Synopsis of Original Research Paper

Result-oriented simulation for maxillofacial surgery using homologous modelling

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A homologous model that converts the surface shape of a living body consisting of a huge point cloud into a small number of parameters (principal component vectors) reflecting anatomical features. In this study, homologous model was applied to the morphology of the facial surface and jawbone and was used in the simulation of oral and maxillofacial surgery, especially jaw deformity (orthognathic) surgery. From the aimed facial form assumed in advance, we tried to make a prediction model for hard tissue surgery for each patient.

Prior to model creation, the reproducibility of anatomical landmarks of facial soft tissue was verified. The subjects were 10 healthy adults. When reproducibility was examined using ICC (intraclass correlation coefficients), 11 reliable landmarks were confirmed.

Based on the CT data of a healthy person (TY), a homology model of hard and soft tissues with 3187 vertices was created as a hybrid homologous model. Using this as a template, a hybrid homologous model of jaw deformity patients with facial asymmetry was created.

The difference between the hard tissue morphology predicted from the amount of change in the jawbone calculated from the aimed facial form of the soft tissue, and the actual post-operative hard tissue morphology had a difference of approximately 5 mm in the mandibular ramus and the lateral part of the chin, which remains asymmetry after the operation.

The result-oriented hard tissue simulation for orthognathic surgery obtained from the aimed soft tissue morphology was useful for planning surgery and discussing postoperative problems.