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Steps in digital denture fabrication

Dhananjay Vasudeva

PG student 2nd year, Dept.of Prosthodontics and Crown & Bridge, Desh Bhagat Dental College and Hospital, Mandi Gobindgarh

Manmeet Gulati

Prof. and Head, Dept.of Prosthodontics and Crown & Bridge, Desh Bhagat Dental College and Hospital, Mandi Gobindgarh

Manmohit Singh Kumar

Professor, Dept.of Prosthodontics and Crown & Bridge, Desh Bhagat Dental College and Hospital, Mandi Gobindgarh

Abstract---Fabricating a complete denture in a conventional manner may be complicated and difficult. The purpose of this presentation is to describe the benefits of a fully digital workflow and fabrication procedure of complete dentures based on digital impressions of edentulous jaws. The digital data for the workflow were acquired using an intraoral scanner and were then used to design the denture base and teeth. The resulting data were exported to a 3D printer or a milling machine for denture fabrication. The high accuracy of digitalized dental fabrication has been proved by several studies compared to conventional methods .CAD/CAM fabrication of complete dentures based on digital impressions of edentulous jaws obtained using an intraoral scanner. By this method the occurrence of human processing errors, inaccuracies, and multiple clinical appointments can be avoided.

Keywords---digital denture, CAD-CAM denture.

Introduction

In the previous time, dentists have used the conventional method for complete denture fabrication, which is complicated, difficult, and time consuming. The conventional method uses functional impression, cast pouring, wax rim fabrication, mounting the models in an articulator, and curing the denture. The conventional process is associated with human processing errors, inaccuracies, and multiple clinical appointments. Recently, computer-aided design and computer-aided manufacturing (CAD/CAM) technology was applied to the

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Corresponding author: Vasudeva, D.

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fabrication of complete dentures. The introduction and evolution of computer-aided technology can overcome the complications related to the conventional method, thereby facilitating the fabrication process. The process of fabricating complete dentures with digital technology involves digitization of clinical information registered from the patient's mouth, digital designing of complete dentures on computer software, and an automatized process of manufacturing. The high accuracy of digitalized dental fabrication has been proved by several studies compared to conventional methods. This paper describes the CAD/CAM fabrication of complete dentures based on digital impressions of edentulous jaws obtained using an intraoral scanner

Conventional dentures

Advantages

- Ability to customize Teeth Arrangements and to confirm preceding steps before the trial placement stage
- Clinically predictable outcomes

Disadvantages

- Minimum 4 to 5 Patient Visits are required and additional Follow up visits
- Lack of Denture base fitting with underlying tissues due to Polymerization Shrinkage
- Inability to easily create an optimal duplicate denture

CAD/ CAM denture

Plenty of researchers tried to constructer dentures or wax patterns with different techniques and methods.

- Williams: introduced a wax pattern made with CNC machien 2004
- Kanazawa ; introduced a trial system for CAD CAM denture construction in 2011

CAD/ CAM denture system

Recently, CAD/CAM technology has become commercially available for fabrication of complete dentures through the introduction of DENTICA™ and AvaDent™ digital dentures. It is a system by which impressions, inter-occlusal records, and tooth selection can be completed in one appointment. The dentures are then fabricated using CAD/CAM technology and placed in the second appointment.

Step by step procedure

Conventionally fabricated complete dentures frequently use a five-step appointment process:

- Making preliminary impressions
- Making final impressions
- Recording jaw relation
- Trial placement of wax denture pattern
- Placement/insertion of complete dentures

Digital denture

Designed to capture the necessary information for the fabrication of complete dentures in one appointment without compromising prosthesis quality. The process consists of:

- Impressions, jaw relation records, occlusal plane, tooth mold and shade selection, and maxillary anterior tooth positioning record.
- Placement of dentures

1st clinical appointment

Construction of patient cast customizing a stock tray making final impression.

Jaw relation record

AMD (Anatomical Measuring Device)

- Adjusted to the desired occlusal vertical dimension
- Determine the correct amount of upper lip support.
- Centric relation is recorded
- The position of the maxillary six anterior teeth.
- The desired medio-lateral orientation of the occlusal plane.

CAD

- laser scans of the impressions
- Laser scanning of the AMD
- Both are processed and connected.
- Denture and teeth are designed (CAD)

CAM

The denture base is milled with recesses that accurately fit each denture tooth teeth are bonded with a proprietary bonding mechanism

2nd clinical appointment

- Denture insertion
Placement and adjustments of CAD/CAM complete dentures are similar to the placement of conventional dentures

Advantages

- The CAD/CAM process offers significant advantages to the dental practitioner and the patient. It is possible to record all the clinical data for complete dentures in one appointment (one to two hours).
- Clinical chair time is reduced considerably
- Set of appropriately accurate complete dentures.
- A repository of digital data remains available that allows for more rapid fabrication of a spare denture, a replacement denture, or even a radiographic or surgical template that aids in the planning and placement of dental implants in the future.
- Because the denture base is fabricated by machining, polymerization shrinkage of the resin is eliminated, and the fit of the denture base is superior to that of conventionally fabricated denture bases.

Disadvantages

- Cost : The initial cost is higher if compared to conventional dentures
- Complexity of procedure : It is only one visit where all procedure has to be fulfilled
- No try in : The dentures will be checked virtually only

Conclusion

It is anticipated that fabrication of complete dentures will be commercially available with CAD/CAM technology. The clinical impression procedures described are very helpful to record the morphology of surfaces of complete denture bases & also identify muscular & phonetic locations for placement of prosthetic teeth.

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