

Procedures Guide  
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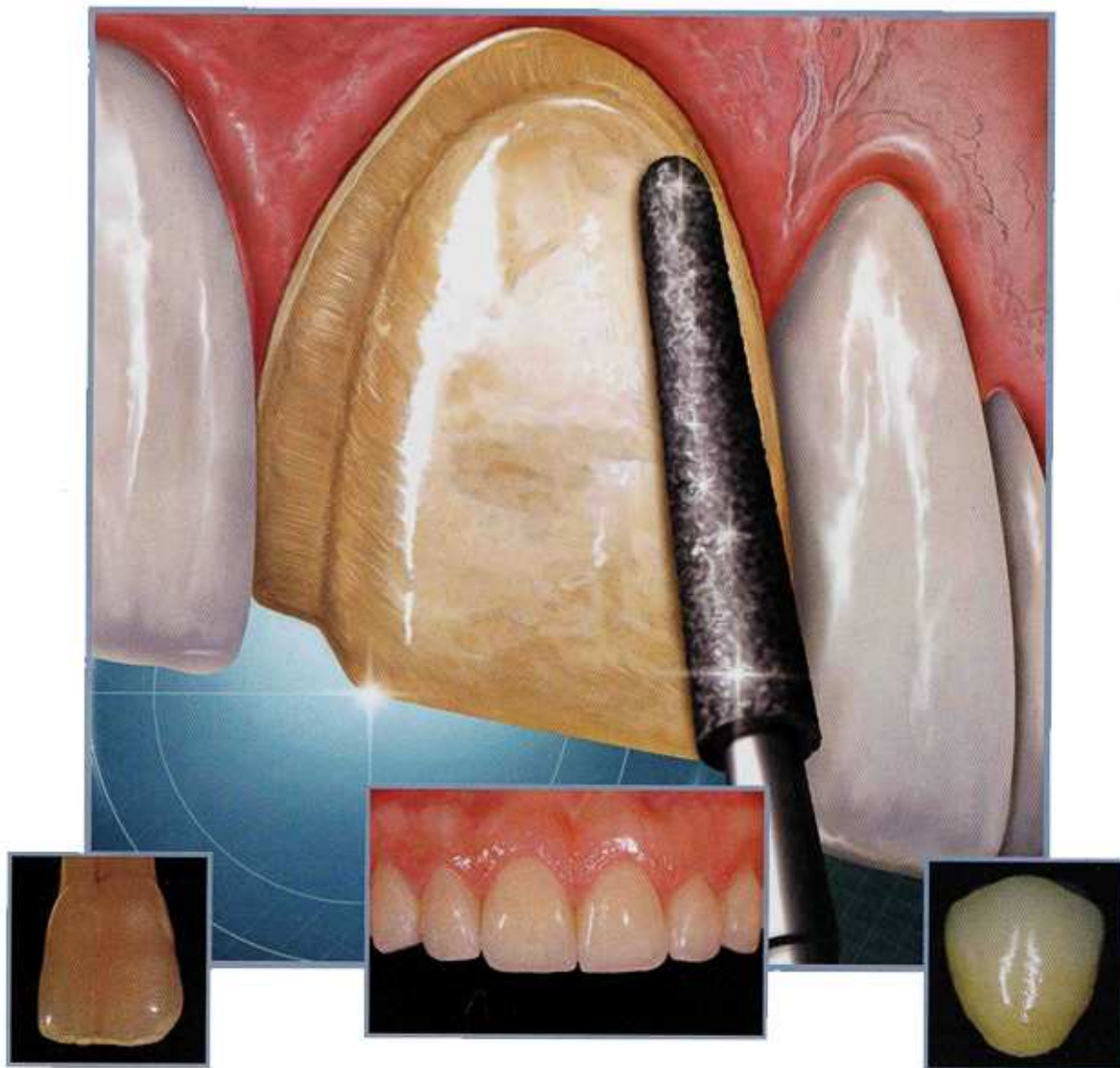
# PPAD

## Practical Procedures & AESTHETIC DENTISTRY

Prosthodontics • Periodontics • Endodontics • Research • Laboratory Considerations

