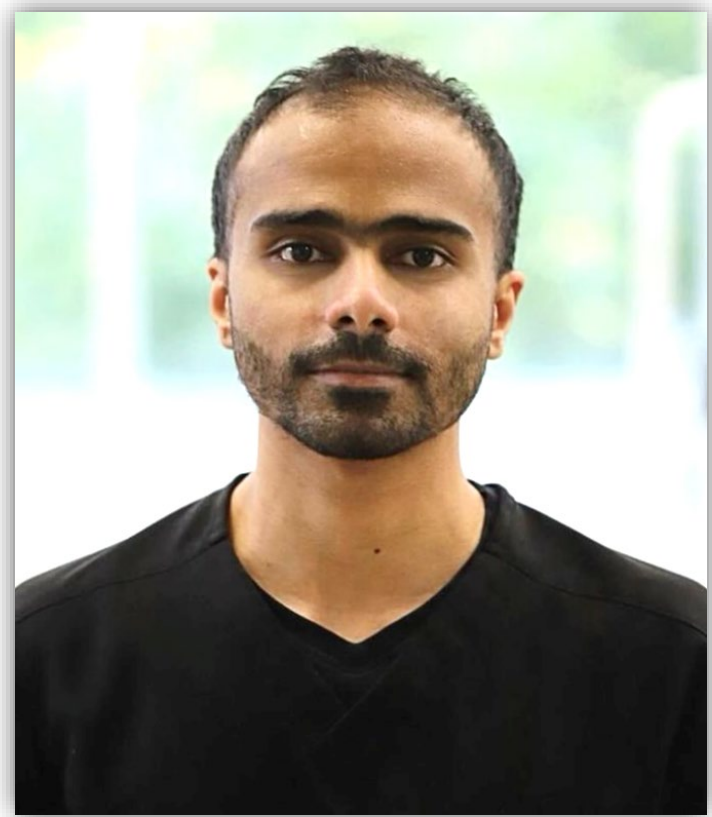




ADVANCES IN DIGITAL IMPLANT PLANNING: COMPARING DENTURE DUPLICATION AND NOVEL FLANGELESS DIRECT RIDGELAP CAD TECHNIQUES FOR COMPLETE EDENTULISM

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INTRODUCTION

In recent years, significant advancements in digital technologies have been used to deliver comprehensive arch implant treatment. Having a solid understanding of treatment planning and diagnosis is essential when treating patients with complete edentulism. However, the introduction of digital technologies has created tools to enhance patient-oriented treatment planning. These tools facilitate communication with dental laboratory technicians and patients through digital smile design, prototype manufacturing, and the creation of the final prosthesis. Through this case report, we aim to compare denture duplication's effectiveness and clinical effects and the novel Flangeless Direct Ridgelap Computer-Aided Design (FDR-CAD) guide for treating complete edentulism. The comparison focuses on the impact on design accuracy and soft tissue visualization. This can be used for immediate loading in implant-supported fixed complete dentures (ISFCD) to achieve an FP1 outcome.

CASE DESCRIPTION

A 58-year-old male presented to the dental clinic with a chief complaint: "I want to have fixed teeth on implants." Medical and dental history were obtained. Clinical and radiographic examination was accomplished.

IMPLANT PLANNING USING A DUPLICATE OF THE PATIENT'S EXISTING DENTURES

The first step is to assess the VDO, centric relation, phonetics, and aesthetics of the patient's existing dentures (Fig.1a-c). Suppose both the clinician and the patient are satisfied with the existing denture. In that case, the dentures will be duplicated by scanning the denture and printing it using radiopaque resin material or conventionally duplicating the denture using a denture duplication flask. The flask can be packed with transparent auto-polymerizing acrylic (Fig.2). After that, a cone beam computed tomography (CBCT) is taken using the duplicated denture, and digital implant planning will be made using any CAD software (Fig.3a-c). This technique has the advantages of being fast, convenient, and low-cost. On the other hand, this technique has flaws, including 1) Often, the denture teeth's cervical portion is covered with acrylic, and teeth will be short in the duplicated denture. 2) Duplicated denture material has a similar radiopacity level compared to the soft tissue, which will prevent the detection of available soft tissue in the CBCT analysis.

