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Determinants of a Healthy Aging Dentition: Maximum Number of Bilateral Centric Stops and Optimum Vertical Dimension of Occlusion

Winfried Walther, Dr Med Dent, PhD Vice Director Academy for Postgraduate Dental Studies Karlsruhe, Germany

Introduction

In 1969 Beyron stated that the determinants of a healthy aging dentition are a maximum number of bilateral centric stops and an optimum vertical dimension of occlusion.¹ This approach should be analyzed considering contemporary results of dental research.

What Do We Know?

Occlusal Philosophies and Knowledge About Occlusal Contacts

Teachers of occlusal philosophies emphasized the location, size, distribution, and number of occlusal contacts, starting from the concept that an ideal occlusion can be found. Clinical investigations have established knowledge about the means of recording occlusal stops and the variations in occlusal contacts.

Occlusal indicators vary, and their markings may not be reproducible. A gold standard for recording occlusal contacts has yet not been established.²⁻⁵ Occlusal contacts change throughout the day and over longer intervals and depend on the pressure and physical state of the masticatory system.^{36,7} The location of occlusal contacts found in clinical studies differs from theoretic considerations, ie, from the concept of tripodism.⁸

Number of Occlusal Contacts

In an elderly population, approximately five contacts on each side of the posterior region of the tooth arch are to be found. Short-span fixed appliances exhibit more occlusal contacts than do longer span prostheses.⁹ In young adults, the number of occlusal contacts relates with masticatory muscle activity.¹⁰

Maximum Number of Bilateral Centric Stops

The concept of providing the patient with the maximum possible number of bilateral centric stops has been challenged by the concept of the shortened arch. There is evidence that the shortened dental arch consisting of anterior and premolar teeth can provide adequate functional rehabilitation.^{11,12}

Occlusion and the Development of Situations Leading to Symptoms

Changes of the occlusal contact pattern toward a traumatizing contact may lead to periodontal alterations. The effect of trauma from occlusion has been evaluated in animal models. A traumatic occlusion leads to increased mobility and reversible alterations of the periodontal apparatus.¹³ There is support for the assumption that a stable occlusion in the intercuspal position is an essential prerequisite for the maintenance of extended fixed partial dentures on periodontally compromised abutment teeth.¹⁴

In rare instances, patients complain about continuous discomfort after restorative dental treatment because of the lack of familiarity of their own bite (phantom bite syndrome). Treatment success is rarely, if ever, obtained.¹⁵

Optimum Vertical Dimension

The difference between vertical dimension of occlusion and rest position (clinical freeway space) has been stated to be of decisive value for diagnostic and restorative procedures. Postural jaw position varies within the same person and is influenced by body posture, speech, and emotional tension.¹⁶ Measures of clinical freeway space depend on the method used.¹⁷ Electromyographic monitoring of the jaw muscles has not been proven to allow diagnostic decisions.¹⁸ The patient has a good chance of adapting to an increase in vertical dimension.¹⁹

What Do We Not Know?

The variability of the results described does not support the assumption that the clinical reality of teeth and jaw relations can be described using mechanistic models.

To develop the rules of an "optimal occlusion," the authors of occlusal philosophies interpreted anatomic findings. They assumed that these needed no further substantiation.^{20,21} Such rules were taught and applied without prior scientific investigation. As a consequence, the scientific thinking of the dental profession appears to be retarded with regard to occlusal treatment and diagnosis. Furthermore, there is a gap between the clinician who performs restorative treatment as a matter of routine using (mostly) reliable conventional techniques and the scientist who is preoccupied with problems that do not occur in the dental office.

To close this gap, prosthodontists should try to find scientific questions that help to resolve clinical problems. The aim should be to compile information that helps clinicians to organize their restorative treatment in a more efficient way. Dental scientists need indicators, ie, quantitative measures, for monitoring clinical care to validate the appropriateness of clinical procedures. The clinician demands criteria to assess the individual case with regard to restorative treatment needs and methods.

Focusing research efforts on relevant care issues may achieve quality promotion of dental treatment. For this reason, it is important to know:

- What are the clinical indicators of the outcome of occlusal treatment with regard to: (1) preservation of oral tissues; and (2) prevention of complications?
- How can these indicators be used to create rules for decision making and treatment performance?
- Which determinants of decision making and treatment performance affect the outcome indicators?

What Research Strategies Are Needed?

Defining Indicators of Treatment Outcome: Strategies of Communication

A multidimensional approach for defining indicators should be elaborated.²² Using appropriate consensus techniques may be useful.²³ Dental practitioners should be involved in the discussion. The dental office should be regarded as a resource of clinical knowledge. New ways of communicating between those who perform dental care and those who perform dental research should be introduced.

