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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

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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 al[2] 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.

Experimental Malocclusion

Experimentally induced RP-IP interferences in healthy individuals have been reported to elicit pain similar to that reported by patients with TMD.[6] This and similar studies induced acute forms of nonideal occlusion, and this particular study was performed on a small number of healthy, young male subjects with complete dentitions. In addition, no control groups, neither healthy individuals nor TMD patients, were included, and, except for 2 subjects, the degree of masticatory muscle tenderness after the interference was induced has to be considered within the normal range.[7]

Conclusion

No study has specifically examined the value of freedom in the retrusion range or multidimensional freedom as determinants for a healthy aging dentition after prosthodontic treatment regarding craniomandibular musculoskeletal disorders, masticatory function, esthetics and patient satisfaction.

What Do We Not Know?

The following list comprises important topics that could progress clinical research aimed to eventually improve clinical outcome of prosthodontic therapies. One suggestion is that the coordination of the research for the 2 first topics be carried out by an international prosthodontic association. The topics are as follows.

- No standardized outcome measure(s) for prosthodontic treatment—regarding overall outcome, craniomandibular musculoskeletal disorders, masticatory function, esthetics, or patient satisfaction—seem to exist.
- What also seems to be missing is a generally accepted and validated diagnostic classification system for specific diseases and conditions possibly initiating prosthodontic treatment. Many studies regarding occlusal factors and prosthodontic treatment or disease have used the very unspecific diagnosis "TMD." However, more specific diagnoses are most probably needed to be able to identify relevant biologic mechanisms behind specific conditions.
- Are there any associations between specific occlusal factors and outcome of prosthodontic treatment in different diagnostic subgroups?
- Which are the biologic mechanisms behind a possible influence of occlusal factors on treatment outcome?
- With the knowledge of such mechanisms, what can we do to modulate them to improve the treatment outcome?
- Do these factors have any prognostic value in determining prosthodontic treatment outcome?
- By which factors, if any, can patients be identified in whom certain occlusal factors might be of importance for treatment outcome?

What Research Strategies Are Needed?

Define, test, and validate clinically relevant outcome measures for overall outcome or function, esthetics, disease, and patient satisfaction separately. Use an available and validated diagnostic classification, or develop and validate a novel diagnostic classification system, for example, to replace the TMD diagnosis with a more appropriate system. With the combination of validated diagnoses and outcome measures, perform adequately designed studies to investigate determining factors as well as mechanisms and prognostic values for acceptable outcomes of prosthodontic treatment.

What Needs Highlighting in Educational Programs?

Modern and evidence-based international prosthodontic curricula, including training in clinical decision making for undergraduate and postgraduate educations, and integration of these curricula into the main curriculum for each faculty should be undertaken. Continuous learning programs should be developed for teachers in evidence-based clinical prosthodontics.

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