Digital Workflow For Immediate Guided Implant Placement For Maxillary Overdenture. A Case Report

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Aim

Dual scan technique is most commonly used for digital planning purposes for implant overdentures. On patients with terminal dentition, though, this is not an option when immediate implant placement is considered. The aim of this case report is to present a novel technique for planning immediate implant placement on a dentate patient with terminal dentition by using the immediate complete denture as a reference.

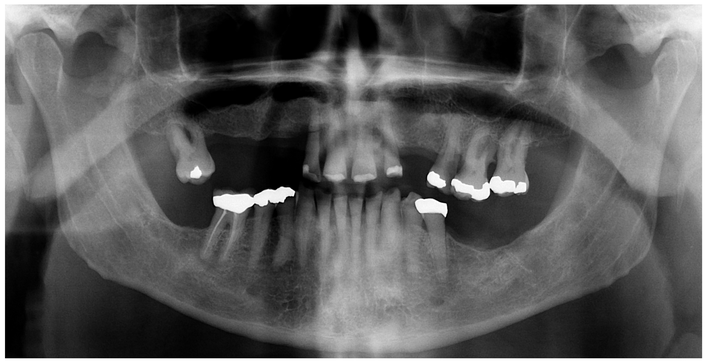

Figure 1. Initial Panoramic radiograph

Figure 2. Low quality scanning of maxillary prosthesis with intraoral scanner

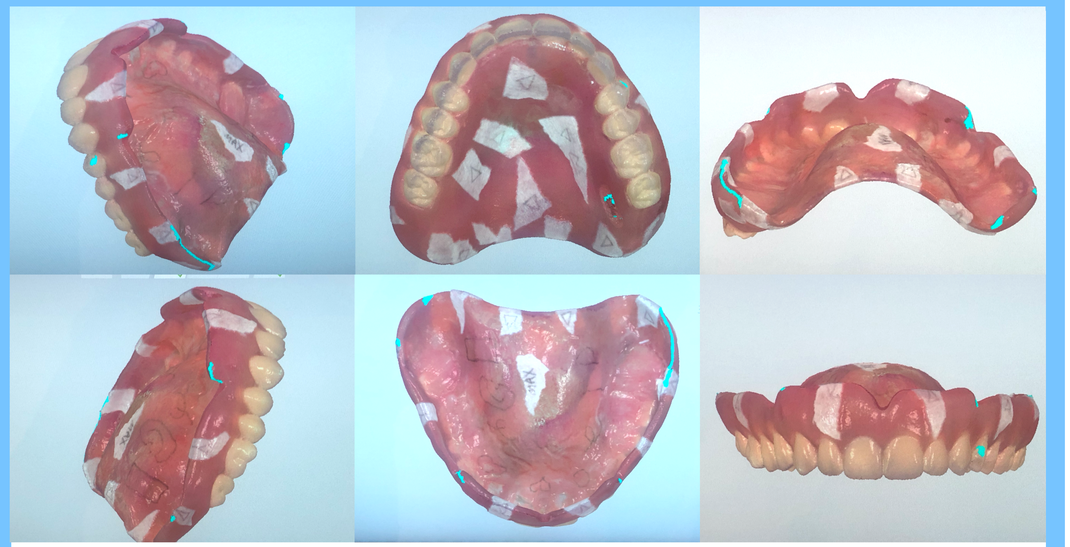

Figure 3. High quality scanning of maxillary prosthesis with intraoral scanner with the use of marking tape

Case report

A 70-year-old man with well-controlled systemic diseases presented at Tufts Implant Center for implant consultation. The patient complained about his upper teeth mobility and wanted to replace his missing teeth. After an oral and radiographic examination (Fig. 1), it was decided to remove all maxillary teeth. Different treatment options were presented to the patient and due to finances, he decided to have an implant retained overdenture. In order to shorten healing and treatment time, immediate implant placement using guided surgery was considered. For digital treatment planning, combined data from prosthesis and CBCT is necessary. In cases with completely edentulous arch, the dual scan technique is usually used to transfer the data to the planning software. However, this technique could not be utilized in this case due to the remaining dentition of the patient.