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A Montage Media Publication

# ENHANCING FACIAL APPEARANCE WITH AESTHETIC DENTISTRY, CENTRIC RELATION, AND PROPER OCCLUSAL MANAGEMENT

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*Dramatic alterations that affect a person's appearance can be accomplished by changing the shade, shape, and location of individual teeth in the dental arch. With further application of scientifically documented anatomic principles, dentists can change a person's facial appearance without using unnatural tooth shapes and/or creating nonphysiologic changes in the masticatory system. What is most important is that the clinician does not have to open a patient's vertical dimension of occlusion (VDO) to exact a change in facial aesthetics. A conservative approach that is harmonious with the natural human form can be successfully accomplished.*

#### Learning Objectives:

This article presents a conservative methodology towards enhancing a patient's facial appearance in order to fulfill their aesthetic objectives. Upon reading this article, the reader should:

- Realize how a basic understanding of both the anatomy of the temporomandibular joint (TMJ) and how it interacts with the dentition can help provide a beneficial and stable occlusion for aesthetic dentistry.
- Understand how the VDO is established and how to decide when and if an increase of VDO is necessary for treatment.

*Key Words: vertical dimension of occlusion, centric relation, conservative preparation*

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Today's dental patient arrives at the dental office requesting aesthetic treatment that can help them in their personal and/or professional lives. Often, the patient will have a set of preconceived aesthetic objectives of what he or she wishes to achieve. Occasionally, the objectives include more than just changing a person's dental appearance. It is beneficial for today's dentist to have a thorough understanding of human facial form and anatomy so that the likelihood of meeting a patient's objectives can be determined early in the process, thereby eliminating the possibility of disappointing the patient.

In order to treat comprehensive restorative cases, there must be a consensual philosophy and a process of communication that allows the dental office and laboratory to have repetitive success. Because of the aesthetic demands placed on the restorative team by today's patient, a great deal of the process is determining the shape, size, and shade of a person's teeth, and how they fit in with a patient's face. To have a satisfied patient, one *must* fulfill the patient's aesthetic objectives. There will be no long-term success, however, and ultimate satisfaction, unless the restorative team utilizes sound philosophical concepts to create the synergy between aesthetics and function that is necessary to allow a case to feel natural. This approach also ensures that the restored case has its best chance to satisfactorily achieve a long period of service for the patient.

Orthodontics and surgery are often utilized to correct a malocclusion and/or alter facial traits.<sup>1</sup> In certain cases, dentistry can create a new condylar position that can change or enhance a person's facial appearance.<sup>2</sup> When seeking a therapeutic position for restorative dentistry, a position that can be physiologically compatible with the muscles of mastication and found



**Figure 1. Centric relation is a natural position of function that requires consideration when undertaking comprehensive dentistry.**



**Figures 2. Clinical image of a patient with an "apparent closed bite" from tooth wear.**



**Figures 3. Preoperative facial view of a patient with an "apparent closed bite."**

repeatedly with precision is beneficial.<sup>3</sup> Of importance for long-term health, a physiologic harmony must be established between the temporomandibular joints (TMJs) and the occlusal relationships of the maxillary and mandibular arches.<sup>4,6</sup>

Many occlusal philosophies accept the position that the TMJ is a load-bearing joint that, in conjunction with the muscles of mastication, work together as a Class III lever system to exact forces through the human dentition.<sup>7,8</sup> Dawson in particular has had a significant influence on defining the TMJ and its anatomic kinesiology. Central to his teachings of "Complete Dentistry" is this definition for centric relation:

Centric relation (CR) being the relationship of the mandible to the maxilla when the properly aligned condyle-disk assemblies are in the most superior position against the eminentiae irrespective of vertical dimension or tooth position. At the most superior position the condyle-disk assemblies are braced medially... thus



Figure 4. Retracted view of the "apparent closed bite" patient in Figures 2 and 3.

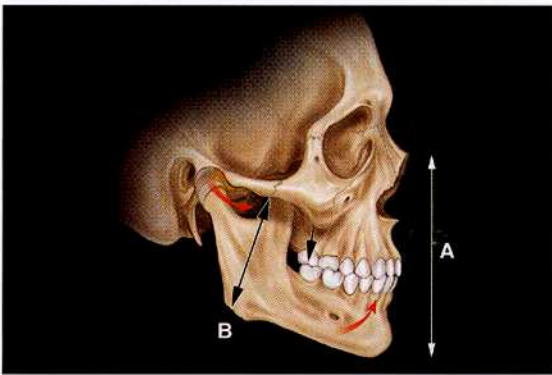


Figure 5. Illustration of a person having occlusion in MIP necessitating a forward condylar position.

