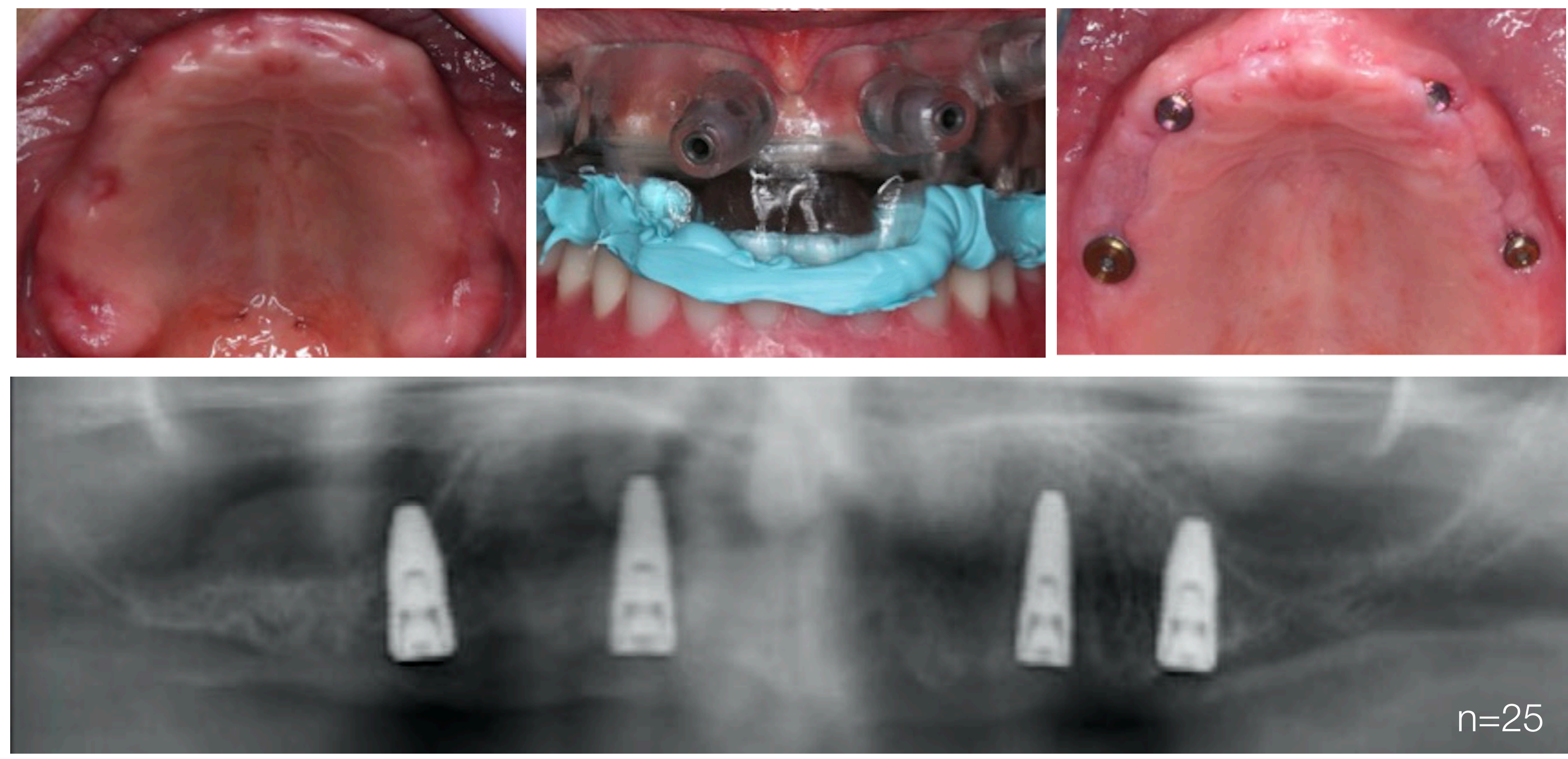


Aim

To compare the 3-D deviations between the digitally planned and actually placed dental implants, in order to determine the accuracy of guided surgery.



