Occlusion and Temporomandibular Disorders: Past and Present Opinions on Management*

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* Footnote: This article is a revised and updated version of a presentation given by the author at the Conference of the International College of Prosthodontists 18–21 September 2013 in Turin, Italy.

ABSTRACT
The role of occlusal factors in temporomandibular disorders (TMDs) has been a much-discussed topic for long, and it still is. This article will briefly present the development of opinions on the relationship between occlusion and TMDs and how this has affected the management. The early belief that deviations from an ideal occlusion would imply a risk of creating TMDs has gradually been abandoned. Today most TMD experts de-emphasize the importance of occlusion in the aetiology of TMD. Available evidence-based knowledge has suggested that occlusal interventions are not justified for treatment of TMDs since occlusion is in general not at all or only weakly associated with TMDs. Instead counselling and simple reversible methods should be the first choice in management of TMD patients. Oral appliances / splints are frequently used and can often effectively reduce signs and symptoms in TMD patients. However, they are not always necessary and a low-cost, non-splint self-care treatment should be the first choice in management of the majority of primary TMD patients.

Conclusion. TMDs will often improve with simple treatment that can be performed in general dental practice, without occlusal interventions. Educating patients about their disorder is an important part of the management. Only few TMD patients need more extensive treatment and / or referral to orofacial or medical specialists.

Key words: Concepts of Occlusion, Differential Diagnosis, Oral Appliances, Orofacial Pain, TMJ Disorders.

How to cite this article: Carlsson GE. Occlusion and Temporomandibular Disorders: Past and Present Opinions on Management. J Pak Prosthodont Assoc 2013; 01(02): 81 – 86.

Introduction
Dental occlusion has been a much-discussed topic for long, and it still is. According to the Glossary of Prosthodontic Terms, occlusion is defined as “the static relationship between the incising or masticating surfaces of the maxillary or mandibular teeth or tooth analogues”, whereas the “dynamic contact relationship between the occlusal surfaces of the teeth during function” is called articulation. These definitions may seem straightforward but the clinical and practical interpretation of them has caused much confusion and many controversies in dentistry. The most persistent controversy has been related to the role of occlusal factors in temporomandibular disorders (TMDs). A great number of names have been used over the years for pain and functional disturbances of the masticatory system; TMD / TMDs will be used in the following text. TMD was earlier considered a single entity, characterised by pain, joint sounds, and irregular or limited jaw function. Today TMDs is a collective term embracing a broad spectrum of clinical joint and muscle problems in the orofacial area with a number of possible aetiologies. During the last few decades the interest has focused more on the pain than on the dysfunction aspect of TMDs. Orofacial pain is increasingly used in parallel with TMD and one of the most respected journals in the field is named Journal of Orofacial Pain.

This article will present a brief description of the development of opinions on the relationship between occlusion and TMDs and how this has affected the management of TMDs.
Some Notes on Development of Concepts of Occlusion

In the 19th century the interest in occlusion increased by the development and improvement of articulators used to facilitate the construction of complete dentures; specific criteria of occlusion were considered necessary for well-functioning prostheses.

Early in the 20th century gnathological concepts appeared stating that ideal occlusion was necessary for the health of the whole masticatory system. This led to the belief of an occlusal aetiology of TMD. Both Monson and Decker in the 1920s and Costen 10 years later maintained that temporomandibular joint (TMJ) symptoms as well as deafness and other ear problems might be caused by distal condylar displacement and overclosure of the mandible. These ideas resulted in recommendations for reconstructive dentistry using bite raising to treat both TMJ and ear problems. However, these ideas also caused both confusion and controversy between anatomists, maxillofacial surgeons and dentists: should the disorder be treated with TMJ surgery or occlusal therapy? Even if the professionals soon agreed that Costen’s explanation was not anatomically acceptable, the concept survived long, at any rate in the name “Costen’s syndrome” that was used for TMD in many texts up to the end of the 20th century.

The textbook Occlusion by Ramfjord and Ash emphasised occlusal disturbances in the aetiology of TMDs, or “Functional disturbances of the masticatory system” as it was called in the book. According to the book occlusal adjustment was also the treatment of choice for treatment of TMDs. This book had an enormous impact on the thinking in the field of pain and functional disturbances of the masticatory system. The book appeared in 4 editions during three decades, the last came in 1995.

