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Copy denture

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وقل رب زدني علما

Dedication

My Father
My Mother soul
My Grandfather
My Uncles
My brothers

They shared all my good & bad moments. They supported me a lot & finally thanks to those who were by my side, to my first hero, my father

Aya

Acknowledgment

First of all, praise is to all mighty ALLAH, for the wisdom he bestowed upon me, the strength, the peace of my mine and good health in every step of my journey. May peace and salutation be given to the prophet Muhammad, the last prophet who is the idol for all of us.

My thanks to Prof. Dr. Raghad Alhashimi, the dean of college of dentistry, university of Baghdad and to Pro. Dr. Ghasan Abdulhamed Altaai, the head of department of prosthodontics.

My gratitude to all the members of the scientific committee of the prosthodontics department, for high ethics and all the help.

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List of Abbreviation

3D	Three Dimension
CAD/CAM	Computer-Aided Design Computer Aided Manufacturing.
CNC	Computerized Numerical Control.
OHIP	Oral Health Impact Profile.
OVD	Occlusal Vertical Dimension.
PMMA	Polymethyl Methacrylate.
STL	Stereolithography.

Introduction

The treatment for patients with complete dentures has challenges to the skills of the dentist, since one concern is the clinical and technical aspect of denture fabrication; the other is the general physical health, local oral factors and psychological well being of the patient. These latter factors can be as important as the clinical and technical treatment aspects in the potential success of treatment. Therefore the need for fabricating copy denture is a must to reduce the challenges mentioned **(Soo and Cheng 2014)**.

Copy denture is not a single technique, but a variety of techniques designed to replicate complete dentures **(Soo and Cheng 2014)**. A range of techniques both clinical and laboratory exist which vary in their ability to "copy" a prosthesis. These techniques allow favourable features from an existing denture to be copied (for example, the shape of the polished surfaces) while also allowing for alterations to less favourable features (for example, worn occlusal surfaces). Therefore, it is important to identify patients who may have difficulty adapting or are unwilling to learn new skills, in these cases, existing dentures are extremely valuable for diagnosis and treatment planning **(Vohra and Habib, 2013)**. Copy dentures enhance neuromuscular adaptation to new dentures, reduce patient-clinician chair side time, reduce laboratory steps, require fewer patient visits, make jaw relation registration simple, provide technical staff with more guidance to tooth position and moulds, allows for copying esthetics and are cost effective **(Vohra and Habiba, 2013), (Özkan et al., 2018), (Ablonski et al., 2018)**.

Moreover, adapting to new dentures can be challenging for patients especially for those with long serving dentures **(Ablonski et al., 2018)**. It has been suggested that older patients may experience difficulties in adapting to new dentures due to a reduced capacity for learning new muscle activity patterns. Since a new prosthesis requires the development of a new learning sequence and the willingness to be persistent, simultaneously, evidence suggests that utilising 'copy' or 'replica' techniques may help older patients adapt more easily to new dentures **(Vohra and Habiba, 2013), (Ablonski et al., 2018)**.

Most existing dentures, whether or not they have been worn successfully, provide extremely valuable information for all stages of treatment. These patients will benefit from treatment that makes minimal change from the old to new dentures, such as the use of the Copy (duplicate) Denture technique because it makes an easier transition to the new prosthesis.

Patient satisfaction with new complete dentures has a strong relationship with the quality of new dentures and also the residual mandibular alveolar ridge, the satisfaction level is higher to the patients with replacement complete dentures fabricated by copy denture technique as compared to replacement complete dentures fabricated by conventional technique **(Syed and Azad, 2009)**.

Aim of the study :

Investigation the copy denture technique and determine the techniques that were used over the years and the development of these techniques according to the advanced technologies.

Chapter One

Review of literature

1.1 Historical background:

The advancement of technology and the need to comfort the patients led to the development of several techniques of copy denture over the years. (**Adam, 1958**) found a means for constructing a duplicate denture. (**Shaw, 1962**) made a technique of copy dentures for immediate denture using acrylic resin teeth. In the 1970s many dentists and technologists developed many techniques of copy dentures **(Wagner, 1970), (Azarmehr, 1974), (Wilson and Anderson, 1975), (Boos and Carpenter, 1976**).

Krug in **1984** described the Ceramic flask technique for duplicating acomplete denture "this technique describes a simple, one-visit, inexpensive procedure with which an existing complete maxillary or mandibular denture,therefore the resulting duplicate denture is not a spare prosthesis for the patient, but serves the dentist as a valuable adjunct in subsequent treatment procedures at chairside and in the laboratory". (**Lindquist et al., 1997)** described Denture duplication technique with alternative materials, using addition silicon instead of condensation-curing silicones or irreversible hydrocolloids materials; the average time required for this duplication technique is approximately 45 minutes "The duplicate denture can now be processed at a convenient time because the impression materials have long-term dimensional stability".

A modification in the above technique was given by **(Nassif J and Jumbelic R., 1984).** The change was in the fabrication of the teeth before going ahead with the flasking procedure. **Soo and Cheng** in **2014** have also discussed a technique wherein they used selective pressure technique and zinc oxide eugenol impression paste to make secondary impressions in clear acrylic copies of existing dentures of the patient. Yet, there are more modern techniques as well which had an impact on the fabrication of the copy denture.

1.2 Definition:

The copy technique (or copy dentures) refers to duplication of an existing denture(s) with or without modification of the existing denture. They are a faster alternative to a remake of complete–complete acrylic dentures. The purpose of the copy technique is to reproduce as closely as possible the polished surface shape of the old dentures in the new dentures **(Özkan et al 2018).**

1.3 Aims of Duplicating Denture Fabrication:

- Obtaining the right maxillomandibular relations by the correction of the occlusion.
- Minimizing adaptation problems by producing a new denture that, as far as possible, resembles the old one (The shape of the base, the form of the palatal vault, the transfer of teeth regarding axial inclination, shape, form and arrangement are all important.)
- Uniting some stages of the production process and fabricating the denture within a few clinical visits **(Özkan et al 2018).**

1.4 indications:

1.4.1 Situations where copy dentures are advisable:

- Correct position of teeth in the neutral zone or correct zone of adaptation and the polished surfaces are satisfactory.
- Loss of retention in otherwise favourable dentures requiring

replacement.

- Wear of the occlusal surfaces.

- Replacement of immediate dentures.
- Spare set of dentures**(Özkan et al 2018)**.

1.4.2 dentures:

Typical dental history that would suggest an indication for copy

- Elderly patients presenting with satisfactory complete dentures.
- Worn occlusal surfaces, indicating long-term acceptability.
- Deterioration of dentures base materials.
- Patient requests a "spare set" of dentures.
- Patients with a history of denture problems make controlled modifications to copy previously most successful dentures **(Özkan et al 2018).**

1.5 Contraindication:

Any serious defects of the denture prosthesis.. So careful evaluation of hard and soft tissues and the prosthesis is done before duplication **(Özkan et al 2018).**

1.6 Advantages and disadvantages:

Copy denture technique has benefits and problems for both dentist and technician as the following:

Table (1.1): Advantages and disadvantages **(Özkan et al 2018)**.

Advantages	Disadvantages
No alteration or mutilation of existing dentures.	The copy technique itself (some dentists have never been taught this technique as undergraduates)
No period for patients without their dentures.	Attempting the impossible, by using the copy denture technique in a patient for whom it is clearly not indicated.
Three clinical stages.	Some flasks are very expensive.
Simple duplication procedure, less time than conventional impressions.	Hard to find a laboratory that is comfortable with the technique and the cost charged by the laboratory.
No individual trays or record blocks are required.	Not all patients are suitable for this denture construction.
Infrequent re-articulation of teeth for try-in necessary.	Inadequate information on the prescription.
Elimination of repolishing after border adjustments.	Crucial assessment of existing dentures.

