastomers to make initial study model impressions. This will allow us to make multiple models of our patient's pre op conditions and that comes in handy during complex case management.

Step 2: Face-bow records

Needless to say, a semi-adjustable articulator is required for successful diagnosis of such cases. A facebow record helps to orient the maxillary

cast correctly on the articulator (Fig 5 & 6). This allows the clinician to see the maxillary occlusal plane in the same way as it is in the cranium and that aids in treatment planning of maxillary occlusal plane when corrections are needed. A facebow also helps in reproducing the arc of closure of the mandible and this will be crucial in deprogramming the



Fig. 5 Face-Bow record being taken.



Fig. 6 Orientation of bite fork on articulator to receive upper cast in correct position.

patient and taking the CR record at an increased vertical dimension so that tooth contacts do not deflect the mandible away from their home position (CR or Adapted CR)

Step 3: Centric and Eccentric records

Centric records in dentate patients need to be taken at an increased vertical dimension of occlusion (Fig 7).

The main reason being that the record should be free of any tooth contacts that could cause deflection of the mandible away from CR.



Fig. 7 Centric record at increased vertical to avoid tooth contacts.

There are several techniques for recording CR. The most commonly used are the Bilateral Manipulation and the Leaf Gauge amongst many others. However the most successful techniques are those that

allow the patient's muscles of mastication to be deprogrammed and allow the condyles to find their most physiologic position in the glenoid fossa without tooth interferences. One such technique is the use of a Kois Deprogrammer (Fig. 8) that is an anterior deprogramming device



Fig. 8 Kois deprogrammer.

and can be worn over several hours or days as needed to deprogram the muscles and allow the CR record to be made at an increased vertical dimension of occlusion without the patient's mandible being manipulated by the operator in any way.

The eccentric records are mainly used in form of a protrusive record (to program the horizontal condylar guidance on the articulator) and lateral records (to program the lateral condylar guidance). These are needed to program the semi adjustable articulator to simulate jaw movements. It is the author's preference to use numerical values to program these parameters on the articulators as the clinical difference in end result by using numerical values is not discernibly different. To aid in simplification of procedures this concept must be pondered on in greater detail. The end goal of achieving anterior guidance in harmony with envelope of function to help disclude posteriors during excursive movements of mandible is all that matters to the success and longevity of the case. This can be achieved with use of numerical values for the condylar guidance on the articulator and the result later verified for correctness during bisque trials. As far as the anterior guidance will be established higher than the patient's condylar guidance, disclusion of posteriors during all eccentric movements will be possible.

Step 4: Trial equilibration

Once the casts are mounted on the articulator with CR record, the treatment strategy has to be devised. There are 2 ways a case can progress from here. The first scenario is that there is no wear of teeth or wear only on certain anterior teeth as in case 1 and posterior anatomy is fine. In this case your goal will be to equilibrate the teeth so that the patient can close in CR without any tooth interferences. Achieving bilateral, uniform contacts of equal intensity will be important here. The second scenario, as in case 2, is where the patient has moderate to severe wear on all teeth and the restorative plan is to treat all teeth by opening the vertical dimension of occlusion. Opening the VDO by itself will take care of all interferences to CR and the management of that will be discussed in next step.

In case the equilibration is to be done on the patient's teeth we

recommend a trial equilibration on the articulator to know the scope of adjustment required to get uniform, bilateral simultaneous equal intensity contacts (Fig 9).



Fig. 9 Trial equilibration on articulator.

This is important as the amount on adjustment needed on some teeth may be drastic in some case especially when malposed teeth are present and may require the clinician to discuss restorative treatment options with the patients for the same.

Step 5: Actual equilibration

The trial equilibration is then followed by actual equilibration in the patient's mouth to achieve interference free closure to CR. The end point of the equilibration is uniform, bilateral, simultaneous, equal intensity contacts and a pathway for closure of mandible that allows anterior guidance to be within the envelope of function without anterior friction or posterior interferences.

