KEY WORDS
Occlusion, full mouth rehabilitation, resin composite

LEARNING OBJECTIVES

- To challenge occlusal philosophies that involve the unnecessary destruction of sound teeth as part of 'traditional' full mouth rehabilitations techniques
- To question whether those occlusal philosophies have a proven scientific basis in relationship to managing tooth surface loss, temporomandibular disorders, bruxism, and infra-bony defects in periodontitis
- To better appreciate the additive approaches to solving many common occlusal challenges previously managed with 'traditional' full mouth rehabilitations techniques, thereby leaving patients with their residual sound tooth tissue and healthy pulps

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FACTS AND FALLACIES ABOUT OCCLUSAL PHILOSOPHIES FOR FULL MOUTH REHABILITATION

ABSTRACT

This article reviews various full mouth rehabilitation occlusal concepts along with their main beliefs and controversies. Many of those occlusal teachings were well-meant at the time they were introduced. However, closer examination reveals that many of them involved serious destruction of sound tooth tissue – without delivering many of their purported benefits.

The biologic and structural disadvantages of **'subtractive' dental procedures**, which were, and still are, undertaken to provide traditional full mouth rehabilitation are discussed. Those approaches are contrasted with the proven advantages of minimally destructive **additive techniques,** which can solve frequently encountered clinical problems previously deemed to require traditional 'full mouth rehabilitations'. Pragmatic clinical cases are used to illustrate how to solve common clinical problems by using minimally destructive means, without causing structural damage to residual sound tooth tissue.

Introduction

The usually stated aim in undertaking an alleged 'full mouth rehabilitation' is to restore *all* the biting surfaces of *all* of the teeth in order to provide optimal chewing efficiency with asymptomatic masticatory muscles and temporomandibular joints. Therein lies the first fallacy, because it is very rare to find that *all* the surfaces of *all* the teeth are equally affected by wear or by the failure of *all* of their restorations.[1] However, many mainly intact teeth were damaged in traditional 'full mouth rehabilitation' treatment plans in an attempt to solve different problems.[2,3]

Various concepts and techniques have been described over the years in order to achieve allegedly 'ideal occlusion outcomes.[4] Unfortunately, serious

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structural, pulpal and longer-term periodontal problems were often inflicted on many innocent teeth in the pursuit of those biologically dubious goals. In truth, the pursuit of the alleged nirvana of 'occlusal perfection' has often been the enemy of the long-term good of many patients' teeth in their older age. For example, Edelhoff and Sorensen[5] demonstrated that approximately 63% to 72% of a tooth's coronal tooth structure is destroyed by the preparations for classic full coverage metal ceramic or all-ceramic crowns. It is a fallacy that doing this amount of destruction is likely to improve the prognosis for any tooth treated in that way, and most dentists would avoid having that amount of destruction done to their own teeth or to the teeth of their children.[6]

Historically, various 'occlusionistas' have claimed that it is getting the occlusion right that is **THE** fundamental key to solving many dental problems.[7-10] Their strong belief was that re-organising the occlusion correctly 'would stop patients breaking their restorations, manage their tooth surface loss, cure or avoid them getting temporomandibular dysfunction (TMD) and/or alleviate their bruxism, as well as helping to manage their periodontal disease.' [7-10] However, based on current scientific evidence, most of those claims for efficacy in solving those problems were, and are, fallacious – either in part or wholly so. Sadly, the evidence advanced for some of the more dogmatic views about the benefits of full mouth rehabilitation was often anecdotal, historical, cultural or tribal.

Controversies about occlusal rehabilitation and periodontitis

Traditionally, especially in North America, correct occlusal management was deemed to be very important in managing and/or preventing infra-bony defects in periodontal disease.[8,11-14] Trauma from occlusion was considered by many periodontists to be a co-factor in the progression of periodontal disease, but its exact role has been debated for over a hundred years. One justification for undertaking full mouth rehabilitations was that it was the predictable way of 'getting the occlusion right' which was considered a key part in managing periodontal disease effectively.[13]

In 2006, Lindhe and co-workers, having reviewed the extensive literature on human autopsy results, multiple animal experiments and human trials, concluded that there 'was convincing evidence that **neither** unilateral forces nor jiggling forces, when applied to teeth with a **healthy** periodontium, result in pocket formation, or in the loss of connective tissue'.[15] Thus, trauma resulting from occlusion cannot induce periodontal tissue breakdown. These Swedish authors then continued stating that 'trauma from occlusion can result in increased mobility, which can be of a transient, or permanent, character and be regarded as a physiologic adaptation of the periodontal ligament and the surrounding bone to the occlusal forces involved. However, in teeth with progressive plaque associated periodontal disease, trauma from occlusion, may, under certain circumstances, enhance the rate of progression of the disease and act as a co-factor in the destructive periodontal disease process'.[15]

