Optimisation in multi-implant placement for completely edentulous mandibles

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Abstract
Although implants connections limit the effects of excessive occlusal forces, it seems obvious, according to the laws of elementary biomechanics, that the vertical axis resultant of mandibular implant systems should be aligned to an ideal closing axis perpendicularly to the closing radius. Consequently, three approaches (theoretical, experimental, and clinical) are used to propose a new way of positioning the implants for the mandibular implant-supported fixed dental prosthesis.

The objective of this paper is to present a new approach while maintaining the principle of orthogonality at the closing radius. The theoretical part was supported by a cone beam computed tomography (CBCT) study on 211 half mandibles (from Vienna collection – R. Slavicek); the poster presents the experimental part.

Introduction
For a mandibular complete prosthesis with bilateral posterior cantilevers fixed on four implants, three theoretical ways of positioning dental implants can be proposed. These simulations, in three sketches, aim to determine the occlusal forces applied to the 4 dental implants with respect to the occlusal plane.

RESULTS

Simulation 1: 4 implants parallel and perpendicular to the occlusal plane

Simulation 2: 2 implants tilted posteriorly by 30 degrees and 2 implants parallel and perpendicular to the occlusal plane

Simulation 3: 2 implants tilted posteriorly by 30 degrees and 2 anterior implants tilted anteriorly by 30 degrees to counterbalance the posterior implants.

To conclude, simulation 3 generates antagonist forces, which tend to balance the simulation.

The posterior implants are the most requested because of the cantilever.

DISCUSSION
Simulation 3 proposes a mandibular implant-supported fixed dental prosthesis on 4 implants but with 2 anterior implants tilted buccally to counterbalance the classical tilting of posterior implants. Indeed, for better mechanical resistance, it seems logical that the posterior angulation should be compensated by an anterior angulation of equivalent but opposite value to maintain a resultant perpendicular to the occlusal plane. Globally, the implant-prosthetic unit axis of resistance must be close to perpendicular to the closing radius.

REFERENCES