The following steps were followed to allow for surgical guide fabrication for immediate placement:

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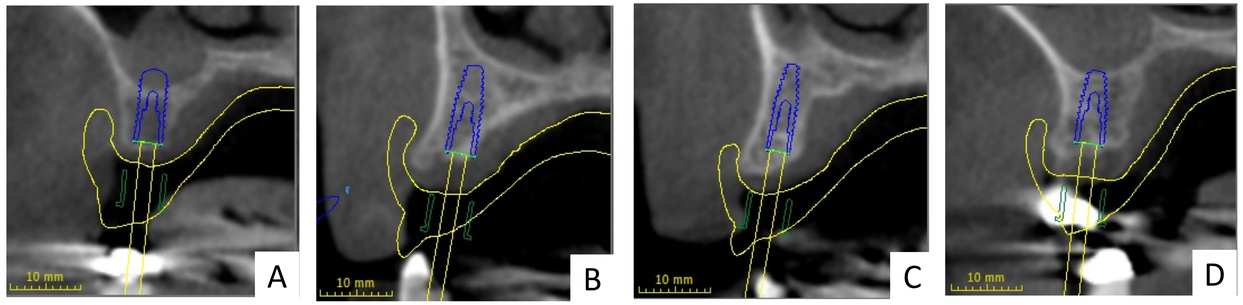

Figures 4A - 4D. Digital implant planning on sites #4,7,10,12 for implant-retained overdenture

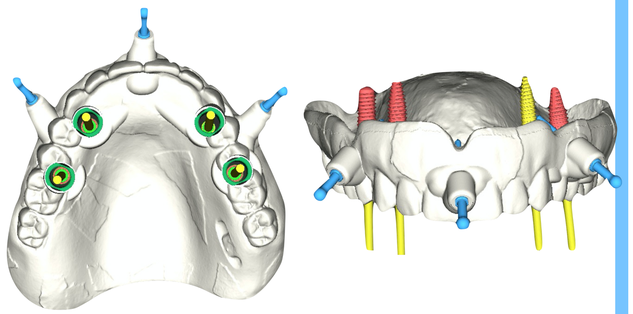

Figure 5. Surgical guide was designed in the CodiagnostiX software

Figure 6. Surgical guide was printed with Formlab 2 3D printer

1. A master cast with the existing teeth was digitized.

2. An immediate denture was fabricated at the ideal vertical dimension and extraorally scanned using an intraoral scanner(TRIOS, 3Shape).

An accurate digital impression of the immediate denture is very challenging, especially at the transition zone between cameo and intaglio surface of the prosthesis, where artifacts and lack of scan continuity decrease accuracy and scan usability (Fig. 2).

3. Marking tape was placed on both the intaglio and cameo surface of the denture, including the denture border before scanning (Fig. 3). This allowed for an artifact-free STL file of the scanned prosthesis.

4. Data was transferred into CoDiagnostiX digital planning software.

5. The STL file of master cast was superimposed to the diagnostic CBCT scan by using remaining teeth as a reference.

6. The STL file of the prosthesis was superimposed on the STL of master cast by using the intaglio surface of immediate denture and soft tissue surface of master cast as references.