No thickening of palate in the finished dentures, as occurs in some reline procedures. Only two laboratory stages.	

1.7 Materials used in copy denture fabrication

Several materials used during the fabrication, and these materials will be discussed as the following:

1.7.1 Mould Materials

Different materials were used for the preparation of mould for duplicating dentures. In the early years, plaster and stone were used as a mould material, however the conventional flasking technique of ordinary denture was used. Later; other methods were used with cold cure acrylic resin in flexible hydrocolloid moulds. **(Wagner A, 1970)** used both reversible and irreversible hydrocolloids for the preparation of the mould. Reversible and irreversible hydrocolloid were used such as shellac base; alginate by **(Wilson LG, Anderson GA, 1975), (Boos RH and Carpenter HO, 1976)**, **(Nassif J and Jumbelic R, 1984)**. Also, Silicon was used by **(Manoli and Griffin 1969)**.

1.7.2 Containers of the mould materials

Various containers were used; ordinary flasks when heat cure acrylic was used, cup flask or perforated tray for holding alginate or flexible mould material, interlocking bowels especially designed for duplication were also used, or special container which has tapered sides outwards from the base to the top with opened base and top to facilitate easy removal of hydrocolloid material, modified denture

flask,disposable plastic tray were also used.

1.7.3 Denture base material

Heat cure acrylic denture base was the material of choice for denture base of duplicate denture, Later on, evolution of flexible mould materials lead to the use of cold cure acrylic denture base, Pourable resin which is a type of cold cure resin was also used with hydrocolloid mould material, but with high residual monomer content with inferior mechanical properties and possibility of distortion, in spite of short time of denture removal of denture from the flask, with less effort and less finishing.

1.8 Techniques for fabrication the copy denture

1.8.1 Techniques during the 20s century:

There are numerous techniques or methods that are used in fabrication of copy denture, and the majority of these techniques are similar except in the use of mould containers and materials. There were two main techniques that were used during the 20th century which are**:** **auto-polymerization acrylic resin** and **heat cure acrylic resin**.

1.8.1.1 Modified flask method using silicone impression material

Manoli and Griffin in **1969** explained a modified flask method using silicone impression material for denture duplication. Silicone rubber was painted on the tissue surface of the denture and reinforced with dental stone. The denture with the silicone rubber lining and stone cast was invested in the lower half of a flask. A uniform layer of silicone rubber approximately 3-4mm thick was applied to the polished surfaces of the denture and to the teeth. The upper half of the flask was placed in position on the lower half and the flask was filled with plaster. After half an hour, the denture was removed from the flask and the teeth of the same shade and mold were placed. The mold was filled with a “pour-in”

type of autopolymerizing resin and the flask was closed and held under pressure until the resin set. The duplicate denture was removed, trimmed and polished.

1.8.1.2 Pour resin flask method

Boos and Carpenter in **1974** designed a special flask to be used with reversible hydrocolloid for making the mold. Tooth shade-autopolymerizing resin was painted into the tooth indentations with a brush and pour type of autopolymerizing resin was used to form the duplicate denture in the mold. The disadvantages involved were the requirement of a special flask and the equipment and formation of voids in the denture.

1.8.1.3 Cup flask method

Wagner in **1970** described a method of duplicating complete dentures by using cold-curing acrylic resin tray material in hydrocolloid molds and a cup as a flask. Which then **(Singer, 1975)** has modified the method by introducing a particularly convenient zipper technique that uses dental floss to section an alginate irreversible hydrocolloid mold poured in a 12-ounce ceramic cup. Pour type of resin and tooth colored autopolymerizing resins were used to fabricate the duplicate dentures.

1.8.1.4 Modified flask method

Brewer and Morrow in **1975** in their technique modified the denture flask by removing a rectangular section from the upper part to provide access for the sprues. Sprues made of utility wax with a diameter of 15 mm were attached to the lingual surface of the heels of mandibular dentures and to the palatal surface of the tuberosity region of maxillary dentures. After mixing and placing the alginate into the fitting surface of the denture and setting of the alginate. The upper part of the flask was placed in position, and the wax sprues were adapted to seal the rectangular opening. Alginate was mixed and poured into the flask.

slowly. After the alginate had set, the flask was opened, and the denture and sprues were removed. Autopolymerizing tooth-colored resin of the proper shade was added to the teeth indentations by the sprinkle-on or paint-on method. Pour-type resin was mixed and poured into one sprue until the resin filled the mold and extruded through the other sprue. The denture was cured at 20 psi for 30 minutes **(Brewer et al., 1980)**. **(Nassif J and Jumbelic R., 1984)** have modified the above technique, the change was in the fabrication of the teeth before going ahead with the flasking procedure.

1.8.1.5 The soap container method

In this method of denture duplication the original denture borders are modified with green stick compound. It is then submerged in alginate in the soap container, denture invested in the lower part of the container. A second pour of alginate to complete the investment. The soap container should be pressed from sides to avoid its distortion. Two halves are then opened and the sprue holes are cut with a sharp knife. The halves are then re-assembled and can be held together with elastic bands. Self-cure resin is being poured down one of the holes with light vibrations, while air escapes from the other. Place the container with the sprue holes upright in a pressure pot that contains water at 110 F and process the resin under 15-30 psi pressure for 30 minutes. The waxed or auto-polymerized duplicate dentures are then recovered from the moulds. The wax teeth on one of the dentures are then replaced with the identical mould of the resin teeth**. (Nassif and Jumbelic, 1984)**.

1.8.1.6 Two tray method.

Cooper and Watkinson in **1976** introduced a technique in which they used two impression trays along with the impression material and the sprued

denture to be duplicated to create a mold. This technique was later modified by **Lindquist** in **1997** where he used a layer of putty consistency polyvinyl siloxane impression material and also lined the tissue surface of the denture with light bodied polyvinyl siloxane impression material to create a mold space **(Lindquist et al., 1997)**.

1.8.1.7 Flask method

Azarmehr P & Azarmehr HY in **1970** used two identical flasks with interchangeable sections for denture duplication. By using two identical flasks: **A**, upper section of original flask; **B**, lower section of original flask: **a**, upper section of duplicating flask; and **b**, lower section of duplicating Flask then the identical flasks were interchangeable.

1.8.1.8 A technique by Izharul Haque Ansari

Izharul Haque Ansari in **1994** used a technique where it required no special equipment or material for duplicating the old dentures to make replica dentures. Used plaster as investing material lined by putty soft material with wire loops inserted as retention for wax denture as they mounted on articulators and teeth replaced with acrylic resin teeth, tried in mouth and processed in the usual way.

1.8.1.9 A technique by Lindquist TJ and Ettinger RL

Lindquist TJ and Ettinger RL in **1999** used additional silicon instead of condensation silicon because additional silicon is more accurate, dimensionally stable, can be used several times without loss of accuracy and can capture the necessary details even with over denture abutments, finally it is easy to use and requires no special equipment.

