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**BACKGROUND:** Accurate dental implant placement is essential to their long-term success, failing which could result in biological and mechanical complications of the implant and prosthesis. Augmented reality (AR) presents an untapped potential in implant dentistry.

**AIM:** To investigate the feasibility of an AR software prototype in a pilot study to compare the threedimensional (3D) accuracy of implant placement using Microsoft HoloLens 2, compared to static surgical guides.



Figure 1: Left: HoloLens 2 in use during the pilot study; Right: sphere-based controls to refine the position of the holographic model in the 3D planes



Scan the QR code for a video of HoloLens 2 and HIDs in use.

## EFFECTIVENESS OF HOLOLENS AR HEADSET IN DENTAL IMPLANT SURGERY

**MATERIALS & METHODS:** A novel AR-based implant navigation software prototype, named HoloLens ImplantDental software (HIDs), was developed to test its feasibility as an implant surgery navigation aid. An in vitro pilot study was conducted on 3D printed dental models that feature real clinical scenarios (Figure 1). Dental implant osteotomy and placement in the dental models was aided by a digitally designed surgical guide (control group, SG) or AR using Microsoft HoloLens 2 and HIDs (test group, HL).

After the implant surgeries, scanbodies were attached to the implants, and the models were scanned with an extra-oral optical scanner. Linear and angular deviations in the bucco-lingual and mesio-distal planes were measured against pre-surgical digital plans (reference data) using Geomagic Control X, a 3D inspection and metrology software (Figure 2).



**RESULTS:** The second and latest prototype of HIDs includes real-time drill tracking, a virtual drill guide, and sphere-based controls to allow refinement of teeth position (Figure 1). A pilot study with 12 model surgeries compared control and test groups, showing comparable linear and angular deviations. Statistical tests confirmed no significant differences between the methods used.

**CONCLUSIONS:** The 3D positional accuracy of implants placed in 3D printed tooth dental models with the assistance of AR technology (HIDs and HoloLens 2) was comparable to conventional static-CAIS using 3D printed surgical guides. The findings of the software prototype development and pilot study imply that this workflow has the potential to be replicated and improved on to produce the comparable and promising results found in literature<sup>1</sup>.

AR in implant dentistry could offer greater advantages over dynamic navigation as the surgeon can focus on the surgical site without having to look at a computer screen for navigation. The communication capabilities in HoloLens 2 also have the potential to allow interdisciplinary and even international discussions of patient cases based on 3D data.

## **DISCLOSURE OF INTEREST:** None to declare

REFERENCE: <sup>1</sup> Liu, L., Wang, X., Guan, M., Fan, Y., Yang, Z., Li, D., Bai, Y., & Li, H. (2023). A mixed reality-based navigation method for dental implant navigation method: A pilot study. Computers in biology and medicine, 154, 106568.

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