From a clinical viewpoint, proper treatment is still required for plaque associated periodontal disease, and undertaking this effectively will arrest the destruction caused by the periodontal tissues, even if the trauma persists. Treatment directed towards dealing with the trauma alone, e.g. by occlusal adjustment or splinting, may reduce the mobility of the traumatised teeth and result in some re-growth of bone, but it will not arrest the rate of further breakdown of the supporting apparatus induced by the dental plaque.[15] In other words, it is a fallacy that extensive full mouth rehabilitations, focusing on a particular occlusal philosophy, will stop the progression of periodontitis in susceptible patients – and it certainly will not prevent it in non-susceptible patients.

In fact, for many patients who have a serious susceptibility to periodontal disease, extensive full coverage restorations involved in full mouth rehabilitations potentially create many more problems than they solve. In truth, for many patients, who are susceptible to their own plaque/biofilm, multiple over-contoured bonded full crowns, particularly if they are splinted together and/or have subgingival margins may very well make their daily interdental and crevicular cleaning much more difficult for them, as most hygienists will attest.

Does 'perfect occlusion' have a role of in improving orthodontic stability?

Finalising the correct occlusal contacts was deemed to play an important role in stabilising orthodontic results.[16] However, to date, there is insufficient unbiased scientific evidence to support that contention.

Occlusion and peri-implantitis?

Establishing the correct occlusion was claimed to be very important in preventing peri-implantitis.[17] Sadly, the scientific evidence for holding that strong belief is also very weak.

Most patients adapt to occlusal changes

In 1962, Declan Anderson, an oral physiologist and polymath working in London, showed that patients readily adapted to changes in their occlusion.[18] Anderson's paper predated the later publication of Dahl et al.[19] by 13 years. Advancements in adhesive bonding systems and developments in resin composite materials have allowed many dental problems, such as tooth surface loss, to be treated successfully by utilizing occlusal changes without causing significant dental destruction.[20-24] In fact, multiple clinical studies[20-24] have shown that most patients adapt well to occlusal changes – provided that they are happy with the change in their dental appearance, i.e., by solving the appearance problems of their significantly worn teeth or by having alignment of their crooked teeth. However, they do need to be warned **in advance** that the price they pay for keeping the sound structure of their natural teeth is adaptation to those occlusal changes.

Case 1: Management of localised erosive tooth surface loss using an additive treatment approach

A 38-year-old male patient presented with erosive tooth surface loss, stained/discoloured resin composite restorations and crowded lower incisors (Figures 1a and 1b).

Figure 1a: Labial view showing stained/ discoloured resin composite restorations and crowded lower incisors

Figure 1b: Palatal view showing erosive tooth surface loss on the palatal aspects of the maxillary incisors. The teeth are still strong because the majority of the strength of teeth is in the marginal ridges, which are still intact

This case of tooth wear was managed by a combination of resin composite addition following night-guard vital bleaching (Figures 2 and 3).

Case 2: Tooth surface loss due to erosion and bruxism in a patient with missing maxillary adult canines who was referred 'for a full mouth rehabilitation'

The resin composite was kept within the occlusal table of the posterior teeth, all of whom had an intact ring structure, as had their opposing teeth. The direct resin composite on the premolars and first molars were loaded mainly in compression. The posterior teeth were bonded pragmatically in thick enough section to separate the upper anterior teeth and the deciduous canines from their opposing lower teeth. Doing that first allowed the maxillary incisors and deciduous ankylosed canines to be bonded with a decent thickness of resin composite material and provide 'group function' during lateral excursions along

*Figure 2: Pragmatic resin composite bonding **added** to the palatal aspects of the upper canines and to the occlusal aspects premolars (which are then loaded mainly in compression) increased the anterior vertical dimension and created plenty of space to allow a durable thickness of direct resin composite to be bonded freehand on to the eroded upper incisors. The erosion of the molars was not progressive following cessation of the patient's habit with frequent drinking of acid drinks*

*Figure 3: Night-guard vital bleaching and **adding** direct resin composite bonding preserved all the remaining sound tooth structure (their 'dental capital') for the patient's future needs, without hazarding the pulps or periodontal health. The main benefit was to protect and preserve the remaining sound tooth structure, but there was some added benefit in providing a modest improvement in the patient's smile and overall facial appearance*

with disclusion of the non-working side teeth (Figures 4-9).

