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Author(s)	諸星, 貴大
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Micro-CT analysis for morphological changes of mandible from unilateral bite elevation in growing rats

Takahiro Morohoshi

Takenobu Ishii

Kenji Sueishi

Department of Orthodontics, Tokyo Dental College

Purpose: Facial asymmetry is a morphological abnormality in the frontal orientation, and is one of the indications for orthodontic treatment. The aim of this study was to investigate the effect of unilateral bite elevation in the molar region on facial and mandibular development in growing rats.

Materials and methods: Thirty Wistar male rats aged 5 weeks were randomly allocated to three groups. The control group was allowed to grow naturally until 9 weeks of age. In the removal group, a device was fitted on the molar to elevate the bite unilaterally at 5 weeks, which was removed at 7 weeks and rats were observed until 9 weeks. In the continuation group, the same device was fitted on the left side molar to elevate the bite continuously for 9 weeks. The rats in all groups underwent craniofacial scanning with 3D micro-computed tomography at 5, 7, and 9 weeks of age.

Results: In the removal and continuation groups, the mandible was displaced to the non-elevated side. At 7 weeks of age, both the removal and continuation groups exhibited greater skeletal growth and molar extrusion on the elevated side, with significant differences between the elevated and non-elevated sides. At 9 weeks of age, there were significant differences in both skeletal and alveolar growth between the removal and continuation groups, and the asymmetry in the removal group improved.

Conclusion: Unilateral occlusal elevation during the growth period resulted in suppression of molar eruption on the elevated side and molar extrusion on the non-elevated side. The vertical growth of the mandibular ramus increased on the elevated side, resulting in asymmetric growth.