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The Accuracy of In-house Personalized Surgical Cutting Guide for Segmental Mandibulectomy: A Proof of Concept *In Vitro* Study

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Abstract

Objectives: Recently, the new computer-assisted surgery workflow for segmental mandibulectomy and reconstruction has been developed. The aim of this study was to evaluate the accuracy of in-house personalized surgical cutting guides for osteotomy on the mandible prior to reconstruction in *in vitro* study.

Methods: Twenty mandibular stereolithography underwent segmental mandibulectomy using the personalized surgical cutting guides. The virtual surgical plans with randomly generated anatomical defects were developed, and personalized surgical cutting guides were created. The stereolithography of mandible and personalized surgical cutting guides were manufactured with the three-dimensional printer using fuse deposition modelling. The segmental mandibulectomy was carried out using the personalized surgical cutting guide. The accuracy of osteotomy was determined using the superimposition between virtual surgical simulation data and scanned images of postoperative stereolithography in software. The error of osteotomy was evaluated in terms of absolute angular and distance deviation.

Results: After superimposition, the mean absolute angulation deviation of osteotomy was 1.3835 ± 0.2357 degrees (95%CI; 1.3081-1.4588) and the mean absolute distance deviation of osteotomy was 1.2975 ± 0.2907 mm (95%CI; 1.2045-1.3904).

Conclusions: The in-house personalized surgical cutting guides provided acceptable accuracy and feasibility for osteotomy on mandible. Further investigation in terms of clinical benefits is needed.

Keywords: computer assisted surgery, mandibular reconstruction, surgical cutting guide, three-dimensional printing, virtual surgical planning