The bonded deciduous canines were kept out of contact in ICP and during lateral excursion movements, and as they were ankylosed, they would not move or erupt further (Figure 10-11).

The addition of direct resin composite to worn teeth acts like individual orthodontic devices to help the patient have their remaining teeth protected while also improving their appearance without significant biologic costs.

Figure 4: A 32-year-old male presented with retained, ankylosed, deciduous maxillary canines, erosive tooth surface loss, some incisal wear facets and stained restorations

Figure 5: The lower left mandibular canine and premolar teeth were biting firmly against the maxillary deciduous canine, which was not mobile

Figure 6: Minor gap present at the upper left lateral incisor, chipped incisal edges, evidence of protrusive bruxism with incisor faceting and overeruption of the mandibular canines

Figure 7: In intercuspal position (ICP), there was minimal space between the right mandibular canine and premolar teeth and the opposing, ankylosed, maxillary deciduous canine

Figure 8: Following night guard vital bleaching (NGVB), direct resin composite was bonded pragmatically on to the posterior teeth to separate the lower canines from the ankylosed maxillary deciduous canines

Figure 9: Following a total etch approach and using a 3-bottle adhesive bonding system, direct resin composite was added free hand to the maxillary teeth in one visit

Figure 10: Prior to bleaching and the addition of direct resin composite

Adaptation in dentate patients to occlusal changes probably occurs mainly because of the presence of exquisitely innervated mechanoreceptors in the periodontal ligaments and in other parts of the face, including the TMJ's. The vast majority of patients treated in this limited and localised way develop a new and different ICP over a period of weeks without the need to have a

Figure 11: No sound tissue was damaged in solving this patient's dental problems with an additive approach. He did ***not*** *require a subtractive 'full mouth rehabilitation' as had been requested by the referring dentist*

destructive full mouth rehabilitation approach.[24]

It might seem self-evident to most, but if the majority of patients did not adapt readily to changes in their occlusion, there would be no orthodontics or orthognathic surgery being undertaken.

Worrying trends: the emergence of new 'digital dentistry full mouth rehabilitationists'

In spite of the widespread trend towards minimally destructive dentistry, by preserving and **adding** to worn but largely sound teeth, some recent advertisements for **subtracting** from mildly worn teeth have been noted to be appearing increasingly in un-refereed commercial dental publications and also on various platforms in social media.

Recent supposed developments, involving 'digital dentistry', especially using veneered zirconia have been promoted with gushing enthusiasm on various websites as well as in some case reports.[25] This has unleashed a new wave of needlessly destructive dentistry with nonsensical occlusal philosophies about full mouth rehabilitations now being re-hashed as a justification for those treatments because it is 'new and better' which is an oxymoron.

Aggressive advertising and unproven claims on various platforms of being the 'latest and greatest' have caused some gullible dentists to fall for crassly superficial straplines, which are often used to promote needlessly aggressive techniques. Unfortunately, gross dental destruction is now being done to sound natural teeth in order to use intra oral scanners and/or CAD-CAM for full coverage restorations techniques for 'full mouth rehabilitations'. In many cases, the treatments shown would be better described as 'full mouth mutilectomies' (Figures 12 a-c and Figures 13a and 14b).

'Normal' occlusion versus 'ideal occlusion' and TMD

Most experienced dentists are likely to acknowledge that there are wide variations in what may be perceived as 'normal' occlusions and that most patients manage reasonably well with those variations. There is little scientific evidence of malocclusion being causative of TMD.[26,27] However, there are some prosthodontists and general dental practitioners who choose to believe that there is a cause and effect relationship in spite of significant evidence to the contrary. In some cultures, the desire to provide multiple restorations to treat someone with mild TMD symptoms might be driven by financial gains for the provider of that treatment, or because it is 'covered by insurance' and/or that a particular patient demands it, sometimes based on their searches courtesy of the allegedly omniscient Professor Google. Some enthusiastic 'occlusionistas' seem able to develop a convenient amnesia about the structural, pulpal and/or periodontal damage that is often wreaked on healthy dental and periodontal tissues in order to deliver the supposed benefits of "an ideal occlusion" in order for them to manage their gullible patients' TMD problems 'properly'.

