World Academy of Science, Engineering and Technology
International Journal of Biomedical and Biological Engineering
Vol:12, No:10, 2018

The Accuracy of an In-House Developed Computer-Assisted Surgery Protocol for Mandibular Micro-Vascular Reconstruction

Authors : Christophe Spaas, Lies Pottel, Joke De Ceulaer, Johan Abeloos, Philippe Lamoral, Tom De Backer, Calix De Clercq

Abstract : We aimed to evaluate the accuracy of an in-house developed low-cost computer-assisted surgery (CAS) protocol for osseous free flap mandibular reconstruction. All patients who underwent primary or secondary mandibular reconstruction with a free (solely or composite) osseous flap, either a fibula free flap or iliac crest free flap, between January 2014 and December 2017 were evaluated. The low-cost protocol consisted out of a virtual surgical planning, a prebend custom reconstruction plate and an individualized free flap positioning guide. The accuracy of the protocol was evaluated through comparison of the postoperative outcome with the 3D virtual planning, based on measurement of the following parameters: intercondylar distance, mandibular angle (axial and sagittal), inner angular distance, anterior-posterior distance, length of the fibular/iliac crest segments and osteotomy angles. A statistical analysis of the obtained values was done. Virtual 3D surgical planning and cutting guide design were performed with Proplan CMF® software (Materialise, Leuven, Belgium) and IPS Gate (KLS Martin, Tuttlingen, Germany). Segmentation of the DICOM data as well as outcome analysis were done with BrainLab iPlan® Software (Brainlab AG, Feldkirchen, Germany). A cost analysis of the protocol was done. Twenty-two patients (11 fibula /11 iliac crest) were included and analyzed. Based on voxel-based registration on the cranial base, 3D virtual planning landmark parameters did not significantly differ from those measured on the actual treatment outcome (p-values >0.05). A cost evaluation of the in-house developed CAS protocol revealed a 1750 euro cost reduction in comparison with a standard CAS protocol with a patient-specific reconstruction plate. Our results indicate that an accurate transfer of the planning with our in-house developed low-cost CAS protocol is feasible at a significant lower cost.

Keywords : CAD/CAM, computer-assisted surgery, low-cost, mandibular reconstruction
Conference Title : ICHNO 2018 : International Conference on Head and Neck Oncology
Conference Location : Barcelona, Spain
Conference Dates : October 29-30, 2018