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Comparative Study of Interferometry and Finite Element Method in Maxillofacial Applications

Juan Alfonso Beltrán-Fernández[1a]*, Luis Héctor Hernández-Gómez[1b], Carolina Alvarado-Moreno[1c], Itzel Bantle-Chávez[1d], Carolina Alvarado-Moreno[1e], Pablo Moreno-Garibaldi[1f], Juan Carlos Hermida Ochoa[2g], Erik Omar Alvarado-Alcántara[2h]

*Corresponding author

1. Instituto Politécnico Nacional - Escuela Superior de Ingeniería Mecánica y Eléctrica - Sección de Estudios de Posgrado e Investigación Edificio 5, 2do Piso, Unidad Profesional Adolfo López Mateos "Zacatenco" Col. Lindavista, C.P. 07738, Ciudad de México, México.
2. Centro de Investigación y Laboratorio Biomecánico, Carmen #18, Chimalistac San Ángel, 01070 Ciudad de México, CDMX

Email: jbeltranf@hotmail.com[1a]*

Human bone tumors, severe trauma and infection are the main causes of large bone defects. Currently, these defects are repaired using reconstruction plates that connect remaining bone, without any bone grafting. This study focuses on two aspects: the first, experimental testings using digital image correlation and secondly a numerical testing studies in order to evaluate the influencing in the design of a custom prosthesis and maxillofacial applications. The main purpose of this study is to know the areas where the stress and strains are concentrated, and how these can affect the integrity of the prosthesis causing a possible failure. The mandibular prosthesis prototype design will be created based on the 3D reconstruction of the mandible of Tomographic studies, which will be obtained using Scan IP software. Subsequently, the 3D models will be exported to CAD software in order to fix the necessary adaptations to the bone. The 3D models were printed in acrylonitrile butadiene styrene and a digital image correlation will be used in order to evaluate the residual stress and strain differences which can be observed in all the cases, also in the case of implants and the remaining healthy bone, caused by masticatory forces.

Keywords: Digital image correlation, 3D printing models, Mandibular Prosthesis, Mandibular Reconstructions, Osteonecrosis, Dental Stress Analysis