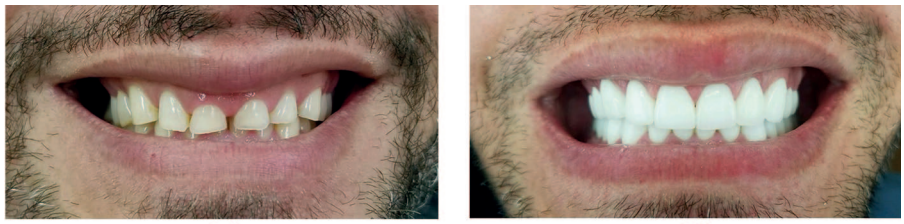
A panoramic radiograph of a patient with a heavily restored dentition and mild TMD symptoms is shown in Figure 14.

Consent issues and full mouth rehabilitations

There is only very weak evidence of proven long-term benefits for the supposed benefits of any 'full mouth rehabilitation' which could possibly compensate many patients adequately for the associated biological costs to them in terms of the destruction of the load

(a) (b) (c)

Figure 12a-c: Unnecessary destruction of mildly worn teeth for a 'full mouth mutilectomy' published online on a dentist's website in 2019



(a) (b)

Figure 13 a & b: This pre-operative **erosive** *tooth surface loss was published on a dentist's website in 2019. It was treated by shameful dental mutilation – partly to provide an 'idealised occlusion' – using ultra-white, over-contoured, monochromatic, veneered zirconia restorations on many teeth which had been minimally affected by the* **chemical** *erosion*

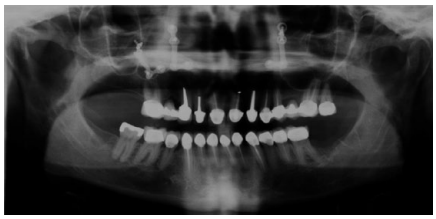


Figure 14: These teeth were unrestored prior to the Le Fort 1 osteotomy and 'occlusal rehabilitation' to treat TMD symptoms. The patient still had intermittent symptoms of TMD after all that treatment

bearing structure of their remaining teeth, or some crowned teeth developing later pulpal problems. Other costs include their time, considerable discomfort, substantial financial costs and, ultimately, the need to adapt to various occlusal changes involved throughout the so-called 'occlusal rehabilitation' processes as seen in Figures 12,13 and 14.

On the negative side, there are many risks incurred in undertaking many elective reconstructions. Those real dangers include pulpal damage which sometimes requires sophisticated endodontic treatments to be undertaken subsequently. Crowns made of bonded ceramic to metal, or of zirconia/ceramic restorations, can increase those endodontic difficulties very significantly, which often means that specialist endodontic skills may be required.[14]

Over-contoured full crowns often evict the interdental papillae, which often makes effective interdental cleaning much more difficult for the patient and thereby leads to further periodontal problems.

Ceramic bonded zirconia frequently results in crazing or chipping of the ceramic, as well as often leading to consequential pulpal problems.[15]

In spite of the gross dental destruction involved in the multiple preparations, veneered zirconia often produces highly questionable appearance outcomes as shown in Figures 12a-c and 13a-b. These and other possible difficulties raise serious issues and concerns about patients' real understanding of the **material risks** which is required in order to make their consent valid ('*Montgomery* consent'). If patients really did **understand** fully the relevant risks that would be involved for them with these destructive approaches and were made fully aware that there are often realistic, viable and minimally destructive alternatives available to solve their tooth wear problems, it is very doubtful that they would choose irreversible removal of around two thirds of their residual structure from many of their remaining sound teeth to try to achieve a supposed 'ideal' occlusion.[24]

For many trusting patients, the enthusiastic pursuit of a putative "ideal occlusion" by means of destructive prosthodontic interventions is often the enemy of the long-term good health of their teeth (see Figures 12).

Traditional versus newer restorative materials for 'full mouth rehabilitations'

Cast restorations involved in 'dental rehabilitations' from the 1920s through to the 1970s used to be made of gold alloy, sometimes veneered with acrylic or resin composite. The skilled preparations required for those metal materials involved considerably less sound tooth structure removal for their fabrication when compared with the destruction required for full coverage porcelain fused to metal restorations (see Figures 14 and 16) or for all-ceramic full crowns or for ceramic veneered zirconia complete coverage crowns (see Figures 12,13 and 15).

