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Study on Internal Structure of Zygomatic Bone Using Micro-Finite Element Analysis Model Differences between Dentulous and Edentulous Dentition in Japanese Cadavers

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Abstract: The purpose of this study was to analyze changes in the internal structure of zygomatic bone using a micro-finite element analysis model (μ FEA) and compare angular orientation of trabeculae against compressive force in edentulous and dentulous jaws. Twenty zygomatic bones from dentulous jaws and 20 zygomatic bones from edentulous jaws harvested from Japanese male cadavers were used. From 2-dimensional slice images, we reconstructed 3-dimensional (3D) structure by the volume rendering method using micro-computed tomography (micro-CT). To analyze mechanical properties, all voxels were converted to μ FEA models. The angle between the strongest direction of trabecular bone and the axial loading direction (angle α) was then determined using the μ FEA models. In the 3-D reconstruction images, trabecular density in dentulous jaws was higher than that in edentulous jaws at all loci. Trabeculae in dentulous jaws showed a plate-like structure. The μ FEA modeling revealed that the angle of the trabeculae at the Jugale in edentulous jaws was lower than that in dentulous jaws. This suggests that the internal structure of trabeculae is influenced by occlusal force in zygomatic bone from edentulous jaws.

Key words: Zygomatic bone, Micro-CT, Japanese cadavers, Bone histomorphometry, Finite element analysis



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