A Digital Technique to Fabricating Removable Complete Dentures with a Printed Denture Duplicate from a Digital Scan of Patient’s Old Complete Denture

Oscar Figueras-Alvarez*, Magí Brufau-de-Barberà, Arnau Brufau-Cochs, Josep Cabratosa-Termes and Francisco Real-Voltas

Department of Prosthodontics, Universitat Internacional de Catalunya, Barcelona, Spain

Abstract

The intraoral digital scan consists of stitching many photographs to build a three-dimensional mesh, which may not be suitable for mobile tissues, resulting in challenging for making removable complete dentures. This technique describes a straightforward protocol for making removable complete dentures by using a printed denture duplicate obtained from the digital scan of the patient's old denture.

Introduction

The use of the intraoral scanner is expanding in clinical practice due to advantages such as saving shipping and manufacturing time and impression material [1-6]. Most patients prefer a digital scan to a conventional impression [1-2,5]. The intraoral digital scan consists of stitching many photographs per second to build a three-dimensional mesh [7-8]. This system works well to register static tissues such as teeth or attached gingiva. However, it is not so successful for mobile tissues, such as those at the buccal vestibule and the floor of the mouth, [9] resulting in challenging for making removable complete dentures. This protocol aims to show a straightforward protocol for making removable complete dentures by using a printed denture duplicate obtained from the digital scan of the patient’s old denture.

Technique

a. Mold the old patient’s denture border with modeling plastic impression compound (Impression Compound; Kerr, Brea, CA). Functionalize the buccal vestibule by activating the frenums and the muscle insertions and pulling the lip. Functionalize the lingual part by asking the patient for moving the tongue up, out, and to the right and left.

b. Make the final impression in light occlusion using light body polyvinylsiloxane (PVS) silicone (Virtual light body; Ivoclar Vivadent, Schaan, Liechtenstein), white-zinc oxide paste (Impression Paste; SS White, Lakewood, NJ), or polysulfide (Permastic; Kerr, Brea, CA). If light body PVS silicone or polysulfide is used, previously apply the adequate adhesive. After the setting of the impression material, remove the material that looks like excess, which is very fine or extends beyond a reasonable margin. Vestibular leftovers may be essential to increase retention on many occasions. Remove only the excess material.

c. Make a 360-degree digital scan with an intraoral scanner (Trios 3; 3Shape, Copenhagen, Denmark) of the patient's old denture with the modeling plastic impression compound and the final impression. A 360-degree digital scan is a digital scan of both the outer and inner (basal) part of the removable complete denture (Figure 1). It is performed extra-orally with an intraoral scanner. After the scanning, remove the impression materials, and give the denture back to the patient. In case of making a removable complete denture only in one arch, make an intraoral digital scan of the antagonist.

d. Make a 3D impression of the scanned denture and the antagonist. If the 3D printer is not available, request printing to the dental laboratory or a 3D printing center. Provide the printed denture duplicate with an occlusion rim by applying wax (Modern materials bite blocks; Kulzer, South Bend, IN) or light-curing resin (Triad VLC; Dentply Sirona, York, PA) on the printed teeth (Figure 2). If the light-curing resin is used, apply adhesive (Triad Bonding Agent; Dentply Sirona, York, PA) previously.

e. Register all necessary intraoral and extraoral parameters in the printed denture duplicate by modeling the occlusion rim. Record the occlusion with the condyles in centric relation with the adequate vertical dimension of occlusion, obtained previously by subtracting 2 to 4 mm from the rest vertical dimension. Adjust the occlusal plane and the buccal corridors exposure and model the wax or resin to achieve adequate lip support. Mark on the wax or resin rim of the printed denture duplicate, with a wax knife or a felt pen, the midline, the line of the outermost part of the nasal wings, the lip line at rest, and the lip line in the maximum smile.
This manuscript describes a protocol for making new complete dentures from old ones using a digital scan, simplifying impressions making. This protocol saves impression material and provides the patient with a better experience [5]. A limitation of this technique is the need for an adequate extension of mucosal support in the patient's existing denture, which will be replicated at the printed denture duplicate. The use of a semi-adjustable articulator is recommended since it allows a standard or customized mounting, which provides a more precisely adjusted occlusion [10-12]. A classic confection of the complete prosthesis with processes such as flashing, wax elimination, acrylic packing or processing, deflasking, finishing, and polishing, is described in this protocol. Digital scans can currently be mounted digitally in a virtual articulator by using either a facial scan or a CBCT scan [13,14]. Then, virtual teeth arrangement can be performed digitally, with the help of extraoral photographs or facial scans [4,6,13-14]. At that time, the designed denture can be milled from blocks of acrylic resin (Pink CAD/CAM disk; Polident, Volcja Draga, Slovenia) or pink and white PMMA materials (Polident full denture PMMA disk; Polident, Volcja Draga, Slovenia), thus obviating the need of physical casts and the processing with heat-activated polymerizing resin [15,16]. When using pink and white PMMA disks, a milling strategy is needed. The disk should be placed in such a position that when milling teeth, the disk is at the white portion, and when grinding the basal part of the denture, the disk is at the pink part [15]. However, nowadays, these methodologies are not habitually used because they are not within reach of most dental laboratories since they require a significant economic investment. Nevertheless, CAD/CAM technologies for fabricating complete dentures will become more prevalent in a nearby future [15]. The technique described in the manuscript is currently accessible to any dental laboratory, allowing the incorporation of complete dentures fabrication into a digital flow.

Discussion

This protocol, accessible to the majority of dental laboratories, describes a straightforward protocol for making removable complete dentures with the use of a printed denture duplicate obtained from the digital scan of the patient's old denture, overcoming the difficulty of intraorally scanning mobile tissues.

Summary

This protocol, accessible to the majority of dental laboratories, describes a straightforward protocol for making removable complete dentures with the use of a printed denture duplicate obtained from the digital scan of the patient's old denture, overcoming the difficulty of intraorally scanning mobile tissues.

References
