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Significance of the Occlusal Interface

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Highlighting Essential Results

Outstanding specialists from different areas of dentistry assembled for the Interface of Occlusion at the symposium "On Biological and Social Interfaces in Prosthodontics." The importance of occlusion for oral health was then examined from diverse relevant perspectives. One point of emphasis was the description of the scientific evidence for the significance of occlusal factors. Most authors concluded that there is little scientific evidence that occlusal factors are important in the pathogenesis of temporomandibular disorders (TMD) and the simple cause-effect relationship between malocclusion and TMD cannot be scientifically demonstrated. In fact, the results of studies on occlusion-oriented therapies with occlusal splints or occlusal contouring have been inconsistent. The gaps in our understanding of healthy occlusion and the effects of malocclusion on oral health were described, as were research strategies that could contribute to our knowledge of basic scientific principles. The published proceedings of the conference can therefore serve as a basis for planning future research and motivating young scientists to close the gaps in our knowledge of occlusion. In addition, the necessity of improving research methods was emphasized.

Discussion of Research Strategies

Beyron's concepts of occlusion are the basis of the prosthodontic and orthodontic therapies used in day-to-day practice.[1] The lack of scientific evidence for the usefulness of these concepts raises numerous questions:

- Why do we lack compelling scientific evidence for the effect of occlusal factors on the emergence of TMD or on TMD therapy?
- Do occlusal factors really only have a subordinate role in oral health, or have research methods often been inadequate?
- Are there subgroups of patients for whom occlusal factors do play a more important role, as demonstrated in a previous splint study?[2]
- TMD studies are often based on the outcome variable of "pain intensity." Is this the best target variable to investigate connections between TMD and occlusal factors?
- Have researchers examined the decisive occlusal parameters, and how exactly and reproducibly have occlusal variables (eg, occlusal interference or occlusal stability) been diagnosed or measured?
- How can the long-term effects of occlusal factors on oral health be evaluated if these factors can change continuously as a result of adaptation processes such as wear and displacement?
- How can we avoid methodological errors when performing studies, keeping in mind clinical issues and ethics committee policies that do not accept untreated control groups suffering from pain?

Numerous clinical studies have examined the efficacy of occlusal interventions in the treatment of TMD. High-quality randomized and blinded studies have employed validated pain scales to describe outcome variables.[3] However, TMD is a collective term for different functional diseases accompanied by acute or chronic jaw or facial pain, pain on palpation of the masticatory muscles, specific diseases of the

temporomandibular joint, or combinations of these. TMD is not a clinical entity, even though numerous studies are based on the assumption that it is. Pain is a central parameter and is of decisive importance in the requirement for therapy. The clinical course of structural joint disease, such as disc displacement, is nevertheless not adequately assessed by pain scales, as these conditions are often associated with only slight or short-term pain.[4,5]

High-quality studies on joint-specific diseases are a rarity. Clinical research on specific joint diseases is handicapped by inadequate reproducibility of the clinical diagnoses, differences in diagnostic procedures, and the frequent combination with myofascial pain.

The introduction of magnetic resonance imaging (MRI) has been particularly useful in extending the diagnostic spectrum for disc displacement.[6] However, calibration of MRI diagnosis and high-quality imaging are essential for reproducible diagnosis.[7] Unfortunately, MRI has hardly been exploited in randomized clinical trials (RCTs) as a noninvasive diagnostic procedure with which to identify healthy joints or detect specific pathological changes. With disc displacement, central occlusion is evidently incompatible with the physiological condyle-disc relation. Significant differences have been detected between control subjects and subjects with different forms of disc displacement[8,9]; however, long-term studies for risk assessment have not yet been completed.

The Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) have allowed classification of the most important TMD subgroups.[10] Calibration of the investigator makes it possible to reduce investigator-dependent variability[11] to such an extent that making a comparison between different studies has become possible. The separate measurement of psychosocial impairment on the so-called Axis II has also led to the elimination of methodological uncertainties in the description of TMD. Numerous clinical studies aimed at further improvements in clinical diagnosis and at studying specific TMD subgroups have now been initiated on the basis of the RDC/TMD.

Separate evaluation of different TMD subgroups appears to be of decisive importance for the future, as patients with myofascial pain, in contrast to patients with a specific joint disease, exhibit a marked tendency to develop chronic pain, accompanied by much more intense psychosocial impairment.[12,13]

Recommendations for Future Research

In addition to the proposed symposiumresearch strategies of the authors at the symposium, the following recommendations can be made:

- Consistent use of RDC/TMD and validation of joint-specific diagnoses
- Division of TMD patients with myofascial pain and joint-specific symptoms into the appropriate RDC/TMD subgroups for research purposes (groups should also be studied in combination)
- Improvement in clinical diagnosis by using high-quality imaging and image calibration
- Development of a consensus regarding occlusal parameters (eg, adherence to Beyron's principles)
- Calibration of the measurement of such occlusal parameters
- Use and validation of additional target variables to describe oral health that go beyond the absence of pain

Significance for the Clinic and for Teaching

Deficiencies in basic scientific knowledge to support routine clinical work are problematic in all branches of dentistry. The aim for every patient subjected to interventions, including changes in occlusion or occlusal rehabilitation, should be to try to achieve an optimal treatment result. Ideally, a careful risk-benefit analysis should be performed for each treatment option, and on the basis of this analysis, the patient should select the optimal treatment variant for him, which should, if possible, also be evidence-based.

The articles by Ross,[14] Bryant,[15] and Walther[16] clearly demonstrate that while ideal or perfect occlusion can be theoretically postulated, natural ideal occlusion is only enjoyed by a small minority. The authors emphasized that there is a wide range of variation of occlusal parameters within which tolerably good pain-free function is possible, including a shortened dental arch, wherein mastication is possible without molars. Nature has evidently equipped us with a series of compensatory possibilities. The individual patient's potential to adapt is obviously widely variable and almost impossible to assess prospectively.

It is important for clinical practice to know the limits of the range of healthy occlusions to be able to identify unfavorable occlusions that support the development of pathological changes. Possible effects of unfavorable occlusion are not limited to the emergence of chronic jaw and facial pain. They extend to painless diseases of the jaw joints; compromised masticatory function, oral quality of life, and esthetics; plus loosening of teeth and tooth displacement.

However, for many occlusal parameters we are missing the scientific basis that permits reliable statements about the risks of nonideal occlusion.[3] If all treatment guidelines which cannot be supported by RCTs were rejected, planning of the occlusal aspects of prosthodontic or orthodontic therapy would be left to the discretion of the responsible dentist. On the other hand, if we were to exclusively continue to base our work on Beyron's requirements, there is a danger of possibly overtreating our patients by persisting with unnecessary expensive precision work or accepting exaggerated indications.

With this background, various strategies for dental treatment can be applied:

- The objective of a high degree of perfection in the occlusal modeling of dental prostheses does not appear to harm patients. It should be retained given the uncertainty of a scientifically based alternative.
- The preventive effect of perfect occlusion is unproven. Perfecting an occlusion should not be used as a single indication for orthodontic/prosthodontic treatment strategy.
- Whenever possible, the results of clinical research should be used as evidence for particularly sensitive situations or patients, where high precision may be necessary.

The last point applies to the evaluation of minimum standards for different treatment situations.

In this context, it is absolutely essential that the scientific basis for evidence-based dentistry be extended. The implementation of this principle and the continuous updating of current knowledge must be taught at university. University courses in dentistry should also be aimed at winning over scientifically interested and talented dentists for research, to help to close the gaps in basic scientific knowledge. These are the people who should be immediately familiarized with the rigorous methods of high-quality clinical research.

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