1.8.2 Modern Techniques

Some of the demand for sophisticated treatment has come from media coverage, especially the electronic media. Rapidly advancing IT developments will supersede current technologies, but all must be developed with a conscious demand for evidence-based care

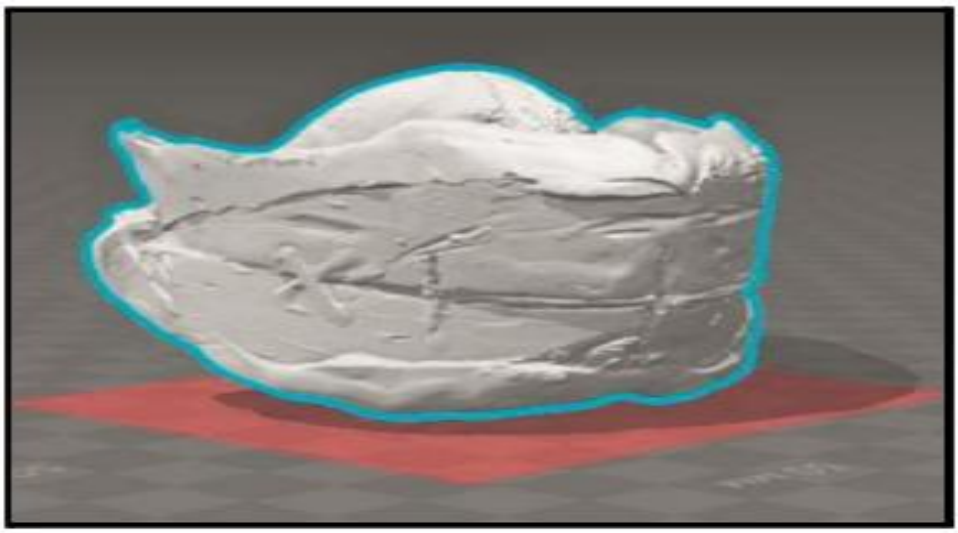
1.8.2.1 Duplication procedure for complete denture by CAD/CAM

Computer-aided design (CAD) computer aided manufacturing (CAM) technologies have been applied in the field of prosthodontic since the 1980 **(Inokoshi et al., 2012).**

Kawahata et al., in **1997** in their study, used the method where shapes of the complete dentures of an edentulous patient were measured using non-contact type shape measurement system and morphological data at the interval of 0.25mm were obtained in the X-axis and Y-axis directions, measurements were performed from the occlusal surface and mucosal surface sides based on the 3-dimensional morphological data, cutter patches for cutting were generated, the 3 steps method consisting of rough cutting, finish cutting and partial finish cutting was used for duplicating the dentures, the modeling wax was cut using a computerized numerical control (CNC) processor and ball-end mills with diameter of 6mm and 1mm.Although further improvements are needed in the measurements and cutting in acute slope areas, the duplication of complete denture appears to be possible using CAD-CAM system.

CAD/CAM has gained in importance to meet various demands for the different dental disciplines **(Wesemann et al., 2017)**. It was also estimated that direct digitalization with intraoral scanners is demonstrated to be a suitable alternative, although it requires more chairside time and does not result in a

higher level of accuracy than an indirect workflow with desktop scanners **(Wesemann et al., 2017)**. In the CAD/CAM technique the maxillary and definitive mandibular impressions and the occlusal rims were prepared for scanning with scan spray in the laboratory, then scanning was performed with an optical 3D scanner. The files from the laser-scanned maxillary and definitive mandibular impressions and connected occlusal rims will be translated into stereolithography (STL) files then the denture will be virtually designed using 3D viewing software as shown in figures below **(Janeva et al., 2017)**.



(a)

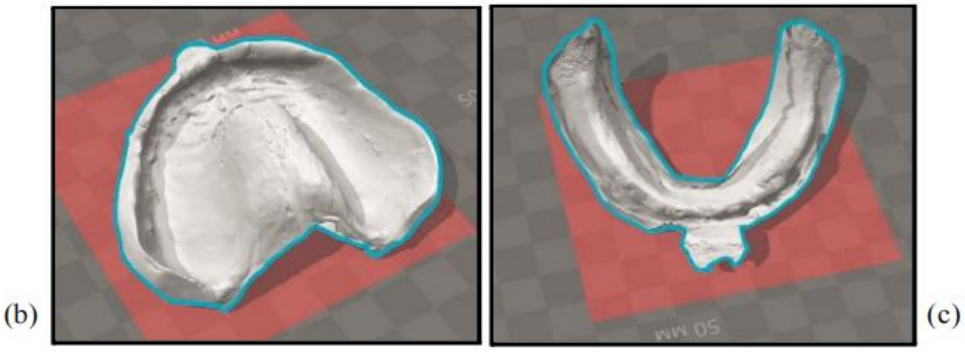


Figure (1.1): (a, b and c) represent screenshots of STL files; a. Occlusal rims; b: Maxillary impression; c: Mandibular impression **(Janeva et al., 2017).**

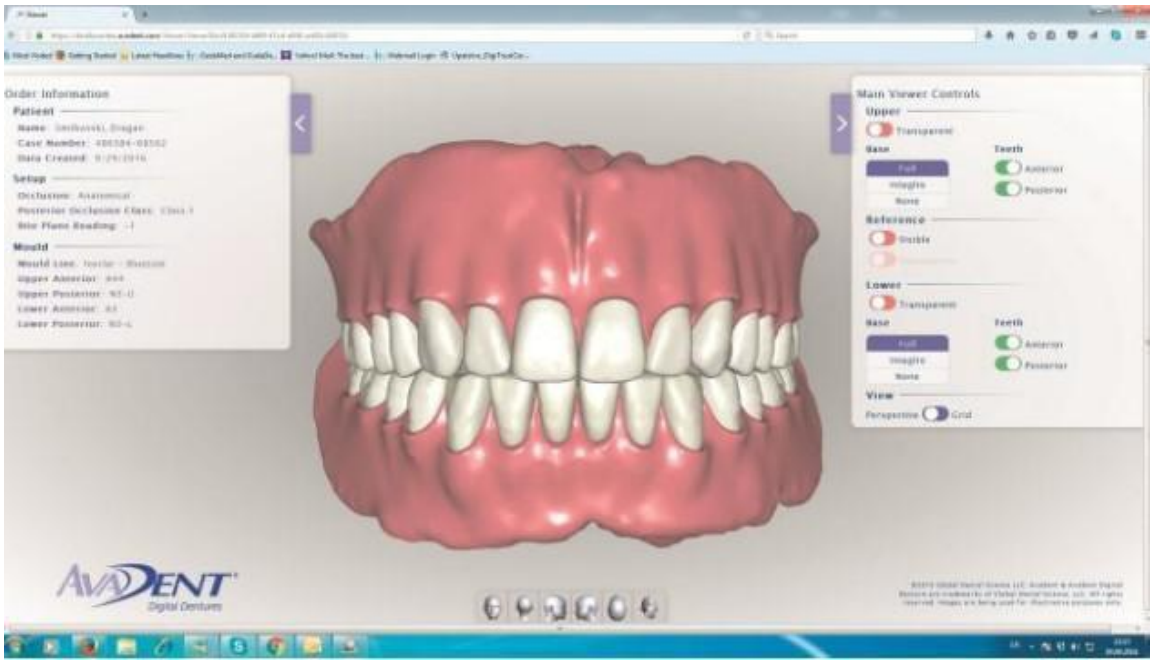


Figure (1.2): Preview of virtually designed dentures **(Janeva et al., 2017)**.