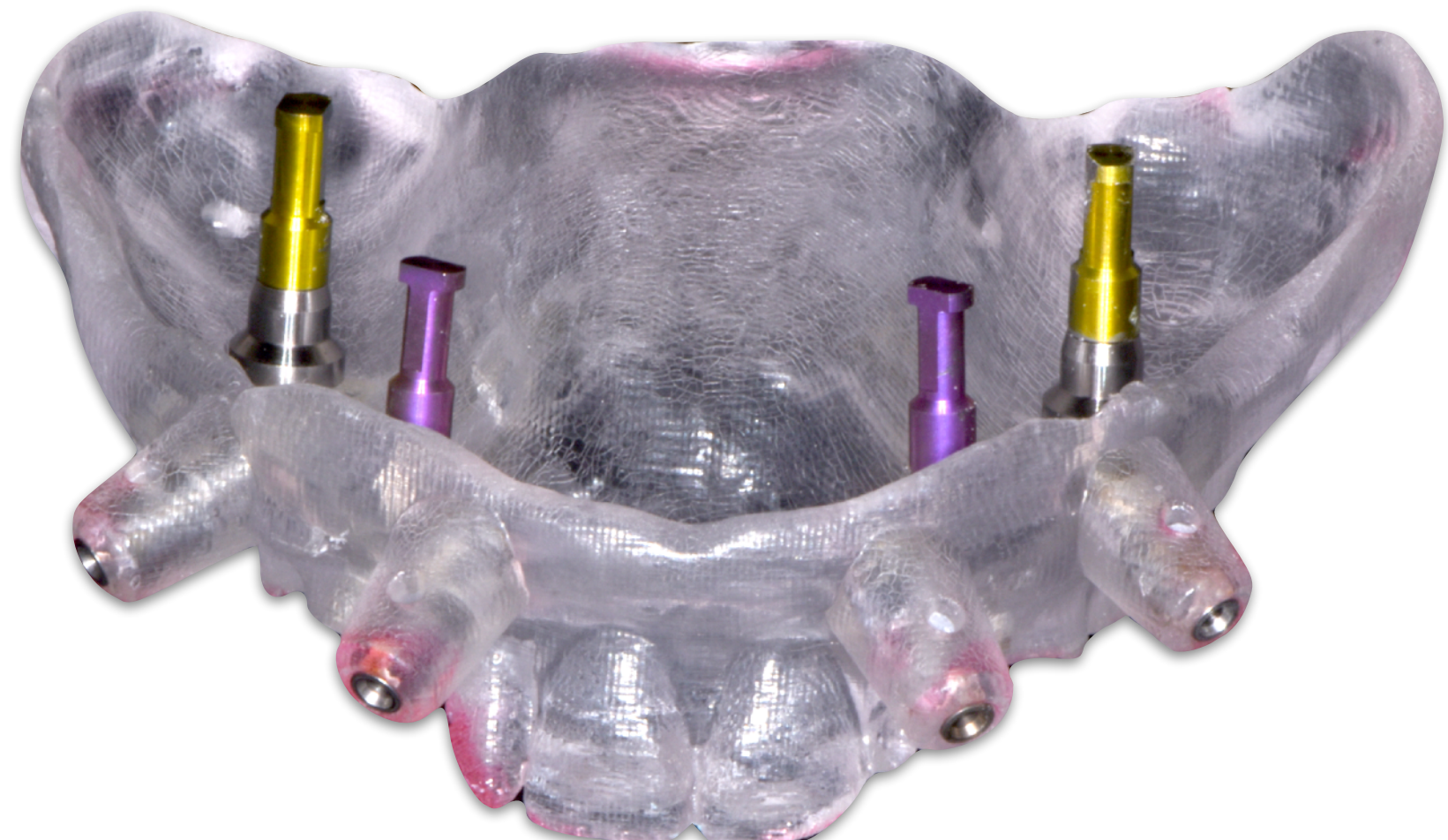
Results

3-D deviations between the virtually planned and placed implants were found.

- The mean root-mean-square error (RMSE) between all 25 arches was found to be **0.199mm** (SD ±0.154).
- The mean RMSE between **maxillary arches** was **0.187mm** (SD ±0.151), and **0.214mm** (SD ±0.163) between **mandibles**. The deviations between the maxillary and mandibular arches were **not significant** (p > 0.05).
- The deviations between the arches with **4 vs 6 implants** were found to be **significant** (p < 0.05).

