

Assessment of Biomechanical Stability of Biodegradable Miniplate – Screw System With Servohydraulic Testing Unit and Finite Element Analysis in A Rabbit Model

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The aim of this study is to evaluate biomechanical stability of resorbable internal fixation system in a servohydraulic testing unit (STU) and using 3-D finite element analysis (FEA) in bilateral mandibular vertical body osteotomies (BMVBO) immediately after surgeries, at the postoperative 1st and 3rd months healing periods in a rabbit model. We used 18 rabbits in our study. Stress tests were measured by applying vertical forces at the anterior incisal edge by loading from 0 N/cm² until plastic deformation and breakage had occurred. Maximum forces that hemimandibles could stand and the amount of deformations were recorded and analysed in the each option by FEA and STU. In immediate group, there is no significant difference statistically in both maximum forces and deformations data in STU and FEA tests. In 1 month group, maximum forces data in FEA is statistically greater than STU values and deformations data in STU is statistically greater than FEA values. In 3 months group, there is no significant difference statistically in maximum forces data whereas deformations data in STU is statistically greater than FEA values. During the monitoring of biomechanical stabilities of rabbit mandibles in which body osteotomies were performed and fixated with resorbable systems, the use STU and FEA interchangeably depended on the time of testing and assessment parameters.

Key words: Biodegradable implant, biomechanics, finite element analysis, mandible, osteotomy