Step 6: Wax up

The wax up is the crucial link between the articulator and the patient. It must be a true representation of the final result that the clinician has in mind. In cases of generalized wear where the VDO must be opened to accommodate the restorative material, the wax up is done to replace the lost tooth structure at the new vertical dimension (Fig 10). In



Fig. 10 Wax up at desired vertical in patient with generalized wear.

cases where the posteriors are equilibrated and anterior wear has to be restoratively treated, the wax up must replace the lost tooth structure at the equilibrated occlusion position on the articulator (Fig 11).

Step 7: Provisionals

The translation of the wax up with proposed treatment changes into a provisional in the patient's mouth is crucial before any tooth preps are done (Fig 12). The tooth preparation entails preparing teeth by a particular amount based on the restorative material chosen. This



Fig. 11 Wax up for case 1 depicting proposed changes to restore lost anterior anatomy.



Fig. 12 Provisional on unprepared teeth in case 1 from the wax-up. calculation is based on the final contour of the tooth which can be discerned only by a true replica of the wax up in form of a provisional on unprepared teeth. This also gives the patient a chance to preview the changes that the treatment will make to the overall facial appearance and test the comfort level with the new vertical dimension of occlusion in the second case where it has been altered (Fig 13). A putty matrix



Fig. 13 First provisionals from wax up on unprepared teeth in case 2.

made of the wax-up can be used to carry chemically cured resin based material to the tooth and directly bonded provisionals can be made on unprepared teeth to preview the final result.

Step 8: Impressions

Once the provisionals have been approved, they will be cut back with burs of known diameter to make room for the final restorative material (Fig 14). This will entail some preparation of the tooth surface in certain areas. The author prefers to use final restorative materials that require less tooth preparation to be done as elaborated in the next section. Gingival deflection techniques are used to reversibly displace the gingiva and cleanly record the tooth surface at the margin (Fig 15). The level of margin placement (Supragingival, equigingival or intracrevicular) depends on the underlying tooth surface colour, gingival health and choice of final restorative material. Accurate record of prepared teeth can be made with addition silicone materials of choice. The author prefers using putty-wash techniques in 2 step method or a single step impression on a custom tray with medium-light

body combination (Fig16).



Fig. 14 Using burs of known diameter on the first provisionals for initiating tooth preps.



Fig. 15 Case 2. Gingival Deflection to record margins precisely.



Fig. 16 Impressions on Custom Tray.

Step 9: Finishing the case & choice of restorative material

The choice of restorative material has changed over the years and can be different based on skill of the clinician and the lab. It's the author's opinion that the material that needs least amount of preparation to be done should be chosen to meet the restorative needs. Porcelain fused to metal will always require more tooth preparation than conservative monolithic lithium disilicate to provide equivalent esthetics. Greater tooth preparation means more enamel will need to be removed from already worn down tooth structure. That will in turn lead to greater flexibility of the prepared tooth and greater chances of post-operative sensitivity. In present times, it is better to think how strong the tooth will be after the preparation is done as compared to how strong the restoration is. A strong restorative material may leave the prepared tooth too weak to survive over the long term.

Conclusion

In this article two cases were used as examples to illustrate different

treatment objectives. The first case had wear mainly on lower and upper anteriors and no posterior wear. She received an occlusal equilibration to harmonize maximum intercuspation with home position of condyles followed by ten upper lithium disilicate veneers and incisal build-ups of lower anteriors with nano filled composite (Fig 17-20).



Fig. 17 Post operative smile case 1.



Fig. 18 Post operative retracted view case 1.



Fig. 19 Post operative retracted view case 1 in MIP.



Fig. 20 Post operative view of occlusal surface of lower teeth showing uniform equal intensity contacts in case 1.

The second case with generalized wear received lithium disilicate crowns up to premolars and onlays on molars at the newly restored vertical dimension of occlusion (Fig 21-25).

A comprehensive approach as illustrated with these two cases will help clinicians strike a balance between the esthetic and functional needs of the patient.



Fig. 21 Post operative smile case 2.



Fig. 22 Post Operative MIP case 2.



Fig. 23 Post operative MIP case 2.



Fig. 24 Post operative MIP case 2.



Fig. 25 Post operative occlusal contacts after completing rehabilitation.