

Robotic-Assisted Immediate Replacement of Fibrous Malunion of an Anterior Fixture: A Case Report

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BACKGROUND: The first commercially-available robot-assisted system for dental implant surgery, Yomi Robot-Assisted Dental Surgery, produced by Neocis Inc, Miami, USA obtained FDA clearance in 2016. This robot-assisted dental surgery (RADS) system provides software to preoperatively plan dental implant procedures and provides physical guidance operatively through haptic technology to assist the surgeon in achieving the planned location, angulation, and depth. Yomi was designed to provide the accuracy of stereolithographic surgical guides while overcoming their visualization and dynamic planning limitations. This clinical case is the first accuracy analysis of RADS for immediate replacement of fibrous malunion of an anterior fixture.

MATERIALS AND METHODS: A 31-year-old man presented with fibrous malunion of an anterior fixture requiring implant revision. The prior fixture was removed using reverse torque. Under robotic guidance, a 4.3 mm x 15 mm osteotomy was completed and a fixture measuring 4.3 mm x 15 mm was placed and torqued into position at 50 N·cm of torque. A cover screw was placed and the surgical site was closed with interrupted 3-0 gut sutures. No complications and minimal blood loss were reported.

METHODS OF DATA ANALYSIS: Data analysis of the dental implant therapy was performed using Yomi analysis software. A comparison was made between the desired implant location as planned in the preoperative computed tomography (CT) scan and the final implant location as recorded in the postoperative CT scan (Fig 1). Accuracy analysis was performed similarly to that described by D'haese et al.[1] and thus provides a complete end-to-end accuracy measure.

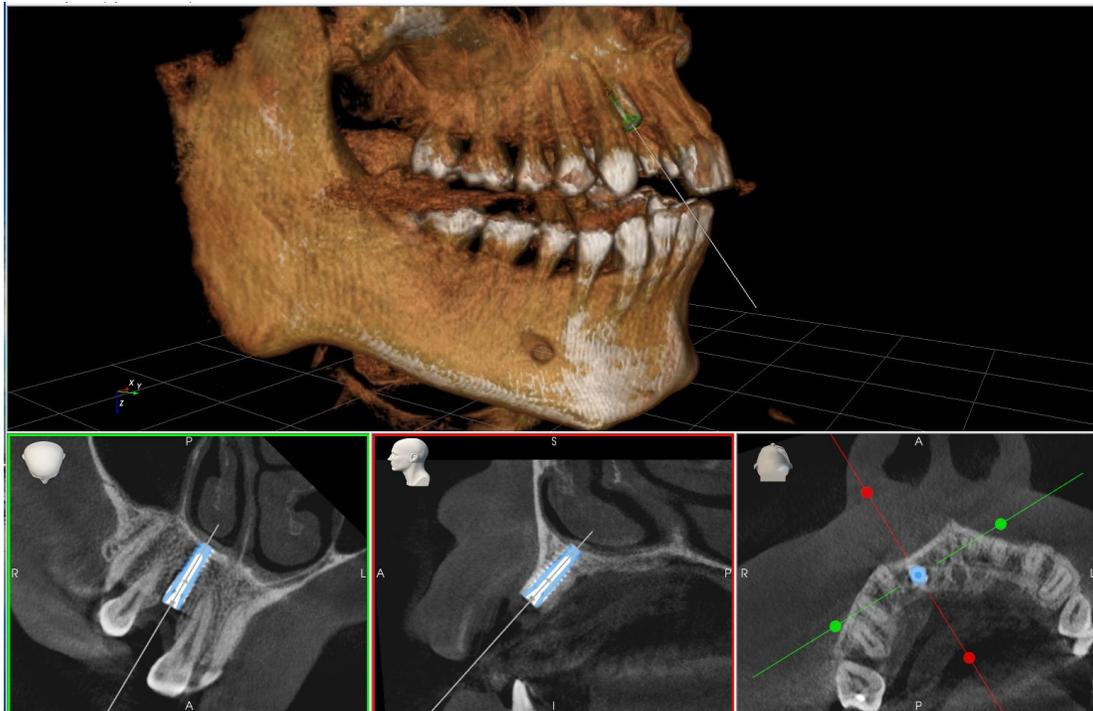


Fig 1. Overlay of desired implant location as planned in preoperative CT scan and final implant location as recorded in postoperative CT scan.

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RESULTS: The deviations between the surgical plan and final implant location for this case were calculated as an angular error of 0.49°, a signed depth error of -0.76 mm, and a lateral error of 0.19 mm.

The accuracy analysis for this RADS case compares favorably with those reported for stereolithic guides, which were reported in a recent meta-regression analysis as a mean deviation of 1.25 mm (95% confidence interval [CI]: 1.22-1.29) at the entry point, 1.57 mm (95% CI: 1.53-1.62) at the apex, and 4.1° in angle (95% CI: 3.97-4.23)[2].

CONCLUSION: This clinical case supports the feasibility of robotic-assisted dental surgery for immediate replacement of fibrous malunion of an anterior fixture. Additionally, the accuracy reported for this case compares favorably with that reported for stereolithic guides.

REFERENCES:

[1] D'haese J, Van De Velde T, Komiyama A, Hultin M, De Bruyn H. Accuracy and complications using computer-designed stereolithographic surgical guides for oral rehabilitation by means of dental implants: a review of the literature. *Clin Implant Dent Relat Res*. 2012 Jun;14(3):321-35.

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