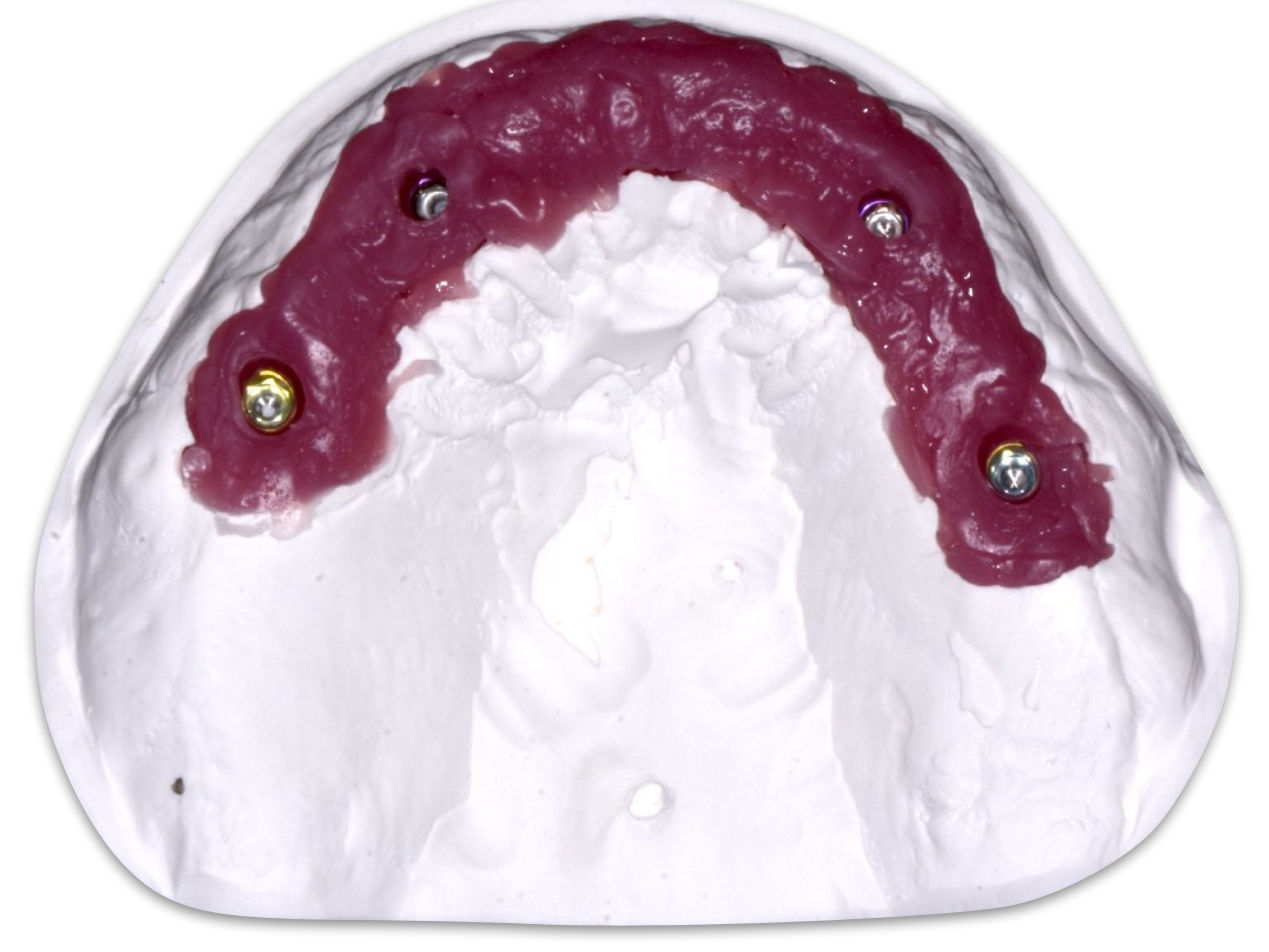
Methods

The stone master casts of **25 fully edentulous arches** (14 maxillae and 11 mandibles) of patients treated with either 4 or 6 implants (9 and 16 arches respectively) with guided surgery were included in the present study.



Group 1 (Test)
Planned implant position

Stone casts were generated from the **surgical templates** used were digitally scanned and digitized into Standard Tessellation (**STL**) files with a high precision reference scanner (Activity 880).