7. Surgical guide was fabricated for immediate implant placement on sites #4, 7, 10 and 12 (Fig. 4-6).

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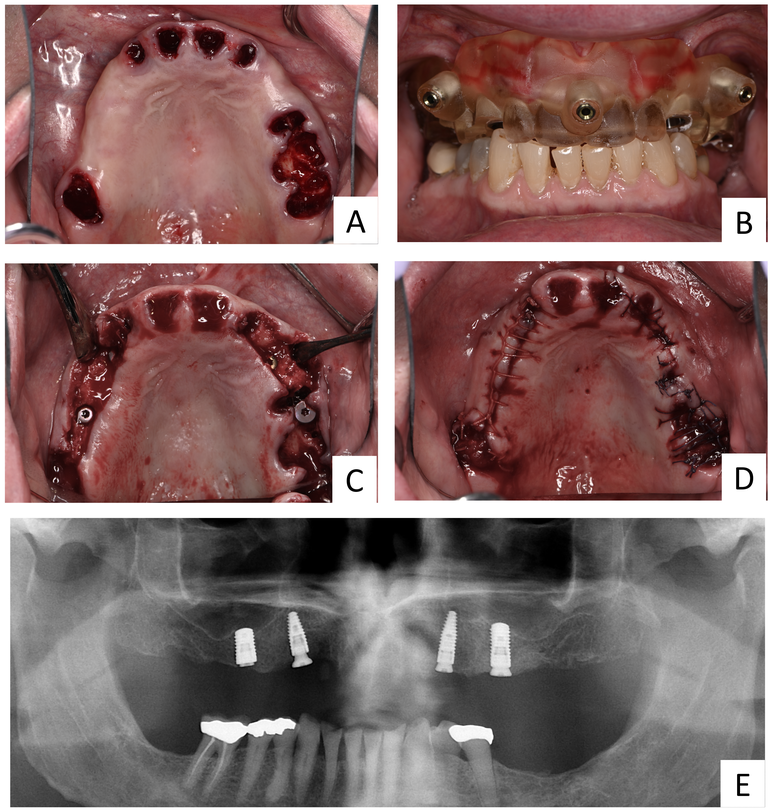

Figure 7. A) After maxillary teeth extractions
B) Surgical guide stabilized it with anchor pins
C) Fully guided implant placement
D) Primary closure of implant sites
E) Post-surgical Panoramic radiograph

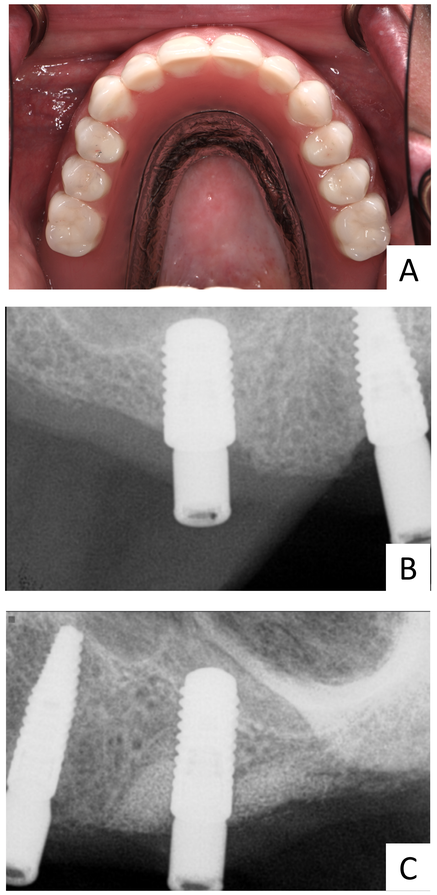

Figure 8. A) Frontal view of the overdenture
B,C) 6-month follow-up radiographs

During surgery, after all maxillary teeth were removed, digitally fabricated surgical guide was tried on and fit was confirmed. It was stabilized with three anchor pins. Fully guided implant placement on sites #4, 7, 10 & 12 was successfully completed. Xenograft was used to graft site #12 only and primary closure was achieved for all sites (Fig. 7).

After a 4-month healing period, the final overdenture was fabricated (Fig. 8).

Clinical relevance

Fully guided immediate implant placement for implant overdenture on a partially edentulous patient was made feasible by using marking tape to get a high quality STL file of the immediate denture with an intraoral scanner and managing to successfully superimpose it with diagnostic CT scan and digitized initial master cast.

References

1. Goodacre, B.J. and C.J. Goodacre, Using Intraoral Scanning to Fabricate Complete Dentures: First Experiences. Int J Prosthodont, 2018. 31(2): p. 166-170.
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3. Al Yafi, F.D.D.S., B.D.D.S.M.S. Camenisch, and M.D.D.S.M.S. Al-Sabbagh, Is Digital Guided Implant Surgery Accurate and Reliable? Dent Clin North Am, 2019. 63(3): p. 381-397.