Parallel with this great interest in occlusion, masticatory muscles were found to be the source of much of the pain in TMDs, and the term myofascial-pain-dysfunction syndrome (MPD) was coined. Treatment directed to the painful muscles, e.g. jaw exercises were shown to be as effective as occlusal adjustment in managing TMDs. However, confusion persisted in the TMD field and the literature gave little help to solve the controversies as the interpretation of available studies was difficult, as they did not use comparable diagnoses and methodological criteria. The launching of the research diagnostic criteria for temporomandibular disorders (RDC / TMD) in 1992 aimed at improving the quality of research in the field. Even if it was far from ideal it became dominant in clinical TMD research worldwide and helped to specify diagnoses. The system included however evident shortcomings and it was criticized. New versions of RDC / TMD have recently been published. It is still too early to say if the new versions will increase the applicability and utility of the system.

The interest in the field of Orofacial Pain / TMDs is reflected in the rapid increase of research articles over the last few decades. Advanced education programs have been developed in several centres to further the specialization in the field. TMD / Orofacial Pain has been accepted as a dental specialty in a few countries, and in others attempts are continuing to achieve a specialty status.

The Future

What will happen with the TMD / Orofacial Pain field in the coming years? To make a prognosis for the future is difficult because we don’t know what will happen...(Unknown thinker). Nevertheless I list a few points, perhaps more hopes than realistic prognoses:

- The relative importance of TMDs increases in parallel with decreasing prevalence of caries and periodontal disease – and / or increasing prevalence of TMDs?
- Improved undergraduate education makes general dentists capable of diagnosing and managing most TMD patients?
- Specialist training and special clinics are necessary and will hopefully be developed for complicated patients, unusual TMDs / Orofacial Pain, and chronic pain syndromes
- Research in the field is expanding and hopefully more of it will be directed to transferring the results to clinically useful treatment methods.

In contrast to these fairly optimistic, or at any rate hopeful, predictions, Türp presented in a recent review, forecasting the development up to 2020, a pessimistic view on the future educational level of the general practitioners, which he prophesised to remain poor. He concluded however that “compared
to today, some clinically relevant changes may be expected, and in the years ahead the field of orofacial pain will continue its journey of emancipation away from traditional dentistry, heading towards pain medicine.

**Diagnosis**

A thorough history and a careful clinical examination and evaluation are the most important steps. A mm ruler and observations of jaw movements are enough to notice restriction and irregularity in mouth opening. Instrumental and electronic devices, e.g. surface EMG and jaw tracking systems, or occlusal analysis in an articulator, do not improve diagnostic accuracy. For differential diagnosis of some TMJ disorders imaging techniques may be desirable, but not always necessary. For the most common TMJ disorders a clinical evaluation by a trained clinician has shown acceptable agreement with diagnoses gained by TMJ imaging. A radiographic examination of teeth and jaws should be performed to be able to differentiate odontogenic pain from TMD symptoms.

In summary, the diagnosis of TMDs should mainly be based on the history and clinical evaluation, whereas imaging of the TMJs can be reserved to a minority of TMD patients.

**Treatment**

A great number of treatment methods for TMDs, such as dental, physical, psychological, pharmacological, surgical and other, have been advocated and tried over the years. In spite of the fundamental differences between these treatment modalities, many of them have shown good therapeutic effectiveness and control of signs and symptoms in the majority (75% to 90%) of TMD patients. One explanation to this may be that TMD was for long looked upon as a single disease entity, i.e. differential diagnoses of TMDs were not included in study designs, and many of the studies presented were of poor methodological quality.

The previously predominant role of occlusal therapy / adjustment has been seriously questioned, and most so-called TMD experts de-emphasize today the importance of occlusion in the etiology of TMD. Several systematic reviews have concluded that occlusal adjustment cannot be recommended for the management or prevention of TMDs. However, many practitioners still adhere to a concept focusing on occlusal factors in TMD diagnosis and treatment. The main reasons for that are that many dentists continue to rely on their early professional training and experiences, they are reluctant to accept that TMDs are mainly non-dentally related disorders, and / or they believe in “schools of thought” sponsored by charismatic gurus. They are also unfamiliar with current literature and continuing education in the field.