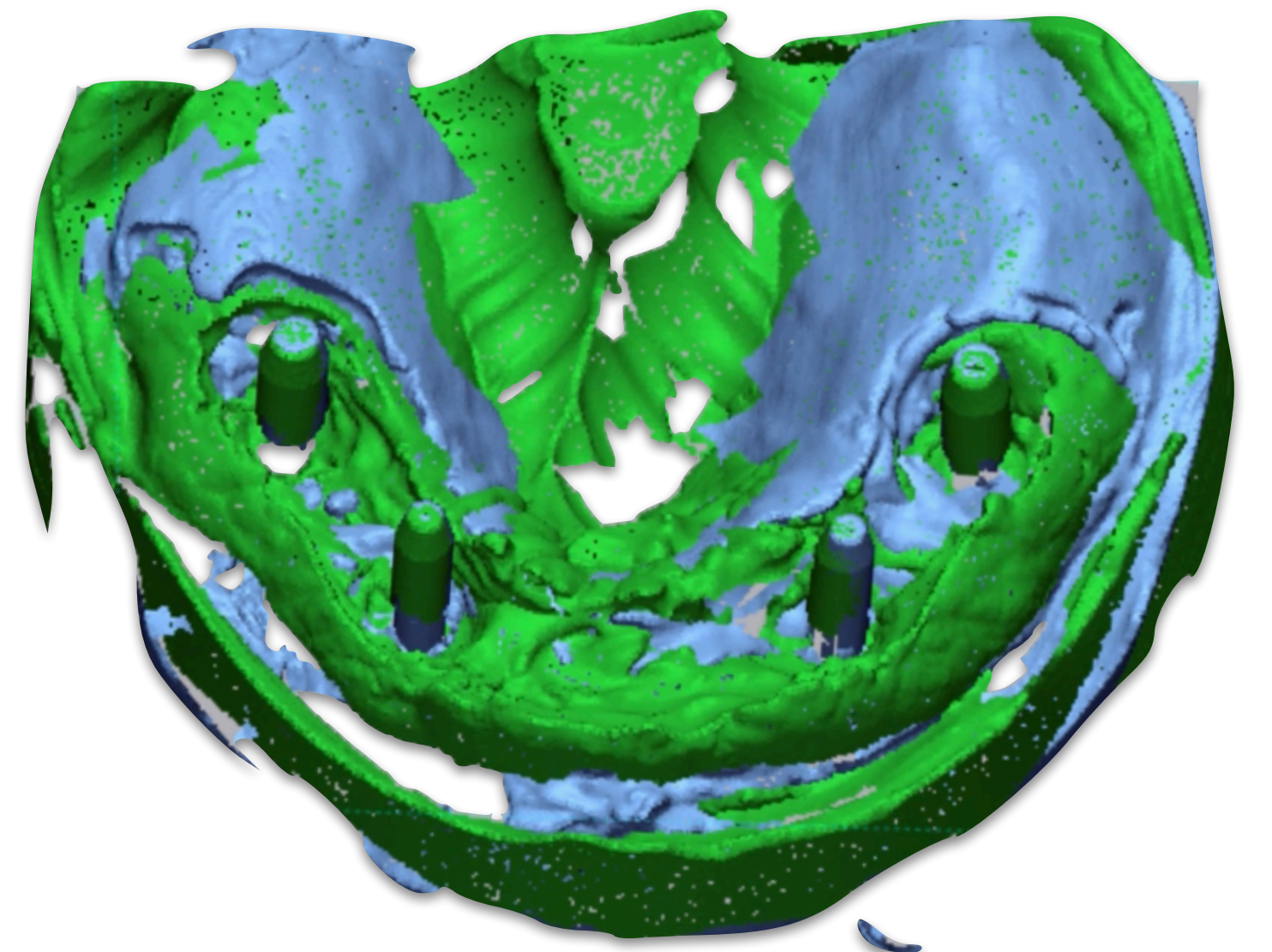
Group 2 (Control)
Achieved implant position

Stone master casts derived from intraoral complete-arch impressions after implant placement were retrieved and digitized, and the resultant **STL** files were superimposed to the test group.

