

Accuracy of computer-assisted template-based implant placement using two different surgical templates designed with or without metallic sleeves: a randomized controlled trial

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Purpose

To compare virtual planning accuracy of novel computer-assisted, template-based implant placement techniques, which make use of CAD/CAM stereolithographic surgical templates with or without metallic sleeves. Furthermore, to compare open versus closed sleeves for templates without metallic sleeves.

Materials & Methods

Study design : A randomized controlled trial of parallel group.

Subjects and Outcomes of the study

Any partially edentulous patients requiring at least one implant to be placed according to a computer-assisted template-based protocol were enrolled.

Patients were randomized according to a parallel group design into two arms:

- 41 implants were placed using surgical templates with metallic sleeves.
- 49 implants were placed with a surgical template without metallic sleeves.

Of these, 16 implants were placed through open sleeves and 33 through closed sleeves.

Outcome measures : Three deviation parameters (angular, horizontal, vertical) were defined to evaluate the discrepancy between the planned and placed implant positions

Results

There was a statistically significant difference in angle ($p = 0.0212$) and in the vertical plan ($p = 0.0073$) with lower values for implants placed with a surgical template without metallic sleeves.

In the test group, close sleeves were more accurate compared with open sleeves in angle ($p = 0.0268$) and in horizontal plan ($p = 0.0477$).



Fig. 1. Surgical template without metallic sleeves: Closed sleeves.

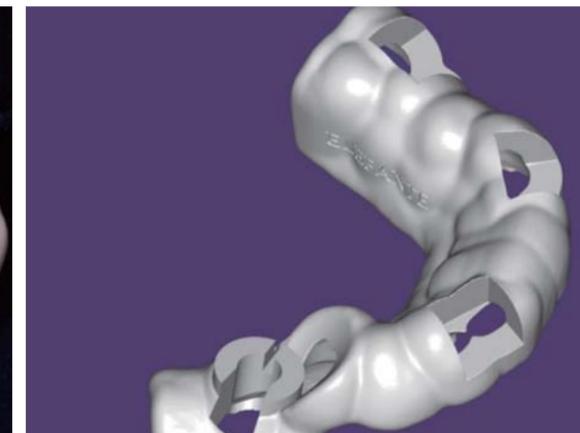


Fig. 2. Surgical template without metallic sleeves: Open sleeves.

Table 1. Analysis of the final implant accuracy.

	Control Group	Test Group
Angle(°)	2.25 ±1.41° (range 0.3-5.0°; 95% CI 0.52 to 1.65°)	1.98 ±2.38° (range 0.1-11.8°; 95% CI 0.13 to 1.47°)
Horizontal plan(mm)	0.52 ±0.30mm (range 0.1-1.1mm; 95% CI 0.39 to 0.61mm)	0.61 ±0.49mm (range 0.05-2.53mm; 95% CI 0.36 to 0.64mm)
Vertical plan(mm)	0.58 ±0.44mm (range 0.0-1.6mm; 95% CI 0.44 to 0.76mm)	0.37 ±0.28mm (range 0.0-1.3mm; 95% CI 0.23 to 0.39mm)

Table 2. Sub-group analysis of the final implant accuracy.

	Open Sleeves	Closed Sleeves
Angle(°)	3.3 ±3.1° (range 0.2-11.8°; 95% CI 1.1 to 4.1°)	1.35 ±1.57° (range 0.1-5.9°; 95% CI 0.19 to 1.25°)
Horizontal plan(mm)	0.87 ±0.62mm (range 0.2-2.53mm; 95% CI 0.45 to 1.05mm)	0.51 ±0.38mm (range 0.05-1.7mm; 95% CI 0.29 to 0.55mm)
Vertical plan(mm)	0.42 ±0.33mm (range 0.0-1.0mm; 95% CI 0.19 to 0.51°)	0.32 ±0.24mm (range 0.05-1.3mm; 95% CI 0.22 to 0.38mm)

Conclusion

With the limitations of the present study, surgical templates without metallic sleeves were more accurate in the vertical plan and angle compared to the conventional template with metallic sleeves. Open sleeves should be used with caution in the molar region only in case of reduced interarch space. Further research is needed to confirm these preliminary results.