# **Occlusion in Prosthodontics**

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Occlusion in contemporary dentistry is the dynamic, biologic interaction of the teeth, temporomandibular joints (TMJs), and jaw muscles, which determine functional tooth contact relationships.

Biologic adaptability of the stomatognathic system to restorations and prostheses is an expectation, but is associated with psychosocial factors for esthetic acceptance and well-being, as well as neurophysiologic factors of central neuroplasticity, which provide mechanisms for adaptation to changes in dental status.<sup>1</sup> These mechanisms allow patients to develop confidence and competence with their fixed and removable restorations.

#### **Clinical Outcomes**

Clinical outcomes are related to psychosocial factors that are dependent primarily on clinician-patient interaction and not dependent on the number of natural teeth remaining, nor necessarily on their condition (pain is an exception), bite force, or chewing efficiency. This is clearly indicated for complete dentures, where the "prosthetic condition" has no correlation with the patient's subjective judgement of their prostheses.<sup>2</sup>

Clinicians' recognition of the need for a patientcentered approach for patient care ensures that each patient's psychologic needs are addressed through informed consent for treatment satisfaction and sense of well-being, while background neurophysiologic adaptation ensures that there is an optimization of function (Table 1).

Data from Sessle,<sup>3</sup> although primarily from animal studies but supported by emerging clinical data, have clearly indicated that subtle and gross changes to tooth form lead rapidly to changes in somatosensory representation in the M1 face motor cortex. These data, by implication, confirm that the plasticity of the M1 face motor cortex is needed to accommodate to changes in tooth form and occlusal relationships, and is crucially important for maintaining and enhancing masticatory function.

#### Table 1 Clinical Priorities\*

Biologic knowledge and clinical evidence for best practice Acknowledgement of each patient's expectations Patient assessment-clinical examination, study casts, imaging, psychologic assessment, psychosocial assessment Treatment planning Informed consent

\*Clinical priorities are summarized to emphasize the expectation in knowledge and the global approach to patient care.

### **Occlusal Form in the Natural Dentition**

Data have indicated that mastication and swallowing occur in the intercuspal tooth position (ICP), which is usually anterior to the retruded tooth contact position (RCP), as an area of contact rather than a point of contact, and lateral guidance may involve canine teeth (canine guidance) or canine and posterior teeth (group function guidance). Group function guidance is a feature of the adult dentition that develops over time with attritional tooth wear; it is not commonly present in the young dentition.

ICP contacts occur bilaterally, although they may be different between the left and right sides, and increase from canine to second molar. Data suggest that the average number of tooth contacts (canine to second molar) is seven to eight.

The presence of posterior teeth enhances masticatory efficiency, but there is no strong correlation between posterior occlusal status and temporomandibular disorder, and in particular, the traditional requirement of "posterior support" for "unloading and protecting" the TMJs is not supported by long-term clinical data.

### **Therapeutic Occlusal Form**

There is no validated evidence from long-term clinical studies to indicate that a particular occlusal form and posterior tooth contact relationship (tripodized, cusp-fossa, lingualized contacts) is superior,<sup>4</sup> and function does not depend on a full arch of posterior teeth; a shortened dental arch does not correlate with poor function.<sup>5</sup>

However, best practice requires that an appropriate occlusal vertical dimension (speaking space and lower facial height) be established for esthetics and function, and that tooth contacts be harmonized with ICP. Both ICP for single-tooth and short-span restorations and RCP for extensive restorative and occlusal rehabilitations are biologically acceptable, recognizing that biologic adaptability of the stomatognathic system will reestablish biologic harmony within as yet undefined reasonable limits of jaw relationship and tooth contact position. Table 2 summarizes clinical specifics.

Table 2	Clinical Specifics*
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Esthetics	
Lower facial height and occlusal vertical dimension	
Smile line and facial symmetry	
Tooth form and tooth arrangement	
Function	
Jaw mobility-jaw joint (disc and condyle) and muscle interaction	
Jaw muscle function	
Stable tooth contact position for function	

\*Clinical priorities are summarized to emphasize the expectation in knowledge and the global approach to patient care.

#### Conclusion

Research evidence is not yet available from long-term contemporary clinical outcome studies to specify a particular occlusal design or jaw relationship for optimizing clinical outcomes.

However, in recognition of the above, and within this complex biologic and behavioral framework, and the limits of clinical outcome data, a paradigm shift in available evidence acknowledges that emerging neurophysiologic evidence, based on peripheral and central neuroplasticity, indicates the remarkable accommodation of the masticatory system to subtle and gross changes in the occlusal status.<sup>1,4</sup>

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## **Removable Partial Dentures**

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#### Trends: Demographic Changes and Prosthodontics

A continuous decline of tooth loss and complete edentulousness can be observed over the past 30 years, as well as a trend to replace removable partial dentures (RPDs) with fixed prostheses<sup>1</sup> and an increasing number of implants placed. In parallel, there is also an increase in the elderly population of the western world. With regard to a highly reduced dentition or complete edentulousness, a shift to the oldest segment of the population is expected. Caries becomes difficult to control and root caries is a major reason for tooth loss in elderly patients (Fig 1). It is undisputed whether adaptation to removable partial and complete dentures in old age is a favorable solution.

Rather, recent publications suggest that periodontally compromised teeth should be maintained in elderly patients by adequate care.<sup>2</sup> Natural teeth might have a better prognosis than implants.<sup>3</sup> Some clinicians and researchers claim that elderly patients should preferably maintain a natural dentition with 20 teeth at the age of 80 (ie, a shortened dental arch [SDA] concept)<sup>4</sup> without the need of wearing any removable dentures. Whether this goal can be reached for a broad average of the elderly population has not yet been demonstrated.

#### **Evidence for the Effectiveness of RPDs**

So far the level of evidence in the field of RPDs is very low and randomized controlled trials or systematic reviews are missing. In the Cochrane collaboration, six major topics in dentistry are elaborated by systematic reviews, removable prosthodontics not included. While experts claim that RPDs improve chewing function, nutrition, esthetics, occlusal support, and guality of life, this has not been proven on a solid basis.<sup>5</sup> In fact, it seems that the pleasure of eating is diminished by wearing RPDs and patients with > 20 natural teeth may be healthier. A review comprising over 80 publications<sup>6</sup> could not identify clear indications for RPDs. RPDs were often delivered to elderly or dependent patients with low general health, low social background, or low education levels. Economic restrictions had the greatest impact on clinical decision-making. Thus, there is some bias in the patient selection for treatment with RPDs and results from studies have to be considered under these auspices.

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