CR is also the midmost position. A properly aligned condyle-disk assembly in CR can resist maximum loading by the elevator muscles with no sign of discomfort.

Dr. Peter Dawson<sup>9</sup>

It is important to note that CR is not a position of rest for the muscles of mastication (Figure 1). Centric relation is a position that is sought during function, placing the condyles in a braced position within the glenoid fossa so that the muscles may apply force at their contracted lengths. For that reason, it is a position that must be respected when treatment planning and fabricating extensive restorative dentistry. If one were to apply electromyographic instrumentation to the muscles of mastication in the CR position, they would find positive readings of activity.

A variety of methods can be utilized to record CR. Some methods are complete in their application and can be utilized exclusively to record CR bite registration (ie, bimanual manipulation), or at times, a combination of acceptable techniques may be necessary, depending

on the situation (ie, anterior deprogrammer with bimanual manipulation). The author has found bimanual manipulation to be a reliable standard in the office, consistent with the findings of McKee when properly executed.<sup>10</sup>

In addition to centric relation, a key component of the masticatory system is VDO. Dawson and colleagues went on to establish that VDO is established by the repetitive contraction of the elevator muscles. Contrary to the relaxed length of a muscle, the length of the muscle measured while it is constricted is amazingly constant. A dynamic balance of equality exists between the forces of the contracted length of the elevator muscles and the resistance of the alveolar processes of the upper and lower teeth. Therefore, a dimensional equilibrium is established between the maxilla and the mandible that is dependently consistent.<sup>9</sup>

The vertical equilibrium established through the dynamic relationship of the masticatory muscles' contracted length and the alveolar processes of the maxillary and mandibular teeth is crucial for one important reason—the principle components will seek that equilibrium over and over again if the VDO is changed. In other words, if the patient's dentition is changed to create an opening of the dentition and a subsequent increase in VDO, as measured from the zygoma to the angle of the mandible, the muscles of mastication will exert their will, and force the dentition to adapt back to its original VDO established via the contracted length of the elevator muscles.

Referring to OVD (occlusal vertical dimension), Kois pointed out that confusion exists in the dental community as to what constitutes opening the vertical dimension. If the increase is calculated by a measuring of nasion to menton with only rotational change in the posterior

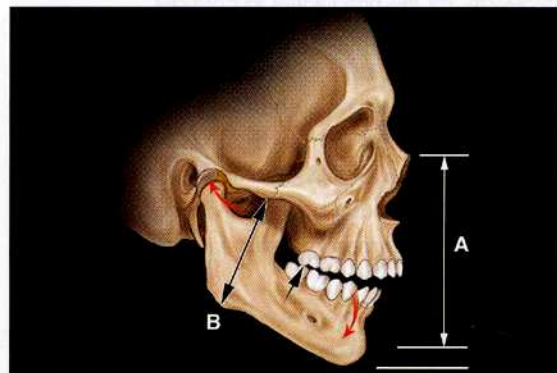
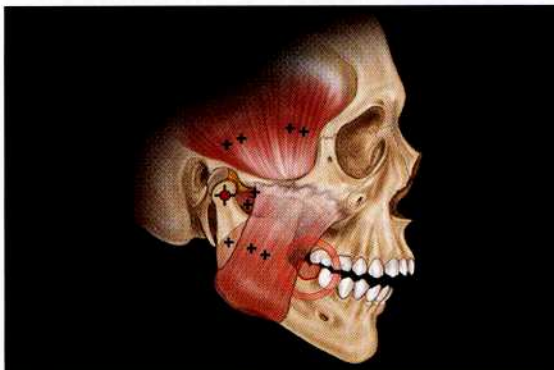


Figure 6. Illustration showing the resulting occlusal changes when the forward positioned condyle is seated in CR without changing the length of the elevator muscles.



**Figure 7.** Posterior interferences caused by a forward positioned MIP when the condyles are seated in CR can cause a variety of problems.

