

Does implant drill design influence the accuracy of dental implant placement using static computer-assisted implant surgery?

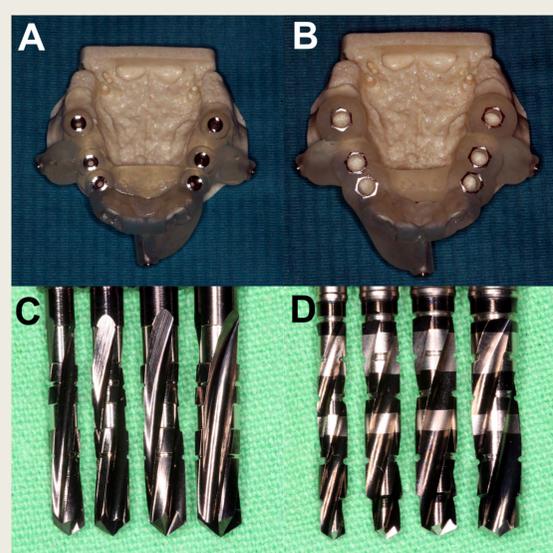
AN IN VITRO STUDY

Takács A, Marada G, Turzó K, Nagy Á, Németh O, Mijiritsky E, Kivovics M, Mühl A. Does implant drill design influence the accuracy of dental implant placement using static computer-assisted implant surgery? An in vitro study. BMC Oral Health. 2023 Aug 18;23(1):575. doi: 10.1186/s12903-023-03297-0. PMID: 37596610; PMCID: PMC10439617.

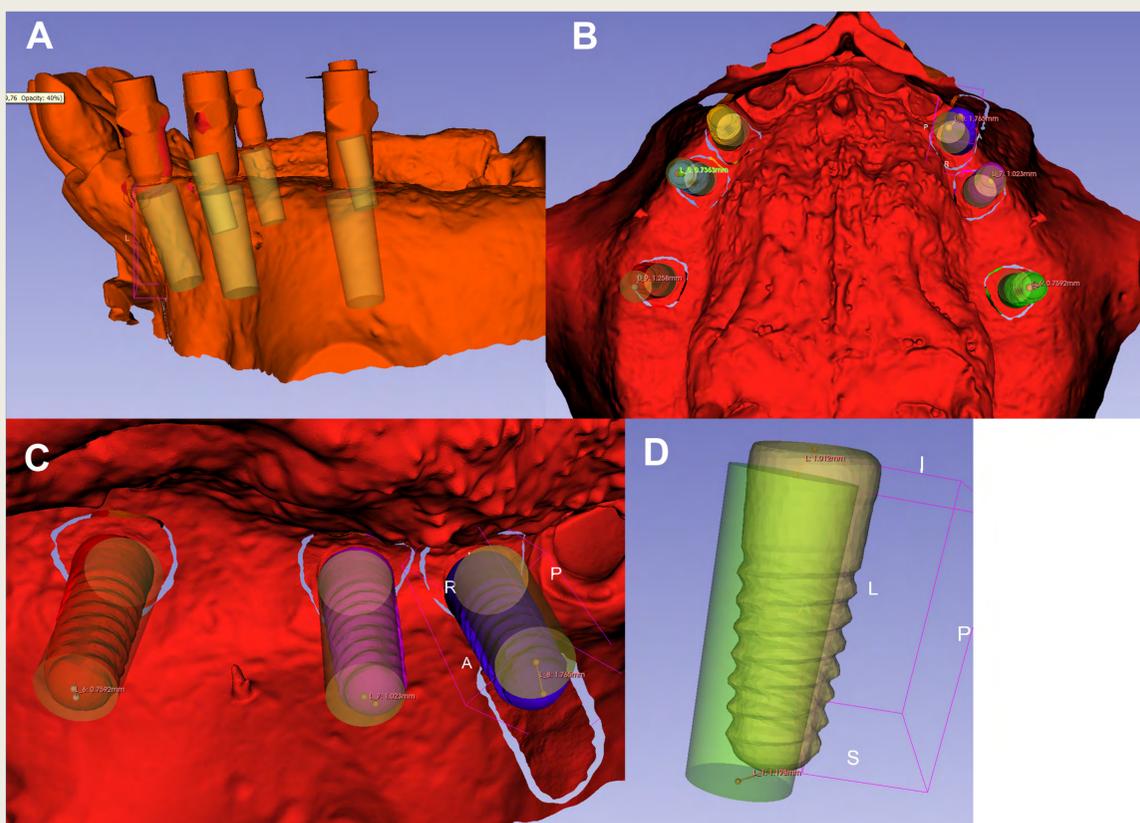
ABSTRACT

Background: The purpose of this in vitro study was to compare the accuracy of implant placement in model surgeries according to the design of the drills (straight drills or step drills) used to finalize the implant bed during pilot-guided static computer-assisted implant surgery (sCAIS).