1.8.2.2 Sectional mold technique

Mohamed TJ and Faraj SA in **2001** used a sectional mold and dental stone to invest the denture, and heat-activated acrylic resin is used to duplicate both the denture teeth and base. This technique allows the fabrication of a duplicate denture by using the superior properties of heat activated acrylic resin. The only disadvantage of this technique is

the risk of fracture of the master cast when undercuts are present. Given this risk, the technique is preferable for situations in which there are no undercuts.

1.8.2.3 A Duplication Method Using "Appropriatech"

Owen in **2006** used Appropriatech (appropriate technology) saving cost and time by using box tray and alginate to take impression of the polished

surface, putty material for the fitted surface, paper clips as retention mean for plaster support, wax sprue added, and a mix of modeling wax and 10 % sticky wax are mixed and poured into the mould, The 2 halves of mould are separated to reveal a wax replica of the denture, every other tooth is replaced to help maintain arch form and tooth position, final impression of the new denture is made with ZnOx inside the trial base. The technique is cost effective with only 3 visits, but the final impression with wax intermediate dentures of weak point as a high percent of distortion can occur while taking impression and vertical dimension verification.

1.8.2.4 3D printed copy denture

Andrew et al., **in 2017** stated that "3D printed copy denture templates reproduced the original polished surfaces and occlusion with greater precision than either of the conventional techniques" based on the study conducted to investigate and compare the accuracy of traditional copy denture techniques with the relatively new technology of scanning and 3D printing a copy denture template and concluded that 3D printed copy denture templates reproduced the original denture with significantly greater trueness and precision, regardless of which error metric was used. Andrew made six copies of a single upper complete denture that were reproduced by the three methods (two conventional and one digital) under investigation. The first method used a traditional 'copy denture technique' including the use of impression

trays to provide support for the material. The second method used unsupported impression material. In both conventional methods, impressions of the polished surface of the denture were recorded using a laboratory silicone putty which is condensation-cured. The maximum error was significantly lower with 3D printing, than with the traditional copy technique as shown in **figure(1.3)**.

Using the typical colour maps of the errors produced by each method of denture template production are shown **in figures(1.4, 1.5, 1.6)**. visual comparisons of the colour maps showed distinctive distributions of error within the different groups. Both CT and CNT templates showed errors on polished surfaces, most noticeably in the palate. Yet, 3D printed copy denture templates reproduced the original polished surfaces and occlusion with greater precision than either of the conventional techniques

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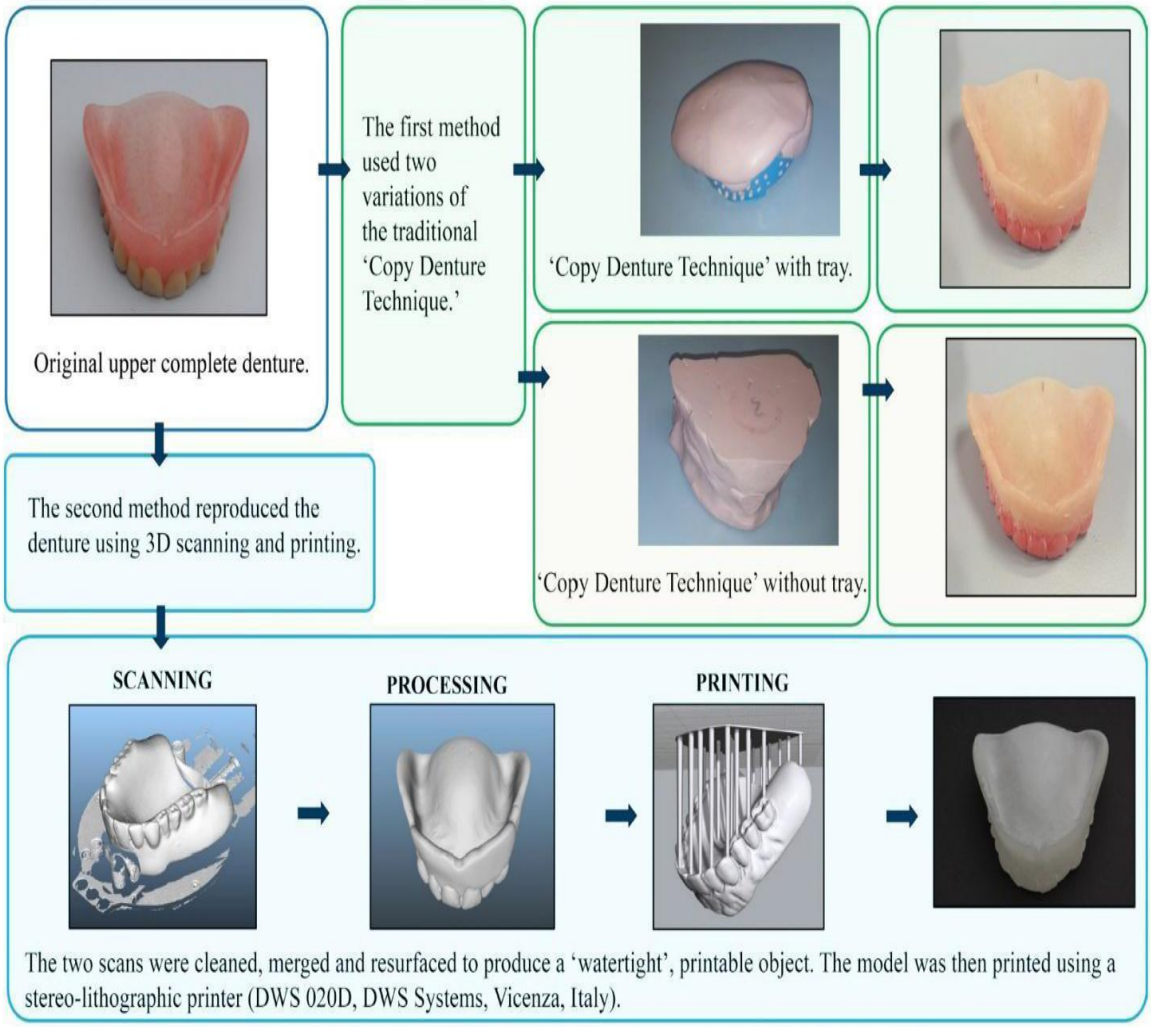


Figure (1.3): overview of the methods for creating traditional and 3D printed, copy denture templates **(Andrew et al., 2017)**.

