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Finite element analysis of stress distribution on the mandible and condylar fracture osteosynthesis during various clenching tasks

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Abstract

Purpose

The purpose of the study was to evaluate the effect of clenching tasks on the stress and strain of condylar osteosynthesis screws and plates, as well as on the stress, strain distribution and displacement on the whole mandible and bone surrounding screws.

Methods

Three-dimensional finite element models of the mandible, two straight four-hole plates and eight screws were established. Six static clenching tasks were simulated in this study: incisal clench (INC), intercuspal position (ICP), right unilateral molar clench (RMOL), left unilateral molar clench (LMOL), right group function (RGF) and left group function (LGF).

Results

Based on the simulation of the six clenching tasks, none of the inserted screws and plates were broken or bended. For the whole mandibular bone, the maximum von Mises stress and von Mises strain observed were yielded by the ICP. For the bone surrounding the inserted screws, the maximum von Mises stress and von Mises strain were yielded by the LMOL (49.2 MPa and 3795.1 ?).

Conclusion

Clenching tasks had significant effects on the stress distribution on the condylar osteosynthesis and the bone surrounding screws. Contralateral occlusion task (LMOL) had the maximal results of von Mises stress and strain and healing problems could be occur, this result confirms the importance of soft diet after surgery.

Keywords
MandibleCondylar fractureORIFClenching tasksFinite element analysis

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