REDEFINING FUNCTION IN A COMPLEX BRUXING CASE
— Treatment position and occlusal considerations

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Occlusion confusion is common among dentists. Occlusion is one of the most important considerations in dentistry, but also most controversial. The balance and the restoration of function of the stomatognathic system is often an everyday challenge during many dental treatments. For these distinct reasons, the dentist needs to study and fully understand the normal function of the temporomandibular joints, how the mandible rests against the cranium in the most favorable position, and of course how occlusion and any dental prosthetic restorations should be adjusted without jeopardizing the stability of the stomatognathic system.

Severe wear, missing teeth and periodontal disease over the years change the maximum intercuspation the patient had when his or her teeth were intact. For example, it is very common for patients with severe wear of their dentition to present with contacts of their anterior teeth in a Class III tendency relationship, which can also be described as a pseudo Class III malocclusion according to Angle’s classification. Determining the treatment position during full-mouth prosthetic reconstruction or orthodontic treatment is a challenge. Dentists often choose to maintain the occlusal relationship the patient presents with. This clinical decision can lead to occlusal discrepancies upon delivery of the final restorations, temporomandibular pain symptoms and discomfort of the patient.

Therefore, it is essential to register and maintain the orthopedic stability of the stomatognathic system during the treatment and determine the musculoskeletal stable position during the dental procedures. In this case presentation, several common clinical problems that the dentist often has to deal with in everyday practice will be presented and the treatment sequence to maintain the stability of the stomatognathic system will be presented. A 57-year-old male patient presented to a private clinic with his chief complaints related to functional difficulties and considerable esthetic impairment created by the appearance of his teeth. Owing to severe wear of his dentition, the dentin was exposed on all of his teeth (Fig. 1). The patient was aware of his parafunctional activity of bruxism that had never been addressed. Although the wear was significant, he complained of no sensitivity to chemical and thermal stimuli. He also complained of no pain or other symptoms related to a temporomandibular disorder. During clinical examination, a clicking sound was detected at the right temporomandibular joint during opening and closing, indicating a disk displacement with reduction in this joint that was however asymptomatic. The range of movement was within normal limits, and the left and lateral movements were 12 and 15 mm, respectively.

Intraorally, the effects of bruxing on the dental tissue were significant. The masticatory surface of the posterior teeth was completely flat, without any cusps and/or physiological anatomy (Fig. 2). Dentin exposure was present on all of the posterior teeth. The anterior teeth also presented with severe wear and dentin exposure. Because of the lack of physiological anatomy and the flat masticatory surfaces, no stable maximum intercuspation was present. The patient, as already mentioned, had a pseudo Class III relationship (Fig. 3), since his most comfortable bite was in an edge-to-edge anterior relationship while all the posterior teeth were also in occlusion. Nevertheless, the patient described feeling like he had several bites, none of which were comfortable.

Important clinical dilemmas arise in such a case. The diagnostic questions that need to be answered before the treatment plan are as follows:
– How can the bruxism be controlled? The bruxing forces applied to the patient’s natural teeth will also be applied to the future restorations. This consideration also leads to the next question.
– What is the material of choice to withstand the bruxing forces?
– Should the vertical dimension of occlusion (VDO) be changed? Usually in bruxing patients, although the wear of the dental structures might be significant, the VDO remains normal owing to the continuous eruption of the teeth.
– What should the treatment position be? The patient presented with several bites and a pseudo Class III relationship. Most dentists would feel more comfortable maintaining the maximum intercuspation that the patient presented with, since he was asymptomatic, although most probably it was not the one that the patient had when his dentition was still intact. Determining the 3-D position of the mandible and where it is resting against the rest of the stomatognathic system should be a priority.
– Is digital dentistry an option?

How can the bruxism be controlled?

Bruxism is an involuntary parafuncti- onal movement that often occurs without the patient even realizing it. The etiology is not fully understood; therefore, there is no treatment that can stop bruxism from happening. Once the patient has been informed about the parafunc- tional habit and how it affects the structures of the stomatognathic system, he or she should be educated on how to avoid grinding and clenching of his or her teeth. We as dental professionals can and should control the parafun- ctional forces applied to the teeth, masticatory muscles and temporomandibular joints with the use of a stabilization appliance during sleep and by educating the patient (Fig. 4). The appliance protects the teeth from wearing down while allowing the rest of the stomatognathic system to determine its most stable relationship dictated by the rest position of the masticatory muscles. Therefore, the stabilization appliance not only controls and redistributes the parafun- ctional bruxing forces, but also dictates the musculo-skeletally stable position that will be the treatment position of choice.

What is the material of choice to withstand the bruxing forces?

Ceramic restorations are popular because of their excellent esthetic properties. However, failures are still a major concern, and dentists fear that sleep bruxism may be associated with an increased frequency of ceramic restoration failures due to occlusal overload. Nevertheless, there is a lack of data to support this clinical fear. Within the limitations of the existing studies, there is no association between higher failure of ceramic restorations and bruxism. Monolithic restorations present better results, but it is important to provide adequate material thickness. Lithium disilicate glass-ceramic is often the material of choice owing to its mechanical properties and high esthetic value.
Fig. 5  Anterior relationship in the musculoskeletally stable position. The mandible now rested in a posterior relationship to the maxilla, guided by the masticatory muscles (compare with Figure 3).

Figs. 6a & b  The anterior deprogrammer was used to register the new relationship of the mandible against the maxilla, the musculoskeletally stable position.

Fig. 7  The increase in the VDO was designed according to functional and esthetic needs that were evaluated during the mock-up stage. In this detailed view of the mock-up, the increased length of the anterior teeth can be appreciated.