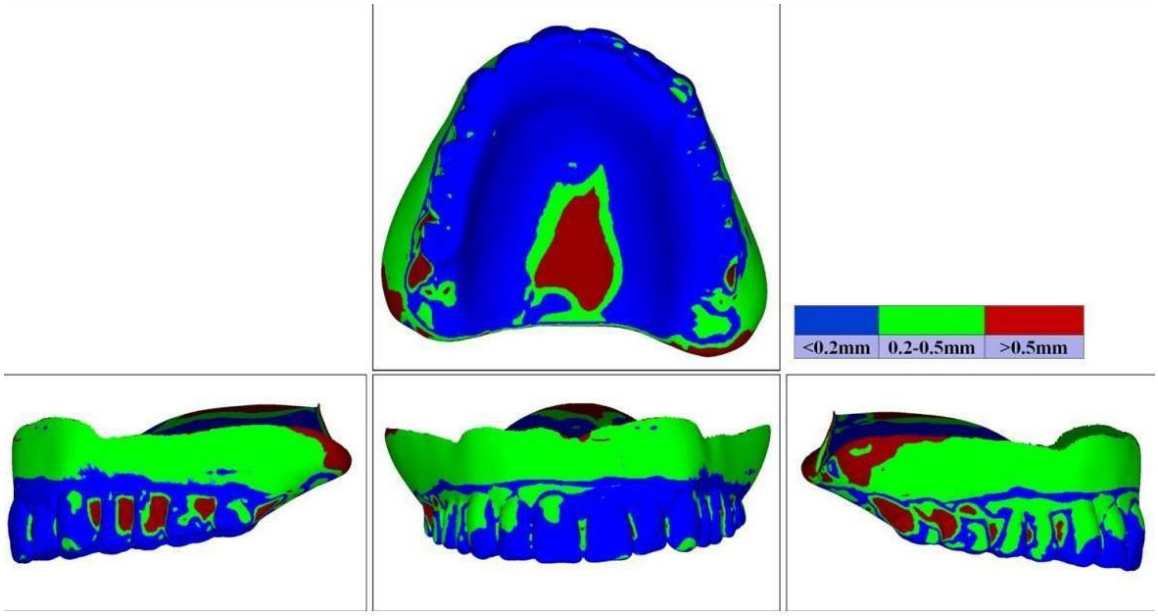


Figure (1.4): Typical reproduction errors for conventional copy denture technique without a supporting impression tray **(Andrew et al., 2017).**

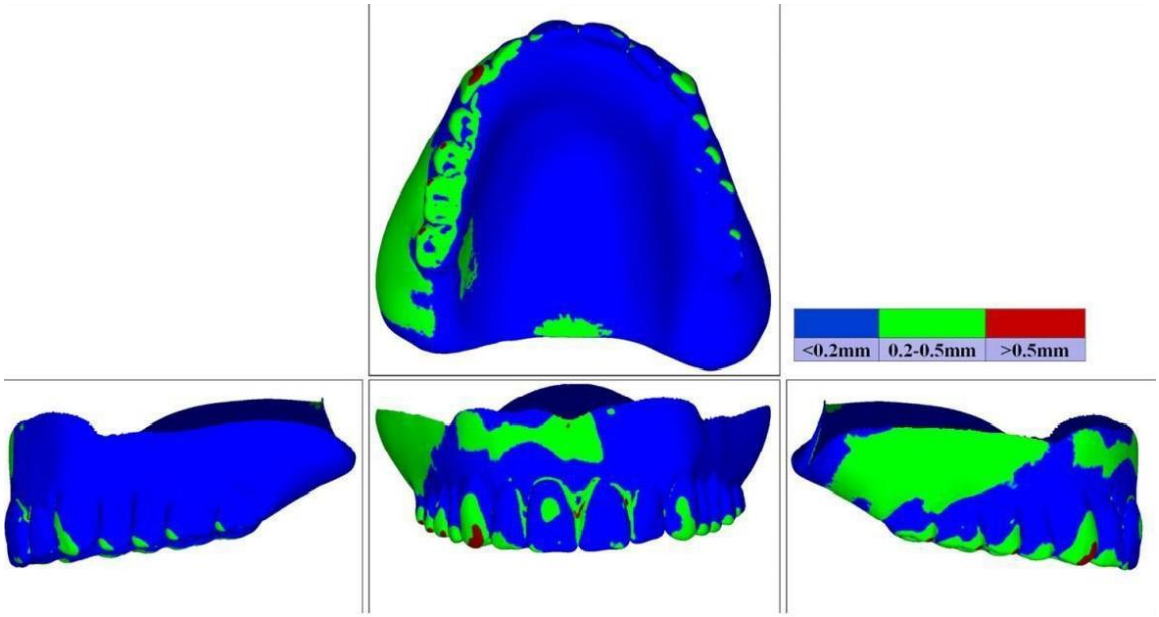


Figure (1.5): Typical reproduction errors for conventional copy denture technique with a supporting impression tray **(Andrew et al., 2017).**

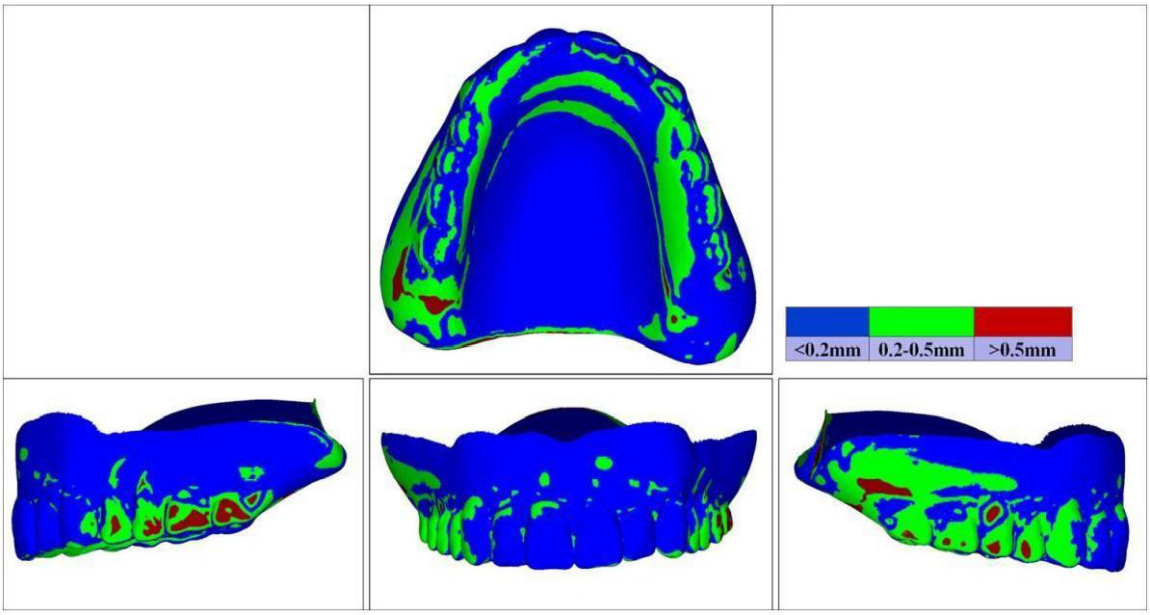


Figure (1.6): Typical reproduction errors for 3D printed copy templates.
(Andrew et al., 2017)

The use of a general-purpose handheld optical scanner and a 3D printer in duplicating complete dentures has been proven to be effective **(Kurahashi et al 2017)**. In this research, they introduced a clinical procedure for fabricating duplicate complete dentures using a general-purpose handheld optical scanner and a 3-dimensional (3D) printer in the dental clinic setting. Before the image capturing, the denture was coated with siccarol powder to facilitate the scanning, then A handheld optical scanner was equipped at the focal point of the denture to digitize the surface topography of the denture. Then after scanning, the 3D data was integrated on the computer and the 3D denture form was constructed using the specific software. This procedure has the advantages of wasting less material, employing less human power, decreasing treatment time at the chair side, lowering the rates of contamination, and being applicable readily fabricated at the time of the treatment visit.

