

BIOMECHANICAL SIMULATION OF IMPLANT SELECTION AND POSITIONING, PROBLEMS AND PROSPECTS

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ABSTRACT

Over the past decades dental implants became an accepted therapy option with reasonably high success rates and patient satisfaction. Nevertheless, depending on the cited publication, a percentage of up to 15 % of inserted implants fail. Causes for failure are various and include inflammation, improper insertion and bone resorption due to biomechanical overloading. Concentrating on the biomechanical aspects of the problem, a detailed mechanical analysis of the loading situation during biting, chewing, and grinding is required.

In this presentation the steps necessary to establish a full patient-individualized biomechanical analysis of the intra-oral loading situation are described. Topics cover the basics of patient-specific numerical (finite element) modelling of teeth, hard and soft tissues, mesh generation and analysis of mesh quality, material properties of all structures involved, and intra-oral loading due to muscular activity.

Aid of several examples, interpretation of the results is presented. The examples cover analysis of implant loading in the “All-on-Four” concept, immediate versus delayed loading or systematic analysis of implant geometries in the course of the development of a new implant series.