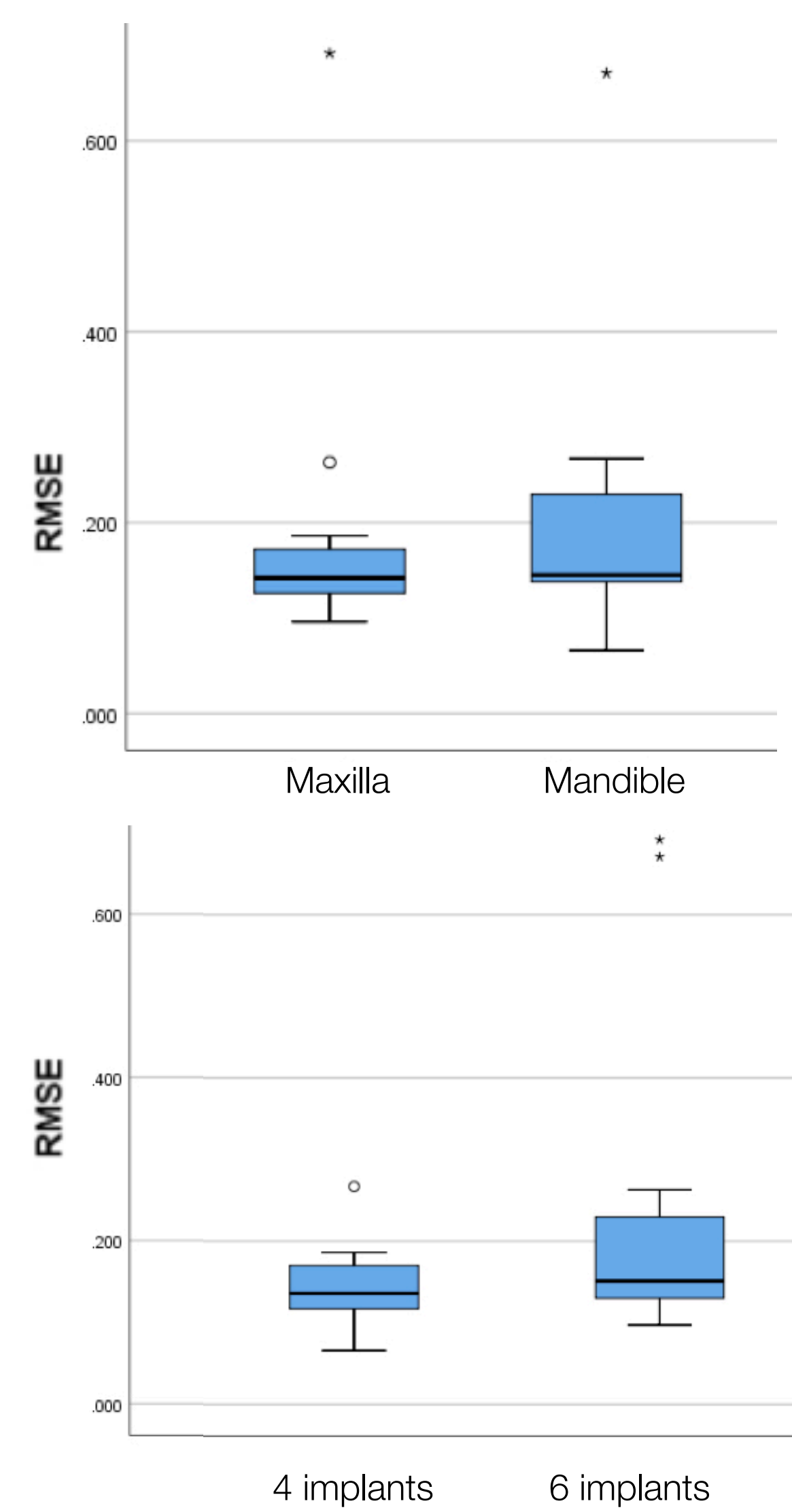
A **best-fit-alignment** algorithm was used to quantify the **3-D deviations present between the digitally planned vs placed implants**. The data were analyzed via a mixed-effects model (= 0.05) and descriptive statistics. The effect of maxillary vs mandibular arch as well as between the placement of 4 vs 6 implants were analyzed to further understand whether these factors are associated with the accuracy of guided surgery.

Guide vs Placed				
Arch N.	Implants	RMSE Mean (SD) (mm)	Median (mm)	IQR (mm)
25	132	0,199 (±0,154)	0.145	0.082

Arch Comparison						
Arch Type	Arch N. (%)	Implants Count	RMSE Mean (SD) (mm)	Median (mm)	IQR (mm)	p-value
Maxilla	14 (56)	74	0,187 (±0,151)	0.142	0.052	0,665* 0,974** 0,428***
Mandible	11 (44)	58	0,214 (±0,163)	0.145	0.115	



Number of Implants Comparison						
Implant N.	Casts N. (%)	Implants Count	RMSE Mean (SD) (mm)	Median (mm)	IQR (mm)	p-value
4	9 (36)	36	0,146 (±0,058)	0.136	0.071	0,006* 0,036**
6	16 (64)	96	0,229 (±0,183)	0.151	0.110	



Conclusion

The **3-D deviations** were found **between the digitally planned implants positions and the placed implants** were found to be clinically acceptable and within reported threshold of discrepancy.

When comparing the implant 3-D deviations found between maxillary and mandibular arches, no statistically significant differences were found.

When comparing the implant 3-D deviations between arches containing 4 implants and arches containing 6 implants, statistically significant differences were found, with lower deviations in the group containing 4 implants.