Validation of a template guided treatment accuracy (NobelGuide®). A CT-based study with a novel validation software tool.

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Topic: Implant and guided surgery

Introduction

Correct implant placement ist one of the crucial factors for the successful implant osseointegration and further prosthetic fabrication[1]. Computer aided technologies allows us to virtually plan the implant position and transfer them to the patients mouth with use of the surgical template[2]. For the verification of the accuracy of the template guided implantology several studies have been published so far[3]. The purpose of this study is to evalute presurgical and postsurgical CT data with novel validation software in order to validate accuracy of the surgical template and to examine and analyse the fusion process steps of this software.

Methods and Materials

After approval of the study protocol by the Ethics Commission of the Medical University Vienna 18 patients were included (m:f = 10:8, mean age 58 years, range 36 – 77 years). All patients were treated at the Department of Oral Surgery, Bernhard Gottlieb-University Clinic of Dentistry Vienna. After computer aided planning (Procera® Software, Nobel Biocare, Sweden) all surgical procedures were performed by two experienced surgeons with the NobelGuide® treatment concept (NobelBiocare®, Sweden). Postoperative high-resolution multislice CT-scans (Tomoscan SR-6000, Philips Medical systems, Einhoven, The Netherlands) were performed using the same preoperative settings. NobelGuide® Validation software (ver. 2.0.0.4) was used to evaluate presurgical and postsurgical CT data as well as presurgical planing files made in Procera® software. The software reconstructs the threedimensional data with the implant position in ten steps and calculates deviations of the implant apex, implant shoulder, implant angle and implant depth. These data are obtained by merging the virtually planned implant with the postion of inserted implants.

Results

According to the virtually planned implant position and inserted implant position, the implant apex deviations vary from 3.30 to 0.43 mm what makes an average apex deviation of 1.45 mm. Compared to implant planning, the average implant shoulder deviation is 1.18 mm and a standard deviation of 0.56 mm . Third assigned parameter is implant axis deviation with average of 3.18° and vary from 8.06° to 0.58° with the standard deviation of 1.64°. Additionally the average depth deviation along the z-axis was 0.31 mm and standard deviation of 0.78 mm.

Conclusions

The study results show a higher deviation compared to other similar studies, which are probably not only caused by the NobelGuide® treatment concept but also by the novel validation software itself. A detailed analysis of higher deviations need to be evaluated thoroughly by further studies.

References

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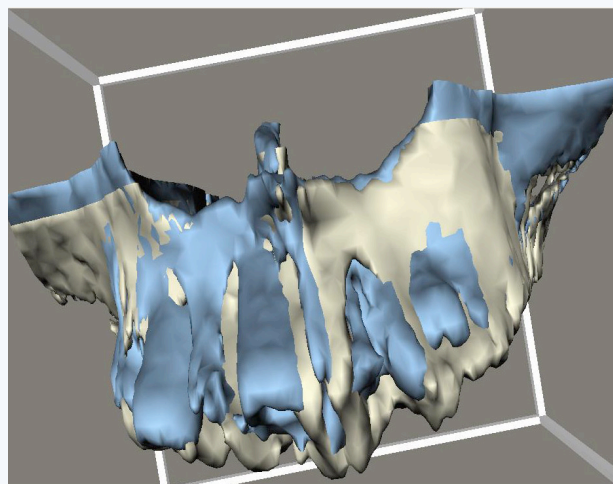
Fusion process of presurgical (white) and postsurgical (blue) data in NobelGuide ® validation software
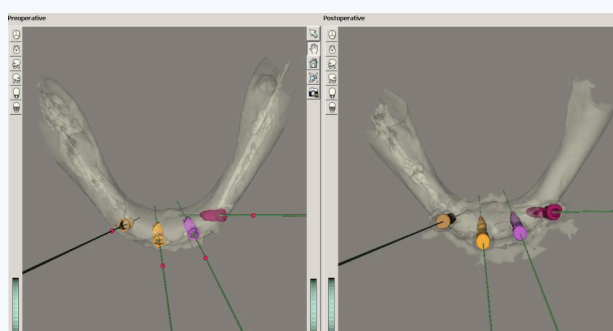
Implant postion aligment – presurgical planning compared to inserted implants
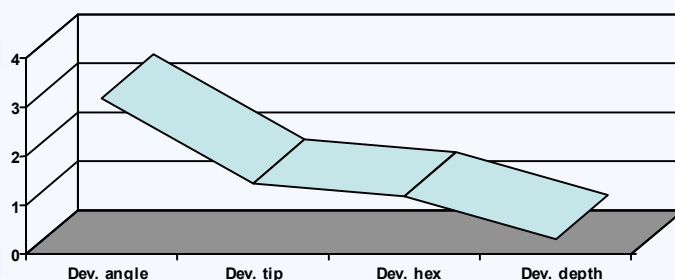
	Dev angle (°)	Dev tip (mm)	Dev hex (mm)	Dev depth (mm)
Mandible (max. dev.)	8.2	3.3	2.6	1.7
Maxilla (max. dev.)	7.3	3.5	2.9	1.7
Total aver.	3.2 ± 1.6	1.5 ± 0.6	1.2 ± 0.7	0.3 ± 0.8