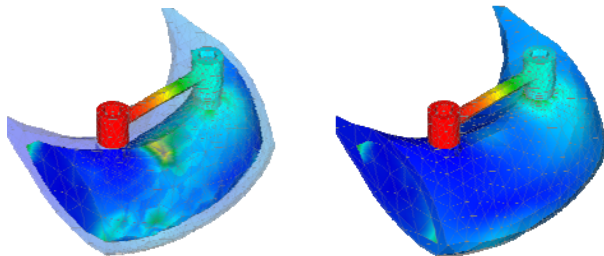
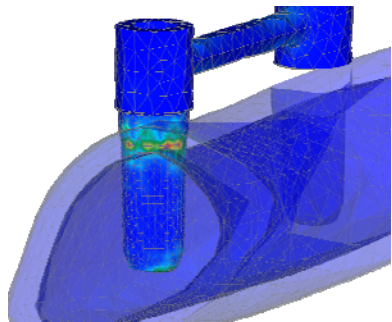
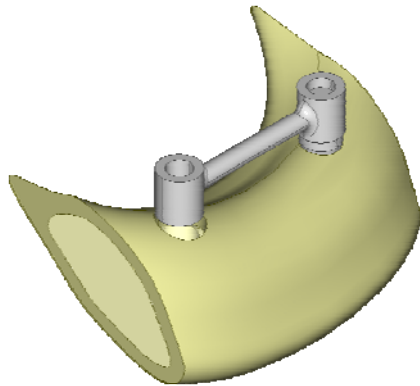


Medical Case Study (CenPRA, Brazil – Human Mandible Implant)



Renato Archer Research Center (CenPRA) – (www.cenpra.gov.br) is a Brazilian public federal research institute, under the Brazilian Science and Technology Ministry, dealing with many different research topics, ranging from micro-electronics to industrial applications of rapid prototyping technology. One of the most recent research lines of CenPRA is the application of high technology for medical demands in which a bioengineering analysis is used.

The use of mandibular implants for bar-clip fixation in order to provide infrastructure for a complete overdenture appliance is a common issue in Brazilian odontologic clinics. Due to this, the study of mechanical behavior and the influence of misfits related with the implant procedure are crucial.

The initiative of the Faculty of Odontology at Piracicaba, part of the State University of Campinas, to evaluate the influence of the misfit in a bar-clip fixation to one of the two mandibular implants applied to a central section of a mandibular bone was conducted with the support of CenPRA using a complex NEi Nastran nonlinear welded contact model.

The high complexity of the model comes from the multiple body interaction, provided the mandibular bone is fully described, with cortical and trabecular structures defined, and the implant, screw and bar-clip attached to the mandible and one to each other using welded contact. Material properties were defined for each type of bone, metallic implant-screw system and bar-clip. For this study, besides the misfit of the bar-clip, the researchers wanted to know the influence of the variation of bar-clip material.

Thanks to NEi Nastran welded contact model and the power of the nonlinear solvers, allied to the flexible pre- and post-processing of FEMAP, not only was a solution obtained but it could be easily visualized and comprehend by professionals of multidisciplinary areas, like dentists, physicians and engineers, typically working together in bioengineering applications. This kind of flexibility is a must for a successful partnership.

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