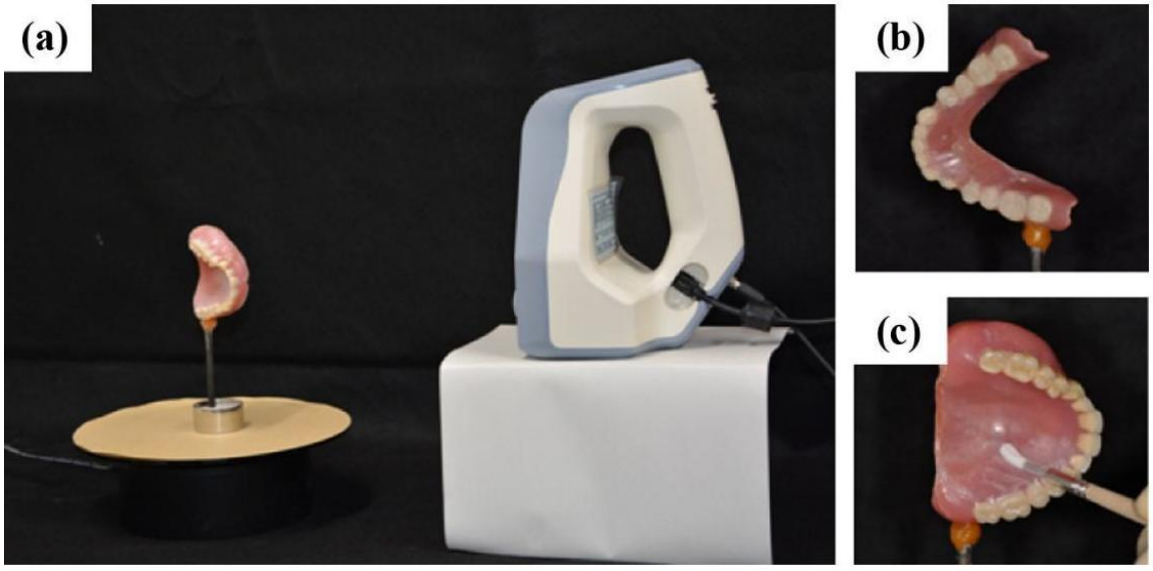


Figure (1.7): (a) Layout of denture and scanning devices for digitalization (white arrow: rotary table, and black arrow: handheld optical scanner), (b) setting of lower denture, (c) setting of upper denture powdered with siccarol **(Kurahashi et al 2017)**.

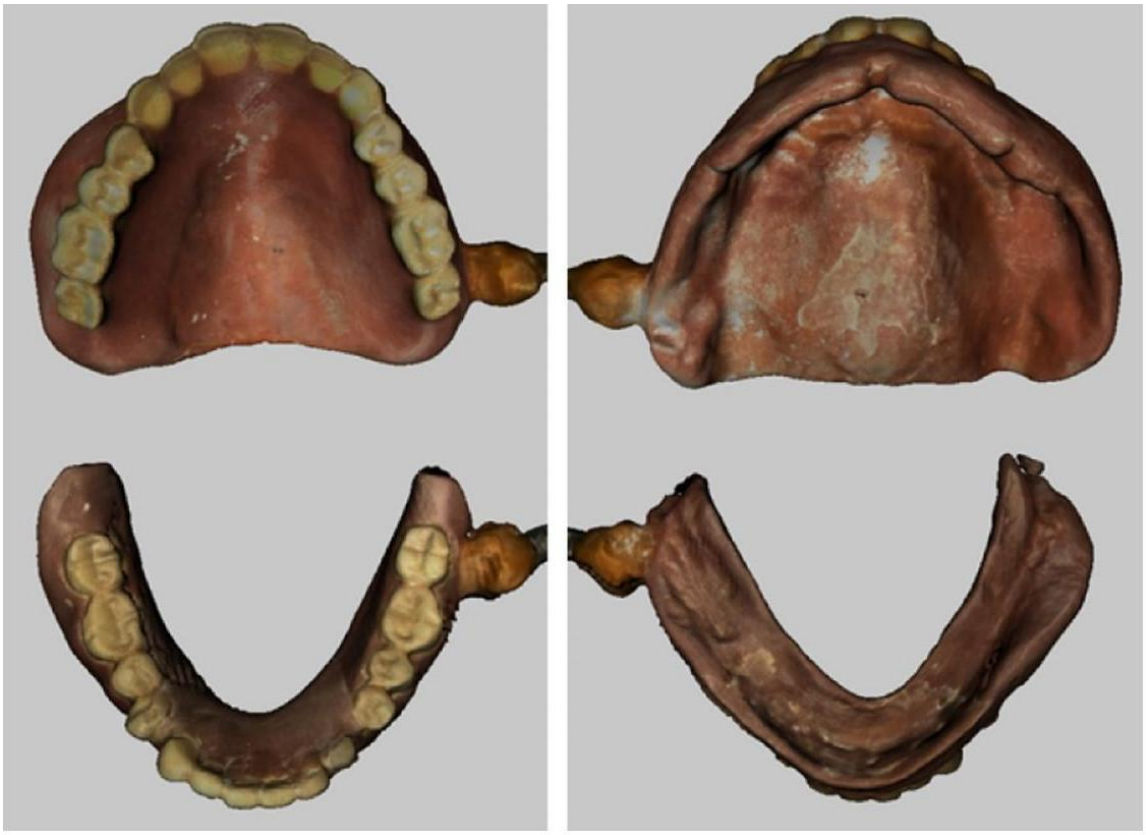


Figure (1.8): 3D images of the upper and lower complete dentures **(Kurahashi et al 2017).**

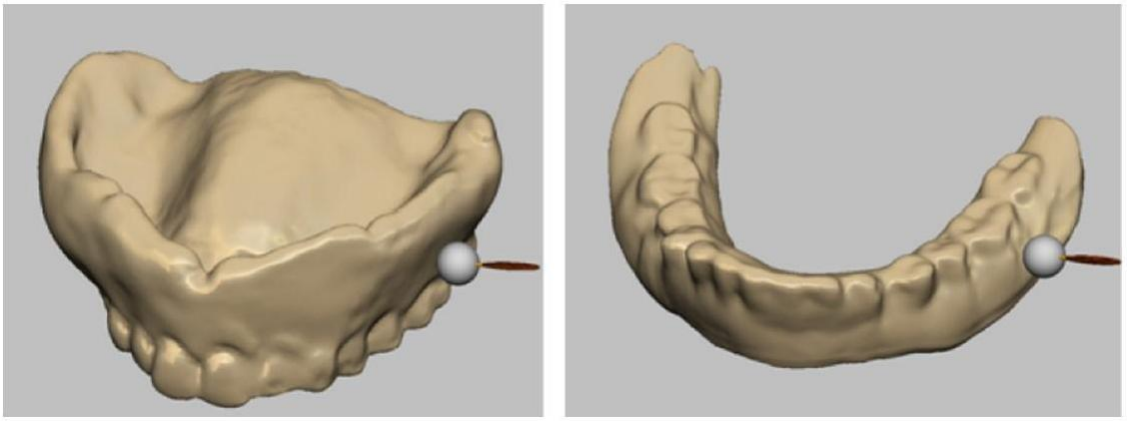


Figure (1.9): Computer-aided modification of the denture form on the monitor **(Kurahashi et al 2017).**

The difference from the conventional methods here is that the conventional fabrication procedure of duplicating a denture has a series of technical steps: impression, moldmade, injection of denture material, and re-contouring and polishing according to a lost wax technique. The new method consists of just two steps: digital impression of the existing denture by using a handheld optical scanner, and fabrication of duplicating PLA denture using a 3D printer.

