

Accuracy of newly developed sleeve-designed templates for insertion of dental implants: A prospective multicenters clinical trial

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Background

The insertion of dental implants by means of computer-assisted template-based surgery is an established method.

Purpose

To investigate the accuracy of a newly developed sleeve-designed template and to evaluate differences between maxillary and mandibular implants as well as anterior versus posterior area.

Materials & Methods

Study design : A prospective multicenter clinical trial.

Subjects and Outcomes of the study

- Period : From July 2016 to May 2018 (Follow-up 12.4 ± 7.1 months after implant placement [range 3-24 M])
- centre one : 16 patients with 48 implants
- centre two : 23 patients with 71 implants

A total of 39 patients with 119 implants were evaluated. Any partially edentulous patients requiring at least one implant to be planned on three-dimensional(3D) cone beam computed tomography(CBCT) scan, according to a computer-assisted template-based protocol, were consecutively enrolled at two centers. Any potential implant position was considered eligible for the present trial.

Outcome measures : implant failure, complications, and accuracy.

Results

A total of 39 patients with 119 implants were evaluated. No patients dropped out during the study period. Three implants failed at centre two, whereas, one complication was experienced at centre one (limited access in posterior area). Differences were not statistically significant ($P > .05$).

- In the horizontal plan (mesio-distal)- the mean error centre one : 0.61 ± 0.49 mm (95% CI 0.36-0.64 mm) centre two : 0.48 ± 0.44 mm (95% CI 0.27-0.47 mm)
- In the vertical plan (apico-coronal)- the mean error centre one : 0.37 ± 0.28 mm (95% CI 0.23-0.39 mm) centre two : 0.45 ± 0.42 mm (95% CI 0.23-0.43 mm)
- The mean error in angle centre one : $1.98 \pm 2.38^\circ$ (95% CI 0.13-1.47°) centre two : $1.06 \pm 1.56^\circ$ (95% CI 0.13-1.856°)

Differences between centers were compared using the nonparametric Mann-Whitney U test ($P > .05$). More accurate results were found for anterior implants in both horizontal plan and angle

Table 2. Overall analysis of the final accuracy

	Centre one	Centre two	P value
Horizontal plan (mm)	0.61 ± 0.49 (0.36-0.64)	0.48 ± 0.44 (0.27-0.47)	.1508
Vertical plan (mm)	0.37 ± 0.28 (0.23-0.39)	0.45 ± 0.42 (0.23-0.43)	.2108
Angle°	1.98 ± 2.38 (0.13-1.47)	1.06 ± 1.56 (0.13-0.85)	.0221
Only closed holes	Centre one	Centre two	P value
Horizontal plan (mm)	0.50 ± 0.37 (0.28-0.53)	0.48 ± 0.44 (0.27-0.47)	.8562
Vertical plan (mm)	0.33 ± 0.25 (0.22-0.38)	0.45 ± 0.42 (0.23-0.43)	.0779
Angle°	1.30 ± 1.56 (0.18-1.22)	1.06 ± 1.56 (0.13-0.85)	.4739

Table 3. Subgroup analyses of implants' accuracy between maxilla and mandible and anterior and posterior implants

	Maxilla (n = 65)	Mandible (n = 54)	P value
Horizontal plan (mm)	0.57 ± 0.41 (0.34-0.54)	0.49 ± 0.52 (0.19-0.46)	.3527
Vertical plan (mm)	0.42 ± 0.36 (0.24-0.42)	0.41 ± 0.39 (0.20-0.40)	.8989
Angle°	1.44 ± 2.12 (0.09-1.11)	1.42 ± 1.81 (0.22-1.18)	.9469
	Anterior (n = 32)	Posterior (n = 87)	P value
Horizontal plan (mm)	0.42 ± 0.23 (0.29-0.45)	0.57 ± 0.52 (0.30-0.52)	.0299
Vertical plan (mm)	0.43 ± 0.40 (0.19-0.47)	0.41 ± 0.36 (0.24-0.40)	.8305
Angle°	0.51 ± 0.37 (0.32-0.58)	1.77 ± 2.21 (0.24-1.16)	.0000

Conclusion

This study showed good precision in all the parameters measured. The results were thus in a range equal to or better than the mean precision found in numerous clinical trials described in the literature. Posterior implants were less accurate because of the use of open sleeves template.