BIOMECHANICAL STUDY OF DIFFERENT SURGICAL APPROACHES OF ZYGOMATIC IMPLANT TO TREAT ATROPHIC MAXILLA PATIENTS

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This thesis is dedicated to Abah, Ma, Abang Long, Abang Ngah, Abang Chik, Abang Lang, Iki and Ikmal, who offered me unconditional love and support throughout the completion of this thesis.
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ABSTRACT

A comparative analysis was made between two different surgical approaches, the intrasinus and the extramaxillary, for the placement of zygomatic implants to treat atrophic maxillae patients. The introduction of the extramaxillary approach was claimed by some quarters to reduce implant complications caused by inappropriate emergence of the implant head. However, implant failures from this surgical approach has been reported in literature. This study utilizes the finite element technique to analyse the strength of implant anchorage for both approaches in various occlusal loading locations and directions. Three-dimensional models of the human craniofacial structures surrounding a specific region of interest, soft tissue and framework were developed using computed tomography image datasets. The zygomatic and conventional dental implants were modelled using computer-aided design software and positioned according to the respective surgical approach. The bone was assumed to be linear isotropic with a stiffness of 13.4 GPa, and the implants were made of Ti6Al4V titanium alloy with a stiffness of 110 GPa. Masseter muscle forces of 300 N were applied at the zygomatic arch, and occlusal load of 150 N were applied onto the framework surface. The results showed that the intrasinus approach demonstrated more satisfactory results under various occlusal loading locations and, hence, could be a viable treatment option. However, the technique resulted in more stress increase to sustain loads in the oblique direction. The introduction of extramaxillary approach, on the other hand, could also be recommended as a reasonable treatment option, provided some improvements are made to address the cantilever effects as exhibited by the 30% higher stress within the zygomatic implant than those in the intrasinus approach. The technique also caused an increase in motion of prosthetic components under simulated masticatory loadings.
ABSTRAK