Takeda in **2019** stated that Digitally duplicated dentures were predictably and efficiently produced by using the replication technique with 3D scanning and printing and the application of this technique may reduce both clinical and laboratory time based on an accurate diagnosis of the problem and an understanding of the advantages and limitations of this technique. During the study, Takeda used Milled monolithic prepolymerized PMMA acrylic resin possesses higher mechanical strength that is not subject to polymerization shrinkage which would negatively affect denture base adaptation and accurate tooth position and another advantage of this material was to have fewer porosities and surface roughness, these improvements translate clinically to stronger dentures, with reduced potential to harbor microorganisms and the resulting oral infections **(Srinivasan et al., 2018), (Steinmassl et al., 2018), (Takeda et al., 2020)**, . It was estimated as well that digital

fabrication has advantages inherent to its digital nature, including efficiency, decreased dimensional inaccuracy, and an STL file that can be modified to alter the denture and used for future treatment. However, the disadvantage of this technique is that it's costy.

1.9 Comparison of Patients Satisfaction with copy denture

technique versus the conventional technique Many people requesting new complete dentures will have worn dentures (often the same set) successfully for many years.' Patients generally expect new dentures to fit, function and look better than their existing dentures. When replacement dentures become necessary, it is helpful if the new prostheses require as little adaptation as possible to the existing skills. This is generally considered to be particularly important for the older patients in whom not only many skills have been developed over a long period, but also the ability to relearn may be diminished **(Syed and Azad, 2009)**. When this study was conducted, it was obvious that the patients satisfaction level is higher with the replacement complete dentures fabricated by copy denture technique as compared to replacement complete dentures fabricated by conventional technique that because copy denture technique presents savings in clinical time, offsetting an increase in material costs, and no penalty in laboratory expenses. Copy denture technique does provide a reduction in discomfort during treatment, and during adaptation to the completed appliances. According to oral health impact, there was little difference in the outcomes of new dentures made by either the copying or conventional techniques on the OHIP based on a study by **(Scott et al., 2006)**. However, in the copy denture group, there was a significant improvement of the OHIP score in relation to embarrassment.

Current dentures:

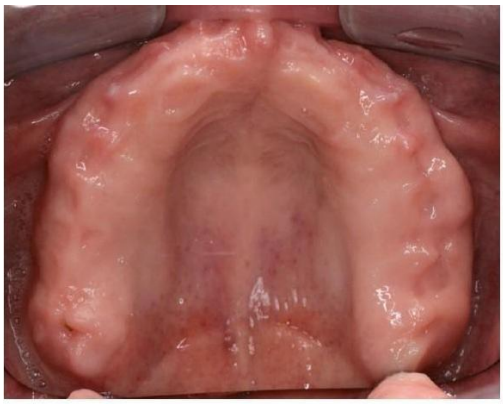
The upper and lower dentures were stable, retentive and well-supported. With both dentures in situ the appearance, centre line and occlusal vertical dimension (OVD) were acceptable as shown in **figure (1.11).** The occlusal plane and incisal level were satisfactory. There was a partial fracture in the midline of the upper denture palatally as shown in **figure (1.12).**

Diagnosis:

The following diagnoses were made:

1- Fractured upper denture and stained lower denture.

2- Poor occlusal scheme not ideal for removable complete prostheses.



a

b

Figure(1.10): (a and b)-represent the upper and lower arches U-shaped with well-formed minimally resorbed ridges showing signs of scalloping where the natural teeth were present. The ridges were firm and the mucosa healthy (c)– represent edentulous ridges at approximate final vertical opening **(Soo and Cheng, 2014).**

(1.11)

(1.12)

Figure (1.11 and 1.12): Current dentures in ICP and Current upper denture showing fracture palatal to upper centrals respectively **(Soo and Cheng, 2014).**

C. Treatment plan:

The treatment plan is outlined below:
1. Repair existing upper denture to be kept as a spare.
2. Construct new upper and lower dentures using copy technique to replicate tooth position and polished surfaces, but allow for minor improvements to mould, shade and arrangement.
3. Take wash impressions to improve accuracy of fit surface with ZnOE using open mouth technique. 4. Ensure balanced occlusion and articulation at the same OVD.

D. Treatment:

- Make clear acrylic copies of existing dentures in laboratory silicone. Heavy bodied silicone is rigid enough to be used without additional support as shown **in figure (1.13).** However, if extra rigidity is required then two large stock trays for each denture can be used to contain and support the impression material.

- Take wash impression, after reduction of any undercuts, with ZnOE using open mouth technique as shown in **figures (1.14 and 1.15).** The acrylic copies are effectively used as close-fitting special trays. They must have the undercuts removed prior to the wash. A fluid wash impression material is used to ensure a thin impression which will not significantly increase the OVD and also capture the denture bearing area accurately. Pressure relief holes in the palatal vault will aid escape of material, reduce pressure build up and ensure a thin impression. An open mouth technique is clinically easier to perform than a closed mouth technique the advantage of which it is thought will minimise changes in the OVD.

- Take jaw registration as shown in figure (1.16) at the same visit as step two. Maintain the same OVD. Silicone jaw registration material to be used. The acrylic copies serve a double purpose as the registration block as well as special tray. If the OVD has increased then it will have to be reduced with an acrylic bur and balanced occlusal contact developed. The choice of jaw registration material is up to the clinician.

- Facebow record and mounting on semi-adjustable articulator in order to make sure that jaw registration material will allow separation of the dentures. Silicone will allow this to be done cleanly and easily.

- Tooth-try in wax to verify tooth position and OVD. Tooth mould and shade information can be taken from the existing dentures, however, the patient may have his preferences accordingly to take into consideration.

- Finish in pink veined high impact acrylic and delivery of dentures.

Figure (1.13) : clear acrylic copies were made for both upper and lower jaw **(Soo and Cheng, 2014).**

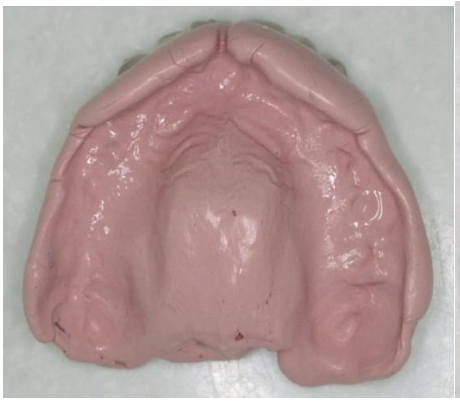


Figure (1.14): ZnOE wash in upper jaw

Figure (1.15):ZnOE wash in lower jaw

(Soo and Cheng, 2014).

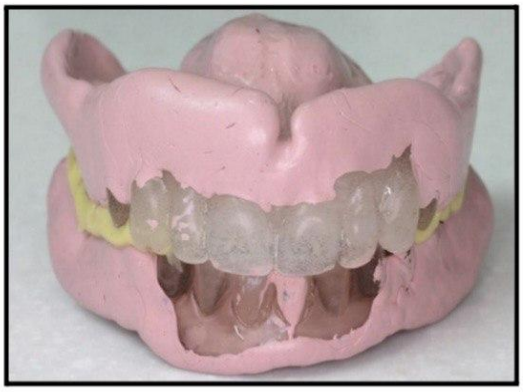


Figure (1.16): Jaw registration with silicone material to maintain the OVD **(Soo and Cheng, 2014)**.

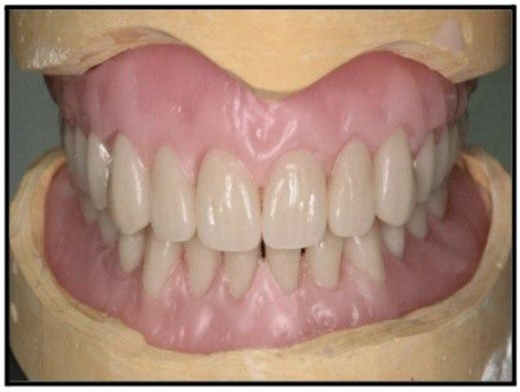


Figure (1.17): Tooth try-in on articulator after taking the facebow record and mounting on semi-adjustable articulator **(Soo and Cheng, 2014)**.