While it appears reasonable to draw attention to the threats to sound natural teeth caused by destructive dentistry for alleged full mouth rehabilitation, modern adhesive materials can be utilised to apply some old but still useful occlusal principles, such as re-establishing canine guidance to protect heavily prepared teeth which are supporting extensive traditional bridgework.[28] This can be done by bonding direct resin composite to the palatal aspects of the maxillary canines (or the labial aspects of the mandibular canines) sufficient to produce disclusion and thereby spare

Figure 15: Cracks and chipping of ceramic from a zirconia sub-structure which was followed by difficult endodontic treatment. About two thirds of the structure of the tooth would have been removed at the crown preparation stage. The access cavity for the endodontic treatment which was required afterwards probably removed another 15% of the residual core

Figure 16: Twenty years after this full mouth rehabilitation was done, the over-contoured restorations, having evicted the interdental papillae and made interdental cleaning much more difficult, are now associated with serious periodontal problems. Five teeth required root fillings through the crowns afterwards

Figure 17: About two thirds of the sound structure of these formerly intact teeth was removed to provide porcelain bonded to metal crowns. In this case, five teeth became non-vital, and these had been root filled (sub-optimally) over the next four years. Probably much less tooth tissue had been removed for the preparations for the posterior partial veneer gold crowns and the pulps in those teeth remained vital

Figure 18: Extensive fixed movable bridge with a movable joint in the pontics. On average about two thirds of the anterior abutment's structure would probably have been removed during the preparation for the full coverage PFM anterior retainer

Figure 19: Composite was bonded to the palatal aspect of the upper right canine to provide canine guidance during lateral movements of the mandible and thereby reduce the lateral forces on the greatly reduced cores under the bridgework

heavily restored posterior teeth from lateral forces (Figures 16-17). A more modern version is shown in Figures 18-23 of how to add composite to provide canine guidance in order to protect the remaining cores of some heavily prepared teeth that were retaining extensive bridgework.

Chilled hybrid composite was applied and covered in KY Jelly (Johnson & Johnson, USA). All the saliva was evacuated by the dental nurse. The patient then closed into that composite (without swallowing) and the composite was cured initially from below the canine tip. Once the initial curing was done, the mouth was opened to complete the light curing prior to finishing the composite. This provided adequate canine guidance to disclude the existing vulnerable bridgework and its cores during lateral jaw movements (Figures 21-23).

Figure 20: The palatal aspect of the upper left and canine was etched and then bonded with a 3-bottle system and the unfilled resin was light cured

Figure 21: Mirror image of the resin composite which increased the canine guidance. The 'canine riser during lateral movements' concept is at least seventy years old. However, it can still be helpful in protecting the weak abutment teeth cores under the extensive bridge from destructive lateral forces in a known bruxist patient

Figure 22: Mirror image of the occlusal marks on the opposing sound teeth biting against the newly bonded maxillary canine. In theory, one could bond the labial aspect of the mandibular canine instead. Doing that would have the same net effect of producing canine guidance during lateral movements of the mandible, but without damaging sound tooth structure

Figure 23: The direct resin composite is a barely visible 'sacrificial' material which can be ADDED to increase canine guidance (or indeed anterior guidance). If deemed desirable that resin composite can be placed and replaced without weakening the structure of the canine (or other teeth) at whatever intervals seem to be appropriate

Summary

To many biologically aware dentists, many of the arguments about the alleged benefits of full mouth rehabilitations seem to have involved a semantic and fundamentalist approach to treating sound natural tooth structure as being expendable. The alleged justification for using controlled violence with a dental drill to remove much of those evolved and beautifully different tooth shapes and sizes was to achieve the goal of a supposed 'ideal occlusion'.

However, the purported benefits were difficult to achieve satisfactorily or predictably. Even if achieved, by using considerable clinical skills coupled with precise laboratory techniques and utilising various sophisticated articulators along with their devices and records, the results remain biologically dubious. That is because **all** of the teeth had to be cut down first in order to achieve these supposed benefits. Furthermore, the concepts of what constituted an 'ideal occlusion' changed over time by different 'occlusal gurus'.

Probably, none of those 'occlusal cults' resulted in their stated aims of predictably preventing, or alleviating tooth wear problems. In many cases, they exacerbated them because the diamond bur abrasion removed vast amounts of structure from the unworn and worn teeth alike. For many patients, the 'solution' for their tooth wear issues was probably worse than the problems it purported to solve.

Different 'occlusal sects' have advocated occlusal rehabilitation to solve or prevent TMD, to cure bruxism as well as managing infra-bony defects and other periodontitis problems.

These authors contend that full mouth rehabilitation was, and is, an inappropriate approach for managing tooth-wear, TMD, bruxism, or preventing or managing periodontitis.

That misguided approach now needs to be challenged to stop it from it being re-popularised with the advent of 'digital dentistry', especially when using, for example, veneered zirconia, which is giving those outmoded destructive philosophies a new lease of life and which will prove to be to the detriment of many trusting patients' long-term dental health.[29]

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