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Occlusal stability and mandibular stability: The major part of dentistry we are still neglecting

It has been a while since Dr. Christensen addressed the question about whether we were neglecting occlusion as a major clinical issue in our dental practices [1]. Moreover, despite the fact this is a fair question and even more a paramount one, he almost primarily referred to importance of occlusal equilibration from a gnathological standpoint, more than referring to which concepts dentists and dental students should be learning in pre-doctoral education. Likewise, in addressing this topic, he also discussed the importance of occlusal adjustment in the treatment of bruxism and temporomandibular disorders (TMD), claims that are debatable and tend to overlook current therapeutic approaches. Notwithstanding if readers agree or not with Dr. Christensen's thoughts on occlusion, the fact that we may still be neglecting important aspects of occlusion is almost undeniable.

Is there consensus?

There are no doubts that occlusion is an essential aspect of ensuring the success of almost any dental procedure. Whether it is from the field of fixed prosthodontics, removable prosthodontics, dental implants, orthodontics, or maxillofacial surgery, understanding the principles of occlusion has been considered for centuries a fundamental aspect of restoring a patient's functionality, and consequently, obtaining abiding and predictable therapeutic outcomes. Still, are these principles well defined or at least consensual? Do we agree on what is a pathological/pathogenic occlusion, or physiological, or even an ideal one?

The answer is NO; we even have trouble in a much broader sense, like defining in an unambiguous way the difference between an acceptable occlusion and a malocclusion. Cairns et al. [2], in their JOR-CORE recommendations, addressed this subject in more detail. From a practical perspective, malocclusions can be almost any occlusion that differs from a theoretically "ideal" occlusion [2]. With that idea in mind, the concepts of an "ideal" occlusion were often founded on the theoretical understanding of what an occlusion should look like to ensure more predictable outcomes [3]. However, are these "ideal" occlusal parameters frequent among the population? Also, are malocclusions per se pathogenic or non-physiologic? The first answer is a resounding "No." Ideal occlusions are not prevalent among the population; in fact,

population-based studies have found that several degrees of malocclusion are prevalent in more than 90% of the population [4], making differentiating healthy individuals from individuals presenting dysfunctional problems only based on occlusal features unlikely [5]. Also, in pondering malocclusion as a risk factor, there is insufficient evidence to support the claim that exposure to more severe malocclusions generates more functional problems than no exposure at all or exposure to milder ones [6]. These facts make it easy to conclude that better definitions and consensus are needed to define which variants of malocclusions are pathologic/non-physiologic or potentially pathogenic, to address which occlusions are ideal and which are not.

No consensus on evidence-based occlusion

With the advent of evidence-based dentistry, many of the previously held dogmatic beliefs in occlusion had been disregarded or at least submitted to scrutiny. As a result of these changes, The American College of Prosthodontists formed a task force on occlusion education, with the objective of reexamining what should be taught about occlusion in the pre-doctoral dental curriculum [7]. The authors noted not only that the majority of the studies had the lowest level of hierarchal evidence, but also many of the articles had equivocal evidence or conflicting views [8]. Furthermore, their conclusions suggested that dental occlusion should be included in pre-doctoral dental education when a sufficient level of evidence is achieved or at least when a consensus among experts is attained, generating evidence-based constructs and validated clinical procedures in occlusal treatments. Even though these conclusions may sound alarming, there is some common empirical ground on which we can all agree, for example, the importance of maintaining stable occlusion as a treatment goal.

The agreed and the neglected

There is a consensus among clinicians that occlusal stability (OS) is imperative to almost any dental procedure. That is because stability is a term used in dentistry to imply temporality: the capacity of an occlusion, dental prosthetics, or dentures to remain constant in character or position in

the presence of forces that threaten to disturb them [9]. Consequently, the determinants of OS should comprehend all of the intrinsic and extrinsic factors that contribute to maintaining a certain occlusal scheme unaltered through time, whether those schemes are part of the patient's natural occlusion or are achieved by a dental procedure. So logically, seeking OS should be pursued as a therapeutic goal in almost any dental treatment. Furthermore, if OS is such an important issue, we must have a pretty clear picture of which procedures are determinants that maintain an occlusion through time. But do we?

In the dental clinic, rational decision-making often requires the conjunction of the best available information, clinical experience, and patients' expectations. However, when we face clinical problems with limited evidence or scarce information, we often rely on expert opinions or personal clinical success. Regarding OS, the lack of reliable information on the issue makes us question if we do manage correctly the factors that determine OS or just do what we were told in dental school. Notwithstanding this fact, there is some agreement of which occlusal features may favor OS. Indeed, occlusal interfaces with multiple and simultaneous occlusal contacts, absence of dental pain, absence of periodontal disease, acceptable occlusal vertical dimension, age appropriate tooth wear, absence of tooth loss, absence of anterior or posterior occlusal plane discrepancies, and acceptable eccentric guidance are thought to be necessary.