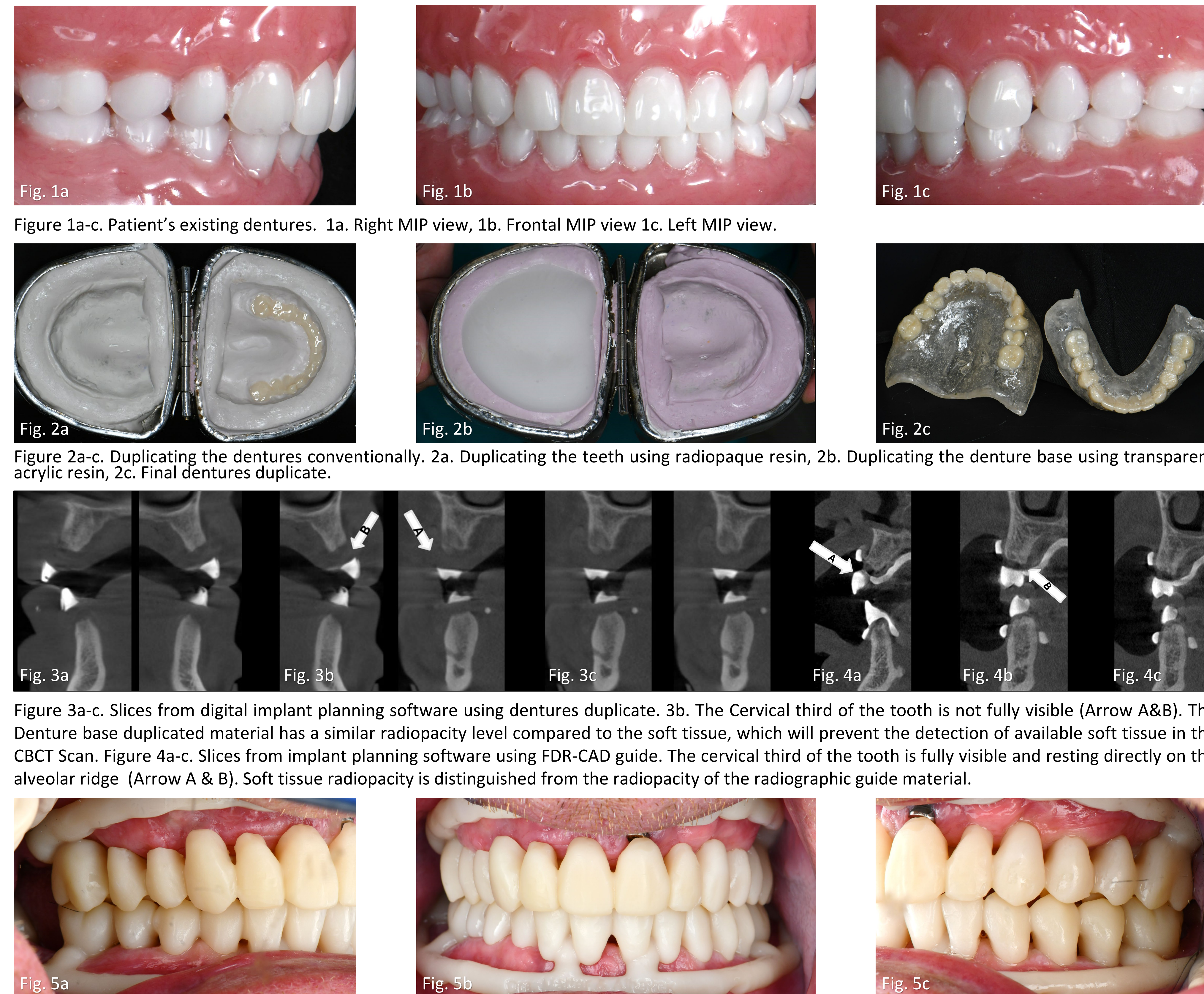


Figure 1a-c. Patient's existing dentures. 1a. Right MIP view, 1b. Frontal MIP view 1c. Left MIP view.

Figure 2a-c. Duplicating the dentures conventionally. 2a. Duplicating the teeth using radiopaque resin, 2b. Duplicating the denture base using transparent acrylic resin, 2c. Final dentures duplicate.

Figure 3a-c. Slices from digital implant planning software using dentures duplicate. 3b. The Cervical third of the tooth is not fully visible (Arrow A&B). The Denture base duplicated material has a similar radiopacity level compared to the soft tissue, which will prevent the detection of available soft tissue in the CBCT Scan. Figure 4a-c. Slices from implant planning software using FDR-CAD guide. The cervical third of the tooth is fully visible and resting directly on the alveolar ridge (Arrow A & B). Soft tissue radiopacity is distinguished from the radiopacity of the radiographic guide material.

Figure 5. Intra-oral photos of FDR-CAD guide. 5a. Frontal MIP, 5b. Left MIP and 5c. Right MIP.

IMPLANT PLANNING USING FLANGELESS DIRECT RIDGELAP (FDR)-CAD GUIDE

The same criteria for the patient's existing dentures will be assessed. Scans of the patient's existing dentures, MIP record, and master cast will be made using an intra-oral or desktop scanner. All data will be imported into CAD software; digital wax-up will be made according to the same teeth arrangement of the patient's existing denture directly on the alveolar ridge. Additional supporting means will be added to the wax-up. The guide will be fabricated using an additive manufacturing technique and, ideally, in a radiopaque material. CBCT scan will be taken with this guide; the patient's labial and buccal mucosa will be retracted during the CBCT (Fig.4a-c & 5a-c). This technique has the following advantages; 1) The ideal length of the teeth will be visible. 2) Soft tissue radiopacity will be distinguished from the radiopacity of the radiographic guide material. 3) The cervical third of the teeth will be directly positioned over the ridge. 4) The same digital design can be used to fabricate a prototype used for immediate loading.

CONCLUSION

The FDR-CAD guide technique outperformed the denture duplication. It provided better soft tissue visualization, accurate design, and potential use for immediate loading, resulting in predictable and successful outcomes for ISFCD.