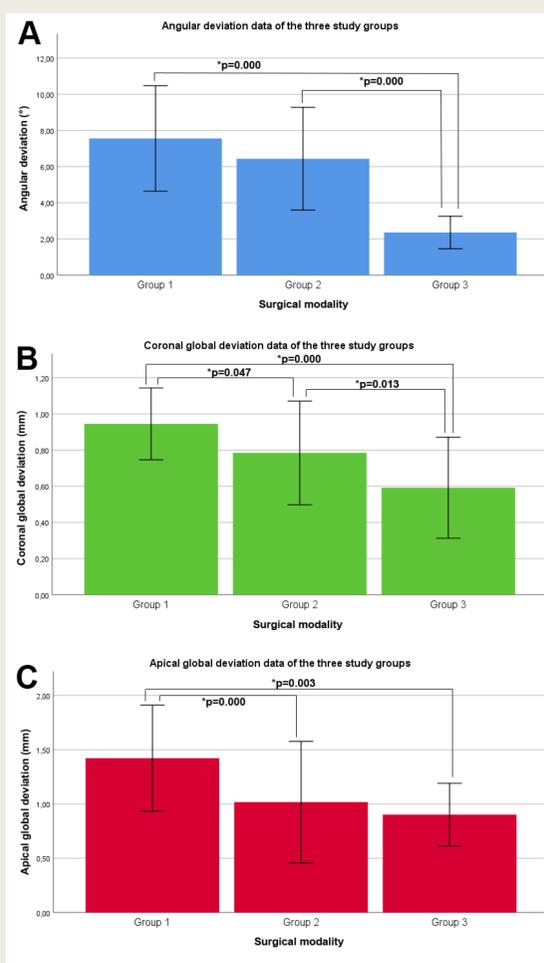
METHODS: Model surgeries were carried out on resin models randomly assigned to three study groups. Virtual planning software (coDiagnostiX 10.6, Dental Wings, Montreal, Canada) was used to plan the implant positions. In Groups 1 and 2, pilot-guided sCAIS was performed. Straight drills were used in Group 1, and step drills were used in Group 2 to finalize the implant beds. In Group 3, fully guided sCAIS was performed using a universal fully guided kit (RealGUIDE Full Surgical Kit 3DIEMME,



RealGUIDE, Cantù, Como, Italy). A total of 90 dental implants (Callus Pro, Callus Implant Solutions GmbH, Nuremberg, Germany) were placed (six implants per model, five models per study group). The primary outcome variables (angular deviation, coronal global deviation, and apical global deviation) were calculated



for all implants based on the comparison of the preoperative surgical plan with the postoperative scans.



RESULTS: Group 2 (coronal global deviation, 0.78 ± 0.29 mm; apical global deviation, 1.02 ± 0.56 mm) showed significantly lower values of both global deviation variables than Group 1 (coronal global deviation, 0.95 ± 0.20 mm; apical global deviation, 1.42 ± 0.49 mm). However, there was no significant dif-

ference in angular deviation between Groups 1 and 2 ($7.56 \pm 2.92^\circ$ and $6.44 \pm 2.84^\circ$). Group 3 produced significantly lower values of all three primary outcome variables (angular deviation, $2.36 \pm 0.90^\circ$; coronal global deviation, 0.59 ± 0.28 mm; apical global deviation, 0.90 ± 0.29 mm) than Group 1 and significantly lower angular deviation and coronal global deviation values than Group 2.

CONCLUSIONS: The design of the drills used to finalize implant osteotomies during pilot-guided sCAIS influences dental implant placement accuracy. Using step drills instead of straight drills for final osteotomies decreases deviation from the surgical plan. The fully guided approach performed better than the pilot-guided sCAIS.

Keywords: Computer-assisted implant surgery (CAIS); Dental implant; Implant drill; In vitro study; Static navigation; Step drill; Straight drill; Surgical guide.