Fig. 8  Minimal preparation of posterior teeth for IPS e.max monolithic onlay restorations. Preservation of enamel is of primary importance and since the VDO was being increased, the preparation of the masticatory surfaces was limited. Since the molars had no antagonists on the mandible, only the premolars were initially treated.

Fig. 9  The final restorations were fully digitally manufactured. Intraoral scanning with TRIOS 3 and CAD/CAM fabrication of the monolithic onlays from IPS e.max lithium disilicate material.

Should the vertical dimension of occlusion be changed?

In a bruxing patient, usually the VDO remains stable even though the wear of the dental tissue might be significant. This is mainly a result of continued tooth eruption compensating for the loss of dental tissue. The prosthetic space is limited and often the vertical dimension needs to be increased in order to gain the prosthetic space needed for the final restorations. The amount of increase is determined by the freeway space and by the esthetic and functional analysis of the case during the diagnostic stage, during which all the information is gathered and analyzed. Fabrication of an analytic wax-up for the reconstruction of a functionally and esthetically adequate tooth morphology and predefinition of the reconstructed tooth is essential. The diagnostic wax-up needs to be re-evaluated intraorally in the try-in stage of mock-up. The esthetic analysis will determine the inclination and position first of the incisal edge and second of the occlusal plane. This will also help the clinician to decide in which dental arch (if not both) the increase in VDO should be performed. In this case, it was decided to increase the VDO in the maxillary arch (Fig. 5). Monolithic onlay restorations fabricated from IPS e.max CAD lithium disilicate blocks (Ivoclar Vivadent) were used on the premolars (Figs. 6a & b). The reason for restoring only the premolars with final restorations was that the molars presented with failing old resin restorations; therefore, definitive restorations would be implemented in different stages. At this stage, only composite onlays were placed over the existing restorations on the molars in order to stabilize the occlusion. The composite onlays were made based on the transparent silicone matrix of the diagnostic wax-up.

Which should the treatment position be?

Since the VDO needed to be increased, the future treatment position needed to be established. The maximum intercuspation that the patient presented with was an inadequate treatment position and was not to be maintained. He also had more than one bite, making it uncomfortable, especially because the anatomy of the masticatory surfaces was compromised due to wear. The new treatment position should be reproducible and stable throughout the treatment. Of equal importance is the maintenance of the stability of this treatment position after the finalization of the case. It has to be a functional one based on normal function without strain of any of the structures of the stomatognathic system. The new 3-D position in which the mandible will rest against the rest of the cranium should be dictated by the masticatory muscles during their rest position. This treatment position is called the musculoskeletally stable position. It is similar to the centric relation, but it is not as exact about the intracapsular condyle position (the debate about the definition of centric relation is still under considerable discussion even currently). Rather, it allows the masticatory muscles to dictate the position of the mandible regardless of the condylar position. Therefore, it is a position highly individualized to each patient and his or her distinctive anatomical and functional characteristics.

This position is determined initially with the stabilization appliance. In order to record this position, we use an anterior deprogrammer (Fig. 7). Compared with jaw manipulation, this device is a predictable way to record the musculoskeletally stable position, since it does not depend on the patient relaxing to
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allow the practitioner to guide the jaw during registration. The difference in the position of the mandible against the maxilla between the initial maximum intercuspation that the patient presented with and the new treatment position of the musculoskeletally stable position demonstrated the importance of defining and restoring the case in this new position (Fig. 8). This would ensure the stability of the occlusion, and effortless function, during treatment, but also most importantly after cementation.

Is digital dentistry an option?

Digitalization of dentistry is advancing rapidly. The advantages are significant, such as the standardization of working steps, increase in material quality through CAD/CAM and reproducible restorations. As a result, the final restorations are easily, more quickly and predictably produced, providing at the same time an excellent fit. The potential is enormous in a case like the one presented here, where the increase in VDO, along with the bruxing parafunctional forces applied, required the maximum making use of and benefitting of restorative materials. IPS e.max CAD lithium disilicate blocks were the material of choice. Intraoral scanning was performed with TRIOS 3 (3Shape), and the restorations were manufactured through CAD/CAM (Fig. 9). IPS e.max monolithic onlay restorations were cemented on the posterior teeth to increase the VDO (Fig. 10). In the anterior area, teeth #11, 12 and 13 were restored with veneers and teeth #21, 22 and 23 with ceramic crowns owing to pre-existing resin restorations that decreased the amount of enamel available for final cementation (Figs. 11–15b).

Conclusion

Defining the treatment position prior to any extensive dental therapy, such as full-arch prosthetic rehabilitation or orthodontics, is essential. A healthy, stable maximum intercuspation is not always present. Skeletal abnormalities, dental malocclusions, missing posterior teeth and severe wear of the dentition are some of the etiological factors for patients presenting with an unfavorable bite. If the clinician does not recognize the former and diagnose this clinical situation, he or she might choose to maintain the occlusal relationship that the patient presents with. After all, it is what the patient is used to, and in many cases, it is also functional. According to the adaptive capabilities of the stomatognathic system, acquired malocclusion might result after completion of the treatment. This is a very unfortunate situation for the patient and the treating dentist. The patient might complain of temporomandibular pain and dysfunction due to the orthopedic instability. Owing to pain symptoms, it is impossible for the clinician to redefine the occlusion, and at this point, no dental treatment can correct the malocclusion. Therefore, before any dental treatment, a stable, reproducible treatment position needs to be defined, registered and maintained. This is called the musculoskeletally stable position, and it ensures the 3-D stabilization of the mandible against the maxilla.