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**FEM simulation of tongue deformation for /i/ with a four-cube
model applied to tagged cine-MRI data**

Sayoko Takano^a, Hiroki Matsuzaki^b and Kunitoshi Motoki^b

^aATR-Promotions, 2-2-2 Hikaridai, Seika-cho Soraku-gun, 619-0288 Kyoto, Japan

^bHokkai-Gakuen University, 1-1, Minami-26, Nishi-11, Chuou-ku, 064-0926 Sapporo, Japan

Roles of extrinsic and intrinsic tongue muscles in the production of vowel /i/ were examined using a finite element method (FEM) applied to the tagged cine-MRI data. It has been thought that tongue tissue deformation for /i/ is mainly due to the combined actions of the genioglossus muscle bundles advancing the tongue root to elevate the dorsum with a mid-line grooving.

A recent study with the tagging-MRI revealed earlier, faster and greater tissue deformation at anterior top of the tongue than posterior part during /ei/ production. This result implies the contribution of the intrinsic tongue muscle (transverse anterior) with an independent hydrostat mechanism from that of the genioglossus muscle bundles.

In this study, a simple four-cube model is built to examine the co-contraction effect of the genioglossus and transverse muscles using using the FEM. The simulation result with the anterior transverse muscle (Ta) showed good agreement with the pattern of the tongue deformation obtained from the tagged-MRI data, suggesting that transverse anterior also plays an important role for the realization of the tongue shape for the production of vowel /i/.