Available evidence-based knowledge has thus suggested that occlusal interventions are not justified for treatment of TMDs since occlusion is in general not at all or only weakly associated with TMDs. It is therefore unethical to continue providing irreversible changes to occlusion as treatment for TMDs. Counselling and simple reversible methods should be the first choice in management of TMD patients.

**Management of TMDs**

The precise etiology of most TMDs is not well known, but successful management is still possible!

- TMDs will often improve with simple treatment.
- Educating patients about their disorder is an important part of the management.
- Combining counselling, analgesics for pain relief, and simple jaw exercises should be used initially in most TMD patients.

This simple treatment can be performed in general dental practice and will be successful for most primary TMD patients. However, there are other types of patients, e.g. those who are psychosocially compromised, do not respond to simple treatment, and / or have persistent or chronic pain. Such patient groups will require additional clinical attention and multidisciplinary treatment planning.

**Oral Appliances**

Splints, also called inter-occlusal or oral appliances, night guards, etc., are common in treatment of TMDs. The most common are stabilization splints (Figure 1). They are thought to be effective by means of occlusal stabilization. However, there are other possible mechanisms of efficacy (Table 1). An anterior bite plate (relaxation plate, Hawley plate, etc.) uses a quite different mechanism but has been found to be
as effective as the stabilization splint. Several studies during the last few years have demonstrated that a so-called placebo splint, which only covers the palate without any influence on the occlusion, also is effective in reducing TMD symptoms. It is therefore probable that the mechanism is not at all or only marginally related to occlusal factors, but can be explained as effects of, for example, placebo, the time factor, and the fluctuation of the complaints.

Table 1: Proposed mechanisms discussed in the literature to explain the treatment effect of intraoral appliances.

<table>
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<tr>
<th>Proposed mechanisms</th>
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<tr>
<td>Occlusal disengagement.</td>
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<td>Stabilization of occlusion.</td>
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<tr>
<td>Neurophysiologic effects on the masticatory system.</td>
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<td>Change of vertical dimension.</td>
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<td>Change of caput-fossa relation.</td>
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<tr>
<td>Cognitive awareness of harmful behaviour (e.g. parafunctions).</td>
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<tr>
<td>Stress absorber / reduced load on masticatory system components.</td>
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<tr>
<td>Placebo effect.</td>
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Since oral appliances in many studies have shown to effectively reduce signs and symptoms in TMD patients they can be recommended and are frequently used. However, splints may not be necessary for a successful management of TMD patients. A well-controlled study found that TMD patients who received a dentist-guided home self-treatment without splint had after 12 months improved as much as those who had been treated with splints. The conclusion was that a low-cost, non-splint self-care treatment should be the first choice in management of the majority of primary TMD patients.

**Occlusal adjustment**

As discussed above, the current opinion among TMD specialists is that occlusal therapy, in general, seldom is indicated in TMD patients! However, occlusion is of course important in many other clinical situations, as in restorative and prosthetic dentistry, although opinions vary much how occlusion should be organized.

There are several clinical situations when occlusal adjustment may be considered

- Gross occlusal interferences.
- Occlusal trauma with tooth hypermobility.
- Occlusal instability.
- Before and after restorative procedures.
- For aesthetic improvement.

As an example of a situation when occlusal adjustment can be used is an open bite, which can often be improved by selective grinding of the posterior teeth (Figure 2).
New paradigm in understanding occlusion

New research has shown a remarkable adaptability of the sensorimotor central control system – neuroplasticity – in response to changes in the orofacial region. Central neuroplasticity supports adaptation to dental treatment, including changes in occlusal design and occlusal status. This new knowledge can enhance our understanding of patients’ adaptation to different types of prosthodontic work and variations in occlusal design and morphology.\(^1,24\) The possible impact of this new knowledge on the diagnosis and management of TMDs is not yet known. It can be expected that new methods in pain research, such as brain neuroimaging for visualizing pain-related brain activity, will be used also in the TMD/orofacial pain field. It is not likely however that such methods will lead to revolutionary changes in patient management in the near future.\(^8\)

Conclusions

- This simple treatment can be performed in general dental practice and will be successful for most primary TMD patients.
- Only few TMD patients need more extensive treatment and/or referral to orofacial or medical specialists.

References

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