Defining and Validating Criteria for Treatment Planning: Strategies of Health Service Research

A rational approach to the way of recording and assessing the initial findings is the basis of clinical reasoning. To evaluate treatment needs associated with occlusal corrections, the methodology of health service research could be applied. Groups of clinicians should reach consensus on guidelines that subsequently can be put into practice. The clinical outcome can then be evaluated and can finally be used for the reassessment of the management of treatment.

Randomized Studies

It is widely accepted that there is a need for more randomized studies. There is one severe problem with randomizing studies on prosthodontic treatment, as patients like to make their own decisions as to treatment alternative. Therefore, this type of study will be restricted to university settings.

There is no doubt that controlled clinical studies will become increasingly important for the validation of the treatment of temporomandibular disorders. Studies concerned with restorative procedures should take the patient's preference into account.²⁴ Controlled studies comparing prosthodontic devices should provide information about adverse clincal effects of occlusal treatment and psychometric documentation of patient comfort to assess the benefit of the treatments examined.²⁵ The usefulness of clinical trials exclusively dedicated to occlusal items of restorations should be considered.

What Needs Highlighting In Educational Programs?

It can be expected that in the future, dental schools will continue to deliver their particular set of occlusal rules to their students. Additionally, educational programs for postgraduate students and clinicians should be established. These should create a clinical learning environment that enables clinicians to discover the preconditions of successful treatment based on mutual efforts for quality promotion.

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Determinants of a Healthy Aging Dentition: Freedom in the Retrusive Range of Occlusal Contacts and Multidimensional Freedom for Functional Tooth Contact

Per Alstergren, DDS, PhD Assistant Professor Karolinska Institutet, Institute of Odontology Huddinge, Sweden

Introduction

Valid and clinically relevant determinants for a healthy aging dentition would indeed be of great value in prosthodontics, with benefits for patients and clinicians. Such determinants could, for example, be based on functional parameters, esthetic variables, and patient expectations. Possible determinants also include occlusal factors, although no conclusive evidence for the contribution of occlusal factors to oral health, disease, or function seems to exist today.

The large biologic variation, for example, in individual morphology and disease, as well as variations in reconstruction designs, makes studies of possible determinants very complicated. Placebo treatment, double blinding, and control of all other variables than that studied are very difficult, if not impossible in many cases. On the other hand, an absence of any relationship seems unlikely, since the occlusion is a fundamental part of the masticatory system.

What Do We Know?

An extensive search of the MEDLINE database regarding freedom in the retrusion range or multidimensional freedom as determinants for the healthy aging dentition did not reveal any study specifically dealing with these issues. However, a small number of other studies provide a few, indirect indications of different strengths regarding the influence of these factors on craniomandibular musculoskeletal disease or patient satisfaction. These indirect facts are mentioned below, but they have to be further investigated before any conclusion may be drawn regarding use of these factors as determinants for the healthy aging dentition.

Occlusal Factors, Prosthodontic Treatment Outcome, and Disease

In patients with mandibular implant-supported fixed prostheses opposing maxillary complete dentures, occlusal factors are of minor and limited importance for patient satisfaction as well as clinical and radiographic treatment outcome.¹

Pullinger et al² showed that while the contribution of occlusal factors to various forms of temporomandibular disorders (TMD) is not zero, most of the variation in each disease population was not explained by occlusal factors. Indeed, certain features such as anterior open bite were

considered to be a consequence of rather than an etiologic factor for disease. For example, the longer slides between the retruded position (RP) and the intercuspal position (IP) found in patients with disc displacement or osteoarthrosis are probably a result of the disease.³ The only qualitative systematic review of TMD treatment with splints or occlusal adjustment so far published found that only 18 of several hundred studies fulfilled the criteria for inclusion. The mean quality scores for these were below the general level for studies in medicine, although they were higher than in a similar review regarding periodontal studies (!). Accordingly, one of the conclusions was that better designed studies are needed in this area.

Prevention

A prospective placebo-controlled study of 123 orthodontically treated healthy adolescents compared TMD signs and symptoms before active or placebo occlusal adjustment, including reduction of RP-IP slides in the active adjustment; the status 3 years later suggested that occlusal adjustment prevents future masticatory muscle tenderness and stabilizes the occlusion.⁵ However, this study included adolescents, and a larger part of the treatment group showed masticatory muscle tenderness before treatment than the control group. Copyright of International Journal of Prosthodontics is the property of Quintessence Publishing Company Inc. and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.