

Ein mechatronisches Konzept für die Nasennebenhöhlenchirurgie (navigated control ©) A first evaluation of Navigated Control© for FESS

Gero Strauss¹, Kirill Koulechov², Robert Richter³, Tim Lüth²

¹Klinik und Poliklinik für HNO-Heilkunde/Plastische Operationen

BMBF-Innovations Centrum Computer Assistierte Chirurgie ICCAS

²Berlin Center for Mechatronical Medical Devices, Charité & Fraunhofer IPK

³Klinik und Poliklinik für HNO-Heilkunde/Plastische Operationen

Problem

CT-based Navigation is frequently used in Functional Endoscopic Sinus Surgery (FESS). Although digital data with inherent accuracy exists, the actual surgical procedure is done manually. Definition of safety regions and work space for a cutting, drilling or shaving instrument seems to be a promising concept for mechatronical assistance with a relatively low expenditure of changing surgical setup. A detailed workflow-analysis including Surgical Integration Profiles for FESS has been conducted. This study examines exemplarily the concept of navigated control© for a Shaver in Sinus Surgery.

Material and Methods

Surgical planning was based on CT of the paranasal sinuses (st=1 mm, 56 slices/average) with an average time consumption of 4 min for definition of safety regions (lamina papyracea, frontal skull base). The control of the shaver was realised with the NaviBase© Navigation System with the Polaris position sensor, NDI, and Navigated Control©. Navigated Control switches of the shaver, if the shaver leaves the preoperatively defined safety region. Routinely acquired data sets were used for the evaluation of the segmentation tool. Accuracy and robustness of the system was measured in a technical dummy, effectiveness is examined in a cadaver experiment.

Results and Discussion

Navigated control of the shaver in FESS is a robust system with more sufficiently accuracy in surgical target region. The preoperative defined safety regions became respected without exception. Both investment demand as well as usability of the systems let expect a far application in ORL-surgery.