

Retrospective Study on Factors Influencing the Accuracy of Template-guided Implant Placement.



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Objectives

The objective of this study was to determine the effect of implant sites varying in number/position of neighboring teeth and the effect of the surgical approach on the accuracy of implant position after template-guided implant insertion.

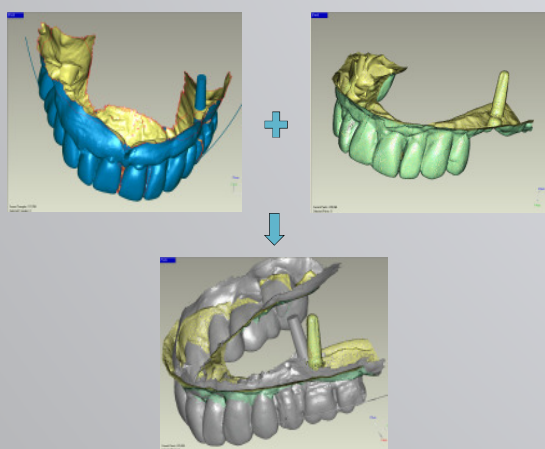


Figure 1 : Matching of planned and clinical implant position

Material and Methods

This retrospective study encompassed 56 patients in a consecutive case series and a total of 122 implants. The evaluation was performed according to the following criteria: type of implant site (single tooth gap = STG, tooth bound space with at least two missing teeth = TBS, unilateral and bilateral free-end situation = UFE/BFE), surgical technique (open flap or flapless), and the presence of adjacent teeth. In all cases, only one

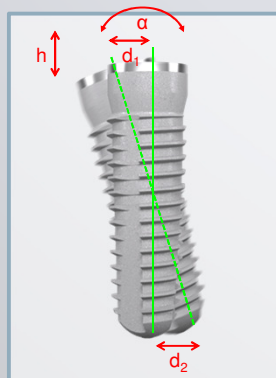


Figure 2 : Angle and distance (neck and apical) between planned and clinical implant position were calculated (Surfacer).

implant (Screw-Line implants, CAMLOG Guide, Camlog, Wimsheim, GER) was evaluated. The analysis was performed by superimposing the data set from the implant planning software SMOP (Swissmeda, Zurich, CH) and the digitization (D700, 3Shape, Copenhagen, DK) of the implant impression with an implant-dummy fixed on the impression post (Geomagic Studio 9.0, geomagic, NC, USA). Angle and distance (neck and apical) between planned and clinical implant position were calculated (Surfacer 10.6, Imageware, Ann-Arbor, MI, USA).

Results

The mean angular deviation of the implant axis was 4.8° (SD: 3.1°). The mean deviation at the implant neck was 1.2 mm (SD: 0.7 mm). The deviation at the apex was 1.8 mm (SD: 0.9 mm).

No significant differences ($p > 0.05$) were found between the implant sites. The surgical technique had no significant effect ($p > 0.05$) on the accuracy of implant placement. A statistical significance was found in the distance of the implant neck ($p = 0,036$) and the implant height ($p = 0,037$) by observing the presence of adjacent teeth. The results were in line with studies on other template-guided 3D-Planning systems.

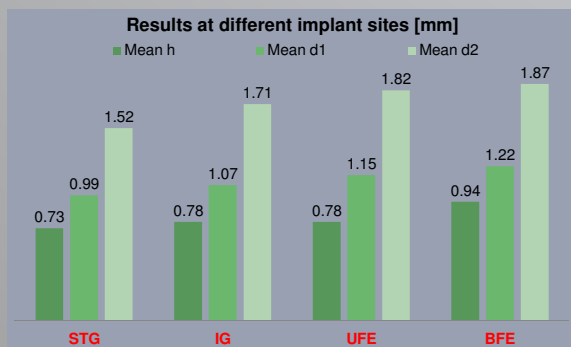


Figure 4 : Calculated deviations

Conclusion

The results show a satisfactory high accuracy when using the SMOP procedure on different kinds of implant sites and with both surgical approaches: open flap or flapless.

		Implant Site				Surgical Protocol		Adjacent Teeth	
		STG	IG	UFE	BFE	Flap	No Flap	Yes	No
Height	Mean	0.73	0.78	0.78	0.94	0.89	0.81	0.76*	1.04*
	95% CI	0.41-1.05	0.54-1.01	0.55-1.01	0.73-1.15	0.70-1.08	0.65-0.96	0.64-0.88	0.76-1.31
Angle	Mean	3.68	4.88	5.04	4.72	4.51	5.03	4.74	4.91
	95% CI	2.71-4.65	3.52-6.24	4.05-6.75	3.94-5.52	3.78-5.25	4.22-5.84	4.07-5.42	3.93-5.90
Implant Neck	Mean	0.99	1.07	1.16	1.22	1.21	1.10	1.07*	1.33*
	95% CI	0.61-1.37	0.84-1.30	0.92-1.39	1.03-1.43	1.03-1.40	0.94-1.25	0.94-1.19	1.07-1.59
Implant Apex	Mean	1.52	1.71	1.82	1.87	1.81	1.76	1.72	1.92
	95% CI	1.07-1.96	1.33-2.09	1.41-2.23	1.57-2.05	1.57-2.05	1.53-1.99	1.53-1.91	1.58-2.26

Table 2 : Results of 56 Patients listed by implant site, surgical protocol and adjacent teeth
 * = significant results, $p > 0.05$ (single tooth gap = STG, tooth bound space with at least two missing teeth = TBS, unilateral and bilateral free-end situation = UFE/BFE)

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