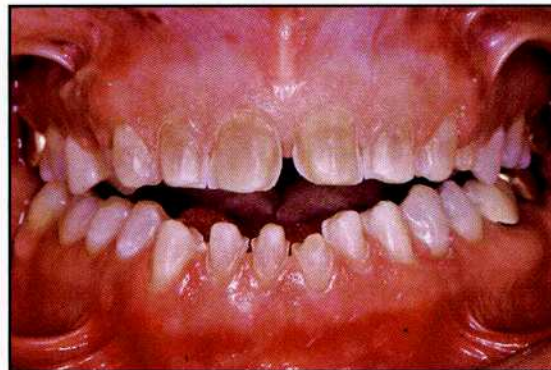
occlusion, allowing for little or no change in posterior muscle length, stability to those changes will follow. He added that the alterations to OVD can improve dentofacial aesthetics, create improved visual proportions in facial height, and provide an important treatment modality for force management of the masticatory system.<sup>11</sup>

### The Apparent Closed Bite Case

A common presentation to the dental office are patients seeking repair of their worn and/or fractured anterior teeth to restore their confidence in their smile presentation and also obtain a more pleasing vertical smile presentation (Figures 2 and 3). It can also be their opinion that the lower third of their face is over-closed from the wear that has occurred. This opinion is not shared by some in the scientific community,<sup>12</sup> because clinicians know that when a person suffers wear and attrition, the alveolus will provide the change that keeps the VDO unchanged (Figure 4).<sup>13,14</sup> For a responsible diagnosis and treatment plan for this condition, it is absolutely necessary for the practitioner to consider:

1. What was the cause for the wear of the teeth in the first place?
2. Can this pathology be eliminated so that dental treatment can be successful and long lasting?
3. Can a successful treatment plan respect aesthetic dentistry's basic tenets of finding a treatment solution that conserves healthy tooth structure as much as possible?
4. Has this pathology resulted in a decrease of the patient's VDO and, consequently, will restoration need to include an increase of the patient's VDO?

The only way for these questions to be answered is for the treating dentist to begin his or her evaluation



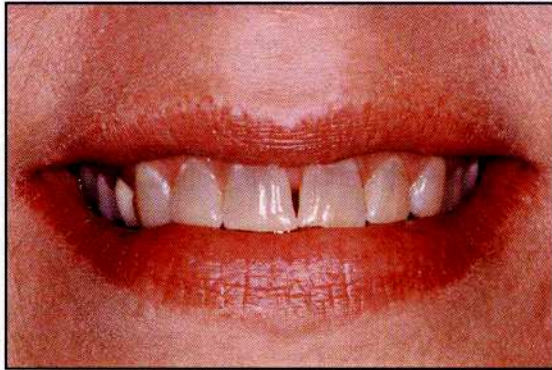
**Figure 8.** Facial view of the preparations reveals the conservative nature of veneer preparations on most teeth.



**Figure 9.** Postrestorative view showing the facial enhancements created by a combination of aesthetic dentistry and CR occlusal concepts.

and diagnosis by determining the health of the TMJs. A definitive treatment plan for a patient's anterior teeth and smile begins with an evaluation of the patient's condyle-disk-fossa assemblies and where the condyles are located in the fossa when the dentition is in maximum intercuspation (MIP). Knowledge of these basic human anatomical variations can allow the practitioner to answer the questions posed previously.

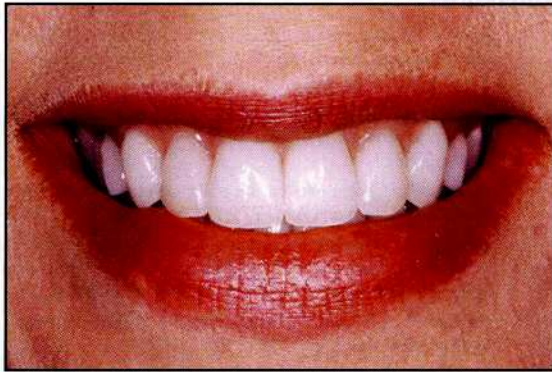
Anterior tooth wear can often be associated with posterior interferences of the posterior teeth. When attempting to close in an arc of centric closure, the mandibular and maxillary posterior teeth will touch first, setting off an imbalance of the muscles of mastication that are attempting to find a home in a concerted position of CR and MIP. As a second alternative for habitual posture, the muscles will adjust the position of the mandible to avoid the posterior interference that causes aberrant wear of the anterior dentition. When this patient is asked to articulate in MIP, the condylar position will be forward to CR (Figure 5). Consequently, when the



