Research activity and concept

The study objective of our laboratory is focused on how to scientifically overcome various problems in clinical orthodontics. To achieve this, we have to develop advanced diagnostic techniques and treatment methods by actively incorporating technologies from various fields other than orthodontics, such as biomechanics and molecular-biology, and each study should always be verified from the major viewpoints: ‘meaning of mastication for humans as a biologic’ and ‘health of the maxillofacial region’.
Development and utilization of dentomaxillofacial cone beam CT

Our department developed Japan’s first dental cone beam X-ray CT capable of acquiring high-precision images from a single tooth to the entire maxillofacial region in cooperation with Hitachi Medical Corporation. Problems in applying the conventional medical CT for the dental field, such as the exposure dose, resolution in the longitudinal direction, acquisition time, and installation area, were overcome, and high-resolution imaging at a low exposure dose was realized. To make a diagnosis based on combination of the conventional panoramic and plain X-ray photographs, dentists have to assume the structures and positional relationship of the actual teeth and jaw bone, but the introduction of cone beam CT facilitated the accurate identification of the condition in the jaw bone.

Selected publications
• Maki K: Orthognathic treatment planning based on CBCT and FEM. (4th International conference Advanced Digital Technology in Head & Neck Reconstruction, May 2011, Freiburg, Germany)
• Watanabe M, Yamaguchi T, Maki K: Cervical vertebra morphology in different skeletal classes A three-dimensional computed tomography evaluation. Angle Orthod. 80:719-724, 2010
Clinical diagnosis employing biomechanics

Various joint studies with the Tokyo Institute of Technology and Kogakuin University are under way.

Selected publications

Clinical application of genetic testing for orthodontics

We intend to provide patients with comfortable and effective orthodontic treatment as much as possible, for which the diagnosis should be accurate. Particularly, for the orthodontic treatment of children, the shape and size of the jaw after they grow into adults are important. The shape and size of the jaw are determined based on various factors, and one of these is ‘heredity’, as you can imagine that children’s faces are similar to those of their parents. If this hereditary information can be understood, accurate diagnosis is possible. Our department has been studying the prediction of the shape and size of the jaw based on genetic information. We aim at orthodontic treatment which is safe and satisfies patients, with sufficient ethical consideration.

Selected publications

Development of patient robot

How should dental school students learn treatment techniques before treating patients? We developed the world’s first robot for skill training utilizing simulation engineering, and use it for education. This study is supported by a Grand-in-Aid for Scientific Research from the Ministry of Health, Labour and Welfare.

Selected publications