Many more conflicting views arise in weighting the role discrepancies between retruded contact position and maximal intercuspation position (MIP), and how they may contribute in OS. First and foremost is a common belief among dentists that discrepancies between these two positions might impair the patient's physiologic adaptability and be important in causing first-onset TMD and bruxism, altering OS, a claim that is not supported by current evidence and originated from mostly anecdotal evidence [10,11].

Cruz et al., in meta-analysis, reported that discrepancies larger than 2 mm might be a risk factor in the onset of muscular TMD. Nonetheless, these results should be viewed with caution because biases were difficult to assess and heterogeneity could be underestimated due to the limited number of studies included in their meta-analysis [12]. Other authors found an association between TMJ arthropathies and centric slides greater than 4 mm. Nonetheless, these authors concluded that discrepancies were probably a result of the arthropathy rather than a cause of TMD itself [13].

Furthermore, current evidence suggests that the influence of occlusion on the onset and development of TMD is low [6], and the weight of specific occlusal variants explains approximately between 10 and 25% of the specific diagnoses [14]. A recent study showed that the overlap between healthy individuals with malocclusions contrasted to the individuals with prevalence of TMDs and malocclusions is so diffuse, that from the epidemiological point of view, it is not advisable to do occlusal interventions in patients with TMD [15].

Interestingly, some relationships between occlusal features and TMD, such as anterior open bite in patients with

osteoarthritic changes, may be secondary to the degenerative joint disease [16]. Additionally, intra-articular inflammatory process in the temporomandibular joint (TMJ) can provoke acute malocclusions [17]. Consequently, it seems reasonable to argue that a stable occlusion depends on an equilibrium of the masticatory system, in which the TMJ and musculature should be healthy or at least adapted in a non-ideal but still physiologic position. It is not an absurd statement to affirm that a healthy or a well-adapted stomatognathic system (a so-called mandibular stability) may determine OS.

Likewise, it is highly possible that the determinants of a stable occlusion are part of a multifactorial model, in which the status of the TMJ, musculature, and other systemic factors may have a major role in maintaining occlusal and mandibular stability. Most certainly then, this should also be taken into account before executing treatments involving periods of occlusal instability, provisional restorations, changes, restoring occlusal vertical dimension, and orthodontics procedures.

In line with embracing the probability that the factors that maintain a stable occlusion are part of a much more complex model, we should not only determine OS from a mechanistic point of view but also adopt more biologic-based concepts. For instance, we should start considering the status of alveolar bone metabolism and systemic conditions that could affect its metabolisms, such as hyperparathyroidism, diabetes mellitus, arterial hypertension, obesity, osteoporosis, menopause, Crohn's disease, chronic liver disease, chronic kidney disease, cancer, and bone metastatic tumors. Also, the influence of drugs that alter alveolar bone turnover should be considered, like anticoagulants, medroxyprogesterone acetate, glucocorticoids, Vitamin A, synthetic retinoids, loop diuretics, chemotherapeutic drugs, some antiepileptic drugs, antiretrovirals, proton pump inhibitors, thiazolidinediones, statins, oral contraceptives, or even smoking.

Again, a better assessment of parafunctional activities is needed to elucidate further if parafunctions may affect OS. For instance, while pondering the putative role of bruxism, studies commonly fail in differentiating the two circadian manifestations of bruxism, not properly addressing sleep bruxism (SB) and awake bruxism (AB) as separate entities. Besides, studies frequently tend to omit important confounding factors, such as not assessing factors that increase (SB), like smoking, caffeine and alcohol intake, and the use of medications and drugs (e.g., antidepressants and methamphetamines). This topic is well addressed in the review of Carra et al. [18].

There might also be other biological factors that we commonly neglect to consider in OS, and it is possible that these may be as critical in ensuring a correct OS and mechanical response than the aforementioned putative factors; namely, the right positioning of the teeth in their apical base respecting their neutral zone, and the quality of the bone and periodontal biotype of the patients, especially in treatments that combine multidisciplinary modalities such as orthodontics/prosthetic rehabilitation and orthodontics/ surgery.

So if we ask ourselves, “are we missing a major part of dentistry,” we presumably are. In the meantime, we will have to wait for newer, well-designed investigations to further clarify or redefine this essential, yet unattended issue.

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