**Figure 10.** Preoperative appearance of patient's smile at 1:2 magnification. Note the lip support.



**Figure 12.** Retracted view of the maxillary anterior at 1:1 magnification prior to treatment.



**Figure 11.** Postrestorative view revealing the soft tissue changes of the facial musculature.

condyles are seated in CR, the resulting occlusal relationship where the posterior teeth touch can act as a fulcrum creating a corresponding relationship of the anterior teeth that shows increased separation (Figure 6).

This relationship creates the optimum position for obtaining the patient's aesthetic objectives while maintaining the dentist's functional parameters for anatomic stability. It has been shown in many studies that simply increasing a patient's VDO will invite adaptation back to the original VDO because the muscles cannot add sarcomeres to change its contracted length.<sup>15,16</sup> By creating an anterior open bite without significantly changing the length of the elevator muscles, especially the strong masseter muscle, the clinician has established a framework for optimum aesthetic changes without altering the length of the elevator muscles, thus eliminating the future possibility of adaptive change. Creating a restorative option that increases the VDO can invite unpredictability because change may occur slowly over time as in the intrusion of the posterior teeth, or change

could occur quickly in the form of restoration fracture, myofascial pain syndrome, or tooth pain (Figure 7).

### Case Study

A 41-year-old female patient presented for treatment, seeking aesthetic solutions for tetracycline staining, anterior wear and an apparent closed bite, "black hole" between teeth #8(11) and #9(21), and mandibular crowding. A comprehensive examination was completed and a treatment plan formulated. Upon hearing that orthodontics would be beneficial, the patient informed the author that for personal reasons, and in the interest of time, she would not consider orthodontic care and therefore wished to undertake a treatment plan that did not include orthodontics.

The patient's occlusion mirrored the illustrations in Figures 3 and 4. Therefore, the treatment plan did have to include a CR bite registration, impressions, and the subsequent mounting of the patient's stone casts. Equilibration to gain a stable occlusion distal to the first premolars was accomplished first in the laboratory on the stone casts. This verification served as the guiding plan for carrying out equilibration on the patient in the operatory utilizing the bimanual manipulation technique.<sup>9</sup> Full-coverage restorations were planned for the first premolars to include them in occlusal articulation of CR=MIP; the anterior teeth were articulated through the increased length of the mandibular incisors, which allowed conservative veneer preparations on teeth #6(13) through #11(23), #22(33), #26(42), and #27(43). The preparations of teeth #23(32) through #25(41) had to involve a more extensive preparation to break the interproximal contacts in order to provide restorations that did not appear to be crowded per the patient's objectives (Figure 8).



**Figure 13.** Postrestorative view showing the success of pressed porcelain (ie, IPS Empress, Ivoclar Vivadent, Amherst, NY) as a restorative option.

As in all cases involving anterior restoration, verification of harmony between the proposed form of the restorations and the facial musculature for phonetics and facial expression was conducted through meticulous attention and alteration of the provisional restorations as necessary. The provisionals can also provide critical information related to the patient's functional movements, verifying permissive pathways within his or her normal envelope of function.<sup>17</sup> Once the final form has been established, communication with the dental laboratory was facilitated through photographic images and three-dimensional communication concepts (ie, impressions and casts of the approved provisionals). Consistent with this reliable transfer of information between the dental office and the dental laboratory, the new porcelain restorations were tried-in and bonded with confidence (Figures 9 through 14).

### Conclusion

As patients seek dentistry that will make them look and feel better, clinicians must be masterful in fulfilling the patient's aesthetic objectives while being mindful of creating a restorative plan that fulfills functional parameters to provide restorations that feel natural and have their best chance for a long life of service. With adherence to basic anatomic principles backed by a voluminous library of science, today's practitioner and their dental laboratory partners can provide this type of dentistry with predictable success.

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**Figure 14.** Postrestorative occlusal view showing the degree of tooth conservation that can be attained with proper cosmetic dentistry.

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