Figure (1.18): Finish in pink veined high impact acrylic in situ **(Soo and Cheng, 2014)**.

Figure (1.19): Final Insertion **(Soo and Cheng, 2014)**.

Chapter Two
Discussion

- Many techniques have been reviewed and found for fabrication of the copy denture over the years. There were different materials used while the fabrication, specially the materials used in the mould preparation, containers of the mould and denture base preparation.

- While selecting one of the methods or techniques used to duplicate a denture, it is important to consider the intended use of the copy denture, the degree of accuracy required, and the materials and time available to the clinician.

- Further investigation is required into understanding the distribution of errors produced from the rapid prototyping process and how these errors will affect clinical management of a patient.

- Further investigation is required to realize the digital use in copy denture more and find if there will be any error or advancement to make.

- There are huge advantages of the digital use in copy denture fabrication, which include wasting less material, employing less human power, decreasing treatment time at the chair side, lowering the rates of contamination, and being readily fabricated at the time of the treatment visit.

- This technology eliminates the need to take physical impressions for copy dentures. As the price and convenience of accurate chairside scanners reduces, it is anticipated the technique will slowly infiltrate primary care dental practices.

- Any serious defects of the denture prosthesis. So careful evaluation of hard and soft tissues and the prosthesis is done before duplication.

- Duplicate dentures are greatly appreciated by patients who fear the embarrassment of being without their denture**.**

References

(A)

Adam CE. (1958) Technique for duplicating an acrylic resin denture. J Prosthet Dent; 8: 406-410.

Ansari IH. (1994) Duplicating an existing complete denture to make a replica. J Prosthet Dent; 72(4): 445-7. **Anderson JN, Storer R.** (1981) Immediate and replacement denture. 3rd ed. Malden (MA): Blackwell Science; p. 218-24.

Azarmehr P, Azarmehr HH. (1974) Technique for duplicating a denture. J Prosthet Dent; 31: 329-334.

(B)

Boos RH, Carpenter HO. (1976) Technique for duplicating a denture. J Prosthet Dent; 31: 329-34.

Brewer, A.A., and Morrow, R M. (1980) Overdentures, ed. 2, St. Louis, The C. V. Mosby Co; 209-213.

(C)

Cooper JS, Watkinson AC. (1976) Duplication of full dentures. Br Dent J; 141: 344-348.

(D)

Davda K, Osnes C, Dillon S, Wu J, Hyde P, Keeling A. (2017) An Investigation into the Trueness and Precision of Copy Denture Templates Produced by Rapid Prototyping and Conventional Means. Eur J Prosthodont Restor Dent; 25(4):186-192.

(I)

Inokoshi. M, Kanazowa. M, Minakuchj. S. (2012) Evaluation of complete denture trial method applying rapid prototyping, dental material journal; 31 (1); 40-46.

(J)

Janeva N, Kovacevska G, Janev E. (2017) Complete Dentures Fabricated with CAD/CAM Technology and a Traditional Clinical Recording Method. Open Access Maced J Med Sci; (6):785-789.

(K)

Krug RS. (1984) Ceramic flask technique for duplication a complete denture. J Prosthet Dent; 52(6):896-9.

Kurahashi K, Matsuda T, Goto T, Ishida Y, Ito T, Ichikawa T. (2017) Duplication of complete dentures using general-purpose handheld optical scanner and 3-dimensional printer: Introduction and clinical considerations. J Prosthodont Res; (1):81-86.

(L)

Lindquist TJ, Narhi TO, Ettinger RL. (1997) Denture duplication technique with alternative materials. J Prosthet Dent; 77(1):97-8.

Lindquist TJ, Ettinger RL. (1999) Patient management and decision making in complete denture fabrication using a duplicate denture procedure: a clinical report. J Prosthet Dent; 82(5):499-503.

(M)

Manoli SG, Griffin TP. (1969) Duplicate denture technique. J Prosthet Dent, (1): 104-7.

Mohamed TJ, Faraj SA. (2001) Duplication of complete dentures using a sectional mold technique. J Prosthet Dent; 85(1):12-4.

(N)

Nassif J, Jumbelic R. (1984) Duplicating maxillary complete dentures. J Prosthet Dent; 52 (5): 755-9.

(O)

Owen PC. (2006) Appropriatech: prosthodontics for the many, not just for the few. Int J Prosthodont; 17(3):261–2.

Özkan Y.K., Aslan Y.U., Kazazoğlu E. (2018) Duplicate (Copy) Dentures. In: Özkan Y. (eds) Complete Denture Prosthodontics.

(P)

Peter H. (2008) Master Dentistry E-Book: Volume 2: Restorative Dentistry, Paediatric Dentistry and Orthodontics. Elsevier Health Sciences; (4): 118-120.

(S)

Shaw DR. (1962) Duplicate immediate dentures. J Prosthet Dent; 12: 47-57. 5.

Scott BJ, Forgie AH, Davis DM. (2006) A study to compare the oral health impact profile and satisfaction before and after having replacement complete dentures constructed by either the copy or the conventional technique. Gerodontology; 23(2):79-86.

Singer IL. (1975) The "zipper" technique for duplicating dentures; final impressions, replica dentures, and a complete denture splint. J Prosthet. Dent; 33: 582-590.

Soo S, Cheng AC. (2014) Complete denture copy technique-A practical application. Singapore Dent J; 35, 65-70.

Srinivasan M, Gjengedal H, Cattani-Lorente M, Moussa M, Durual S, Schimmel M, Müller F. (2018) CAD/CAM milled complete removable dental prostheses: An in vitro evaluation of biocompatibility, mechanical properties, and surface roughness. Dent Mater J; 37(4):526-533**.**

Steinmassl O, Dumfahrt H, Grunert I, Sterinmassl PA. (2018) Influence of CAD/CAM fabrication on denture surface properties. J Oral Rehabil; 45(5):406-413.

Syed Rashid Habib ,Azad Ali Azad. (2009) Comparison of patients satisfaction with replacement complete dentures fabricated by copy denture technique versus conventional technique, J. Pak. Dent. Assoc; (1): 9-13.

(T)

Takeda Y, Lau J, Nouh H, Hirayama H. (2020) A 3D printing replication technique for fabricating digital dentures. J Prosthet Dent; 124(3):251-256.

(V)

Vohra FA, Habib SR. (2013) Copy denture, Existing dentures Replacing Techique Geriatric patiant. J Pak Dent Assoc;22, 265-270.

(W)

Wagner A. (1970) Making duplicate dentures for use as final impression trays. J Prosthet Dent; 24(1):111-3.

Wesemann C, Muallah J, Mah J, Bumann A. (2017) Accuracy and efficiency of full-arch digitalization and 3D printing: A comparison between desktop model scanners, an intraoral scanner, a CBCT model scan, and stereolithographic 3D printing. Quintessence Int; 48(1):41-50.

Wilson LG, Anderson GA. (1975) A denture tray technique for remake dentures. J Prosthet Dent; 34(1):81-5.

(Y)

Yacob, N., Abdul Rahim, K., Mohd Isa, M. N., & Abdul Fatah, F. (2019) The Satisfaction of Copy Denture Box for Replica Denture Procedures. Malaysian Journal of Science Health &Amp; Technology, 3(1)